

# **Adaptation to climate change: assessment of the national process and recommendations**

**Report to the Prime Minister and Parliament**

# Foreword by the President of COP21

The opening for signature of the Paris Agreement by 175 Heads of State and Government in New York on 22 April 2016 marked an historical moment in the transformation process that began in 2015. France must now build on the exceptional impetus generated by COP21 and set an example with its climate change adaptation and mitigation policies.

The Environment Conference held on 25 and 26 April 2016 demonstrated the commitment of all French stakeholders to this promising process. It confirmed the need for a new national climate change adaptation plan and indeed acted as a starting point for the new plan.

So, let us work together to speed up the green transition and bring the world with us!

**Ségolène Royal**  
President of the 21<sup>st</sup> Conference of the Parties to the United Nations Framework  
Convention on Climate Change,  
Minister of Environment, Energy and the Sea,  
in charge of International Relations on Climate

# A word from the President of the National Observatory on the Effects of Climate Change (ONERC)

Over the last 22 years, we have proved that we are able to galvanize our energies to tackle the challenge of climate change. We have come a long way since the adoption of the United Nations Framework Convention on Climate Change in Rio in 1992, with the adoption of the Kyoto Protocol in 1997 and with the opening for signature of the Paris Agreement on 22 April 2016.

However, this does not mean that everything is now in order. The details of how these agreements will be put into practice have yet to be established, whether in the area of preventing the worsening of the greenhouse effect, reducing greenhouse gas emissions or mobilising funding for climate policy, development aid and technology transfer. All of this must be done before the Paris Agreement comes into force in 2020.

The determination and commitment demonstrated by the parties both in the lead-up to and during the 21<sup>st</sup> Conference of the Parties, held in Paris in 2015, are signs of the birth of a new dynamic full of optimism. France played a momentous role as the COP 21 Presidency, ending with an ambitious international agreement a long period of preparatory worldwide discussions.

Everyone at their own level is now in a position to act according to their own perception of climate change issues and their own primary concerns. In the area of adaptation to climate change, the 2016 ONERC report brings together the principal assessments of our national process. This 10<sup>th</sup> report to the Prime Minister and Parliament highlights the main findings and recommendations made over the last few years. These have come from studying the implementation of the first National Climate Change Adaptation Plan (2011-2015), the governance system that was set up and the links between adaptation policy and the policies of the various sectors concerned. The wealth and variety of proposals and points of view put forward by the organisations who are tackling the subject will contribute greatly to improving the national process.

The work being done on adaptation in France has been boosted by national and local achievements and draws upon the international and European frameworks. However, it is currently at a crucial point. We have all the ingredients we need to prepare the follow-up to the first national plan, in terms of strengthening the adaptation process as a component of sustainable development in both mainland France and French overseas territories. But, for the sake of all our territories and their inhabitants, we must do what is necessary to step up the work at all scales and in all areas. This is a key point to ensure the success for inhabitants and territories.

**Paul Vergès**  
ONERC President

# Summary

In its 5<sup>th</sup> assessment report, the Intergovernmental Panel on Climate Change (IPCC) points out that the effects of global warming we have already witnessed will continue to be felt for several more decades to come even if greenhouse gas emissions are significantly reduced, due to inertia in the climate system. As a result, the interest in global, European, national and local adaptation issues has grown continuously over the last few years. International climate negotiations have tackled the subject via the United Nations Framework Convention on Climate Change (UNFCCC), informed by the scientific observations the IPCC has been disseminating for over 25 years. The Nairobi work programme adopted in 2006, followed in 2010 by the Cancún adaptation framework are two tangible expressions of this growing interest. As a result of the work done at both the scientific and the diplomatic levels, considerable attention was devoted to adaptation in the Paris Agreement adopted in December 2015 during COP21. France has been among the pioneers in Europe, devising an adaptation strategy as early as 2006. The adoption of the European Adaptation Strategy in 2013 gave added impetus on a larger scale. Most European Union Member States have now public policies on adaptation to climate change.

These developments are in keeping with the analyses of regional impacts of climate change produced by scientists, such as the scientific task force coordinated by Jean Jouzel, whose findings were published in the five volumes of the series “The French climate in the 21<sup>st</sup> Century”. In addition, everyone can now access the high resolution climate projection maps for mainland France via the DRIAS future climate portal set up in July 2012. With these two major achievements, the first French National Climate Change Adaptation Plan (2011–2015), or the NAP, has met one of the main requirements established during the consultation leading up to the drafting of the plan in 2010. This information is essential for most of the actions envisaged in the plan, including conceptual developments such as the interpretation of the concept of “acceptable risk” by the Prevention and Precaution Committee, and technical developments such as changes to the infrastructure and transport network construction guidelines.

France is also a pioneer in terms of its evaluation of adaptation policy, as it has undertaken an open, transparent and collaborative approach aimed at documenting as extensively as possible the experience gained through the implementation of the first national adaptation plan. The first milestone was the mid-term review published in January 2014, which drew together the immediate self-evaluations produced by the theme leaders of the plan’s 20 action sheets (“theme leads”). The many statements and comments from members of the National Council for Ecological Transition (CNTE, Conseil national de la transition énergétique) during the presentation of the review also demonstrated the growing interest in the subject among the stakeholders concerned. Several further evaluations following on from this review, both on individual themes and on the overall plan, were published during the plan’s final two years of implementation.

The opinion issued by the Economic, Social and Environmental Council (CESE, Conseil économique social et environnemental) in May 2014 summarised the findings of the first overall assessment of the NAP conducted by CESE’s Environment section in 2013 as part of its internal programme. Among the points it emphasised were the need for further research, the need for special attention for the overseas territories and the difficulty of joined-up work between bodies at various infra-national geographical levels. One important avenue recommended was to take the adaptation issue into account in the “Regional Climate, Air & Energy Master Plans” and “Climate, Air & Energy Local Plans”. The research by the European Environment Agency (EEA) published in November 2015 looked at processes for monitoring and evaluating adaptation on the European scale. EEA gave an overview of the different countries’ approaches to evaluating adaptation policy and presented a chart showing a summary by country.

France’s national adaptation plan also underwent several in-depth assessments by theme over its final two years of implementation. The Scientific Advisory Council on Natural Heritage and Biodiversity (CSPNB, Conseil scientifique du patrimoine naturel et de la biodiversité.) regretted that the plan lacked ambition in the area of biodiversity and stressed the need to find appropriate ways of tying climate policy in with biodiversity preservation policy. The High Council for Public Health (HCSP, Haut Conseil de la santé publique) studied the plan from the public health point of view and emphasised how adaptation by populations is highly dependent upon individual and collective behaviours. Meanwhile, the farming and forestry aspects were studied in detail by the General Advisory Council on Food, Agriculture and Rural Areas (CGAAER, Conseil général de l’alimentation, de l’agriculture et des espaces ruraux), which recommended that adaptation policy be closely linked with mitigation policy in these two sectors and drew attention to the issues of water usage, animal health and special insurance schemes.

Within the framework of the implementation of the roadmap stemming from the 2014 Environmental Conference, the General Council for the Environment and Sustainable Development (CGEDD, Conseil général de l’environnement et du développement durable) was entrusted with the final review of the NAP, by the Minister of the Environment, Ségolène Royal, in June 2015.. The CGEDD’s findings form the bulk of this report. They highlight the plan’s flagship achievements, areas for improvement and most significant shortcomings. This first plan focused primarily on developing knowledge and methods and has produced a clearer picture of what the public policy issues around adaptation are. In this sense, it can certainly be said that the plan has improved France’s preparedness for climate change. The CGEDD also concluded that actions must be better coordinated and governance of adaptation strengthened by creating links between the different themes and the different levels. The review concludes with the recommendation that: the targeted research programme on “Management and impacts of climate change” should be continued on a permanent basis; adaptation initiatives should be given greater publicity; issues surrounding climate change should be brought to the attention of the various economic sectors and adaptation work should be significantly increased at local level.

# Introduction

Since 1992, which saw the creation of the United Nations Framework Convention on Climate Change (UNFCCC), the international community has been working to reduce greenhouse gas emissions. In spite of this, the global atmospheric concentration of greenhouse gases is still rising, and because of inertia in the atmospheric and ocean climate systems, global warming will continue for at least several more decades. We must therefore adapt so that we can live in a climate that is in transition, both now and in the future.

In 2001, the wish of the French Government and Parliament to address the issue of adapting to climate change was put into action through the creation of the National Observatory on the Effects of Global Warming (ONERC), established by the Law on the 19<sup>th</sup> of February 2001. One of the observatory's official tasks is to make and follow up on recommendations on prevention and adaptation measures that should be considered with a view to limiting the impacts of climate change (Article L. 229-3 of the Environment Code).

To this purpose, ONERC produced a National Strategy for Adaptation to Climate Change, which was approved by the Government at the meeting of the Joint Ministerial Committee on Sustainable Development on the 13<sup>th</sup> of November 2006.

This national strategy states that since the purpose of adaptation is to reduce our vulnerability to the impacts of climate change, all adaptation measures must address four major objectives:

- to act in the interests of public safety and health;
- to reduce inequalities in exposure to the risks;
- to limit the costs and take advantage of the potential benefits;
- to preserve our natural heritage.

As a logical progression and in the light of the IPCC's 4<sup>th</sup> summary report published in 2007, the programming bill enacted on the 3<sup>rd</sup> of August 2009 on the implementation of the Grenelle Environment Roundtable (Grenelle de l'Environnement) stipulated the development of a National Adaptation Plan for the different sectors concerned by 2011.

Our nation's adaptation to climate change therefore became a major issue requiring all parties throughout the country to get involved. From that moment, adaptation actions became seen as a vital addition to the mitigation actions already under way.

The report by the Joint Ministerial Group on the impacts of climate change, associated costs and avenues for adaptation<sup>1</sup>, published by ONERC in September 2009, provided evidence of the significance of climate impacts and the associated costs, as well as the opportunities they represent for France.

In 2010 and 2011, a wide-ranging consultation between all groups represented at the Grenelle Environment Roundtable (central government, elected representatives, civil society, employers' associations and trade unions) was used as a basis for drawing up the National Adaptation Plan, which took almost 18 months.

In accordance with the principles set out in the National Adaptation Strategy<sup>2</sup>, 20 themes were chosen based on the topics discussed during the nationwide consultation process. The subjects of coastal and mountain environments were added, as these are especially vulnerable to climate impacts, as was the subject of European and international action, due to the systemic aspect of the issue.


The goal of this national plan was to put in place measures for the period 2011-2015 that would help France prepare to cope with new climate conditions and turn them to its advantage wherever possible.

This first adaptation plan deals primarily with national measures. Specific adaptation measures geared towards local situations fell under the remit of the regional and local "Climate, Air and Energy" plans and guidance documents for specific areas (such as the Development and Water Management Master Plans).

In accordance with the provisions included in the plan itself, monitoring and evaluation of the NAP have been carried out at progressively higher governance levels<sup>3</sup>.

Annual follow-up of the actions' progress was carried out within the General Directorate of Energy and Climate by ONERC, on the basis of indicators set out in the NAP. A mid-term review of the plan took place at the end of 2013 and the report was presented to the CNTE in January 2014. In this report, ONERC presented the results achieved up to that point and the CNTE issued recommendations for improving performance of the actions or prioritising their implementation over the latter stages of the plan's implementation. This evaluation also presented the adaptation actions organised at local level in the context of the Regional Climate, Air & Energy Master Plans and Local Climate & Energy Plans and assessed the links between these and the NAP actions.

Lastly, a final overall evaluation of this first NAP was carried out by the CGEDD, which was presented to the CNTE at the end of 2015. This review was carried out within the framework of the Environment Ministry Roadmap stemming from the 2014 Environment Conference to prepare for COP21 and strengthen France's adaptation initiatives. The final evaluation (excluding the annexes) is reproduced in the first section of this ONERC annual report. It forms the main part (Section A), around which the

 [www.developpement-durable.gouv.fr/IMG/spipwwwmedad/pdf/rapport\\_onerc\\_cle098a8d-1.pdf](http://www.developpement-durable.gouv.fr/IMG/spipwwwmedad/pdf/rapport_onerc_cle098a8d-1.pdf)  
[www.developpement-durable.gouv.fr/IMG/pdf/Strategie\\_Nationale\\_2-17\\_Mo-2-2.pdf](http://www.developpement-durable.gouv.fr/IMG/pdf/Strategie_Nationale_2-17_Mo-2-2.pdf)  
[www.developpement-durable.gouv.fr/-Suiivi-et-evaluation-html](http://www.developpement-durable.gouv.fr/-Suiivi-et-evaluation-html)

other points of view expressed in Section B (general assessments) and Section C (assessments by individual theme) are centred. The annexes to the review provide a detailed picture of the implementation of the plan in the context of each action and measure. They serve as a useful addition to the general and subject-based discussions, by providing a more detailed diagnosis that will be useful for the parties involved in adaptation actions.

The assessment also took advantage of new knowledge acquired through study and research activities such as those conducted in the context of the NAP and the 5<sup>th</sup> IPCC assessment report published in 2013 and 2014. All the reviews and evaluations were made public.

For the additional general and subject-based points of view, ONERC's report is based in particular on evaluations carried out at inter-regional level (CGET), international level (OECD) and European level (European Union, European Environment Agency) and on reports published by the different sectors (health, biodiversity, overseas territories, defence) during the NAP reference period (2011-2015).

The Paris Agreement adopted during the 21<sup>st</sup> Conference of the Parties to the UNFCCC confirmed that international policies on adaptation to climate change (see Annex I) are as important as those on mitigation. The worldwide reviews that are to take place every five years will also include follow-up of adaptation measures. With the experience it has gained through producing, monitoring and evaluating the National Plan on Adaptation to Climate Change discussed in this report, France will no doubt set an example in this area.

### Adaptation Terminology

**Adaptive capacity**<sup>4</sup>: the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to the consequences.

**Adaptation**<sup>4</sup>: the process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects.

**Autonomous or spontaneous adaptation**<sup>4</sup>: adaptation in response to experienced climate or its effects without explicit or conscious planning.

**Incremental adaptation**<sup>4</sup>: adaptation actions where the central aim is to maintain the essence and integrity of a system or process at a given scale.

**Transformational adaptation**<sup>4</sup>: adaptation that changes the fundamental attributes of a system in response to climate and its effects.

**Maladaptation**<sup>4</sup>: actions that may lead to increased risk of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future.

**Adaptive failure**<sup>5</sup>: loss of the ability to respond effectively to a new situation or conflict.

<sup>4</sup> According to IPCC: Glossary of terms from the 5th assessment report.

<sup>5</sup> Translation of the French *Désadaptation*. Source: Larousse Dictionary: [www.larousse.fr/dictionnaires/francais/désadaptation/24147](http://www.larousse.fr/dictionnaires/francais/désadaptation/24147)

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Part A  
Assessment of the National Climate Change  
Adaptation Plan (CGEDD)

*This section consists of the main body of Report N° 010178-01 drafted by Geoffroy Caude (Coordinator), Patrick Lavarde and Mireille Viora, with contributions by Martin Guespereau, published in November 2015 by the General Council for the Environment and Sustainable Development (CGEDD). The annexes to the report have not been reproduced here, but all the references have been kept so that readers can refer to them in the full version, which is available online at: <http://www.cgedd.developpement-durable.gouv.fr/evaluation-du-plan-national-d-adaptation-au-a2095.html>*

# Summary

Over the last two decades, scientific research has confirmed that climate change is real and progressing. Governments along with public and private decision-makers have therefore been led to become involved in a double process of global mitigation and local adaptation.

In France, a National Climate Change Adaptation Plan (PNACC), applicable from 2011 to 2015, was elaborated in 2011 from a strategic base developed in 2006 as well as upon the recommendations of the national consultation working groups which met in 2009 and 2010 and were led by the president of the Observatory (ONERC).

As Lima COP20 had confirmed the need to include a section concerning adaptation in the COP21 agreement expected at the end of 2015 in Paris, the round table during the 2014 environment conference « National mobilization towards the COP21 on the climate and biodiversity issues » concluded that, by the end of 2015, after a PNACC external assessment, it was necessary to reinforce the national strategy of adaptation 1.

This external assessment which is the purpose of the present report, was entrusted to the CGEDD , by a letter from the Minister of Ecology dated 25 June 2015. It was mainly carried out by a three-member team from the CGEDD (Mireille Viora, Patrick Lavarde and Geoffroy Caude) with the support of Martin Guespereau.

The PNACC being divided into 20 themes comprising 84 actions broken down into 242 measures, the Mission heard all the persons appointed to conduct the selected actions and extended its hearing to almost one hundred interlocutors.

Its task consisted in putting the national plan into perspective within an international context (chapter 1), in providing a summary of its assessment (chapter 2) and in outlining recommendations for a future plan which will cover the years 2017-2021, taking into account the time required both to complete the actions undertaken during the first plan and to reach a consensus on its content.

## **1- France, a pioneer in Europe, its PNACC enabling the state to mobilize its various levers for action**

Although over one third of OECD countries (notably many southern countries) and two thirds of the countries listed as being associated to the European area by the European Agency have published national strategies of adaptation, only one third of the 27 EU countries had a national plan of adaptation in 2014 (Germany, Austria, Denmark, Spain, Finland, France, Malta, Holland, United Kingdom).

The Mission could not conduct a detailed benchmarking study but pointed out that Finland had been the first country in Europe to adopt a national strategy in 2005, most of its regions having implemented a climate strategy with adaptation measures in 2012. The Mission also pointed out that with the Delta Programme, Holland had undertaken a large-scale programme ensuring safety measures against marine submersion and flooding as well as a water supply system at an annual cost of about one billion euros thanks to the Delta Reform Act, which came into force in 2012. The Mission also focused on the British plan, the advantage of which is to involve all the stakeholders thanks to the 2008 Change Act, knowing that the UKCIP (United Kingdom Climate Impacts Programme) had already been created in 1997.

In addition to Europe, the Mission focused on the situation of the United States where, in 2009, the federal government became involved with the Presidential Executive Order 13 514 and the setting up of a working group coordinating the federal agencies involved. It also focused on the situation of Australia where various sectoral initiatives have been developed in the agricultural and forestry sectors, as well as in the fields of water and coastal engineering.

Although the Mission could not carry out a full assessment of each national plan content, it has become convinced that, by bringing closely together elected officials, scientists and administrations in its construction process, the first French plan represented a substantial and exhaustive effort which has given France a pioneering position thanks to its large-scale method for mobilizing all the levers at the State's disposal.

## **2- An initial plan which improved France's preparedness for climate change and succeeded in producing some remarkable results, although progress was not sufficiently coordinated**

The Mission noted that although it was the first plan, its overall progress was very satisfactory since 80% of the actions and about 75 % of the measures initiated would be completed by the end of 2016. On the other hand, the mission was quite unable to comment on the extent of the financial commitment of the plan for which 171 M€ had been considered, since the monitoring of the allocated financial resources is not done in a comprehensive manner.

This first plan has placed much emphasis on the deployment of the key levers that the state could use to move the whole country forward, such as laws, statutory provisions, planning tools, methodological tools, improvement in observation systems and the sharing of analyses and observations.

Some remarkable results deserve special attention:

- Volumes 4 and 5 of « the Climate in France during the 21st century » make it easy for everyone to better understand the expected changes in France in precipitation, average summer or winter temperatures, and sea level variations along the coasts. For example, a test to identify the consequences of a 1 meter rise in average sea level was performed along the coasts of France and its overseas territories. Such knowledge together with other documents relevant to climate research have been disseminated widely and freely on the DRIAS website (« les Futurs du Climat ») which represents an important step forward for the plan.
- Planning tools have been significantly improved regarding:
  - a) hydrographic basins, partly considering adaptation in the planning and water management master plans (SDAGE) , as well as the launch of calls for projects,
  - b) for coastal areas, the development of the national integrated coastline management strategy, with the first calls for an experimentation project dealing with the relocation of activities and property and with the call for projects concerning the inclusion of coastlines in the territorial coherence schemes (SCOT) ,
  - c) concerning risk management, the development of local strategies of flood risk management and the integration of the raising of baseline sea levels in the coastal risks prevention plan (PPR),
  - d) the inclusion of an adaptation section in the mountains schemes signed in 2015 for the period 2015-2020,
  - e) the integration of ecological continuity plans (green and blue belts) in urban planning documents
- operational measures to adapt specific business sectors or activity sectors with key impacts:
  - a) such as the basic nuclear installations, thanks to the work conducted in 2012 by the Nuclear Safety Authority (ASN) along with EDF on maintaining the functioning of the power plants and of their cooling system,
  - b) the transport infrastructures, where a complete inventory of the infrastructures' design and operational technical reference documents to be updated in order to take climate changes into account has been performed, whatever the mode of transport,
  - c) reports conducted by the National Centre of Expertise on Vectors (CNEV, Centre National d'Expertise sur les Vecteurs) on the enhanced surveillance of vector-borne diseases by studying insect vectors which will spread with climate change,
  - d) updating guidance for a proper use of the main species for reforestation in order to address the expected climate change.

The plan cannot take exclusive credit for all these results since adaptation and resilience to extreme weather events take place whenever a new disaster occurs (the 1999 storm, the 2003 drought and heat wave, the 2010 submersion and coastal flooding...), however they bear the evidence of an increasing awareness of adaptation that is now partly integrated into public policies which should be able to support them.

### **3- Content and method proposals for a more focused NAP declined into territorial plans**

In the light of the overall success of the first plan's achievements -since it has largely produced a knowledge base with regulations, methodological or planning tools useful for subsequent work- the Mission urges the various parties to pursue their efforts while making up for noted shortcomings, to change the production rate focusing on key priorities, to foster a real territorial participation, and to aim at enlisting all the economic players with a particular focus on a more strategic steering than during the 2011-2015 period.

The Mission calls for particular attention to the fact that the scientific research effort will be completed only if the General Commissioner for Sustainable Development (CGDD, Commissariat général au développement durable) adopts a complete research programme with a 2 to 3 M€ a year endowment in order to encourage the adaptation policy implementation, if the Ministry of Ecology manages to create a technical resource center that will closely associate the Centre of Studies and Expertise on Risks, Environment, Mobility and Planning (CEREMA, Centre d'Etudes et d'Expertise sur les Risques, l'Environnement, la Mobilité et l'Aménagement) and the Environment and Energy Management Agency (ADEME, Agence de l'Environnement et de la Maîtrise de l'Energie) and, when required, other institutions which have indeed greatly contributed to the previous plan.

It also points out that the dimension of economic analysis and a prospective approach to adaptation, notably concerning population movements in France, deserve to be given far more attention than they have up to now.

The first NAP has addressed all the recommendations from the national strategy and from consultation groups, in a comprehensive but perhaps not sufficiently hierarchical manner. However, it appears that it should be possible for three key priorities to be handled in a more transverse manner and in project mode:

- the available water resource priority, for it will be necessary to initiate large scale water saving in water stressed sub-basins,
- the priority of adaptation in coastal areas which, beyond what has been experimented so far, calls for a real solution to the inevitable relocation of property and activities that will have to be performed over the next few decades,
- the priority of cities and public space adaptation to protect city-dwellers from impending heat waves and droughts.

The Mission also proposes to include some additional topics such as climate change adaptation diplomacy and the participation in this new plan of other ministerial departments such as the Ministry of Defence and the Ministry of Economy.

Going forward, the Mission considers that by 2017 the methodological tools needed to conduct relevant regional vulnerability assessments will be available. Thanks to the significant development of regional dynamics in the field of mitigation in the Climate and Energy Territorial Plan (PCET) , the new national plan will be actually deployed at the territorial level in the regions on the one hand, and in the Public Intermunicipal Cooperation Institutes (EPCI) , in charge of the new Climate, Air and Energy Territorial Plans (PCEAT) or of the Intermunicipal Local Urban Plans (PLUi) on the other hand.

The Mission also recommends that a new effort should be undertaken in order to attract the private economic sector, starting with public institutions or companies and quickly identifying key priority areas as well as fostering an economic sector approach as in the agricultural and forestry sectors. Special attention must also be given to the question of adaptation funding, particularly the strong current imbalance between funding requirements and offers.

Finally, the Mission believes that a more strategic steering of the plan could be deployed both concerning the orientation of the plan, with the support of the CNTE and its territorial development and that the operational control calls for an inter-ministerial delegation of tasks entrusted to the DGEC by an engagement letter in order to better ensure that all the ministerial departments concerned are involved.

### **List of recommendations**

1. We recommend that the CGDD resume a targeted research programme to support the implementation of climate change adaptation policy, backed by funding of between 2 and 3 million euros per year.
2. We recommend that the DGEC:
  - a) develop the work on climate scenarios at finer scales requested by the users ;
  - b) decide on the themes on which vulnerability studies might be carried out at national level and look together with the regions at how to draw up climate change vulnerability studies and maps based on impact models;
  - c) encourage Météo-France (the French meteorological office) to continue developing the DRIAS portal as a public source of climate change data;
  - d) liaise with the other government departments and operators concerned to assess how the country's monitoring networks need to be developed to ensure they cater more effectively for climate change effects.
3. We recommend that the DGEC and the CGDD entrust a consortium between ADEME and CEREMA with the task of setting up a resource centre on climate change adaptation, with support from other specialist organisations. The resource centre would be responsible for providing technical support on drawing up adaptation charts and plans at the various geographical levels and on incorporating adaptation issues into the plans and policies of the various economic sectors.
4. We recommend that the CGDD conduct, in liaison with the Economy Ministry and other relevant government departments:
  - a) forward planning on the effects of climate change in various sectors (e.g. transport, tourism) and population movements;
  - b) economic studies on areas such as the costs and benefits of adaptation.
5. We recommend that the CGDD, along with the DGEC and the other government departments involved, look into terms and conditions for creating and issuing special quality labels for climate change adaptation initiatives.
6. We recommend that the government departments concerned – the General Directorate for Energy and Climate (DGEC), the General Directorate for Development, Housing and Nature (DGALN) and the General Directorate for Risks Prevention (DGPR) – carry out in project management approach at least three adaptation issues: water resource management, coastline management and management of cities and buildings. With respect to policy on coastline management in particular, we recommend that the discussions undertaken on the relocation process be finalised. As regards town planning, an approach based on calls for proposals aimed at all the relevant stakeholders would be beneficial and should promote new bioclimatic architecture approaches.
7. We recommend that the General Directorate for Energy and Climate (DGEC) and the Directorate for European and International Affairs (DAEI), in liaison with the Ministry of Foreign Affairs, develop a climate adaptation diplomacy section within the framework of the new National Adaptation Plan (NAP).
8. We recommend that in drafting the NAP, care should be taken to ensure that the measures proposed contribute to preventing and reducing climate-related environmental, social and geographical inequalities.
9. We recommend that the Ministry of Environment bring in other ministerial departments on the drafting of the next NAP, especially those that were not strongly represented in the first plan, such as the Ministries of Economy and Defence
10. We recommend that the Ministry of Environment undertake a general review of regulations and public funding initiatives, to assess whether they are more likely to facilitate or to hinder climate change adaptation. The general inspectorates (General Advisory Council on the Environment and Sustainable Development, General Advisory Council on Food, Agriculture and Rural Areas and the Administration, Finance and Social Affairs Inspectorates respectively) could be asked to carry out a joint ministerial review.
11. We recommend that CGDD look into the possibilities for conducting climate impact studies or analyses on a routine

basis, to prevent the risk of maladaptation in certain major long-term investment projects susceptible to climate change, where these are fully or partly publicly funded.

12. We recommend that CGDD and DGEC:

- a) organise a consultation in 2016 based on the Prevention and Precaution Committee's proposals from 2013 on risk acceptability;
- b) begin discussions, in liaison with the Department for water and biodiversity, on transitional management of environments that are likely to be permanently affected by climate impacts.

13. We recommend to the Ministry of Environment that the National Climate Change Adaptation Plan be drawn up by central government from now on, after consultation with delegations from regional and local authorities.

14. We recommend that the Environment Ministry commission the Prefects, with the support of the Regional directorates for environment, development and housing (DREALs), to negotiate with the regions on how the national plan will be translated into practice at regional level, with support from the relevant public bodies.

15. In order to provide project management assistance to local authority organisations, we recommend that the Environment Ministry delegate the regional environment departments to study page 12/203 of the assessment report on the national climate change adaptation plan (Report N°010178-01), in conjunction with the regional councils, and look at how to build the necessary capacity to provide technical support to local authorities as they devise their adaptation strategies and plans.

16. We recommend that the Ministry of Environment (General Directorate for Energy and Climate and General Directorate for Planning, Housing and Nature):

- a) send out calls for proposals for climate change adaptation labelled projects, which would be funded either out of the ministry's existing funds or those of government agency funds (Environment and Energy Management Agency, water authorities, etc.) and could possibly benefit from saving fund loans from the Public Deposits and Savings Fund (CDC, Caisse des dépôts);
- b) initiate more in-depth discussions generally around funding for adaptation measures.

17. We recommend that DGEC iron out the details of the overseas' territories' climate scenarios and develop initiatives geared specifically towards them over the course of 2016, which can then be included in the new NAP.

18. We recommend that the Environment Ministry (General Directorate for energy & climate, for Development housing & nature and for Infrastructure, transport & the sea) encourage public service companies to carry out climate change adaptation assessments or studies and incorporate them into their public service contracts, in order to identify an achievable level of resilience for sectors that supply essential public goods (electricity, transport, etc.).

19. We recommend:

- a) that the General Directorate for energy and climate (DGEC) examine into what is needed in order to begin the study to identify the industries affected by climate change;
- b) that the General Directorate for risk prevention (DGPR) continue the work already under way on baseload nuclear power plants and include all the environmental protection classified facilities (ICPEs) concerned in the climate risk studies;
- c) that the Department of private sector economic and environmental performance encourage the agriculture and forestry sectors to organise discussions aimed at identifying climate change adaptation measures that might be beneficial in both the upstream and downstream segments.

20. We recommend that the DGEC and the CGDD review the various industries and segments in terms of identifying possible management and risk-sharing solutions for climate change adaptation, and solutions for allocating resources to emerging needs, bringing in the regions on issues that affect them.

21. We recommend that the General Directorate for risk prevention (DGPR), in conjunction with the Treasury department and the other departments concerned, undertake a review of risks associated with climate change impacts, to obtain an up-to-date picture of those that might fall under insurance schemes.

22. We recommend that the CGDD consult the financial sector, in conjunction with the Treasury department, as to the quality of information it requires in order to assess finance applications for adaptation projects.

23. We recommend that the CGDD include in the discussions on the next plan a strategic study to examine whether the funding that can be accessed for adaptation is sufficient to meet the needs, at least for the priority themes.

24. We recommend that the Environment Ministry entrust the National Advisory Council on the Green Transition (CNTE) with the task of guiding the policy aspects of the next NAP, both at the drafting and at the mid-way and final assessment stages. A special sub-committee of the CNTE or the ONERC steering committee, comprising members chosen to fit in with the plan's new priorities, would be given the task.

25. We recommend that the Environment Ministry strengthen both the operational coordination of the plan and inter-ministerial involvement in the plan, entrusting DGEC with these aspects via a commissioning letter from the Prime Minister.

# Introduction

Scientific research, such as that done by the Intergovernmental Panel on Climate Change (IPCC), has confirmed that climate change is already happening. While everything must be done to prevent climate disruption by implementing measures to mitigate greenhouse gas emissions, it has been demonstrated that this disruption is an inevitability, due to inertia in the climate system.

Although there are still many uncertainties about how the climate will change and the effects this will have on our societies, major global impacts are expected over the next few decades, even under the best-case scenarios of less intense warming. The impacts in Europe over the coming decades are expected to be less significant than in the rest of the world; however the IPCC still anticipates major knock-on effects on economic activity, farming, forests, biodiversity, health and infrastructures. We must therefore waste no time in adapting to this situation.

The IPCC defines adaptation to climate change as “*adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities*”.

Without adaptation policies, human societies and environments are doomed to suffer the most harmful effects of climate disruption, as mitigation policies will not be able to protect them against future climate change patterns that have already set in.

Adaptation and mitigation policies do complement each other, however. Mitigation will preserve the climate with medium- to long-term effect due to climate inertia, while adaptation will protect societies against climate change impacts in the short-term also. Adaptation is designed to reduce the harmful consequences of climate change or plan ahead for them, and can also enable us to take advantage of any opportunities it creates. Neither adaptation nor mitigation alone will enable us to completely prevent the effects of climate change. Without a drastic reduction in greenhouse gas emissions, there is strong risk that we will reach a critical threshold beyond which adaptation could become extremely difficult or even impossible. The more effective our mitigation attempts, the less costly adaptation will be. But whatever happens, we will need to adapt, as climate change has already begun.

It is against this background and to address these issues that France drew up its first National Climate Change Adaptation Plan, covering the period 2011-2015.

The round table on “Mobilising the country on climate and biodiversity issues in the lead-up to COP 21”, which took place at the November 2014 Environment Conference, concluded that the national adaptation strategy needed to be strengthened, once an external evaluation of the National Plan had been carried out by the end of 2015 <sup>6</sup>.

In a commissioning letter of 25 June 2015 (see Annex 1), the Minister for the Environment requested the General Advisory Council on the Environment Sustainable Development (CGEDD) to carry out this assessment.

On 22 July 2015, the Vice Chair of the CGEDD designated Mireille Viora, a senior civil servant, Geoffroy Caude (Coordinator) and Patrick Lavarde, both general engineers (bridges, water and forestry), to conduct the assessment, with subsequent assistance from Martin Guespereau, chief engineer.

The assessment team conducted its work in two stages. The first was to gather as much information as possible about the progress of the measures listed in the plan and the results obtained, from those responsible for following up each of the NAP themes. As the timing coincided with the summer holiday season, they were only able to begin this work in September 2015. The second stage was to meet with various figures outside of government departments who have been directly involved in the plan, in order to broaden the scope of the review. Around 100 people were consulted in all, whom the team wishes to thank for their time and the quality of the information they provided.

In keeping with the request set out in the commissioning letter, this report first provides a brief overview in Chapter 1 of the ways in which adaptation to climate change is addressed in international policies and in European countries. The deadline set for completing the assessment precluded any comprehensive benchmarking and the team did not have time to visit the few countries that have adopted the most thorough adaptation plans. Nonetheless, the review puts the NAP into perspective in the European context. The annex on the individual themes highlights those for which benchmarking would be the most beneficial.

In the second chapter, the assessment team discusses the overall assessment of the NAP, both in terms of the process of carrying out the actions and measures (the extent to which they were actually implemented and their coordination, monitoring, funding) and the assessment of their effectiveness. To obtain this information, the team interviewed each theme lead individually, which enabled them to provide a detailed summary in Annex 3.1 of the report of how each of the NAP themes is being implemented (Annex 3.2 shows the list of actions and measures for each area). In Annex 3, after a brief presentation on the content of each theme, the team examines the extent to which the actions and measures have been implemented, identifies any limitations and obstacles that may have impeded their implementation, highlights the main results obtained, gives a brief opinion on the way in which the theme has been run and looks at prospects for the area going forward. As requested by the Minister, the report identifies key achievements that should be flagged up and provides an opinion on the plan’s contribution to issues specifically affecting the overseas territories. It also provides an opinion, as requested, on the ways in which the plan has been translated at regional and

<sup>6</sup> Measure No 10 of the 2015 Roadmap for the Green Transition, “Mobilising the country in the lead-up to COP 21”.

local level and on the various stakeholders' involvement. To conclude chapter 2, the assessment team try to assess to what extent the NAP has improved France's preparedness for climate change.

In the last chapter, in the light of the points they felt needed to be improved or given greater attention, the team proposes new areas and changes of focus, culminating in recommendations for the next National Adaptation Plan (2017-2021).

## Section 1

# The French plan in the international context of policies on adaptation to climate change

Unlike mitigation, which is aimed at reducing greenhouse gas emissions globally, adaptation to climate change is only managed at local level. After a brief review of how this issue is addressed in international climate policy and EU policies, we describe the experiences of other countries. This will help place the French national plan in perspective. We then go on to explain briefly how the plan came into being.

# The emergence of adaptation to climate change as a theme in international and European policy

The subject of adaptation to climate change is relatively new in the realm of public policy. The necessity of adaptation (due to the irreversible nature of climate change, regardless of our greenhouse gas mitigation efforts) and its importance (because of the costs we would incur without it) have only been fully recognised since the early 2000s. Since then, adaptation has been given increasing attention in public policy, alongside legislative measures and other mitigation initiatives focusing on reducing greenhouse gas emissions.

## The growing focus on adaptation in international negotiations

Climate change emerged as an issue in international talks in the mid-1980s. In 1992, the international community adopted the United Nations Framework Convention on Climate Change (UNFCCC) in Rio de Janeiro, on the basis of the first report by the Intergovernmental Panel on Climate Change (IPCC). The convention has been ratified by 195 countries to date. Its main focus is mitigation, but it also stipulates that States “*shall Cooperate in preparing for adaptation to the impacts of climate change; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by drought and desertification, as well as floods*”.

In the context of the COP<sup>7</sup>, work on mitigation has been the primary focus of talks for many years. However, as a result of factors such as the increased number of climate-related events and the continuing rise of greenhouse gas emissions, increasing attention has been paid to issues surrounding adaptation to climate change. The most vulnerable countries (small island nations, the African Group and the least developed countries) have been the principal driving force behind the development and funding of adaptation measures.

The protocol adopted during the 1997 Kyoto conference lays down the obligation of reducing greenhouse gas emissions, but Article 10 of the protocol also stipulates that the parties should establish programmes for adaptation to climate change. The work programme drawn up at the 2004 Buenos Aires conference encourages the parties to continue their action on vulnerability and adaptation and to gather information and methods.

In 2006, the economist Nicholas Stern<sup>8</sup> estimated that the annual cost of climate change impacts would be between 5 and 20% of global GDP, whereas the cost of adaptation would be between 1 and 2% of GDP; in other words far lower than the costs it would save us. Also in 2006, the Nairobi work programme called for the development of scientific knowledge and methodology on climate change impacts.

While the issue of adaptation is high on the agenda for many developing countries, it is now seen as a problem that affects not only southern countries, but northern countries also, some of which have been the first to embark on national adaptation strategies.

In Copenhagen in 2009, plans were made to boost funding for climate policies in developing countries by 30 billion dollars by 2012 and by 100 billion dollars per year from 2020 onwards. A recent OECD report<sup>9</sup> calculated that the current funds set aside for adaptation in developing countries stood at 57 billion dollars per year over the period 2013–2014, of which 70% came from public funds (including 8 to 10 billion dollars from developed countries<sup>10</sup>).

In 2010, the Cancun agreement established a framework for advancing the work on adaptation, through a process of support for adaptation planning, especially for the least developed countries. This was to include support with formulating and implementing national adaptation plans if the countries wished it so (Decision 5/CP.17). A committee was set up to address adaptation objectives, vulnerable areas and adaptation funding. A work programme on loss and damage was launched, which led to the creation of the Warsaw International Mechanism in 2013, which stated objective is to “*promote the implementation of processes to address the loss and damage associated with the adverse effects of climate change*”.

COP20, held in Lima in 2014, confirmed that adaptation should be fully addressed in the COP21 agreement due to come out of the Paris conference in 2015, on an equal footing with mitigation, even though the UNFCCC merely promotes the implementation of adaptation measures. It was decided that the allocation of funds should be split equally between mitigation and adaptation, and that at least 50% of resources set aside for adaptation should be allocated to the most vulnerable countries, giving priority to small island nations and the least advanced countries. The above-mentioned OECD report states that only one sixth of all climate funding has gone to support adaptation measures, whilst a small percentage has gone to supporting mitigation and adaptation goals.

The ambition for the new legally-binding agreement on post-2020 climate actions that was to come out of COP21, held in Paris from 30 November to 11 December 2015, was to address both climate change mitigation and climate change adaptation issues,

<sup>7</sup> COP: Conference Of the Parties to the UNFCCC.

<sup>8</sup> Stern N., Stern Review: *The Economics of Climate Change*, 2006.

<sup>9</sup> OECD, *Climate Finance in 2013-2014 and the USD 100 billion goal*, 2015.

<sup>10</sup> Canfin P., Grandjean A., *Mobiliser les financements pour le climat – une feuille de route pour financer une économie décarbonée* (“Mobilising climate funding – a roadmap to finance a carbon-free economy”), 2015.

and to provide adequate financial, technological and capacity-building resources to implement the objectives. In doing so, the Paris Agreement should confirm the political significance of adaptation and contribute to climate change resilient development. In addition, the Paris-Lima action plan, or “solutions agenda”, which lists the initiatives developed the different stakeholders should provide a basis for exchanging best practice and contribute to knowledge transfer.

It should be noted, lastly, that when the 2030 sustainable development goals (SDGs) were adopted at the UN Sustainable Development Summit on 25 September 2015, the General Assembly “reaffirmed that the protocol ... under the Convention ... shall address in a balanced manner, inter alia, mitigation, adaptation, finance, technology development and transfer and capacity-building; and transparency of action and support”. One of the 17 SDGs (Goal 13) is for urgent action to be taken to combat climate change and its impacts. This goal covers strengthening resilience and adaptive capacity to cope with climate events and natural disasters, and improving education, awareness and individual and public capacity for adaptation to climate change. Climate resilience is also one of the pillars of the development agenda in the goals relating to the sectors most affected (water, energy, farming, land and marine ecosystems).

### A recent strategy at European Union level

Since 2004, the European Environment Agency has published several reports in which it concludes that adaptation strategies must be put in place at European, national, regional and local level.

In a statement on climate change issued in February 2005<sup>11</sup>, the European Commission devoted a chapter to adaptation and the need to put our energies into it. The Commission subsequently set up a work programme which culminated in the publication of two papers:

- a Green Paper published on the 29<sup>th</sup> June 2007<sup>12</sup>, which described the main climate impacts expected in Europe and the four pillars on which the EU’s adaptation strategy should be based: incorporating adaptation into all the EU’s activities as quickly as possible; incorporating adaptation into the EU’s external activities; developing research on adaptation within the EU programmes and working together with other parties involved in adaptation;
- a White Paper published on the 1<sup>st</sup> of April 2009<sup>13</sup>, which described the EU’s forthcoming adaptation framework, the content of the framework and the implementation process and timetable. It was to begin with the development of an EU adaptation strategy between 2009 and 2012, which would then be implemented from 2013 onwards. The white paper also highlighted the coordinating role the EU institutions would play, for example on joint cross-border adaptation initiatives, on solidarity between Member States and on changes that would need to be made to other EU policies, such as those on energy, farming, etc.

An impact assessment was carried out in February 2013 on the implementation of the measures provided for in the white paper. Most of the planned actions had been launched; however the study highlighted that “adaptation is still in its infancy in most cases, as relatively few concrete measures have been implemented on the ground. Some Member States have produced plans for specific sectors ... but only a third have implemented an impacts, vulnerabilities and adaptation assessment to support policy. In addition, very few indicators and monitoring methods have been developed”.

The European Union’s adaptation strategy was adopted on the 16<sup>th</sup> of April 2013<sup>14</sup>. It comprises eight actions, based on three objectives:

- to promote action by Member States, including support for the development of national adaptation strategies and financial support aimed at strengthening their adaptation capacity and putting the strategies into action;
- to address climate change in EU policies in those sectors considered most vulnerable to climate change (such as farming, fisheries, infrastructure), and develop appropriate insurance;
- to develop more knowledge on the subject, which should be disseminated and shared with the general public, decision-makers and the stakeholders concerned. In March 2012, the Commission set up an online platform for sharing information on adaptation (Climate-ADAPT).

To support the strategy, at least 20% of the EU budget will be set aside for climate actions over the period 2014-2020, which is triple the amount allocated over the previous period. The necessary means are already included in the existing financial mechanisms.<sup>15</sup>

To encourage Member States to adopt comprehensive adaptation strategies, the Commission developed “core indicators” for adaptation, as a means of assessing each country’s level of preparedness<sup>16</sup>. During the evaluation of the strategy due to take place in 2017, it will use these indicators as a basis for deciding whether or not to adopt a legally binding instrument (which the European Economic and Social Committee has called for).

<sup>11</sup> European Commission Communication COM (2005) 35, “Winning the battle against global climate change”, February 2005.

<sup>12</sup> Green Paper of 29 June 2007, “Adapting to climate change in Europe: options for action”, European Commission, Brussels.

<sup>13</sup> White Paper of 1st April 2009, “Adapting to climate change: towards a European framework for action”, European Commission, Brussels.

<sup>14</sup> “An EU Strategy on adaptation to climate change”, European Commission Communication COM(2013) 216 final, 16 April 2013.

<sup>15</sup> For example, 35% of the Horizon 2020 programme resources are set aside for climate research.

<sup>16</sup> The initial evaluations were produced for 9 countries in September 2015.

## Some other countries' adaptation strategies and plans

An analysis of different countries' planning around adaptation reveals distinct adaptation strategies and adaptation plans. Over three quarters of OECD countries have published national adaptation strategies. Most of these countries adopted their strategies on the basis of national scientific climate change impact and vulnerability assessment reports published in the wake of the fourth report by the Intergovernmental Panel on Climate Change (IPCC), which concluded that certain impacts are irreversible. Some of these countries have also produced adaptation plans, which set out concrete actions in varying numbers of priority sectors.

### Two thirds of EEA countries have embarked on an adaptation strategy

According to the European Environment Agency<sup>17</sup>, of the 33 countries in the European Economic Area (EEA)<sup>18</sup>, 21 had adopted a national adaptation strategy in 2014. The longest-standing strategies have been in place since 2005-2007 (Finland, Spain, France), with several other countries following in 2008-2009 (Denmark, Germany, Hungary, Netherlands, Sweden, United Kingdom). A dozen or so countries have published their strategies since 2010 (Austria, Belgium, Ireland, Lithuania, Malta, Norway, Poland, Portugal, Romania, Slovakia, Switzerland, Turkey).

In 2014, 12 countries in the EEA were equipped with a national adaptation plan: Norway<sup>19</sup>, Finland, Netherlands, Turkey, France, Germany, Austria, Denmark, Malta, United Kingdom, Spain, Switzerland (chronological order). Other countries were in the process of drawing up their plans (Belgium, Ireland, Italy, Poland, Romania).

As a whole, action on adaptation is in the early stages in Europe. Most of the strategies give little detail on implementation and only a few countries say that they currently have a set of operational measures in progress.

In the following paragraphs, we briefly describe the policies of some of the EU Member States that have been working on adaptation for the longest.

#### *Finland: a pioneer within the EU*

Finland was the first European country to adopt a national adaptation strategy, which it did in 2005. The plan sets out 15 priority sectors for which measures must be put in place: agriculture & food production, forestry, fisheries, reindeer farming, wildlife management, water resources, biodiversity, industry, energy, transport, land & community development, buildings, health, tourism & leisure and insurance. Water management is seen as one of the most important sectors, especially in the area of flood management and dam safety. The plan was updated in 2009 and 2013.

Certain ministries, including the Environment Ministry, the Agriculture and Forestry Ministry and the Transport Ministry, have drawn up action plans to implement the strategy in their respective sectors. A large number of research programmes have been organised, to study the best adaptation measures to put in place in the light of the anticipated impacts.

The individual regions and a significant number of town councils have also published their climate strategies, which include adaptation measures<sup>20</sup>.

The 2015 Climate Act stipulates that the Government must approve a national adaptation plan every ten years. On the basis of an evaluation of the strategy in 2013, a national adaptation plan was adopted for 2014-2022, which is due for review in 2018. It contains a list of measures applicable to all sectors for 2014-2018.

#### *Spain's work programmes*

Spain's first national plan on adaptation to climate change was adopted by the Cabinet in October 2006, following a consultation process between central government and the 17 largely autonomous regions. The plan covers 15 themes: water, biodiversity, forestry, agriculture, coastal zones, inland fisheries & hunting, mountains, soil, marine fisheries & ecosystems, transport, health, industry & energy, tourism, finance & insurance and town planning & construction.

The plan is implemented through work programmes coordinated by the Environment Ministry. The first programme, approved in 2006, focused on producing regional climate scenarios and conducting activities aimed essentially at gathering knowledge about the different themes. The second work programme, adopted in July 2009 for the period 2009-2012, continued the work begun under the first programme on producing scenarios and assessing impacts in the different sectors. It also focused on: identifying the legal instruments that would be needed to take adaptation into account in policies on the various sectors; getting all the stakeholders concerned involved and developing a monitoring system, which would include indicators. It relied on increased research efforts and stronger coordination between the national and regional levels. A third work programme based on the same priority themes has been adopted for 2014-2020 and aims to make use of all the European Union funding instruments.

<sup>17</sup> European Environment Agency, *National adaptation policy processes in European countries*, 2014.

<sup>18</sup> The European Economic Area comprises the EU Member States plus Iceland Liechtenstein, Norway, Switzerland and Turkey.

<sup>19</sup> Norway had a national plan in place before it published its strategy.

<sup>20</sup> According to Finland's report to the UN Convention on Climate Change, 16 of the 18 regions and approximately 40% of town councils had published their plans at the end of 2012.

### *Water the top priority in the Netherlands*

In the Netherlands, the floods of 1953, in which more than 1800 people died, triggered the adoption of a proactive risk management policy which addresses strong public demand for safety, bearing in mind that 60% of the country is susceptible to flooding from the sea or rivers. A large part of adaptation policy therefore concerns flood defences and the country has undertaken a strategy of long-term planning, developing a 40-year prevention plan based on very high risk scenarios. Added to this, the country may experience considerable problems from 2040 onwards in terms of the availability, quality and supply of fresh water.

Unlike most other European countries, the Netherlands has not adopted an adaptation policy based on a national framework strategy which is then applied and coordinated at regional and local levels, complemented by a risk and vulnerability assessment in the principal sectors. The national adaptation strategy, adopted in 2008, centres around water safety and security. An annual implementation programme has been drawn up every year since 2010.

The country's most thoroughly developed solutions are therefore focused primarily on water and flood risk management: surplus water retention and storage structures, beach nourishment, developing dune belts and artificial reefs, reinforcing the existing dykes and dams<sup>21</sup>. A budget of 2.5 billion euros has been allocated for the period 2009-2020, but it is thought that this will not be sufficient to cover the needs.

The Delta Programme<sup>22</sup> is the Netherlands' principal initiative concerning adaptation to climate change. It comprises plans and measures aimed at ensuring safety against flooding (dam reinforcement, urban development plans, beach nourishment) and a fresh water supply system that will meet the needs of both present and future generations (water storage, desalination). The estimated costs of implementing this programme, which is based on the worst-case climate scenarios, are between €1.2 b and €1.6 b per year up to 2050, then between €0.9b and €1.5b per year over the period 2050-2100. The "Delta Act", which came into force on 1 January 2012, forms the legal basis for the Delta programme.

The "Space for the river" programme must also be mentioned, which covers 40 interconnected infrastructure projects worth a total of €2.1b euros.

Aside from the water sector, little has been done in other areas, such as farming, forestry, fisheries, transport or energy. For this reason, the preparation of a more comprehensive national strategy was announced in the context of the "Climate Agenda" examined by the Dutch Parliament in October 2013. The strategy is due to be presented in 2016.

### *The various parties involved in the United Kingdom*

The Climate Change Act passed by the UK Parliament in 2008 established the legal and political framework for adaptation measures. It required that an assessment of the risks and opportunities associated with climate change be conducted every five years. It conferred on both the UK and Welsh Governments the power to require the various government agencies (for example those in charge of road and port infrastructures or water and energy production and distribution) to take climate change-related risks into account in their decision-making and measures. The act also created the Adaptation Sub-Committee, whose tasks included assessing the progress of the National adaptation programme and submitting a report to Parliament in 2015.

In 2008, the UK adopted a strategy centred around four objectives: regional-scale climate projections and climate change risk assessments (published in 2012); raising awareness among the parties involved and identifying vulnerabilities in key national infrastructures<sup>23</sup>; taking adaptation into account in the formulation and conduct of public policy and monitoring and evaluating progress.

The UK National Adaptation Programme was drawn up in July 2013. It focuses on the most urgent risks<sup>24</sup>, under the following five key themes: Agriculture & Forestry; Business, Industries and Services; Health & Wellbeing; Natural Environment and Buildings & Infrastructure. An assessment is scheduled for 2017 and the plan must be reviewed every five years.

The UK's National Adaptation Programme is overseen by the Adaptation Sub-Committee, which coordinates work between the different ministries. Businesses, local authorities and other stakeholders are involved in implementing the programme. As part of this joined-up process, each ministry must produce a ministerial adaptation plan. This is intended to send a signal to businesses and other stakeholders and to show that the government takes adaptation seriously. A report was presented to Parliament in June 2015 by the Committee on Climate Change, which assessed the progress to date and made recommendations. It called for stronger measures on water resource management, flooding, high temperatures in urban areas, natural resources and farmland.

In 2010, a strategy was also published for Wales, followed in 2011 by sector-based adaptation strategies (natural environment, infrastructure, local authorities, business, tourism, health). An adaptation plan for Northern Ireland was adopted in 2013. In line with an Act of the Scottish Parliament, an adaptation framework was adopted in Scotland in 2009, under which 12 sector-based action plans are to be produced. The first of these were published in March 2011.

Like most countries, the United Kingdom has chosen to concentrate on "no regrets" measures<sup>25</sup>, most of which require minimal change to government action. Funding for adaptation is based almost entirely on the integration principle, whereby resources are allocated via existing budget processes, with no special funds set aside for adaptation. Cost-benefits analyses are widely used as a means of distributing spending between the different priorities.

<sup>21</sup> Estimated cost between €4 bn and €8 bn.

<sup>22</sup> The Delta Programme continues on in some ways from the Delta Plan launched in the wake of the 1953 disaster. Works under the Delta Plan were carried out from the 1960s to the 1990s.

<sup>23</sup> The bodies responsible for managing the main infrastructures must prepare reports including proposals for mitigating climate-related risks, under the "Adaptation Reporting Powers".

<sup>24</sup> The UK Climate Change Risk Assessment, carried out in 2012, considered approximately 700 potential risks, of which 100 were identified as the most significant. The Government has given priority to risks that require urgent attention.

<sup>25</sup> Such measures will be beneficial whatever the future level of warming.

The local level is seen as being the front line in terms of establishing strategies suited to the situation on the ground, while the national level is responsible for providing the appropriate tools, creating a favourable public environment, checking on implementation of adaptation at local level and providing arbitration in the event of regional disputes.

The UK Climate Impacts Programme (UKCIP) was set up in 1997 to coordinate research and provide technical support on climate change adaptation to both public and private organisations. UKCIP works with central government, the devolved governments and local authorities and facilitates effective coordination between the different governance levels. UKCIP<sup>26</sup> has developed tools and methods for forecasting local climate change impacts, assessing the financial consequences of the impacts and developing adaptation strategies. Special tools have been devised for businesses and local authorities respectively.

### *Germany's decentralised policy*

Germany adopted a national adaptation strategy in December 2008, drawn up in collaboration with the all the individual states (Länder). The strategy lays down the principles and criteria for prioritising actions, proposes measures to be implemented at federal level, provides an overview of measures to be taken by other players and information on funding. It deals with the themes of human health, construction, hydrological patterns, soil, biodiversity, agriculture, forestry management, fisheries, energy, financial industry, transport & transport infrastructure, commerce and industry & tourism, plus cross-sector subjects such as development or disaster preparation. In addition to explaining the potential consequences of climate change and the possibilities for action in the above areas, the strategy also describes Germany's role in adaptation in other parts of the world.

An action plan to implement the strategy was presented in August 2011. The plan sets the federal government's priorities, gives an overview of the concrete steps the other stakeholders will need to take and provides information about funding for adaptation. It concerns gathering knowledge, routinely taking adaptation into account in government action, adaptation measures for federal assets (buildings, transport infrastructure, forests) and transfer of knowledge to developing countries.

Two committees have been established to coordinate the strategy: a joint ministerial group representing all the ministries concerned and a group within the framework of the Federal and State Environment Ministers' Conference. The first assessment report on implementation of the strategy is due to be published by the end of 2015. It will report on the progress of the 2011 plan and propose measures for a new plan.

There are also adaptation strategies and plans for the individual states and cities, which are responsible for implementing a growing number of adaptation initiatives.

### Some examples from outside Europe

Apart from European nations, several other developed countries have also published climate change adaptation strategies, some with and some without an adaptation plan: Chile (2006), Australia (2007), Mexico (2007), South Korea (2010), Canada (2012), United States (2013).

### *Adaptation slowly taken on at federal level in the United States*

The United States has a high level of vulnerability to climate change: it has recorded the world's greatest economic losses – close to 30 billion dollars per year – and is one of the ten countries most affected by desertification and rising sea levels.

Adaptation to climate change initially fell under the remit of state and local government levels. In addition to the states that have developed adaptation plans<sup>27</sup>, many cities are also at the forefront in terms of planning and implementing adaptation measures and have developed some interesting operational tools<sup>28</sup> and governance systems<sup>29</sup>.

At federal level, an Executive Order issued by the President in 2009 instructed the various agencies to form a joint climate change adaptation task force responsible for making recommendations on policies and practices that could form the basis of a nationwide climate change adaptation strategy.

This resulted in the publication of the National Action Plan for Managing Freshwater Resources in 2011, the National Ocean Policy Implementation Plan in 2012, then the National Fish, Wildlife, and Plants Climate Adaptation Strategy in 2103. Federal bodies have begun to incorporate adaptation measures into their activities. For example, in 2009 the US Army Corps of Engineers drafted instructions on taking rising sea levels into consideration in the public works programme. These are updated regularly on the basis of scientific and public policy developments. In 2013, the Environmental Protection Agency published its Climate Change Adaptation Plan, which entrusted the agency's ten regional offices with developing an implementation plan. The plan emphasises methods and tools for reducing vulnerability, strengthening ecosystem resilience and protecting critical ecosystem services on which human beings and economic activities depend.

### *Pre-eminent role of the provinces in Canada*

At federal level, the government is concentrating on building knowledge and capacity within the public bodies, through actions

<sup>26</sup> Around 15 individuals work for UKCIP and it has a budget of €1.2 m per year. It is based at the University of Oxford's Environmental Change Institute.

<sup>27</sup> According to the OECD, 14 states had climate change adaptation plans in place in July 2012, including the 12 coastal states.

<sup>28</sup> The City of New York has developed a software application that enables householders and water utility companies to plan ahead for the impacts of climate change on their service and to weigh up the most appropriate solutions. The application combines a traditional risk assessment model with a climate model and can be used, for example, to minimise the impacts that torrential rain and storms would have on the city's wastewater disposal system.

<sup>29</sup> The City of Chicago established an external evaluation committee to monitor its adaptation plan, adopted in 2008. The committee is made up of the various stakeholders concerned and continuously monitors the implementation of the plan's objectives.

such as special budget allocations for the provinces and the production of climate projections and scenarios. The Ministry of Natural Resources (Natural Resources Canada) is especially active, through its Climate Change Impacts and Adaptation section. For example, it has sought to initiate regional adaptation policies on the basis of a national impact and vulnerability assessment report by region. The Ministries of Transport, Health, Indigenous & Northern Affairs, Agriculture & Agri-Food and Fisheries & Oceans Ministries are also developing specific initiatives for the areas within their respective remits.

Regional, provincial and local level adaptation strategies were developed following a climate change impact assessment report produced in 2007 by Natural Resources Canada and the introduction of two federal government funding programmes worth \$85.9 m over the period 2007-2011 and \$148.8 m for 2011-2015<sup>30</sup>. The different provinces prepared and adopted adaptation strategies and action plans within this framework, between 2008 (New Brunswick) and 2012 (Quebec). It took almost ten years before the Federal Adaptation Policy Framework was adopted. It was published in 2012, but does not seem to be very operational.

One of Canada's innovative initiatives has been the development of the Regional Adaptation Collaborative Climate Change Programs (RAC programs), based on Natural Resources Canada's 2007 impact assessment, which highlighted regional vulnerabilities so that specific measures could be identified to address them. There have been six RAC programs, covering the whole of Canada, with a budget of \$30 m over three years. They have strengthened the pooling of knowledge and tools specific to the regions, such as community development plans, construction practices and water management strategies, as well as strengthening collaboration between the different parties involved and encouraging the sharing of experiences and tools, with a view to accelerating planning and decision-making around climate change adaptation.

Another initiative has been the establishment of partnerships between public bodies and research institutions. For example, the federal government has developed climate scenarios and projections within the framework of the Canadian Climate Change Scenarios Network. In Quebec, the *Ouranos* consortium brings together 400 scientists and professionals from a variety of disciplines. It contributes to improving adaptation capacity through its research in the fields of population and infrastructure security, energy supply, water resource management, health, protection of the natural environment and forestry, farming, mining, tourism and transport activities.

### *The water issue in Australia*

Australia's National Climate Change Adaptation Framework was adopted in April 2007. Between 2007 and 2013, the Australian Government invested \$129 m in implementing the framework, which centres around understanding and managing climate risks and opportunities arising from climate change.

Sector-specific initiatives have also been initiated: training for farmers on the risks they should plan for, with support for implementing adaptation actions (\$130 m over four years); a nationwide assessment of the coastline's vulnerability to climate change in 2009; research into the impacts of climate change on forestry management (\$5 m); aid to local governments for adaptation capacity building (\$2 m); training for architects, engineers and natural resource managers (\$2 m); the Water for the Future programme, aimed at maintaining a reliable water supply for the country, for example by developing alternative water supply systems for the country's main urban areas.

Several research initiatives have also been organised: the CSIRO<sup>31</sup> programme, backed by funding of \$44 m over a five-year period, and the creation of a research facility specialising in national-level expertise, which will support the government, industry and communities with adaptation to climate impacts (\$20 m over four years).

Every year since 2011, a competition has taken place to single out excellent examples of adaptation practices at various scales, in several categories of participant (businesses, local authorities, government and individuals). The competition has proved a valuable tool for sharing good practice.

## Lessons from benchmarking

Adaptation strategies are generally high-level documents setting out a government's overall approach to adaptation. While the content of adaptation strategies varies from one country to the next – climate impact projections, vulnerability assessments, possible adaptation solutions and real-life data – they are usually a means of informing a wide audience of the government's approach and commitment to adaptation and facilitating national coordination of adaptation efforts. National strategies often lead to a refocusing of existing policies and the associated tools, rather than separate adaptation actions.

Some countries have drawn up adaptation plans laying down concrete actions in different numbers of priority sectors. However, these plans vary in terms of the process behind their development and the details they provide on allocation of responsibilities and implementation time-lines for adaptation actions.

A sector-based approach tends to take precedence, rather than an overall approach. The most advanced sectors are water, agriculture, forestry and health, while industry and other predominantly private sectors seem to be the least active.

Since the assessment team did not have time to study the situations in the countries concerned, it is difficult to assess the efficacy of their strategies and plans, especially since they are mostly recent and have not yet been evaluated<sup>32</sup>. However, while it is difficult to draw lessons at present from what other countries have achieved, the following facts emerge from their experiences:

– there is often a lag between the data that are available and the data that are needed. To address this issue, it is important to supply people with the more detailed data and climate projections they are calling for and at the same time help end-users with applying

<sup>30</sup> Adaptation initiatives had already been carried out at local level in response to climate-related events, independently of the 2007 report and the federal funding programmes.

<sup>31</sup> CSIRO: Commonwealth Scientific and Industrial Research Organisation, a federal research body.

<sup>32</sup> Finland is the only country to have evaluated its national adaptation strategy, which it did in 2013.

the data. A flexible process is therefore the most appropriate, so that the adaptation objectives and measures can be updated as new scientific data become available;

- effective coordination systems need to be in place in order to implement the adaptation plan or strategy. This all the more necessary since most of the documents are organised by theme but the subjects do not coincide exactly with the various ministries' remits. Most of the countries that have set up coordinating bodies have done so through the intervention of their environment ministry, and where high-level coordination exists it is complemented by groups which provide technical guidance for the actions;

- the stakeholders concerned are involved to varying degrees in devising and implementing adaptation actions. Some countries have opted for a decentralised approach when developing their plan, with the actions, time-lines and responsibilities established by agreement between the main public and private sector stakeholders. Other countries have preferred a more centralised approach, whereby the national bodies decide on the actions, determine who is responsible for implementing them and set priorities. Whichever approach is taken, it is important to consult with all the sectors and civil society, and to undertake communication and awareness-raising activities;

- there are significant differences in the way priorities are set in different countries, in particular regarding the choice of criteria, the level of importance attached to each criterion and the degree to which priorities are set on the basis of quantitative and/or qualitative information. Due to the uncertainty and complexity of the whole climate change issue, it is important that the priority-setting process be backed up by cost-benefits analyses, even if the costs of adaptation actions are often easier to identify than the long-term value of the benefits they will bring;

- the specific details of how adaptation measures will be funded are not generally dealt with in either the strategies or the plans. Only some national programmes include details of funding for preliminary activities (such as vulnerability assessments and climate research) and have calculated the costs of adaptation measures and identified specific funding sources (pre-existing initiatives and investments that will contribute to achieving the adaptation objectives);

- few countries have developed detailed methods for monitoring and evaluating their adaptation planning. Those countries with the most highly developed monitoring and evaluation systems have tended to focus more on monitoring the processes than the results. However, it is important to carry out long-term evaluations as well as regular ongoing monitoring, so as to determine whether the original objectives have been met, whether they were pertinent and whether the results observed can be attributed to the adaptation actions themselves.

# Adaptation in France: from strategy to plan

The founding principles of France's adaptation policy were laid down in the Law of 19 February 2001, which states that "preventing the worsening of the greenhouse effect and averting the risks associated with global warming shall be recognised as national priorities". The same law established the National Observatory on the Effects of Climate Change (ONERC), which was entrusted with gathering and disseminating information, studies and research on the risks associated with global warming and extreme weather events. The observatory was set up within the General Directorate for Energy and Climate (DGEC), a section of the Ministry of Ecology, Sustainable Development and Energy. It contributed to drawing up the national adaptation strategy, which marked the true beginning of organised government action on the subject<sup>33</sup>.

## France as a pioneer in Europe with its national strategy

France's National Climate Change Adaptation Strategy was drawn up by the appropriate government departments, under the guidance of the joint ministerial representative on sustainable development, and was adopted in November 2006 by the joint ministerial committee on sustainable development. This made France the second country in Europe to adopt a climate change adaptation strategy.

The strategy sets four priorities and nine principle avenues for implementation, which are then approached from three different angles (resources and risks, economic and activity sectors and living environments):

- Priorities: protecting people and property; preventing inequalities in exposure to risk; limiting the costs & taking advantages of the opportunities and preserving natural heritage;
- Avenues for implementation: developing knowledge; strengthening observation systems; informing, training and educating stakeholders; promoting an approach geared towards local situations; funding adaptation actions; making use of statutory and regulatory instruments; fostering a voluntary approach and dialogue with private sector stakeholders; taking account of the specific circumstances in the Overseas Territories; contributing to international discussions.

The strategy contains 43 recommendations and proposes that they should be implemented in a coordinated manner under the framework of a national adaptation plan.

The *Grenelle de l'environnement* consultation process, which included a topic on climate change, repeated this recommendation in "Commitment 7", which became enshrined in Law N°2009-967 of the 3<sup>rd</sup> of August 2009 (the "First Grenelle Act"). Article 42 of the act stipulated that a national climate change adaptation plan should be created for all economic and activity sectors by 2011.

In addition to these national aspects, a further law (Law N°2010-788 of the 12<sup>th</sup> of July 2010 on national undertakings for the environment – the "Second Grenelle Act"), introduced "Regional Climate, Air and Energy Master Plans" and "Local Climate and Energy Plans"<sup>34</sup>, with sections devoted to climate change adaptation.

## A consultation process before moving from strategy to plan

Between 2007 and 2009, a joint ministerial group was tasked with identifying climate change impacts, assessing the costs of these impacts and proposing how to go about adaptation. A report published in September 2009<sup>35</sup> described the considerable impacts of climate change on several sectors and calculated that the costs involved would be in the region of several billion euros per year. A further report was produced in February on the economics of adaptation to climate change<sup>36</sup>.

Before the national plan was drawn up, a consultation took place in the first half of 2010, led by the chair of ONERC. Three working groups were set up, made up of representatives of the five Grenelle Environment Roundtable groups (central government, elected representatives, civil society, employers' associations and trade unions)<sup>37</sup>. The parties to the consultation reached a consensus on 202 recommendations, to which nine recommendations by the overseas territories were added. An online public consultation received 4,300 replies in one month in the autumn of 2010 and interregional meetings were also held.

In addition, Jean Jouzel was asked to consult with the scientific community to determine how to select which climate scenarios should be used as a basis for the national adaptation plan. The result was that two climate scenarios were selected, one more optimistic and one more pessimistic. Both scenarios predicted the same levels of warming by 2030 and 2050 respectively, with a temperature rise of between 0.5°C and 1.5°C. However, in the worse scenario, the temperature rises more (between 2.5°C and 3.5°C) by the end of the century than in the better one (between 2 and 2.5°). As regards rainfall, the worse scenario anticipates a

<sup>33</sup> The "Heatwave Plan", introduced following the summer of 2003, could be viewed as an initial adaptation measure. Similarly, the 2004-2012 National Climate Plan included a small section on adaptation.

<sup>34</sup> "Local Climate and Energy Plans" are compulsory in local authorities with more than 50,000 residents; whereas those introduced in 2004 were voluntary.

<sup>35</sup> Environment Ministry report, *Évaluation du coût des impacts du changement climatique et de l'adaptation en France* ("An assessment of the costs of climate change impacts and adaptation in France"), September 2009.

<sup>36</sup> De Perthuis, Hallegatte & Lecocq : *Économie de l'adaptation au changement climatique* ("Economics of Adaptation to Climate Change"), CEDD (Environment & Sustainable Development Commission), February 2010.

<sup>37</sup> The groups worked on the following subjects: biodiversity, water resources, natural risks and health (Group 1, chaired by the Member of Parliament for Rhône, Mr Havard); agriculture, forestry, fisheries, energy, transport infrastructure, tourism, town planning and buildings (Group 2, chaired by climatologist J.Jouzel) and funding, governance, information, education and research (Group 3, chaired by the Member of Parliament for Haute Savoie, Mr Saddier).

10% reduction in summer rainfall by 2050 and a 30% reduction by 2090. In the better scenario, this reduction occurs at a later date. Lastly, the number of days when the maximum temperature is abnormally high is significantly higher in both scenarios, with much more prolonged periods of summer drought in all our regions.

The Chair of the Prevention and Precaution Committee was also tasked with looking at what might be a definition of “acceptable risk” in the various fields covered during the consultation stage. The committee’s report was published in 2013<sup>38</sup>.

## The National Adaptation Plan 2011-2015

The National Climate Change Adaptation Plan (NAP), presented by the Minister for Sustainable Development on 20 July 2011, covers a five-year period and is based on the following objectives:

- to improve knowledge about the effects of climate change, in order to inform public decision-making on adaptation;
- to take adaptation into account in existing public policies with a view to ensuring consistency across all sectors and to reflect the cross-cutting dimension of the subject;
- to inform society about climate change and the adaptation measures that must be put in place, so that everybody can take the issues on board and take action;
- to take the interactions between sectors into consideration and thus ensure effective financial management of climate change adaptation;
- to clearly define the different stakeholders’ respective responsibilities in terms of implementation and funding.

The NAP reflects the recognition of forward planning as an essential part of public policy. The plan constitutes a national framework designed to ensure consistency on climate change adaptation across all public policy areas.

The plan covers 20 themes, which reflect the subjects discussed during the consultation process leading up to the plan and the principles set out in the national strategy adopted at the end of 2006. These are: Cross-Cutting Actions, Health, Water, Biodiversity, Natural Risks, Agriculture, Forestry, Fisheries & Fish Farming, Energy & Industry, Transport Infrastructure, Town Planning & Buildings, Tourism, Information, Training, Research, Finance & Insurance, Coastal Zones, Mountains, European & International Actions and, lastly, Governance. The plan does not contain a theme on the overseas territories, as the prior consultation concluded that a period of more in-depth study was required first, before deciding on measures specific to those territories<sup>39</sup>.

In view of the uncertainties that still exist over the magnitude of future changes, the plan prioritises the following types of measure:

- “no regrets” measures, which will be beneficial regardless of climate change impacts;
- reversible measures, which can be halted if the changes are less significant than anticipated;
- measures that increase safety margins and cost less than if we wait to make the adjustments;
- measures implemented over a long period of time, which can therefore be adjusted and revised according to developments in the knowledge.

The NAP contains 84 national-level actions, split into 242 measures. It recommends a series of actions and measures in the areas of research and observation. The national plan does not cover local or regional level adaptation actions, as these fall under the Regional Climate, Air and Energy Master Plans (SRCAE) and the Local Climate and Energy Plans (PCET).

The published document states that it was not possible to assess the financial cost of all the measures, and that the funding required for the plan is likely to be close to €171 m. This figure is the combined total of all the funds already set aside and no provision is made to allocate any new funds specifically to the plan. The breakdown of funding by theme was not published together with the plan.

The national observatory (ONERC) is responsible for monitoring the performance of the NAP actions annually, on the basis of information from all the designated action and measure coordinators. It was stipulated that an assessment committee would produce a mid-way assessment report on the NAP in late 2013, including an evaluation of how actions conducted locally and regionally and the SRCAEs and PCETs had tied in with the NAP actions. The same committee was to produce an overall assessment at the end of 2015.

**The approach taken by the National Adaptation Plan emerges as a process of collective learning and understanding of the issues. The process centres around government-run initiatives, with a domino effect on the private sector, the aim being to equip all parties concerned with the skills they will need to adapt to future climate conditions whose precise nature is not yet known. The first step in this process is to be aware of how living things and human societies are affected by the climate and of the work we need to do right now to adapt.**

<sup>38</sup> Committee on Prevention and Precaution, *Adaptation au changement climatique – acceptabilité et gouvernance des risques* (“Adaptation to climate change – risk acceptability and governance”), June 2013.

<sup>39</sup> At the same time as its 2012 Annual Report, ONERC published the document entitled *Les Outre-Mer face au défi du changement climatique* (“the Overseas Territories in the face of climate change”), which assesses the impacts of climate change in the various sectors and suggests guidelines for action, though without pre-empting any future action plan.

## Section 2

### Assessment of the national plan in practice and the results obtained

The assessment team sought to evaluate the national adaptation plan's adequacy (NAP), its implementation effectiveness, the results it has generated and its impact on the situations on the ground and towards the various stakeholders concerned. This should then provide an assessment of the extent to which the national plan has contributed to improving France's preparedness for climate change.

This overall assessment is based on the summary reviews of the implementation of the plan's 20 themes, which are presented in Annex 3, as well as the interviews conducted by the team (see Annex 2).

## Overall, the plan is in line with the strategic objectives and the stakeholders' recommendations

To assess whether the national plan is fit for purpose, the assessment team referred back to the national strategy adopted at the end of 2006 and the working groups' proposals contained in the report on the national consultation conducted in 2009 and 2010, as both these exercises resulted in a large number of recommendations for the national adaptation plan.

### Adherence to the objectives of the national strategy

The national adaptation strategy adopted in November 2006 set out 43 recommendations and expressed the wish that they should be implemented in a coordinated manner under the framework of a national adaptation plan. As a whole, these recommendations were taken into account when the NAP's actions were drawn up<sup>40</sup>, with the exception of those on the overseas territories, which were dealt with in the context of other themes (except for recommendation 20) and not as a subject in their own right.

However, some recommendations, including those listed below, were not taken into account in any of the NAP's actions, or were not covered explicitly:

- N° 5 on assessing the costs and impacts of adaptation;
- N°7 emphasising the need to strengthen expertise in the area of observation (by creating posts);
- N°8 on establishing and updating indicators of climate change, climate impacts and adaptation, which would enable more accurate monitoring and at the same time serve as decision-making aids<sup>41</sup>;
- N°9 (elaborated on in N°30, 34 and 36) on more frequent information sharing between decision-makers, in the form of meetings between local and regional politicians, government departments and professionals from the different sectors concerned<sup>42</sup>. This recommendation was dealt with on a sector-specific basis, but did not cover communication between these different players;
- N°13 on incorporating climate change adaptation into the Central-regional government agreements was not included in the Governance theme measures;
- N°15 and 16 on funding for adaptation and appropriate economic rationales ;
- N°17 on regulatory watch.

The more general recommendation N°19 on the involvement of private sector players was not sufficiently taken into account within the NAP.

### Most of the recommendations from the 2010 consultation were followed up on

The consultation conducted within the three working groups<sup>43</sup> in late 2009 and the first half of 2010, prior to the drafting of the NAP, resulted in a list of 202 recommendations covering all the themes of the NAP apart from European and International Action.

Most of the recommendations, which reflected a consensus among the stakeholders, are taken into account in the plan's theme-based actions and measures. However, the assessment team found that, while the content of some of the NAP themes faithfully reflects the subjects suggested by the consultation groups (e.g. water, forestry, energy, transport infrastructure, natural risks, information), others followed up only partially on the recommendations:

- None of the seven recommendations on the Tourism theme, covering the whole country (coastal zones, mountains, etc.) and all the industry segments (transforming the tourism model, transforming the hospitality industry, etc.) were included (although one action under the Mountains theme relates to tourism). The two actions listed under Tourism only take a very small part of the 2010 working group's recommendations into account;
- The Health theme only partially reflects the 20 recommendations. None of those relating to the health impacts associated with changes in air or water quality or with the proliferation of toxin-producing micro-organisms are addressed (recommendations N°65, 72, 73, 74 & 75). The same goes for health risks at work, or population behaviour in extreme climate conditions (recommendations N°69, 77 & 80);
- The Governance theme, for which 18 recommendations were made, does not take into account those regarding revision of the impact assessment methodology guides, mal-adaptation or home working (recommendations 156, 157 & 163)<sup>44</sup>.

<sup>40</sup> Some of the strategy's recommendations have also been implemented outside the NAP framework. For example, recommendations 15 and 16 on funding mechanisms and assessing the costs of adaptation were dealt with before the NAP was adopted, within the framework of a cost assessment report by the Environment Ministry (2009), followed by a report by the Sustainable Development Commission on the economics of climate change adaptation (2010).

<sup>41</sup> A few initiatives have been started in some of the themes, but they have not been fully developed.

<sup>42</sup> For example, the climate change information exchange forums between the government departments and professionals from the farming, environmental management and insurance sectors, proposed in recommendations 30, 34 and 36, are not explicitly mentioned anywhere in the NAP measures. The Local Climate & Energy Plan Resource Centre (Measure 1.2 of the Governance theme) could be viewed as following up on recommendation 38 on a forum for discussions with local authorities.

<sup>43</sup> The groups worked on the following subjects: biodiversity, water resources, natural risks and health (Group 1, chaired by the Member of Parliament for Rhône, Mr Havard); agriculture, forestry, fisheries, energy, transport infrastructure, tourism, town planning and buildings (Group 2, chaired by climatologist J.Jouzel) and funding, governance, information, education and research (Group 3, chaired by the Member of Parliament for Haute Savoie, Mr Saddier).

<sup>44</sup> Recommendation 159 on the "acceptable risk" concept and recommendation 164 on duties to be assigned to public servants were taken into account in the Cross-Cutting Actions theme.

More generally, the recommendations relating to measures of a local or regional nature do not appear in the NAP, as it is restricted to nationwide measures<sup>45</sup>.

Lastly, it should be noted that, alongside the recommendations relating to specific themes, the consultation discussions had also highlighted the need to tackle certain issues on a cross-sector basis: adaptation in coastal zones, water resources, biodiversity conservation, heat in cities and links between adaptation and mitigation policies. Due to the way in which the plan was put together and implemented, it was not really possible to address the many interactions between themes. Several of the people whom the assessment team interviewed flagged up this absence of horizontal links between the different themes as a weakness.

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<sup>45</sup> For example, recommendations 16 and 202 on trials in volunteer local authorities, or recommendation 20 on regional expert assessments.

## Room for improvement in the plan’s implementation process

The assessment team studied the process of implementing the national adaptation plan by looking at the degree to which the actions and measures listed in the plan had actually been carried out<sup>46</sup>, the procedures involved in performing and monitoring them, the financial resources that were budgeted for and those that were actually spent, as well as the ways in which the stakeholders were involved in the process.

### A satisfactory level of achievement of the actions and measures

Table A.1 summarises the progress to date of the National Adaptation Plan’s 84 actions, as far as the team was able to judge following discussions with each theme lead:

	Number	Completed	In progress	Delayed	Abandoned
1– Cross-cutting actions	5	1		4	
2– Health	5		4	1	
3– Water resources	5	3	1	1	
4– Biodiversity	4	1	2	1	
5– Natural risks	5		5		
6– Agriculture	5	3	2		
7– Forestry	5	1	2	1	1
8– Fisheries & fish farming	1		1		
9– Energy & industry	5	3	1	1	
10– Transport infrastructure and systems	4		4		
11– Town planning and buildings	4	2	1	1	
12– Tourism	2	1	1		
13– Information & communication	4	3	1		
14– Education & training	5	3		1	1
15– Research	4	1	2	1	
16– Funding & insurance	7	3	1		3
17– Coastal zones	4	1	3		
18– Mountains	4		3	1	
19– European & international actions	4	3	1		
20– Governance	2	2			
Total	84	31	35	13	5

Table A.1: Estimated state of progress of the NAP’s actions as at end 2015

According to the assessment team’s estimation, 80% of the actions will have either been completed in full or be in progress by the end of the current plan in December 2015. Delayed or abandoned actions account for the remaining 20%. The situation is especially critical for the Funding theme, in which actions concerning mobilising adaptation funding and incentive schemes were abandoned due to lack of adequate support.

Table A.1 summarises the progress to date of the National Adaptation Plan’s 240 measures, as far as the team was able to judge following discussions with each theme lead<sup>47</sup>:

<sup>46</sup> The plan includes 84 actions, divided into 247 measures.

<sup>47</sup> We were unable to obtain reliable information on the progress of some measures and it must also be borne in mind that some measures were added later on top of those listed in the original plan.

	Number	Completed	In progress	Delayed	Abandoned
1– Cross-cutting actions	5	1		4	
2– Health	16	6	5	5	
3– Water resources	19	9	6	3	1
4– Biodiversity	22	7	7	5	3
5– Natural risks	28*	10	13	2	1
6– Agriculture	15	9	5	1	
7– Forestry	16	5	5	3	3
8– Fisheries & fish farming	1		1		
9– Energy & industry	5	3	1	1	
10– Transport infrastructure and systems	12	5	3	3	1
11– Town planning and buildings	10	5	3	1	1
12– Tourism	2	1	1		
13– Information & communication	12	11	1		
14– Education & training	5	3	1	1	
15– Research	16	7	4	2	3
16– Funding & insurance	15	3	2	1	9
17– Coastal zones	13	7	5	1	
18– Mountains	13	4	7	1	1
19– European & international actions	12	6	3	2	1
20– Governance	5	5			
Total	242*	107	73	36	24

Table A.2: estimated state of progress of NAP measures as at end 2015 (\*two measures not accounted for)

In the assessment team's judgement, almost half of the measures have already been completed, and if we add to these all the measures still in progress that will continue to be implemented beyond December 2015, approximately three quarters of the plan's measures will have been implemented. The remaining quarter comprises measures that have been delayed or abandoned, due to practical problems (lack of funding, preliminary knowledge not available, etc.) or lack of commitment by the organisations responsible, or because their relevance has not been ascertained.

Overall, the implementation of the NAP can be said to have been satisfactory, in terms of the proportion of actions and measures that have actually carried out.

## More follow-up and stronger leadership required

### *Lack of strategic leadership of the themes*

The governance system set out in the plan does not clearly describe the leadership process for the themes, though it does state who the leader or leaders are for each action and measure. Responsibility for each of the themes, without exception, was assigned to a specific central government department. They designated a "theme lead" to liaise with ONERC, which was entrusted with the overall coordination of the plan<sup>48</sup>.

The assessment team contacted and met with all the theme leads. Some of them carry out their duties as and when they are able and monitor some of the measures effectively, but without always having an ongoing overview of the actions. There can sometimes be a lack of continuity in these monitoring activities, also, when a new theme lead takes over. In one case (tourism), the team found that the unit identified by ONERC as the theme lead was not aware of the National Adaptation Plan and did not perceive its activities as being part of it<sup>49</sup>. The circumstances tend to be more favourable when the lead is someone working in a post directly related to climate change, as for example in the Forestry theme, which has a full-time officer.

Coordination of the themes often consists solely in monitoring the implementation of the measures and gathering information on their progress from the organisations responsible. Where responsibility for carrying out the actions is shared between several

<sup>48</sup> ONERC has two officers working on a 1.4 x full-time equivalent basis between them to coordinate and monitor the National Adaptation Plan. They are supported from time to time by interns who help with research.

<sup>49</sup> The Tourism section of the Department of Enterprise (formerly the Department of Competition, Industry and Services) coordinates numerous measures on a day-to-day basis, with support from many different public and voluntary sector players. However, the measures are not identified as NAP measures and the section in question is not even aware of the NAP, even though it is stated as being the theme lead for Tourism in the plan.

government departments, the theme leader will often only monitor the actions his or her own department is responsible for, making it difficult to have an overview of the whole theme. Some theme leaders told us that receiving an official commissioning letter would give them the legitimacy they need to properly fulfil their role.

In some cases, there is absolutely no coordination or leadership within a theme, and all the actions and measures are run separately. However, some themes do have initiatives in place. For example, in the Transport Infrastructures theme, a consultation group was set up, which meets every six months and this has enabled the parties to develop a shared approach to the work. Similarly, the theme leader on Forestry regularly brings the measure coordinators together. For the Water Resources theme, a standing committee on climate change has been formed, with representatives from the Department of Water and Biodiversity, the regional environment departments covering the various river basins, the utility companies and the national water authority (ONEMA). This has enabled them to work collaboratively on the NAP Water Resources measures.

The assessment team generally found a lack of strategic leadership within the individual themes, and even less cross-coordination between them. This is why some of the people we spoke to in the different departments do not see the NAP as the framework governing climate change adaptation policy in their specific sector and it is not recognised as such<sup>50</sup>, which in turn makes the task of the theme leaders more difficult.

#### *Consultative processes lacking in the formal follow-up of the plan*

The NAP stipulates that ONERC is responsible for monitoring the implementation of the plan annually.

ONERC set up an initial meeting with the theme leads in September 2011 to organise monitoring procedures. A further meeting was held on assessment methods in November 2011.

After this, the progress of the actions and measures was generally monitored in the form of communication between ONERC and the theme leads.

An initial six-month summary of the plan's implementation was presented to the National Committee on Sustainable Development and the Grenelle Environment Roundtable (CNDDGE) on 9 February 2012, in which there was substantial follow-up information on the Forestry, Agriculture, Fisheries, Water, Energy, Transport, Research, Health, Tourism and Cross-Cutting Actions themes.

At the end of 2012, ONERC carried out a progress review based on the monitoring charts sent in by the theme leads. A ministerial review meeting scheduled for mid-2013 was unable to be held.

In accordance with the provisions of the NAP, ONERC carried out a mid-way review at the end of 2013, after gathering the necessary information from the theme leaders and holding a joint working meeting with them. After this review, ONERC continued gathering information, but no formal joint monitoring activities took place. For example, there was no end-of-year review in 2014.

Apart from monitoring of the NAP implementation process from a technical point of view, the theme leads were also invited by ONERC to attend two symposiums, on biodiversity and coastal zones respectively, and two presentations on reports by the IPCC. The only joint review exercise between ONERC and some of the theme leads was a series of meetings held to examine the possibility of using revenue from emissions quota auctions to fund new adaptation actions or boost existing actions. However, these were not followed through with any practical action.

## **Difficult to calculate what funding has been mobilised**

#### *Initial funding estimate not very reliable*

After the official launch of the National Adaptation Plan on the 20<sup>th</sup> of July 2011, a final inter-ministerial negotiation meeting was held on the 8<sup>th</sup> of July to approve all the NAP's theme summaries and the funding.

Of the funding for the measures set out in the plan, €174 m was to come from existing budgets and a further €54 m would therefore be needed (€17.5 m for 2012-2013 and €36.5 m for 2014-2015). It was eventually decided to proceed on the basis that each ministry would fund the actions it was responsible for, without any additional funds.

At the end of the inter-ministerial meeting, the total budget for implementing the NAP was fixed at €170.7 m, of which €165 m was already considered to be covered, while the remaining €5.7 m was yet to be funded and would be allocated to the Research theme. The budgets for most of the themes were broken down by action, or even by measure. However, those for the Natural Risks and Mountains themes were overall budgets for the whole theme. No information on funding was mentioned for either the Governance or the Finance & Insurance themes, which stands to reason given the nature of the measures envisaged.

Two thirds of the overall funds were allocated to seven measures: €51 m for "saving water" and "storage" under the Water Resources theme; just under €23 m for "natural resources management" and "insurance" under the Agriculture theme; €16 m for "habitat mapping" under the Biodiversity theme; €15 m for "flood risk mapping" and €10 m for works to improve the yield of a water supply network under the International Action theme.

These figures are relatively large but were only based on estimates. In addition, the budget did not fully cover the estimated costs of the measures and some of the figures allocated to specific measures only accounted for one year's costs, as opposed to the costs for the whole plan duration. In some cases, it was also difficult to estimate what percentage of the costs should be attributable to

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<sup>50</sup> Some of the theme leads reported that a number of measure coordinators were not aware that their activities were part of the NAP.

adaptation<sup>51</sup>. Due to all of these factors, the budget estimated for the NAP cannot be seen as sufficiently reliable or comprehensive. The overall total of €171 m (excluding remuneration costs for government officials) stated in the NAP, with no breakdown of the funding between the themes, is therefore only a very rough estimate.

#### *Patchy monitoring of budget implementation*

From its interviews with the individuals responsible for monitoring the different themes, the assessment team noted that the follow-up of financial aspects had been patchy.

Several of the theme leaders, in particular those who were not in office when the NAP was being drafted, were not able to provide any evidence to support the budget figures that had been mentioned. They referred to the budgets even less where no specific funds had been allocated for the NAP measures. Since the measures were part of their department's day-to-day activities, they did not see special financial monitoring as being warranted. In these cases, the best they feel they can do is to estimate how much has been spent on the measures once they have been completed.

While some of the theme leaders are fully aware of the financial resources allocated to the NAP measures and keep dedicated management charts for them, especially when they have direct control over the budget, others only have a superficial or patchy knowledge, in particular when the funds are spent by third parties, such as the Environment Agency (ADEME). Some of these third parties may have some useful data on the subject.

#### *Difficult to assess financial implementation of the plan*

Due to the unreliable nature of the budget information and the incomplete monitoring of the financial aspects in most of the themes, the assessment team did not feel it was in a position to provide a proper estimate of the financial costs to date of implementing the NAP. The team also therefore queries the method that led to the statement made in the mid-way review of December 2013 that 60% of the original budget had been spent at that point.

The assessment team noted that some of the NAP's top priority measures could not be carried out due to a lack of funds. Conversely, incorporating certain measures into the NAP meant that funding for the activities in question was protected, amid a climate of spending cuts.

The assessment team feels that the budgets allocated to the next plan's measures should be calculated more precisely and should distinguish between funds that already exist and those that are not definite. These figures should be explicitly stated in the descriptions of the measures, since their implementation is dependent upon them.

### **Stakeholders not sufficiently involved in the plan**

The drafting of the National Adaptation Plan (NAP) was preceded by a wide consultation with all the stakeholders, which resulted in a large number of recommendations. Many of these were taken into account during the process of formulating the NAP actions and measures.

However, in terms of the implementation of the plan, the local authorities have not been involved at all, while the various activity sectors have barely been involved. This situation is a reflection of the fact that the NAP consists first and foremost of nationwide measures, which have been run by central government or delegated by the latter to the various government agencies. This has narrowed the plan's scope in areas where concrete adaptation measures cannot be put into practice without involvement from either economic players (agriculture, forestry, industry, tourism, etc.) or local authorities (natural risks, biodiversity, coastal zones, town planning, etc.).

One illustration of the lack of attention paid to economic activities in the implementation of the NAP is the fact that the study to identify the industry segments most vulnerable to climate change in France was not carried out<sup>52</sup> (the situation was the same for tourism). Studies of this nature have been conducted in other countries, such as the United Kingdom, to identify the most vulnerable sectors and highlight any opportunities. Another example is the lack of follow-up or dissemination of the interregional surveys of economic sectors initiated by the Joint Ministerial Regional Development Department (DATAR), under action 1 of the Governance theme. The problems encountered with negotiating public service contracts incorporating climate change considerations with the major public companies should also be mentioned (action 2 of the Cross-Cutting Actions theme).

Similarly, the stakeholders were not really brought in on the monitoring or evaluation of the NAP, as had originally been envisaged. According to the terms of the plan itself, the head of the Department of Energy and Climate was to be responsible for forming an assessment committee to evaluate the NAP, with representatives of all the government departments in charge of implementing the plan, the stakeholders who took part in the consultation process, including local and national level politicians, as well as representatives of the scientific community. Annual meetings were to be held to look at how the implementation of the measures was progressing, as well as evaluation meetings proper.

The evaluation system originally provided for in the plan was not set up. Nor was the assessment committee, whose composition was supposed to have been defined by the National Committee on Sustainable Development and the Grenelle Environment Roundtable (CNDDGE). It was later decided that the National Advisory Council on the Green Transition (CNTE) would act as a

<sup>51</sup> The "insurance" measure under the Agriculture theme (Measure 5.1) is a good example of the difficulty in calculating the budget headings. The national budget set aside for this measure was €110m for 2011-2014, after which the funding would be taken over by the EU's EAFRD fund. It was arbitrarily decided to allocate 10% of the total annual expenditure to the adaptation account, without any evidence to justify that percentage.

<sup>52</sup> The study was listed as action 5 of the Energy & Industry theme, placed under the leadership of the Department of Enterprise (formerly the Department of Competition, Industry and Services).

monitoring and evaluation committee.

The mid-way progress review of all the NAP actions, produced in December 2013 by ONERC in conjunction with the theme leaders, served as a self-evaluation of the degree to which the objectives had been achieved and the appropriateness of the actions initially planned. The review was presented to the CNTE on the 16<sup>th</sup> of January 2014, but the latter did not express a formal opinion on it. The observations focused primarily on: the ways in which the national plan had tied in with local and regional exercises (Regional Climate, Air & Energy Master Plans and Local Climate & Energy Plans), whose adaptation elements were considered weak; the importance of prioritising the actions, which were seen as being very numerous; the need to clarify the details of the budgets allocated to the NAP and the need to strengthen cross-cutting aspects such as training, information and dissemination of tools.

The present report by the General Advisory Council on the Environment and Sustainable Development constitutes the scheduled final overall assessment of the plan. The assessment team was only able to consult a few of the stakeholders in the time allowed.

Overall, while all the relevant stakeholders were included in developing the National Adaptation Plan, this was not the case when it came to implementing or monitoring the plan.

# Results achieved

The principal results achieved by the end of the National Adaptation Plan are listed in Annex 3a, in the review of each of the 20 themes. Some of the achievements were not solely a result of the plan and the assessment team also noted that more significant progress was made where the measures set out in the NAP were effectively incorporated into the general policies for which the government departments concerned were responsible. The team identified certain key results, some of which will have a positive impact on our adaptive capacity over the coming years. These are described below.

## Advances in knowledge

In terms of advances in knowledge, several key research initiatives have been carried out or begun under the framework of the NAP, aimed at supporting public action: for example 10-year climate event predictions and the associated uncertainties, understanding the part played by climate change in extreme events, understanding wave climates, climate scenarios for mountainous regions, adapting buildings to the problems of urban heat and cooling and clay soil shrinkage and swelling, or the use of innovative methods for developing adaptation actions in the country. At the fringes of the NAP's measures, significant work has been done to develop knowledge in certain fields: for example the meta-programme on adaptation of agriculture and forestry to climate change adaptation run by the National Institute of Agricultural Research (INRA).

Long-term planning exercises have also been carried out; for example the "Explore 2070" programme in the water resources field, or the "AFCLim" project, which has yielded useful information on factors that enable or hinder adaptation actions in the agriculture and forestry sectors and identified factors that will help adapt certain environments that are likely to be worsened by climate change. Some interesting initiatives have also been undertaken to facilitate dissemination of the research results to the industries themselves; for example the "Aforce" joint technology network in the forestry sector.

The impetus created during the development of the NAP's Research theme prompted the principal climate research laboratories to work together and this led to valuable results on climate developments, which have been made openly available via the DRIAS portal. These important results are presented below:

### .1 Volumes 4 and 5 of "The French Climate in the 21st Century"

The research done on baseline climate scenarios, which tied in with the data from the 5th IPCC report (2013-2014), resulted in two major publications:

– Volume 4, published in August 2014<sup>53</sup>, analysed climate change in France in the 21<sup>st</sup> Century on the basis of trends in above or below average rainfall and temperatures over time, in terms of summer and winter averages. These were simulated using two regional climate models run by the French Meteorological Office's National Research Centre and Pierre Simon Laplace Institute, in collaboration with the National Industrial Environment and Risk Institute. The simulations are based on three of the four scenarios considered in the latest IPCC report. The main climate variables available are average temperatures, average rainfall and indexes of extreme cold spells, heatwaves, droughts and rainfall. The study reveals changing temperature and rainfall trends in France as compared with an average reference period (1976-2005);

– Volume 5, published in February 2015<sup>54</sup>, looks at changing sea levels along French coastlines. It updates Volume 3 of the report on the French climate published in February 2012, and discusses the latest knowledge on past and future sea level variations, as well as the main physical impacts of rising sea levels (sea flooding, coastal erosion, salt-water intrusion into aquifers close to the sea) and impacts on coastal and port infrastructures. It does not deal with socio-economic issues or management of the risks in question.

These data are made available via the DRIAS portal and can be used, for example, to update technical guidelines for transport infrastructures, or to inform various issues currently arising in town planning (e.g. heat islands). They are also fed into the "climate impacts" tool available for local authorities or engineering firms to use when drawing up local vulnerability diagnostic studies.

This vital work to obtain knowledge about climate developments must be continued on an ongoing base, as the research will need to be updated as new information is issued by the IPCC. It will also be necessary to extend it to the overseas territories, narrow down the uncertainties connected with climate projections, produce projections on more detailed temporal and spatial scales and combine climate models with other models (e.g. hydrological or agricultural models, etc.).

<sup>53</sup> Ouzeau G., Déqué M., Jouini M., Planton S., Vautard R., edited by Jean Jouzel, *Le climat de la France au XXI<sup>e</sup> siècle*, ("The French Climate in the 21st Century") Volume 4, *Scénarios régionalisés* (Regionally downscaled scenarios): 2014 edition for mainland France and French Overseas Territories.

<sup>54</sup> Planton S. et al. edited by Jean Jouzel, *Le climat de la France au XXI<sup>e</sup> siècle*, Volume 5, *Changement climatique et niveau de la mer : de la planète aux côtes françaises* ("Climate Change and Sea Level: from the global scale to the French coasts").

## 2 Assessment of the effects of a 1 metre rise in sea level in French Overseas Territories

A study was conducted to assess the vulnerability of overseas counties and communities<sup>55</sup>, similar to the one carried out for mainland France (see Table A.4).

The purpose of the study was to produce an overview of current knowledge on coastal risks and attempt to assess the territories' vulnerability. This in turn would help to assess which sectors are most exposed to the effects of climate change.

A survey was conducted of the buildings, transport infrastructures and protected natural areas that might be affected by a 1 metre rise in sea level. Table A.3 below shows the results.

After Table A.3 on the areas at risk in the overseas territories, we have reproduced the corresponding table produced in 2009 for mainland France, before the adaptation plan was launched (Table A.4).

Overseas counties or community	Buildings	Transport infrastructures	Protected natural areas
	Number	Linear distance (km)	Area (ha)
971 Guadeloupe	2336	114	1375
972 Martinique	829	25	4
973 French Guiana	1302	187	14123
974 La Réunion	356	30	26
976 Mayotte	725	19	0
<b>Total for counties</b>	<b>5548</b>	<b>375</b>	<b>15528</b>
975 St-Pierre and Miquelon	249	45	0
977 St Barthélemy	75	4	7
978 St Martin	467	13	5
988 New Caledonia	6100	158	0
<b>Total for communities</b>	<b>6891</b>	<b>220</b>	<b>12</b>
<b>TOTAL</b>	<b>12439</b>	<b>595</b>	<b>15540</b>

Table A.3: Features at risk in low-lying areas under the scenario of a 1m rise in sea level

Region	Number of buildings	Linear distance of transport infrastructures (km)	Area of "sites of ecological interest" (ha)
Nord-Pas-de-Calais	65576	3757	1918
Picardy	10149	545	5445
Haute-Normandie	9003	923	12410
Basse-Normandie	15591	868	28923
Brittany	22375	1611	15540
Pays de la Loire	59658	3074	125901
Poitou-Charentes	28762	1783	64052
Aquitaine	25916	1582	34367
Languedoc-Roussillon	16135	1905	27752
Provence-Alpes-Côte d'Azur	10571	711	64973
Corsica	1320	45	1359
<b>Mainland France</b>	<b>265156</b>	<b>16804</b>	<b>382640</b>

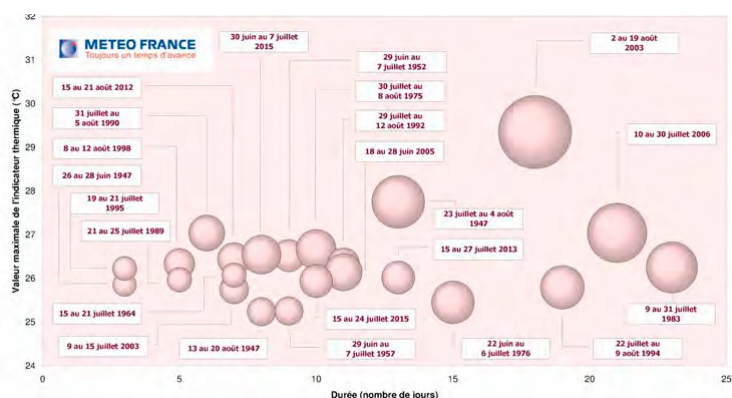
Tableau A.4: Features at risk in low-lying areas under a hundred-year sea level scenario

<sup>55</sup> *Vulnérabilité du territoire national aux risques littoraux* (France's vulnerability to coastal risks): Mainland (December 2009) and Overseas Territories (September 2012).

### .3 Data on climate developments freely accessible via the “DRIAS future climate” portal

The DRIAS portal disseminates knowledge about climate change, made available in a standard format that anyone can use. DRIAS has been one of the major cross-sector achievements of the national adaptation plan and is of clear benefit to all end-users of the data.

Launched in July 2012, the portal was developed by the French Meteorological Office (Météo-France), in collaboration with French climate modelling laboratories and in close consultation with a wide selection of potential users. It is intended to guide, explain and facilitate access to climate information for all, whether they are end-users or intermediaries. DRIAS has three sections: “Discovery”, “Education” and “Data and Products” and the portal contains a large quantity of data, all provided free of charge and easily accessible, which constitutes a major advance. The new version delivered in 2014 provides new regional-scale climate scenarios, to which uncertainty estimations obtained from a series of simulations will be added. It also has information on the overseas territories. Lastly, DRIAS provides access to the results of an impact assessment on water resources, which will be of interest to all sectors and paves the way for disseminating other sector-specific impact studies from a single location. Overviews such as the one drawn up by Météo-France presented below in Figure 1, which looks back at all the heatwaves over the period 1947-2015, confirms that the 2003 heatwave was unusual and illustrates the high quality of the information the portal provides.



La surface des sphères symbolise l'intensité globale des vagues de chaleur, les sphères les plus grandes correspondant aux vagues de chaleur les plus sévères

Figure A.1: Intensity of heatwaves in France over the period 1947-2015 (source: Météo-France).

### Adaptation taken into account more in planning processes

Over the period covered by the National Adaptation Plan, several new acts of parliament have mentioned adaptation as being a public policy priority. For example, the “ALUR” Act of March 2014 (“on accessible housing and new approaches to town planning”) states that construction projects must set aside areas that are non hard-surfaced or nature-friendly. Or the Law “on the future of agriculture, food and forestry”, enacted in October 2014, which stipulates that the State must oversee the adaptation of forests to climate change. This is being put into practice through the process currently under way of incorporating climate change adaptation as a priority area first in the national-level, then the regional-level forestry policy plans. Interregional studies have also been carried out<sup>56,57</sup>, with a view to proposing adaptation strategies at this intermediate level also. The information gathered by these studies has fed into various local planning processes and has provided a clearer picture of the sort of adaptation issues that affect each type of zone. The Regional Climate, Air & Energy Master Plans drawn up under the NAP all have sections on adaptation, though their scope varies depending on the region concerned and its specific vulnerabilities. At the local level, half of all the Local Climate & Energy Plans have sections on adaptation, but they are often not very extensive. The Environment Agency (ADEME) has recently disseminated tools it has developed and these should help progress the situation.

Climate change is taken into consideration on a sector-by-sector basis in town planning documents such as the “local planning continuity” documents (SCoTs) and the local authority and joint local authority town planning documents. Risks in particular are widely identified and addressed with a view to finding solutions that strike a balance between the needs of public safety and sustainable local development. The subject of climate change is now on the agenda of the joint local authority planning club<sup>58</sup>. A promising trial was conducted on the inclusion of coastal risks in the “local planning continuity” documents and local authority town planning documents. Lastly, methodology guides aimed at helping local authorities incorporate green and blue-green grids in their plans are widely disseminated.

In terms of more operational public planning and action, several successful initiatives stood out, which the assessment team has described below:

### .4 The involvement of catchment area authorities in adaptation to climate change

<sup>56</sup> Chanard C., Strosser P., Lebrun J. B., Le Gallic T., *Etudes interrégionales sur l'adaptation au changement climatique: connaissances et enjeux de communication*. (“Interregional studies on climate change adaptation: state of knowledge and communication issues”).

<sup>57</sup> Strosser P., Le Gallic T., Parrod C., Chanard C., *Assurer une prise en compte effective de l'adaptation au changement climatique dans les politiques publiques: éléments de réflexion*. (“Effective provision for climate change adaptation in public policy: some initial thoughts”).

<sup>58</sup> PLUi produces and disseminates materials on theory, methods and good practice to the stakeholders concerned.

All of the catchment area authorities have become involved to one degree or another in looking at climate change adaptation and are all at different stages in their action on the subject. Political commitment has been especially strong in the Rhône-Méditerranée catchment and was translated into a catchment area climate change adaptation plan in 2014. The plan was the result of joint work between the five south-east regions, the catchment area's coordinating prefect, the catchment area committee and the water authority. The plan centres around three main strategies: retaining water in the ground, combating water wastage and supporting biodiversity. Funding of €260m between now and 2018 is in the pipeline, to carry out a series of concrete actions (see inset in Water Resources theme review). The Seine-Normandie catchment area authority embarked on a similar process in September 2015.

All of the "Water Development and Management Master Plans" for 2016-2021 contain a section on ways in which to take climate change into consideration, including assessing the impacts on both aquatic environments and water resources, assessing potential impacts on areas identified as under pressure, producing an adaptation strategy and incorporating these priorities into the master plan's strategies, provisions and work programme. Some existing measures have been strengthened and new measures have been added.

When the mid-way review of the water authorities' tenth works programme was carried out in 2015, it underwent some significant refocusing, aimed at identifying more clearly and in many cases expanding the main operations designed to contribute to climate change adaptation. The changes were deliberately tied in with the master plans' strategies and provisions. Climate Change research programmes were expanded, some grants to priority areas were increased to help address pressures on water resources and funding was set aside for calls for tenders aimed at encouraging water saving, in line with actions 3 and 4 of the NAP's Water Resources theme.

With this experience under their belts, the French catchment area authorities could sign and commit to implementing the draft Global Pact for Adaptation to Climate Change in the Basins of Rivers, Lakes and Aquifers proposed by the International Network of Basin Organizations (INBO) under the framework of the Lima-Paris COP21 Solutions Agenda.

#### .5 The national integrated coastline management strategy

The National Strategy for Integrated Management of the Coastline was adopted in March 2012, following on from a report produced as part of the *Grenelle de la mer* consultation process in November 2011. It deals with the influence of climate change both in Section A on "developing observation of the coastline and identifying areas at risk of erosion so as to prioritise public action" and Section C which looks at the factors involved and questions arising in connection with the various options for coastline management (defences, relocation of activities and properties or management of disruption on a temporary basis).

The Office for Geological and Mining Research (BRGM) subsequently produced a summary of coastline monitoring techniques in November 2012, which is a good practice guide and a survey of indicators, methods and tools. The summary was based on five case studies carried out in mainland France (Aquitaine, Languedoc-Roussillon, Pays de Loire, Noirmoutier) and one overseas territory (French Guiana). The data gathered from these observations were placed on the Coastal Zones section of the government's "geo-portal", to accompany the summary and to disseminate the coastline monitoring data as widely as possible.

While the overall process of adapting to the receding coastline is a question of strategy (management plans, utilities, adaptability of developments, etc.), in some areas it may be advisable to relocate activities. In 2013, five projects were selected under the call for proposals entitled "Trialling relocation of activities and properties: spatial rearrangement of areas threatened by coastal risks"<sup>59</sup>. This call for proposals by the Environment Ministry aroused a good deal of interest, as these were pilot schemes aimed at encouraging the implementation of integrated activity and property relocation processes without compromising the areas' vitality. The projects were distributed among all the mainland and overseas seaboard and were representative of the different coastal morphologies (dunes, sand, rocks, cliffs) and different types of issue involved. Some methodological and theoretical pointers on the relocation of activities and properties should emerge from the experience gained in these trial projects.

Another call for proposals was sent out at the same time by the Department of habitats, town planning and the countryside (DHUP), aimed at taking coastal flooding into consideration in coastal "local planning continuity" documents. The three winning projects received substantial methodological support, as a team of experts was made available and local workshops were organised for three years running (they also received financial support for the research aspects from the Barnier Risk Prevention Fund). The lessons learned on the inclusion of "risk" aspects in the appropriate strategic planning documents, in particular coastal risks, will be consolidated and disseminated from 2016 onwards.

The last point worth noting is that a committee representing a wide range of stakeholders, co-chaired by two members of parliament, was set up in January 2015 to monitor the national coastline management strategy. On 19 October 2015, the committee proposed a series of climate change adaptation measures for coastal areas.

#### .6 Flood risk management strategy and actions

France's implementation of the European Floods Directive since 2011 (Directive 2007/60/EC of 23 October 2007) has been a major step forward for climate change adaptation. As a result of this directive, the country adopted a national flood risk management strategy for the first time in October 2014, following the creation of the national governance body the Joint Floods Commission in 2011. A preliminary assessment of the country's flood risks was carried out and a map of the 122 areas at high risk of flooding was produced, both of which constituted significant progress in our knowledge of the subject. The major catchment area authorities were to adopt their first flood risk management plans for the first time by the end of 2015 and the 122 areas were

<sup>59</sup> The sites concerned were: Vias (Hérault), Ault (Somme), La plaine du Ceinturon in Hyères (Var), three sites within the Aquitaine coastal consortium (Lacanau, la Teste du Buch [Gironde] and Labenne [Landes]), plus Bovis and Pointe-à-Bacchus in the Petit-Bourg local authority area (Guadeloupe).

to have local flood risk management strategies in place by the end of 2016.

The specific issue of flooding in major cities was looked at in 2014 in the context of the POPSU-Europe discussion, research and benchmarking platform and France's major cities compared their practices with the Dutch model for adapting cities<sup>60</sup>.

#### .7 Climate change adaptation included in mountain range plans and agreements

The mountain range councils now deal with the subject of climate change adaptation is now included in their work. The mountain range planning documents for mainland France have been revised and each document now has a section describing climate-related concerns. The new interregional mountain management agreements signed in 2015 for the period 2015-2020 include a section on climate change adaptation (section 3), which states the kinds of action that will need to be funded. These vary depending on the priority issues facing each range: mobility and vulnerability in the face of natural risks in the Pyrenees; adapting tourism activities and renewable energies in the Jura; protecting biodiversity and user fewer fossil fuels in the Massif Central; renewable energies, thermal renovation of buildings, integrated risk management and ecosystems in the Alps; improving impacted aspects (e.g. water, forests and soil) and new forms of power generation in the Vosges.

#### .8 Ecological continuity plans incorporated into town planning and development documents

The inclusion of designs for blue-green grids within the framework of the "regional ecological continuity plans"<sup>61</sup> is a major step forward for biodiversity conservation in the context of climate change. Many species will be able to make a new home in these high quality spaces, in anticipation of shifts in their range and habitats. The inclusion of these blue-green grids in plans, programmes and development projects, which now have the support of widely disseminated methodology guides, is also having a positive effect on the cities' resilience and the organisation of urban spaces. Policies to promote wildlife in cities<sup>62</sup>, the accelerated development of both government-labelled and de facto "Ecodistricts", based on the principles of interacting better with the environment and disciplined management of energy, travel and waste, have also contributed to this progress.

### **Progress in preparing certain sectors and society as a whole to cope with the effects of climate change.**

The assessment team also identified some results that will contribute to making certain activities or society as a whole more resilient. In addition to the results described below in a wide range of fields, genuine progress has been made in adaptation activities in the area of health. These include plans for extreme weather conditions (heatwaves and extreme cold) and planning around insect-borne diseases (dengue and chikungunya fever). They have led to certain measures that are already well advanced in care provision, equipment, surveillance and communication. However, these results have probably come out of public health crises that are not necessarily related to climate change.

In the field of agriculture, actions such as the creation of a national health and environmental risk-sharing fund in 2013 and the allocation of an average of €100m per year in EAFRD grants to managing climate-related risks are illustrations of the sector's efforts to equip itself to cope with environmental events that may be exacerbated by climate change.

#### .9 Transport infrastructure guidelines updated to take climate change impacts into account

The technical guidelines on design, maintenance and operation have been assessed for seven different areas: highways, roadside artworks, railways, maritime and river transport, airports, urban roads, ski lifts and guided transport systems. None of these relate to transport equipment.

Of the 241 guidelines studied, almost two thirds (160) are considered to be unaffected by climate change, 23 are definitely affected and their technical elements will need to be revised, while around a quarter (58) may need to be revised, depending on decisions based on the more detailed climate projections we are expecting from the scientists. Details of the timetable for amending the guidelines and any costs this may entail have yet to be ironed out. Individual technical guidelines and regulatory provisions may be revised fairly quickly or may have to go through a standards revision process, depending on each specific situation. Revision of standards falls under French and European processes that can take several years; however both the French body AFNOR and the European body CEN now have climate change adaptation groups in place.

#### .10 Vigilance around nuclear power station cooling systems

Together with the General Directorate for energy and climate, France's nuclear safety authority conducted a study in 2012 on the implications of climate change for the operation of nuclear power station cooling systems. The study was carried out on the basis of projected temperatures, water course flow rates, heatwave frequency, cumulative air conditioning degree days and sea level rises by 2030 and 2050 respectively. One of the things the study sought to do was to compare the projections with the experience gained from the summers of 2003 and 2006 and to compare the future climate values against the upper and lower safety margin thresholds currently in use. The study identified no critical areas of concern and the points of vigilance identified for power stations during the summer season related to facilities that should no longer be in operation by 2050. It will be important to repeat this type of study on the basis of developments in scientific knowledge and update the relevant guidelines accordingly if necessary.

<sup>60</sup> POPSU: "Study platform for urban strategies and projects". This research was covered in the bilingual work *Villes inondables, prévention, adaptation, résilience* ("Cities prone to flooding: prevention, adaptation and resilience"), edited by Jean-Jacques Terrin, Éditions Parenthèses, December 2014.

<sup>61</sup> As at 15 August 2015, 11 regions had adopted Ecological Continuity Plans and all the regions should have them in place by the end of 2016.

<sup>62</sup> The Environment Ministry recently supported and/or organised a series of regional workshops (10 in all) between 22 June and 19 November 2015, in the lead-up to COP21. The topic was "Nature in cities as a vehicle for adaptation to climate change" and they were run in conjunction with various stakeholders, some of whom had initiated the project (Natureparif, Arpe, Regional Biodiversity Agency, CEREMA, GRDF...). A wide range of solutions was presented for local implementation; for example creating ecocorridors, ecological grounds management, integrating biodiversity with buildings, managing rainwater via ground surfaces).

#### .11 Heightened surveillance of insect-borne diseases

The National Centre for Expertise on Disease Vectors (CNEV) was set up for five years (2011-2016)<sup>63</sup> and has already conducted several expert investigations of disease-transmitting insects (ticks, biting midges, Asian tiger mosquito, etc.), which are likely to proliferate as the climate becomes warmer. The Asian tiger mosquito (*Aedes albopictus*) has been studied especially closely, for example by conducting surveillance in the *départements* (counties) that are free from the insect, installing a network of nest traps, and taking steps to prevent it from becoming established in the counties it has been found. In addition, heightened surveillance of cases of imported arboviruses has been put in place in those counties and entomological surveys are carried out whenever a human case is reported.

A national animal health epidemiological surveillance platform has also been set up to monitor emerging animal diseases. Its activities include monitoring mollusc- and insect-borne diseases (blue-tongue disease, schmallenberg virus). The links between these diseases and climate change still need to be fully assessed.

#### .12 The long-term issue of genetic forestry resources

During the course of the NAP, work began on updating the guidelines on the principal tree species used for afforestation, to factor in climate-related risks. The state has also funded some tree breeding programmes aimed at producing new seed orchards. These will need to improve adaptive capacity, to make them the trees fit to withstand future growing conditions, amid increased uncertainty over climate. Some of the species concerned are maritime pine, Douglas fir (originating from more southerly parts of America), black poplar and hybrid larches. Research is being carried out at the same time on the sources of the oaks that are best suited to France's different "forest ecosystem regions". Genetic resource conservation activities have also been stepped up and now cover eight in-situ conservation units, which are representative of national species diversity, and several ex-situ collections. These measures relating to genetic resources and effective planning for the future when replacing populations are vital, considering the long time frames involved in forestry.

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<sup>63</sup> CNEV provides an effective means of rapidly mobilising all of France's skills and expertise in the fields of medical and veterinary entomology, the fight against insect-borne diseases and applied human and social sciences in the field, with a view to informing decision-making processes.

# Assessing the plan's effectiveness: is France better prepared to cope with climate change after implementing its National Adaptation Plan?

The assessment team examined the effectiveness of the NAP from several points of view: the implementation of the plan and the results obtained; the ripple effects and impetus provided by the plan for the areas affected by adaptation issues (especially the overseas territories), the stakeholders concerned and the general public.

## The plan was fit for purpose

As mentioned in Section 2.1, from its analysis of the plan's 20 themes (see annex 3a) the assessment team concluded that the vast majority of the 43 recommendations made in the National Climate Change Adaptation Strategy adopted in November 2006 and over 200 recommendations that came out of the nationwide consultation in 2009-2010 had been taken into consideration. The result was that France's national plan can be seen as bringing together all the measures that will contribute to achieving the adaptation objectives in a thorough and appropriate way. In this respect, it is certainly one of the most comprehensive national plans.

In order to assess whether the NAP was fit for purpose, even though this report post-dates the process of developing the plan, it is also worth comparing it against the three priorities for Europe<sup>64</sup> (inland and coastal flooding, water restrictions during low-flow periods and heatwaves) mentioned by the IPCC in its 2014 summary for policymakers<sup>65</sup>, in which the issues and prospects around adaptation are identified. The three climate impacts identified by the IPCC are addressed as follows in the NAP:

– on the subject of coastal flooding: the step-by-step implementation of the national coastline strategy, with the possibility of assessing the feasibility of relocating activities and properties; the inclusion of a projected sea level rise of 20cm for the short-term scenario and 60cm for the end-of-century scenario in coastal risk prevention plans, and the transposition of the EU Floods Directive. These actions clearly show that this high-priority theme has received close attention, although not solely as a result of the NAP;

– as regards water restrictions in the country's Mediterranean and south-west regions, climate change adaptation considerations have been incorporated into the relevant Water Development and Management Master Plans and the water authorities' works programmes have recently been revised. Among the amendments has been an increase in the level of aid to priority areas to help with pressures on water resources and funding for calls for proposals aimed at encouraging water saving. The Rhône-Méditerranée Catchment Area Plan mentioned above has set ambitious targets for reducing water consumption. On the subject of droughts, baseload nuclear power facilities have carried out an in-depth study in conjunction with the Nuclear Safety Authority into possible limitations on cooling capacity;

– similarly, the approaches recommended for adapting to heatwaves appear in the actions under several of the NAP themes, with the exception of measures for workplaces.

The assessment team concluded that overall, the NAP addressed the main climate change adaptation issues highlighted by the IPCC, and this reinforces the overall assessment that the plan is generally fit for purpose.

## Priorities not clearly defined in the plan

As we have already mentioned, this first plan was devised by central government and was intended to be coordinated by the government's own departments. It was thought that public bodies and state-owned companies would then be brought on board by direct chain of command and a ripple effect would be generated in the private sector as a result. While this approach to developing the plan obviously fits in well with coordination by the central government departments responsible for overseeing the plan's implementation, it does not facilitate involvement by economic players and local authorities.

A great deal of care was taken over the correct sequence of operations, as many of the actions by theme or by geographical area required initial methodological work that has not yet been completed (for example some vulnerability assessments). This has delayed the implementation of some measures.

A closer look at the nature of the actions that were chosen reveals that the downside of the plan's comprehensive coverage is an absence of prioritisation, as major measures are listed on a par with measures that have far more limited scope. This lack of prioritisation within the plan was flagged up by most of the people the assessment team spoke to. Without losing sight of the

<sup>64</sup> Damage due to inland or coastal flooding can be prevented fairly effectively by adaptation measures (protecting or relocating, depending on the cost of the measures); water restrictions in southern Europe due to increased evapotranspiration will be mitigated by adopting more effective water management technologies, while adaptation to heatwaves will require major steps to be taken fairly rapidly to adapt living spaces, workplaces and energy and transport infrastructures, combined with emissions restricting measures to improve air quality. Forest fire risks will also need to be controlled more effectively and insurance products developed to protect against fluctuating crop yields caused by weather conditions (see Annex 6).

<sup>65</sup> IPCC – Climate Change 2014: Impact, Adaptation and Vulnerability Summary for Policymakers – WGII contribution to the fifth assessment report.

positive momentum the current plan has built up, the assessment team recommends that for the second plan, energies should be focused on a smaller number of strategic actions, which should be run on a project management basis.

### A relatively effective implementation process

As outlined in Section 2.2.2, ONERC split the responsibility for oversight of the NAP by entrusting the follow-up of each specific theme to a managerial-level individual in a central government department. While this method meant that the whole of the plan could be covered, it did not make for effective monitoring, due to staff changeovers during the life of the plan, lack of time to spend on the plan, or because they lacked the necessary seniority. All of this meant that the theme leads were often able to do little more than formally monitor the plan’s progress. Only in a few themes was more continuous follow-up carried out, with ad hoc groups set up to oversee the theme’s progress. The internal systems within most of the themes were therefore inadequate.

Strategic leadership and annual monitoring were supposed to have been organised first within the National Committee on Sustainable Development and Grenelle de l’Environnement (CNDDGE), then within the National Advisory Council on the Green Transition (CNTE), but this did not happen. The Prevention and Precaution Committee had spent some time considering the concepts of risk acceptability and governance in the context of climate change in June 2013, but was not subsequently able to provide an opinion on the plan. This is another indication of the fact that the core topics and cross-cutting issues covered by the plan were not properly coordinated and this is a shortcoming that ought to be corrected in the next plan.

In Section 2.2.1, we summarised the state of progress of all the actions and measures. While the processes involved certainly enabled most of them to be launched, they are at very different stages of completion, due to the intensive methodological preparations that some measures required. In any event, the process of adjusting policies relating to development or production processes has to be gradual.

As illustrated above in Section 2.3 (and in Annex 3.1), some significant results have already been achieved, for example in the area of knowledge about the climate, and this work now needs to be continued, focusing on regional scales and shorter-term forecasts. The progress made in planning activities in several fields is also worthy of note, and these must now be followed up with management actions.

For the reasons explained in Section 2.2.3, we were not in a position to assess the plan’s cost-effectiveness.

**Nonetheless, as summarised by theme in the table below, the implementation process of the NAP may be considered to have been relatively satisfactory, though the results it yielded are of limited and sometimes partial short-term impact. This situation is partly due to the nature of the actions and measures themselves, as there was considerable focus on improving knowledge, and the impact of this will only be known once the subsequent management actions have been carried out. In addition, given the nature of climate change adaptation, assessing the impacts of the measures will be a long-term process.**

Impact	Implementation process		
	<i>Inadequate</i>	<i>Incomplete</i>	<i>Satisfactory</i>
<i>Weak</i>	Industry	Tourism Finance & insurance	
<i>Partial</i>		Cross-cutting actions Health Biodiversity Fisheries & fish farming	Water resources Natural risks Agriculture Forestry Transport infrastructure Town planning & buildings Education & training Research Mountains European & international action Governance
<i>Strong</i>			Coastal zones Energy Information & communication

Table A.5: Summary of the assessment team’s appraisal of the implementation process and impacts of each of the NAP themes.

### Translating the NAP into practice locally: a challenge for the next plan

As stated in the first National Adaptation Plan itself, the plan only deals with measures concerning the national level, while measures to implement adaptation at regional and local levels fall under the Regional Climate, Air & Energy Master Plans (SRCAEs) and the Local Climate & Energy Plans (PCETs), both of which were in the process of being drawn up at the time the national plan was launched. Consistency between the national-level actions and the local and regional actions and policies was one of the subjects that the 2103 mid-way review of the plan was to examine, and this was done from a relatively general perspective.

The SRCAEs were all finalised in 2014 and while they vary widely in terms of ambitiousness and structure, they all contain a section on adaptation. Some of them explicitly state that the subject of adaptation will be incorporated into their policies for individual sectors, and some delegate this aspect to the local climate & energy plans.

According to the survey carried out by the Consortium of Regional Environment Departments<sup>66</sup>, 11 of the NAP's 20 themes appear in the SRCAEs taken as a whole, and each SRCAE contains between 2 and 8 avenues for adaptation that correspond to the avenues listed in the NAP. This would seem to reflect the informal interactions that took place between national and regional levels when the SRCAEs were being formulated. The following NAP themes appear most often in the SRCAEs: information & research (vulnerable zones, climate change impacts and public policy); water (conflicting demands, factoring climate change impacts into the revised water development & management plans and master plans), town planning (heat islands), biodiversity, health, agriculture & forestry (transforming practices, afforestation), natural risks, coastal zones and economic resilience.

However, the SRCAEs vary in the degree to which they make use of the interregional studies coordinated by the Joint Ministerial Regional Development Department (DATAR), partly because half of the studies were completed after the SRCAEs had been produced. The best example is the plan produced for the Languedoc-Roussillon region, where highly-motivated local stakeholders gained access to the study results available at the time the plan was being formulated.

In each regional plan, the priorities are set according to the issues that are most important locally. Some productive work has begun in certain regions, with the development of analytical capacities within local authorities. The prominence given to adaptation depends on the nature of the areas themselves and their specific vulnerabilities. For example, some regions see adaptation measures as an important long-term planning issue, in terms of their continuing attractiveness, and this has given them added motivation.

As regards the Local Climate & Energy Plans (PCETs), only half of them have a section on adaptation, according to the information we received from the Environment Agency (ADEME)<sup>67</sup>, and these are often not very highly developed. The Regional Environment Departments' Consortium confirmed that adaptation aspects still receive little attention compared with mitigation or energy saving. In spite of the tools which ADEME has developed and made available to local authorities<sup>68</sup>, this situation reflects the difficulty the authorities have with considering issues of a long-term nature and getting the relevant economic players involved. It also reflects the limitations of the SRCAEs, which are seen as a useful tool for developing methods for the local plans, but not detailed enough to put into practice locally through concrete measures<sup>69</sup>.

Climate change adaptation has also been taken into account in the mountain ranges and catchment areas. The interregional mountain range agreements for 2015-2020 include a section on climate change adaptation, with different actions in each agreement, according to the priority issues for the mountains in question (see the Mountains theme review). As regards the catchment areas, a climate change adaptation plan was adopted for the Rhône catchment in 2014, by central government and the five regional councils concerned (see theme review in Annex 3.1). All the Water Development and Management Master Plans for 2016-2021 include an assessment of climate change impacts on both aquatic environments and water resources.

The local authority associations, the Regional Environment Departments and the Environment Agency all confirmed to the assessment team that better links and greater consistency were needed between the National Adaptation Plan, the Regional Master Plans and the Local Plans, once the respective roles of the different players and government levels have been clarified. They also felt it could be beneficial to increase support for local authorities with drawing up their local adaptation plans and systems.

As this first NAP was primarily a central government plan, it is logical that the actions translating it into practice at local and regional levels are at a very early stage<sup>70</sup>. The plan was not designed with them in mind and the methodological vulnerability assessment tools were not in place. In the assessment team's opinion, the next NAP should devote more attention to the local and regional aspects of climate change adaptation.

## Specific issues for the overseas territories not addressed adequately

The National Adaptation Plan does not contain a specific theme or specific actions for French Overseas Territories, as the consultation leading up to the plan showed that further in-depth study was still needed before specific measures could be established.

In 2012, ONERC devoted its annual report to the overseas territories, entitled "The Challenge to French Overseas Territories from Climate Change"<sup>71</sup>. These territories face significant challenges in terms of both population and climate, as emphasised by ONERC Chairman and Senator for La Réunion, Paul Vergès, who pointed out that this *département* has seen its population grow from 240,000 inhabitants in 1946 to 800,000 today. In addition, the population of La Réunion tends to be concentrated around the coastal fringes, which exacerbates its vulnerability to rising sea levels and makes the need for preventive adaptation even more pressing.

The overseas territories are also home to 80% of France's biodiversity, even though they only occupy 22% of its territory, while 98% of all the country's vertebrates and 96% of all its fleshy plants are found there. These features have also contributed to the expansion of the territories' tourist industries.

In terms of the different economic and activity sectors, the ONERC report therefore identifies tourism as a priority, but also other

66 Summary produced for the assessment team on the basis of contributions from 10 regions (Languedoc-Roussillon, Midi-Pyrénées, Provence-Alpes-Côte d'Azur, Champagne-Ardenne, Nord-Pas-de-Calais, Centre, Haute and Basse-Normandie, Île-de-France, Limousin).

67 According to the declarations sent in to the ADEME resource centre by the local authorities, half of the 560 PCETs include adaptation actions, a figure which was corroborated by a study of 3 regions carried out in 2014 (Source: Hélène Desbriens, AgroParisTech ENGREF – École des Ponts ParisTech, MSPAPDD, 2014) and by a survey of local authorities conducted by AdCF in early 2015.

68 The "Impact Climat" local diagnostic system and the "Objectif Climat" tool for formulating action plans.

69 According to a 2015 survey of local authorities that have PCETs in place carried out by AdCF, two thirds of the 89 joint local authority organisations who replied have a positive opinion of the SRCAE, but 20% of them find it too general to put into action locally.

70 Nonetheless, many local authorities have already taken the issue of adaptation on board, although the assessment team is not in a position to list them. For example, at regional level a large number of Regional Economic, Social and Environmental Council (CESERs) have either discussed the issue or joined forces in order to do so.

71 ONERC, *Les Outre-Mer face au défi du changement climatique – Rapport au Premier Ministre et au Parlement* ("The Challenge to French Overseas Territories from Climate Change: Report to the Prime Minister and Parliament"), La Documentation française, December 2012.

sectors such as fisheries, farming, forestry, health, energy and coastal risks, which are all present among the 20 themes of the NAP.

Since the issue of the overseas territories was expressly mentioned in the commissioning letter, we will examine the ways in which the general aspects of the plan relating to climate scenarios have incorporated issues specific to the overseas territories, before looking at how each of the themes mentioned above has been addressed in relation to the territories themselves.

### .13 More detail needed in the overseas territories' climate scenarios

At the time that ONERC's annual report focusing on the overseas territories (OTs) was drafted in 2012, the regional climate projections had not yet been produced. The report "The French Climate in the 21st Century"<sup>72</sup> mentions that, unlike for mainland France, the only simulations available for the OTs are based on the Aladin-Climat model, which means that the range of uncertainty of the projections is not yet defined. In addition, the absence of any corrections of the observation data explains the low number of variables taken into consideration.

The general picture is a temperature rise of between 0.7 and 3.5°C, depending on the reference scenario, and a reduction in rainfall during the dry season (Caribbean, French Polynesia, La Réunion and New Caledonia). In addition, the frequency of cyclones should be the same or lower, but they will be stronger, with more intense rainfall. According to the latest IPCC report, there is a high level of uncertainty at the beginning of the century and the end of the century.

Further scientific study therefore needs to be carried out on the overseas territories, in order to increase the number of variables taken into consideration and establish a range of uncertainty.

On a more general point, the lack of local scientific capacity will need to be addressed by involving national research bodies and expert panels more in work on the principal knowledge gaps for the overseas territories, with the support of regional partnerships.

### .14 A hesitant start to climate change adaptation on a few themes

The overall assessment found that a start had been made during the first NAP on taking the overseas territories' specific needs into consideration, with initial emphasis on coastal risks and natural risks more generally. On the subject of coastal flooding risks, for example, a storm surge alert system is now operating in mainland France and there are plans to extend it gradually to the overseas territories, starting in 2016. The work on coastal risks must be continued and should look at issues specific to island nations, which are crucial in the OTs with low-lying coastal areas. If necessary, they could be supported by setting up regional scientific groups, for example between the Caribbean and the Gulf of Mexico and Florida in the United States.

In the field of health, the overseas territories are the most exposed of all French regions when it comes to worsening health risks and some initial work has been done on helping them catch up with the rest of the country. However, they ought to be singled out more specifically in the Health theme, because of their many special needs and much greater exposure to worsening risks (extreme problems such as biological risks).

In the area of fisheries, the overseas territories were taken into account in specific instances, for example the situation regarding prawns in French Guiana<sup>73</sup>. The study was not completed, but could draw inspiration from research such as that done by NOAA in the United States<sup>74</sup>, which has developed a special plan for reducing the impacts of climate change on fisheries and fish resources, with seven priority actions<sup>75</sup>.

In terms of forestry, attention should be devoted to the overseas territories' issues in the next plan, given the size of their forests (9Mha), their diversity and their special features compared with forests in mainland France. The same goes for biodiversity, with significant challenges around some exceptional but fragile ecosystems (mangroves, coral reefs, etc.).

As regards Water Resources, the overseas territories were not included in the current plan, even though they are experiencing some serious problems that warrant short-term adaptation measures (high rates of leakage from the network, water quality issues connected with the rise of saltwater wedges, severe low-flow periods, etc.).

As for insurance, the insurance companies are currently drawing up proposals, which should be published in the next plan, in spite of the fact that a smaller proportion of properties are insured in the OTs than in the mainland.

To conclude, in view of the wide diversity between them, the overseas territories were not taken into consideration adequately in the first NAP, either from the point of view of scientific knowledge or in terms of the plan's main themes. Many of the recommendations made at the end of the 2012 ONERC still need to be addressed, with a view to formulating measures that can be included in the new plan (see Annex 5). We therefore feel that a specific section should be devoted to the overseas territories in the new plan, given the high level of awareness they have already developed and in order to facilitate the follow-up of measures that specifically concern them. In addition, as emphasised by the Advisory Council for Economic, Social and Environmental Affairs<sup>76</sup>, a greater level of national solidarity with the overseas territories is needed in order to put public adaptation policies into practice.

<sup>72</sup> G. Ouzeau, M. Déqué, M. Jouini, S. Planton, R. Vautard, M. Vrac, edited by Jean Jouzel, *Le climat de la France au XXI<sup>e</sup> siècle*, MEDDE (Environment Ministry), November 2014.

<sup>73</sup> Lampert L., *Étude portant sur l'effet du changement climatique et/ou du réseau trophique sur le stock guyanais de crevettes pénéide* ("Study of the effects of climate change and/or the food web on the Guianese tiger prawn stock"), Ifremer, March 2013.

<sup>74</sup> NOAA: National Oceanic and Atmospheric Administration.

<sup>75</sup> Link Jason S., Griffis Roger, Busch Shallin (Editors), NOAA Fisheries Climate Science Strategy, August 2015.

<sup>76</sup> Bonduelle A., Jouzel J., *L'adaptation de la France au changement climatique mondial* ("France's adaptation to global climate change"), CESE Opinion, May 2014, p.7.

## Little ripple effect on non public-sector players

While the scientific community has now taken climate change adaptation on board in the development of its research programmes, at least in the most susceptible areas (biodiversity, forestry, agriculture, etc.), this is not yet the case for many other parties.

### .15 Some decision-makers still need to be persuaded to take concrete steps

Some national-level governance bodies have now incorporated climate change adaptation into their agendas, such as the National Advisory Council for Mountains, the National Advisory Council for Forests and Wood, or the National Monitoring Committee for the Coastline Management Strategy. However, this attitude does not prevail across the board, and some recently produced plans, such as the National Plan on Health in the Workplace, have completely omitted the issue of climate change.

Local and regional joint governance bodies, such as the catchment area committees or mountain range committees, have been forums where awareness of climate change-related issues has progressed in certain fields – in this instance on water and mountains respectively. Nonetheless, while the dialogue established in this way ensures that adaptation is included in management plans, encouraging certain parties to take the necessary fundamental steps is still difficult. This has been the case, for example, on the subject of encouraging water saving action among users who consume the most water (especially farmers), or persuading highland tourist resorts to diversify so as to become less dependent on ski-related winter tourism.

Because of the uncertainties associated with climate scenarios and forecasting, some people dispute the reasoning behind certain adaptation measures, especially in the area of risk prevention, which makes it all the more difficult to get some politicians or the residents directly affected to accept them<sup>77</sup>. Using digital or physical tools to simulate climate events helps give decision-makers and local populations a clearer picture of the issues, by making them more tangible.

### .16 Patchy involvement from economic players

The assessment team found that the expected ripple effect of the NAP on certain public companies or organisations, which was implicitly planned under the cross-cutting actions, did not take place. However, one positive development to note on this point is that companies such as EDF have established management measures to plan ahead for extreme weather events, separately from the National Adaptation Plan: plans for extreme cold, extreme heat, storms and, more recently, a tornado plan, which is currently being developed.

While some private-sector companies, especially the largest and those that need to make long-term investments, have incorporated climate change adaptation into their business plans, the level of awareness among most economic players on the subject is still very low. On this point, it is regrettable that the planned prospective study of the risks and opportunities of climate change for French industry was not carried out<sup>78</sup>. The tourist industry is in a similar situation, as it is struggling to develop suitable analyses (see Theme 12 on Tourism in Annex 3.1).

However, some positive initiatives have been started up in certain sectors to raise awareness of climate change adaptation issues among economic players. For example, the Aforce network is a group of public and private sector operators in the forestry sector. The group gathers and summarises information which it then circulates to the industry and produces decision-making aids for forest managers.

The issues of passing on information about actions in the most affected sectors, raising awareness among economic operators and the kinds of support they will need in order to develop adaptation actions are all worth considering when formulating the second plan.

Both socioeconomic players and local and regional authorities have all expressed the need to have access to information on the current state of knowledge, examples of adaptation solutions that have been tried and technical support with devising adaptation measures.

### .17 Work done to raise public awareness

In terms of public awareness, in addition to the NAP's overall communication strategy, some of the individual themes also include public awareness-raising and education through targeted information and publicity activities. For example, communication in the health field has been thoroughly planned, though it is primarily intended for crisis situations (heatwaves, extreme cold or insect-borne diseases).

Public awareness of climate change in relation to the NAP can be gauged by the increased number of visitors to the ONERC website, which has grown five-fold on average every month between 2010 and 2015 (in blue on the chart below) and the number of pages viewed (in red on the chart: between 15,000 and 35,000 every month for the last two years).

Not all of this increased viewing can be attributed to the communication measures planned in the NAP, naturally, and international events on the subject of climate, such as the IPCC's publications, attract much media attention and arouse public interest<sup>79</sup>.

<sup>77</sup> For example, of the 303 priority coastal risk prevention plans, only 60 have been approved, and some local authorities have put up strong opposition to them being pushed through.

<sup>78</sup> The UK also had similar plans in this area (see Section 1.2.1.4) and the 2015 annual report to Parliament shows that many actions aimed at the private sector will come to fruition in 2017 (source: *Reducing emissions and preparing for climate change, Summary and recommendations*, Committee on Climate Change, June 2015).

<sup>79</sup> The very high increase in the number of visits noted at the end of 2013 coincided with the publication of Volume I of the fifth IPCC assessment report.

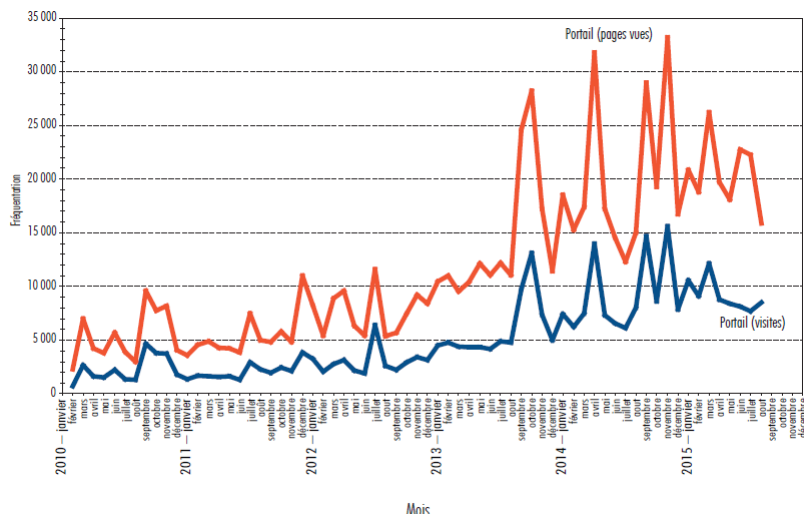


Chart A.1: Monthly visitor numbers and number of pages viewed on the ONERC website

### France is better prepared today than it was in 2011

To conclude, the assessment team considers that the National Adaptation Plan has generated a certain degree of impetus in the central government departments concerned and that the principal issues identified as priorities for Europe by the IPCC have been taken on board in France. However, the team also found that the plan has not had any real strategic leadership, which has prevented its cross-sector measures from triggering sufficient action in the private sector.

Overall, though the situation varies widely from one theme to the next, France is better prepared to cope with the effects of climate change now, after the first NAP, than it was in 2011. The results already obtained demonstrate this, although some of them are not purely a result of the plan. For example, the occurrence of real climate-related events pre-dated the plan (the storms of 1999, drought of 2003, coastal flooding during Storm Xynthia in 2010), but these events have contributed quite widely to raising awareness of the need to act and adapt.

This improvement in preparedness has taken place in the areas of energy, water, natural risks, coastal zones and several others, though not all of the progress observed can be attributed to actions carried out in the context of the NAP. Some significant advances have also been made in the research field, though the work still needs to be continued.

One very positive development to note on this point is that companies such as EDF have established management measures to plan ahead for extreme weather events, separately from the National Adaptation Plan: plans for extreme cold, extreme heat, storms and, more recently, a tornado plan, which is currently being developed. In the area of forward planning, the storm surge alert system is another example of improved preparedness for climate-related events.

The themes of Transport Infrastructure, Town Planning & Buildings, Biodiversity (with the ecological continuity plans), Forestry and Mountains have made a positive start to improving their preparedness for climate change, though many of the results obtained through the first plan still need to be put into action.

On other themes, such as Agriculture, Industry, Fisheries and Tourism, a good deal of work still needs to be done to increase preparedness in these sectors. Efforts also need to be stepped up on changes to certain occupations and the related vocational training. Work has yet to begin on the Finance theme within the framework of the plan, although other bodies are also working on it in parallel.

The work begun during the first NAP must now be continued and must focus on the highest priorities for action, though without losing sight of other actions that have begun in earnest and need to be either completed or continued on an ongoing basis. The necessary links must be organised between the work done by central government and the local and regional authorities respectively, focusing primarily on the regions and joint local authority organisations.

## Section 3

# Proposals on content and method for the new national climate change adaptation plan

Since 2011, when France's first National Adaptation Plan was launched, the subject of climate change adaptation has continuously grown in importance at international level, since the UN General Secretary included it in the global plan, although it has been difficult to gain recognition for the subject as a priority of equal importance to climate change mitigation.

Since its second assessment report, published in 1995, the IPCC has devoted a volume to adaptation in each new report<sup>80</sup>. Its latest stand-alone report on adaptation was published in March 2014 and scientific research has gradually increased in precision and reliability in terms of the climate impacts we should expect to see at the scale of our national territories.

France's new decentralisation laws (the law on "modernisation of local and regional public action and the status of big cities" of January 2014 and the law on the "new organisational structure of central, regional and local government" of August 2015) revised the framework for local planning and introduced the Regional Climate, Air & Energy Master Plans as part of the overall regional development plans ("regional planning, sustainable development and geographical equality plans"). The Law of 17 August 2015 "on the energy transition for environmentally-friendly growth" requires joint local authority organisations with over 20,000 inhabitants to adopt a Local Climate & Energy Plan (PCET) by the end of 2018. These tools are links in the chain that will enable the national adaptation plan to be put into practice at regional and local levels. They represent an opportunity for moving forward on adaptation in several sectors, provided that the subject is not overtaken by other priorities that are easier to grasp.

In the four years since its launch, the general principles of the first NAP have not become outdated and it will be worth retaining these in the main. However, the plan does not seem to be vigorous enough to address the most fundamental challenges posed by adaptation to climate change. It seems that we now need to move from a plan run by central government to one that involves the whole nation, and to do this it would be beneficial to take a fresh look at the role played by other public and private sector stakeholders. Since the overall leadership and financial coordination were also inadequate, robust strategic planning and stronger coordination will be needed.

For these reasons and in line with the 2015 Roadmap for the Green Transition, it is therefore imperative to develop a new National Climate Change Adaptation Plan. The new plan would follow on from the present one on 1 January 2017 and would constitute both a continuation and a progression. France will play host to COP21 and was a pioneer in 2011 with its first NAP, before the European Union introduced such plans as an obligation in 2013. France can continue to be a driving force behind adaptation, especially since many other countries will be very interested in any solutions that others have tried out.

The task entrusted to the assessment team did not include proposing content for the next national adaptation plan, especially since the stakeholders and parties responsible for developing it are the ones who will have to implement it. In the light of the conclusions arrived at in Section 2, the team has set out below: the areas of content it considers need to be adjusted in the new NAP (3-1); the procedures it recommends in order to translate the plan into action at local level (3-2); the method it proposes in order to trigger action among all the economic sectors affected (3-3) and suggestions on coordination of the plan (3-4).

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<sup>80</sup> [http://www.ipcc.ch/publications\\_and\\_data/publications\\_and\\_data\\_reports.shtml](http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml)

# Adjusting the content of the new plan

Adjusting the content of the new plan means: both continuing and expanding on the cross-cutting actions already started (3-1-1); concentrating on only a few top priorities in order to address the lack of prioritisation between the actions in the first plan (3-1-2), and introducing new avenues for action (3-1-3).

## Cross-cutting actions

Central government has an important role to play in conducting various actions that are common to all the individual areas of adaptation. These include research, studies, provision of methods and tools and exchanging good practice.

### *Resume a targeted research programme on climate change adaptation*

As the Climate Change Impact Management programme (GICC) has been stopped due to lack of funding, there is now no national-level programme in place to support research that can inform public action on climate change adaptation. The kinds of project supported by the National Research Agency (ANR) are not able to address this need.

The assessment team is therefore of the view that a targeted research programme to support the implementation of climate change adaptation policy should be relaunched, with funding of between 2 and 3 million euros per year. The current GICC programme committees could be tasked with proposing the future priorities for such a research programme, before the programme comes to an end. Some topics are mentioned under the future plans for some of the themes listed in Annex 3a.

It would also be worth looking more closely at the idea of a “foundation for research on adaptation” put forward by the Advisory Council for Economic, Social and Environmental Affairs (CESE), to which companies and local authority organisations could contribute.

Special research will need to be done for the overseas territories. Their lack of local scientific capacity will need to be addressed by involving the national research bodies and expert panels more in work on the principal knowledge gaps for the overseas territories, with the support of regional partnerships.

Pilot projects to test new methods and technologies should be conducted in conjunction with the regions, while the national level concentrates on generic work. At EU level, advantage should be taken of the joint programming on climate and France should take part in European initiatives such as the ERA-Net research on climate services due to begin in 2016.

It will be essential to maintain the observation systems currently in place for the long term, together with their operational procedures (e.g. the river flow and temperature measurement networks). This could also facilitate the development of preventive warning systems for climate events.

1. We recommend that the Sustainable Development Commission (CGDD) resume a targeted research programme to support the implementation of climate change adaptation policy, backed by funding of between 2 and 3 million euros per year.
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### *Refine climate scenarios and developing “climate services”*

Stakeholders are looking to the government to establish national reference values and produce climate scenarios that can be used as a basis for action in conjunction with the IPCC’s research. This will enable them to make no-regrets decisions, for example on long-term investments in the fields of town-planning, energy, infrastructure or forestry.

Significant progress was made on this work during the first plan and some useful results are available on the DRIAS portal. However, more still needs to be done to complete the work, especially for the overseas territories.

Over the course of the next plan, more work will need to be done on transposing climate scenarios into even more detailed geographical and temporal scales, while specifying the associated uncertainties. The work based on new parameters must also be completed and climate models need to be combined with other types of model so as to simulate climate change impacts on natural systems and certain production activities (agriculture and forestry in particular). This work will need to be done before climate services are developed.

This progress on climate scenarios goes hand-in-hand with improved monitoring of climate change impacts in the country. Most of the current monitoring systems were not designed to take climate change into account and while they overlap in many areas, they cannot cover all the necessary aspects or ensure the systematic approach that is expected of the government. It is essential that they be rationalised, future-proofed and coordinated more effectively. For the sake of cost-effectiveness, it will be a case of developing the existing systems rather than creating new ones.

In addition, in order to produce downscaled regional climate projections (see 3-1-1-3 above), climate science teams will need input from experts who can establish the most useful parameters for modelling the effects in their respective fields, at the appropriate spatial and temporal scales. The assessment team has seen this type of method in action in several fields (insurance, urban

climates, technical transport infrastructure guidelines) and it could be extended to all the fields concerned alongside the development of vulnerability assessment methods. These approaches and skills sets are emerging worldwide as climate services and are already being developed in large companies. Expanding them in France would help make them a vehicle for exporting French expertise.

### *Facilitate national and regional vulnerability assessments*

Research was carried out during the first NAP into methods for producing vulnerability assessments. It is now possible, therefore, to produce both national assessments by theme (as was done by the Explore 2070 project for water resources) and regional assessments or maps that draw these sector-based components together<sup>81,82</sup>.

To this end, the assessment team is of the view that the Ecology Ministry should establish the themes on which national vulnerability assessments should be carried out: drying out of soils, heat islands, water availability, biodiversity, snow cover, unforeseeable events (storms, heatwaves, high tides, coastal flooding, clay soil shrinkage, forest fires, landslides and erosion in mountain regions, etc.) and pollution (water eutrophication, air quality, health risks linked to pollen or disease-transmitting insects).

This mapping of vulnerable areas with a view to natural resource management and risk management falls more naturally under the remit of central government in the French system. However, the regions are also interested parties and are in a good position to carry out in-depth studies by sector, in conjunction with their economic policy (tourism, transport infrastructure, agriculture, forestry, energy, industry, etc.) or policy relating to aspects specific to the region (e.g. buildings). It would therefore seem desirable to develop these maps jointly.

2. We recommend that the General Directorate for Energy and Climate (DGEC): a) develop the work on climate scenarios at the more detailed scales users have requested; b) decide on the themes on which vulnerability studies might be carried out at national level and look together with the regions at how to draw up climate change vulnerability studies and maps based on impact models; c) encourage Météo-France (the French meteorological office) to continue developing the DRIAS portal as a public source of climate change data; d) liaise with the other government departments and operators concerned to assess how the country's monitoring networks need to be developed to ensure they cater more effectively for climate change effects.

### *Create a resource centre*

The Environment Agency (ADEME) already supports local authorities through the resource centre for local climate and energy plans (PCETs) and offers local authorities and businesses support with mitigation methodology. Other scientific and technical organisations also produce useful materials, though as yet there is no effective system for distributing them to potential users.

Local authorities have expressed the need for support with the methodology and technical aspects involved in developing the climate change adaptation sections of their various local planning documents and associated action plans. Most economic sectors are in a similar position, and often find it difficult to imagine what an adaptation strategy might consist in for their particular industry, especially in the case of small companies. These parties need access to materials such as adaptation preparation tools and examples of good practice. There is also a general need for technical help with incorporating adaptation considerations into plans and policies in other sectors (mainstreaming), which is currently lacking.

A resource centre could be set up to address these needs, which could centre around ADEME's PCET resource centre and CEREMA's "territories and climate change" skills and innovation hub, with support from other sector-specific specialist bodies (INRA [agriculture], IRSTEA [environmental science], BRGM [geology], etc.). The national resource centre would support the regional climate change observatories, which have gradually asserted themselves as a valuable means of raising awareness and are having an influence on new sectors in the regions and local authority areas.

3. We recommend that DGEC and CGDD entrust a consortium between the Environment and energy management agency (ADEME) and the Centre for studies and expertise on risk, environment, mobility and development (CEREMA) with the task of creating a climate change adaptation resource centre, with support from other specialist organisations. The resource centre would be responsible for providing technical support with the production of adaptation charts and plans at the various geographical levels and incorporating adaptation issues into plans and policies in the various economic sectors.

### *Carry out economic and long-term planning studies*

In addition to the examples of long-term planning studies carried out during the first NAP (Explore 2070 on water and AFClim on agriculture and forestry), the assessment team is of the view that other studies are needed in several fields, including: the transport sector, to look at the transport supply and demand implications should climate change have an impact on passengers' mobility; the growth of international trade and balancing concerns for the environment with mobility; the tourism sector, to plan ahead for the transformations it will undergo as the climate changes; long-term population shifts as a result of climate change effects, both nationally and internationally, so as to examine the implications for France.

Few economic studies were carried out during the course of the first NAP and it would be beneficial to strengthen this aspect in the new plan.

<sup>81</sup> These assessments use scientific data on expected climate change impacts and translate them into vulnerabilities, while revealing the level of uncertainty due to the variability between models. They are aimed at everyone: planners, local authority project managers, businesses, with a view to guiding them towards more effective adaptation. As well as climate change, they also take existing fragilities in specific regions into consideration, whether these are due to natural physical constraints or human activities, and they include foreseeable population growth trends.

<sup>82</sup> These map summaries are a new type of management tool. In the current state of scientific knowledge, they can be produced on grids of similar climate conditions equivalent to the size of a *département*, though their perimeters are approximate. They express uncertainty regarding climate impacts, unlike the traditional administrative zones. They can therefore only contribute further to the work being done in the most vulnerable areas and cannot slow down adaptation activities elsewhere. They bring uncertainties to the attention of local decision-makers so that they can choose the most robust solutions to different climate scenarios when there are discrepancies between them.

In terms of cross-sector measures, it will be necessary to assess and plan for the limits of our adaptation capacity, which will have consequences in terms of risks and the potential costs they may generate. To do this, climate models will need to be combined more widely with economic models at the level of the specific regions or economic sectors that will be impacted. Cost-benefit assessments of adaptation measures will be an important component of decision-making aids.

4. We recommend that CGDD conduct, in liaison with the Economy Ministry and other relevant government departments: a) forward planning on the effects of climate change in various sectors (e.g. transport, tourism) and population movements; b) economic studies on areas such as the costs and benefits of adaptation.

#### *Develop decision-making aids*

Local authorities and businesses have generally been expressing the need for simple decision-making aids on the subject of adaptation. The resource centre that could be set up between ADEME and CEREMA would be the ideal body to develop these kinds of tools and would no doubt make use of experiences from other countries or from mitigation activities<sup>83</sup>.

These simple decision-making aids could set an order of priority (choosing no-regrets measures in the first instance, as they will work under all scenarios and cost less, and only opt for major solutions as a second-line approach, subject to impact assessments if necessary). The challenge for all projects is for decision-makers and investors to opt for adaptation solutions that will have the maximum social benefits. They range from “soft” projects that work with nature<sup>84</sup> so as to limit the need for protective infrastructures, to major protection projects, such as the plans to add to the Thames barrier built in 1986 (10 gates over 520 metres) to protect 125km<sup>2</sup> of central London.

#### *Create an “adaptation action” label*

The fact that “green finance” has yet to get properly off the ground in the field of adaptation is widely deplored, considering that it has taken off in the area of mitigation. There is no simple system for assessing the value of an adaptation project, unlike mitigation projects, for which there is a universal gauge thanks to carbon pricing mechanisms.

At a basic level, tools such as programmes of measures under the EU water framework directive, floods directive or marine strategy framework directive can be used to establish adaptation priorities in certain areas.

However, it is important to go further and consider labelling projects. The labels would serve different purposes, for example recognising the benefits of major adaptation projects (e.g. relocating a road, building a strategic dam, etc.) or bringing attention to certain soft adaptation solutions (e.g. controlled washlands, protected wetlands, etc.) Adaptation projects also often have co-benefits. For example, introducing swales or infiltration systems in cities creates a greener environment, added to which trees are the best tool for combating heat islands. These co-benefits are a significant additional motivating factor, but they can sometimes be inadequately assessed in projects where they are not the main objective. This is why a specific label (separate from the ‘Ecocities’ label, for example) would be beneficial. As an information measure, this would have a positive effect in terms of guiding both private and public operators, with central government taking the first step.

5. We recommend that the Sustainable Development Commission look into a system for creating and issuing special quality labels for climate change adaptation initiatives, in conjunction with DGEC and the other government departments involved.

### **Encourage a joined-up approach on a few high-priority themes**

The current plan’s theme-based approach has the advantage of enabling each central government department to easily identify the parts of the plan that fall within its remit. However, the assessment of the first plan has revealed that this system did not cater adequately for work on aspects where themes intersect and did not establish an order of priority among the actions and measures.

The success of the new plan will depend on its capacity to tackle the areas that are the most crucial priorities for France. This is all the more necessary as a plan of this nature will naturally tend to expand, whereas the first plan contained too many measures from the outset. Some countries, such as the Netherlands, have made the even more radical decision to restrict their national plans to just the most critical subjects.

The assessment team proposes that the next plan should pick up on the themes covered by the first, but should restrict national-level actions to the most vital priorities for each theme and place the emphasis on methodological tools that will help with implementing the plan at local and regional levels.

The assessment team also suggests that certain high priority areas that are central to adaptation issues and require short- and medium-term measures should be managed in project management mode. This would mean: designating a lead person for each priority area, with sufficient authority to move the project forward and coordinate it effectively; putting in place a suitable governance structure; setting project milestones and expected outcomes and organising appropriate funding systems.

In keeping with the recommendations made during the 2010 consultation process, the assessment team suggests that the three following priorities be retained as a minimum:

#### *Water resources: a key factor in many adaptation issues*

Water resources are a vital issue when assessing climate change impacts and potential solutions to them, and all adaptation plans

<sup>83</sup> Climate-KIC has recently developed a tool of this nature, LoCal (for Low Carbon City Lab) aimed at these users, but relating to mitigation.

<sup>84</sup> The Danish Copenhagen Cloudburst Plan, for example, sets aside “blue and green areas” for storing excess rainwater - see: [http://en.klimatilpasning.dk/media/665626/cph\\_-\\_cloudburst\\_management\\_plan.pdf](http://en.klimatilpasning.dk/media/665626/cph_-_cloudburst_management_plan.pdf).

treat issues surrounding water as a high priority. This is because water is a key factor in many fields. For example: in agriculture, summertime water shortages lead to lower crop yields, while too much water delays sowing; in forestry, a stand will die after repeated periods of drought; in energy, hydroelectric output is reduced and pressure is put on power stations' cooling systems, while biodiversity and health are both affected by degradation of the environment.

Some progress was made during the first NAP, but we now need to begin actions to save water and optimise water usage on a large scale, giving priority to areas experiencing pressure on water resources. Other important actions will be: to retain water in the ground rather than losing it through the drainage systems; to preserve wetlands and to build resilience in aquatic environments so as to preserve the ecosystem services they provide.

These issues surrounding water require a joined-up approach and dialogue between several sectors (e.g. agriculture, forestry, town planning, energy, transport, tourism, biodiversity and health). The field of water lends itself well to a project management approach, as several multi-party governance structures are already in place at both national and local levels (National Water Committee, catchment area committees and local water committees), as well as technical facilities and substantial funding resources through the water authorities.

#### *Adaptation of coastal zones*

The rising sea level and changing coastline brought about by climate change will entail new pressures on various sectors. Their adaptation strategies will need to be consistent if we are to avoid maladaptation.

Some of the fields that are directly concerned are: development and town planning policies, management of risks to people and property and changes to some of the zones' core activities (especially tourism, which could present new opportunities in some coastal zones in the long term). The decisions that will need to be made concern both central government and local and regional governments and will require more awareness-raising actions aimed at local residents, in order to encourage both social acceptance and the mobilisation of funding to facilitate or incentivise adaptation actions.

The pressure on central government to compensate people for losses and build defences to help withstand climate change impacts will become ever greater. However, in the long run the only viable solution in some highly exposed zones will be to work with nature, accept the receding coastline and plan for it in an organised way. The global benchmark for management of receding coastlines is the Netherlands, which has made it a central issue in its national adaptation plan. One step the country has taken is to define areas that will no longer receive support to cope with the ravages of the sea once the higher sea level and potential increase in storms have made continued support untenable.

#### *Adaptation of cities and public spaces*

Even without periods of extreme drought, higher summer time temperatures and increased numbers of heatwaves will compromise the health and wellbeing of urban residents, especially those who live in unadapted buildings. Town planning and architecture have a role to play in limiting these effects, as does bringing water and wildlife into cities. They reduce the need for cooling systems and hence energy consumption, but without giving up urban density, which helps to combat the growing area of ground covered by hard surfaces.

Heavy rain is finding increasingly fewer places to infiltrate in urban areas, which can jeopardise public safety and the efficient operation of some services. New forms of urban development and management are essential in terms of health, habitats, water resources, biodiversity and energy. It could be beneficial to include explicit criteria on adaptation within the "Ecocities" certification framework.

New ways of building and living in buildings must also be promoted. The focus must not be solely on insulating buildings, but also on thinking more about the ways they are used. For example, natural ventilation can be improved and work can be done on developing intermediate open spaces between the interior and exterior. It is therefore important to promote and trial bioclimatic architecture schemes in order to rethink approaches to building and living.

6. We recommend that the government departments concerned – the General Directorate for energy and climate, General Directorate for development, housing and nature and General Directorate for risk prevention – take a project management approach to at least three adaptation issues: water resource management, coastline management and management of cities and buildings. With respect to coastline management policy in particular, we recommend that the discussions undertaken on the relocation process be finalised. As regards town planning, an approach based on calls for proposals aimed at all the relevant stakeholders would be beneficial and should promote new bioclimatic architecture approaches.

### **Incorporate new aspects**

Some of the issues flagged up during the preparations for the first NAP were not really addressed during the course of the first plan, while other issues have emerged subsequently.

#### *Develop climate change diplomacy*

The first NAP's "European & International Action" theme focused primarily on measures involving knowledge-building and cooperation with developing countries. In line with the impetus provided by COP21, the assessment team is of the view that the next plan could devote more attention to climate change diplomacy, from the adaptation point of view. It would be especially useful to:

follow up the implementation of the solutions agenda initiated by France during COP21, to ensure the initiative is being kept up;  
call for climate change adaptation to be given greater prominence in the objectives and instruments associated with the principle

EU policies, especially the common agricultural policy;  
disseminate French know-how on adaptation internationally (economic diplomacy);  
follow the implementation of national adaptation plans in other EU countries and some non-EU countries, so as to identify best practice.

7. We recommend that the General Directorate for energy and climate and the Department of European and international affairs, in liaison with the Foreign Affairs Ministry, develop a climate adaptation diplomacy section under the framework of the new National Adaptation Plan (NAP).

#### *Prevent and reduce environmental, social and geographical climate-related inequalities*

The “National Strategy for a Green Transition to Sustainable Development” for 2015-2020 contains a section on adaptation in its objective on preventing and reducing environmental, social and geographical climate change-related inequalities.

The next NAP should take this strategy’s objectives into consideration: building knowledge about the impacts of climate change on the local population, capital goods, production facilities and national heritage; acting to promote the adaptation of economic activities to climate change; protecting local inhabitants against climate-related events; planning funding for the economic and social impacts of climate change-related risks. Given that implementation of the plan will be devolved in part to local and regional levels, it will also be important to ensure that the solutions found are socially just, innovative and suited to the needs of the whole local population. Special care will need to be devoted to the overseas territories on this point, for which national solidarity appears to be necessary in addition to actions they are able to implement with local resources.

8. We recommend that in drafting the NAP, care should be taken to ensure that the measures proposed contribute to preventing and reducing climate-related environmental, social and geographical inequalities.

#### *Bring other ministerial departments in on the plan*

Some ministries, such as the Economy and Defence Ministries, had no significant role in the first national adaptation plan. And yet problems associated with climate impacts, such as natural risks or resource shortages, have the potential to be destabilising, whether in the near future or the longer term. Climate change is therefore a major economic and strategic issue that calls for thorough consideration of the economic model that comes out of the green transition. The defence sector has a valuable contribution to make to organising alert systems and identifying areas of vulnerability. Military research also has a role to play in innovation and technology aimed at adaptation.

9. We recommend that the Environment Ministry bring in other ministerial departments on the drafting of the next NAP, especially those that were not strongly represented in the first plan, such as the Economy and Defence Ministries.

#### *Identify obstacles to adaptation*

France should initiate a review of government aid schemes and regulations that could pose an obstacle to geographical and economic adaptation, along the lines of the work done in the United States<sup>85</sup>. For example, the obligation to apply for permission under the Water Act to create water infiltration on one’s land is an obstacle to what is a valuable adaptation solution, while the “any pipes” alternative simply requires a declaration. Similarly, certain aid schemes to help in the event of natural disasters can deter people from developing adaptation solutions, as in the case of storm risks in forests, which is insurable.

10. We recommend that the Environment Ministry undertake a general review of regulations and public funding initiatives, to assess whether they are more likely to facilitate or to hinder climate change adaptation. The general inspectorates (General Advisory Council on the Environment and Sustainable Development, General Advisory Council on Food, Agriculture and the Countryside and the Administration, Finance and Social Affairs Inspectorates respectively) could be asked to carry out a joint ministerial review.

#### *Avoid maladaptation*

Maladaptation can occur despite the best of intentions, and in-depth expert assessments are often needed in order to be aware of the possibility. What works in one place can be a mistake in another. For example, a new reservoir will be desirable in a location that will have a regular, plentiful supply of water, whereas it will be a waste of money in an area where the quantity of water is going to dwindle and become erratic. The golden rule across the board will be to consider all possible solutions before taking action and to start with those that are the most flexible and reversible.

Certain steps can be taken to avoid the worst maladaptation scenarios. This primarily involves carrying out risk assessments that include climate risk factors before embarking on any major long-term capital projects that may be affected by the climate<sup>86</sup>. In the United Kingdom, it is compulsory to factor the likelihood of particular climate scenarios occurring into the financial calculations and a similar practice could be adopted in France. The impact assessment should compare the project envisaged with other possible solutions, as stipulated by the Government for replacement dams in its Directive of 4 June 2015<sup>87</sup>.

These impact assessments are necessary because public funding can skew the project managers’ decision-making process and managers need to be particularly vigilant. In addition, some alternative solutions do not fall within the remit of the body responsible for them and they cannot implement them. For example, the Aquitaine regional government is considering what should be done about the Landaise man-made forest which proved highly vulnerable during the storm of 1999 (30% of the trees

<sup>85</sup> See recommendation 17 of the national climate change adaptation strategy.

<sup>86</sup> The threshold above which an impact assessment for a capital project must incorporate climate-related risks could be adjusted according to the nature of the works (for example €10m for a dam, but more for a coastal road).

<sup>87</sup> *Instruction gouvernementale du 4 juin 2015 relative au financement par les agences de l’eau des retenues de substitution* (Government Directive of 4 June 2015 on funding of replacement dams by water authorities).

were blown down), but is aware that the owners will not be able to incorporate overall management considerations into their individual decisions (managing water resource aspects, wood industry aspects, etc.), which may therefore prove unwise.

11. We recommend that the Sustainable Development Commission (CGDD) look into the possibilities for conducting climate impact studies or analyses on a routine basis, to prevent the risk of maladaptation in certain major long-term investment projects that could be susceptible to climate change, where these are fully or partly publicly funded.

*Initiate discussions on risk acceptability and transition management*

The assessment team noted that the consultation organised by the Prevention and Precaution Committee on the acceptability of risks did not lead to any wider debate. However, the committee's proposals warrant such a debate and the team therefore recommends that this should take place in 2016 before the next plan begins.

The assessment team also considers that the fate of certain ecosystems that have been badly affected by climate change should be studied in detail, from the point of view of how to manage these environments. For example, the gradual drying out of certain water courses during the summer months raises the question of how to manage the implications of dry beds on biodiversity during the transition period between the present day and the time when these dry beds become a permanent feature.

12. We recommend that Sustainable Development Commission (CGDD) and the General Directorate for Energy and Climate (DGEC): a) organise a consultation in 2016 based on the Prevention and Precaution Committee's proposals from 2013 on risk acceptability; b) begin discussions on transitional management of environments that are likely to be permanently affected by climate impacts, in liaison with the General Directorate for water and biodiversity.

# Translating adaptation into practice at regional and local level

While the first plan initially benefited from the impetus of the *Grenelle de l'environnement* process, as time went on it remained too restricted in scope. The regions had jointly drafted their Regional Climate, Air & Energy Master Plans and the local authorities had drafted their Local Climate & Energy Plans, but they often felt ill-equipped to put the adaptation aspects of these plans into practice. However, it is at these levels that the majority of adaptation actions will be carried out.

The next version of the plan must therefore pay particular attention to the implementation of adaptation actions by the local and regional authorities, who will be responsible for translating the plan into action at their respective levels, as well as being responsible for a large proportion of public expenditure. It will be a case of developing policies to strengthen the authorities' capacities and convert existing facilities and resources with a view to adaptation.

The most recent laws on devolution of powers made the regional councils responsible for drawing up planning and development master plans ("SRADDETs") and entrusted them with managing European funds on the country's behalf. Meanwhile, local authority groups with more than 20,000 residents are now solely responsible for the Local Climate, Air & Energy Plans. Both of these planning processes must have sections devoted to adaptation. In addition, the new central-regional government agreements (CPERs) provided an opportunity to include sections on the energy transition and green transition in their contract frameworks, and this is likely to continue for the long term. Within this new framework, the assessment team recommends that the NAP should evolve from being a central government plan and become a nationwide plan involving central government, regional and local governments and the private sector.

13. We recommend to the Environment Ministry that the National Climate Change Adaptation Plan be drawn up by central government from now on, after consultation with delegations from regional and local authorities.

## Organise interactions between central and regional governments

Coordination between central government and the regions is now entering a new phase, therefore, which will play an increasingly vital role if the country's adaptation processes are to progress effectively.

The objectives for the new plan should be established by central government in liaison with the regions, to ensure that the implementation process is carried out as effectively as possible at the regional planning level. The National Advisory Council on the Green Transition (CNTE) is made up of representatives of central government and the regions, along with the other parties they will need to consult in order to make their decisions. It has the advantage of being a forum in which they share common ground and of being outside both the national government level and the regional plans. CNTE could be the forum that approves each of the main stages in the plan's development, starting with jointly reviewing the current situation and establishing the plan's main objectives.

The central-regional government agreements (CPERs) will still be the vehicle for joint financial planning between the two levels. Government agencies such as the Environment Agency (ADEME) and the water authorities will need to organise the exact procedures for joint implementation of adaptation policy in their individual agreements with the regions (both those signed in implementation of the CPERs and direct agreements), to ensure consistency between their funding policies and those of the European funds and, where applicable, the regions' own funds.

Lastly, the regional environment departments (DREALs) could be delegated to negotiate regional adjustments to adaptation plans with the regional governments, in particular with respect to vulnerability maps or programmes under the EU Water Framework Directive, Floods Directive or Marine Strategy Directive (in conjunction with the Interregional Marine Departments on the latter point), especially as these programmes can set priorities for action at smaller geographical scales.

On top of this, the regions will gladly take on responsibility for other areas where the plan will need to be adjusted to fit in with their local situations, for example buildings or biodiversity, to complement the central government actions that will form the common base.

14. We recommend that the Environment Ministry commission the *département* Prefects to negotiate with the regions, with the support of the regional Environment Departments (DREALs), on how the national plan will be translated into practice at regional level, with support from the relevant public bodies.

## Support joint local authority organisations by developing project management assistance capacity

The Local Climate, Air & Energy Plans (PCAETs, formerly PCETs) are likely to become one of the most operational links of the chain in France's adaptation to climate change. It will therefore be vital to build capacity within the joint local authority organisations that will help them develop the adaptation sections of their PCAETs, produce their joint local authority planning documents and conduct their public procurement processes for local capital and development projects. Both central and regional governments have an important role to play in building this capacity. This will involve passing on information about best practice to the local authorities, organising training and providing high quality information about climate change issues and vulnerability at the relevant geographical scales. Specialist agencies, such as the water authorities, have organised technical information days for

local authorities, based on feedback from the authorities' practical experiences or expert assessments by CEREMA. The resource centre proposed above would be the natural choice of organisation to continue with this task.

At this stage, the main concern is to build capacity for project management assistance on adaptation for the joint local authority organisations. Some regions have set a valuable example by coordinating network specialists from the regional environment department, the national environment agency and the regional council, which they will be able to call upon for more specialist resources on specific subjects.

To foster the development of this project management assistance capacity, the Environment Ministry could earmark certain public funds intended for the Environment Agency or the water authorities (and the future French Biodiversity Agency) and at the same time help coordinate engineering firms or the new public structures for which local authorities are now responsible.

15. In order to provide project management assistance to local authority organisations, we recommend that the Environment Ministry delegate the regional environment departments to consult with the regional councils on building technical support capacity within local authorities as they devise their adaptation strategies and plans.

## Send out calls for proposals

Local authorities are responsible for most of the public expenditure that will affect our preparedness for climate change, and they take public finance guidelines thoroughly into consideration when they fund their capital projects. Local authority project managers therefore need clear messages and proven solutions so that they can embark on the adaptation operations they are expected to carry out.

Central government should therefore send out calls for proposals<sup>88</sup>, publicised as concerning climate change adaptation, to help kick-start activities and to build up a national bank of outstanding adaptation projects. This will be needed especially in the fields of urban transformation (bringing green spaces into cities and decreasing impermeable surfaces), natural risks, water saving and biodiversity (wetlands and blue-green grids).

The Government has all its own funding instruments at its disposal (such as the 'investing in the future' funds), as well as those of its specialist agencies (ADEME, water authorities, and soon the French Biodiversity Agency).

16. We recommend that the Environment Ministry (General Directorate for energy and climate and Development, housing and nature): a) send out calls for proposals for climate change adaptation labelled projects, which would be funded either out of the ministry's existing funds or those of government agencies (Environment Agency, water authorities, etc.) and could possibly benefit from loans from the the Public Deposits and Savings Fund (CDC, Caisse des dépôts) and b) initiate more in-depth discussions generally around funding for adaptation measures.

## Convert existing structures to incorporate climate change

With a view to encouraging local authority project managers, it will be more useful to convert existing structures to incorporate climate change instead of creating new ones.

For example, water is a major element of adaptation issues. The catchment area committees (and the catchment area flood committees) have all now included climate change adaptation as a key objective in the Water Development and Management Master Plans they have recently produced and they now need to direct water authority funds towards certain high priority concrete actions that will yield immediate results (water saving, decreasing permeable surfaces in cities, etc.). The new role of water course management, which will be devolved to local authority organisations with their own tax arrangements in 2018 under the MAPTAM and NOTRe laws (known as 'aquatic environment and flood prevention management'), will be an opportunity for local authorities to develop soft, natural management solutions for water courses, addressing the objectives of flood risk mitigation and wetland conservation while at the same time restoring the water courses' natural functions. This will create biodiversity refuges and help build the areas' resilience to extreme events. These solutions are also the most effective in terms of keeping costs down and it would be worth creating an incentivising framework for action that the water authorities could operate, together with the regions as holders of European funding. The Ecology Ministry could make use of its regulatory powers to prompt the departments responsible for water course management to produce climate change adaptation plans for their water courses by 2022, either in the context of a Water Development and Management Plan drawn up under the revised Water Development and Management Master Plan, or in a standalone works contract.

The example of water could be extended to other fields, such as mountains, with the mountain range committees, health with the regional health & environment programmes, or forestry, with the forthcoming "regional forestry and wood industry programmes".

## Devote special attention to the overseas territories

The assessment team noted that the decision not to address the overseas territories (OTs) separately in the NAP meant that the central government departments in charge could coordinate adaptation policies and make provision almost on a routine basis for measures concerning the overseas territories. However, the team also noted that further scientific research still needs to be done on the OTs and in spite of the special report published by ONERC in 2012, a special action plan has yet to be established for these territories. Moreover, as the Advisory Council for Economic, Social and Environmental Affairs (CESE) stated in its opinion, national solidarity will probably be called for in order to boost their local funding capacity for the highest priority themes<sup>89</sup>.

17. We recommend that the General Directorate for Energy and Climate (DGEC) iron out the details of the overseas' territories' climate scenarios

<sup>88</sup> As was done, for example, to study the relocation of activities in highly vulnerable coastal zones.

<sup>89</sup> A solidarity scheme of this nature exists in the water sector, for example, whereby financial contributions from the mainland water authorities are allocated to actions in the overseas territories via the National Water Authority, ONEMA.

and develop initiatives geared specifically towards them over the course of 2016, which can then be included in the new NAP.

# Get all of the economic sectors impacted by climate change involved

The assessment team's observation that the first NAP had little ripple effect in the private sector suggests that it is essential to find more effective ways of increasing awareness on the subject in the next plan. France will be better prepared for climate change when adaptation becomes the rule rather than the exception in business and industry. This represents an opportunity for France and its "clean tech" sector, as well as being a rational choice for the future of several sectors, given that the report by N. Stern in 2006 revealed the costs to our economy if we fail to act. However, businesses, in particular SMEs, are still struggling to conduct long-term assessments and undertake the individual, short-term actions that will be needed in order for the country to adapt as a whole. Only 16% of French SMEs see themselves as being well prepared, well behind the 41% of Chinese SMEs who say they have a disaster management plan in place<sup>90</sup>. All too often, companies still do not act until a climate-related disaster harms their own business.

The assessment team therefore suggests organising a process that will get the public service sector involved without delay, as it is vital to ensure continuity of services and resilience to extreme weather events (3-3-1). The process must also get industry involved, once the study has been carried out to identify which sectors will be the worst affected (3-3-2), plus the insurance sector (3-3-3) and the financial services sector (3-3-4), as they have a key role to play in encouraging all economic stakeholders to take climate change adaptation into consideration. Lastly, the team reiterates the need to ensure that the supply of funding for adaptation is adequate to meet the demand (3-3-5).

## Ensure continuity of public services in the event of a climate-related disaster and build resilience in these services

There are two reasons for taking action in this field. Firstly, the sectors that provide essential public goods (electricity, energy, transport, water, etc.) are vital for the country, while at the same time being among the most exposed to the effects of climate change. They will need to provide service continuity in the midst of extreme events such as storms or floods and will also need to be part of any relocation of activities within the country.

The second reason is that the government has tools at its disposal to encourage them to act, such as concession regulations, public service agreements or public service delegation. The Ecology Ministry ought to encourage them to carry out climate change impact assessments or studies on their activities and look together with them at achievable levels of resilience and business continuity plans.

These studies will be important for the companies themselves, but also for all those businesses that will feel the knock-on effects when they are running smoothly or otherwise.

18. We recommend that the Environment Ministry (General Directorate for energy & climate, Development housing & nature and Infrastructure, transport & marine affairs) encourage public service companies to carry out climate change adaptation assessments or studies and incorporate them into their public service contracts, in order to identify an achievable level of resilience for sectors that supply essential public goods (electricity, transport, etc.).

## Opt for a sector-based approach

Because the state does not control the private sector's actions, public efforts aimed at private sector players will be required. The government has a duty, first and foremost, to give them as much accurate information as possible about the risks they face. The resources we described above, including databases such as DRIAS, vulnerability maps and possible in-depth studies into different sectors by the regions should suffice, provided that a system is in place for bringing this knowledge to the private sector's attention.

Secondly, the individual trades and industries are the obvious level at which actions should be coordinated. They are the only parties in a position to tackle the issue of climate change risk-sharing, discuss large-scale relocation operations and even look at their sector's long-term prospects, beyond the usual time-frame that individual companies deal with. Common interests take precedence within each sector.

The study into which industries are most in need of adaptation, planned under the first NAP's Cross-Cutting Actions theme, could not be carried out. The assessment team is therefore of the view that this subject should be included again in the new plan, so as to identify which sectors are the most affected by climate change (for example tourism). In addition, climate-related risk assessments should be extended beyond the assessments for baseload nuclear power plants included in the first NAP, to all the "environmental protection classified facilities" concerned.

In the area of agriculture, the development of adaptation measures should not be restricted to producers only. All stakeholders must be involved, on a shared interests basis: a producer who needs to diversify his crops to include ones that are less dependent on water, less affected by higher summer temperatures or less vulnerable to pests cannot succeed unless he has a market to sell them to; while the downstream segments are keen to keep the variability of their supplies to a minimum from one year to the next

<sup>90</sup> Source: survey by the firm Penn Schoen Berland, October 2015.

and preserve their quality. The government could encourage this sort of dialogue by calling upon the agriculture and fisheries office (France Agrimer) at the national level, which should get its sector committees involved in looking at issues relating to climate change adaptation in the agricultural sector.

At local level, the network of chambers of agriculture and the whole agricultural advice sector have an important role to play in creating links between short-term trends and more long-term strategic decisions.

This dialogue is already well under way in the forestry sector, within the framework of the preparatory work for the national forestry & wood industry programme and it will continue in the regions when the regional programmes are drawn up.

19. We recommend: a) that the General Directorate for energy and climate (DGEC) examine what is needed in order to begin the study to identify the industries affected by climate change; b) that the General Directorate for risk prevention continue the work already under way on baseload nuclear power plants and include all the environmental protection classified facilities (ICPEs) concerned in the climate risk studies; c) that the Department of private sector economic and environmental performance encourage the agriculture and forestry sectors to organise discussions aimed at identifying climate change adaptation measures that might be beneficial in both the upstream and downstream segments.

The various sectors may need to set up climate-related risk sharing schemes, as has been done in the agriculture sector with the risk-sharing fund created by the trade associations, and possibly redistribute resources already allocated for certain actions, since the needs of the most vulnerable zones may increase significantly. It will be important not to abandon studying the feasibility of major projects, such as the extended producer responsibility schemes that have led to the creation of environmental protection bodies responsible for running a circular economy within a given segment, which the segment's operators pay into. Tax arrangements could provide a means of funding these needs in certain sectors. Relationships within the value chain could be adjusted so that operators distribute the risk between their suppliers and customers.

A good model for this type of system exists in the United Kingdom, where UKCIP<sup>91</sup> has developed a toolkit to support individual businesses and professional or trade associations. It can be used to assess the financial impacts of climate change ("Costing the Impacts of Climate Change" tool) or look at suggestions for adaptation strategies ("Adaptation Wizard" tool). The "Business Assessment Tools" are aimed at individual businesses, while the BRAIN adaptation database is available to all.

Within the framework of this sector-based approach, it will be useful for the General Directorate for energy and climate (DGEC) to address all mitigation and adaptation actions from the point of view of both the national low-carbon strategy and the national adaptation plan, especially in fields such as buildings, agriculture & forestry, industry, energy and waste management.

20. We recommend that DGEC and CGDD review the various industries and segments in terms of identifying possible management and risk-sharing solutions for climate change adaptation, and solutions for allocating resources to emerging needs, bringing in the regions on issues that affect them.

## Increase the insurance sector's role in adaptation

Sharing the financial burden of risks is an established principle in France, which is put into practice through insurance, the natural disasters scheme and the Barnier Fund. The latter fund is fed by "Catnat" natural disaster insurance premiums and is used for preventive actions (e.g. buying buildings in high-risk areas, or collective protection actions). However, this principle does not mean that all losses will routinely be shared, as no system would be capable of this when dealing with climate change.

The insurance laws could be adjusted to make some new climate-related risks ineligible for shared liability. Shared liability also entails certain responsibilities, first and foremost the responsibility to take reasonable decisions in order to protect oneself, so that the public purse does not have to bear a disproportionate financial risk. The United Kingdom tested a liberal system whereby the insurance sector was free to adjust premiums according to location, and hence according to risk level. While this proved effective in terms of making people act more responsibly and reducing the burden on the public purse, the down-side was that some people were left with next to nothing following a natural disaster. The assessment team therefore suggests that a system of setting a threshold for the sums payable by insurance companies should be looked into, or a system of adjusting the excess payable in critical zones by local authorities or businesses. This system would be especially relevant in areas where the coastline is threatening to retreat back to the level of streets and houses. It would send a message to the property market that these properties, which are often expensive, will no longer be supported in the event of severe damage by the sea, nor will they be eligible for compensation from the local authority under the natural disasters scheme. It will also be important to begin a process of removing the eligibility of certain risks for cover under the natural disasters scheme or compensation by the public purse, for example, and re-classing them under standard personal insurance cover. A similar process was carried out for climate-related risks affecting woodland, accompanied by an insurance incentive scheme.

These adjustments to the framework governing the insurance sector must be made as soon as possible, especially since insurance providers have a significant influence on the private sector in terms of encouraging prevention and protection measures and action by them will therefore have a strong incentivising effect.

21. We recommend that General Directorate for risk prevention, in conjunction with the Treasury department and the other departments concerned, undertake a review of risks associated with climate change impacts, to obtain an up-to-date picture of those that can fall under insurance schemes.

## Equip the financial sector with the tools it needs to take adaptation into consideration in its decisions

According to the OECD, 90% of funding for adaptation measures can be found by redirecting the usual sources of finance and only 10% needs to come from new sources. What is needed above all, therefore, is to supply very clear information on the adaptation aspects of projects in order to guide financial providers, as they are often confused at present. The assessment team therefore advocates clear standards, local-level planning processes and adaptation labels, as mentioned in the above

<sup>91</sup> United Kingdom Climate Impacts Programme. The CDC-Climat research team suggests studying this programme in its report *L'élaboration d'une politique nationale d'adaptation au changement climatique: retour sur cinq cas européens* ("Developing national climate change adaptation policy: five European case studies"), March 2011.

recommendations.

This redirecting of finance involves substantial sums: the Public Deposits and Savings Fund (CDC, Caisse des dépôts) estimates that the funding needed for adaptation between now and 2030 is in the region of €150bn per year, compared with the €25bn currently invested in Europe as a whole. This figure is not dissimilar to the sums required for mitigation. The vast majority of funding will come from private finance and 85% of city councils say that access to funding is top of the list of their concerns around adaptation<sup>92</sup>.

Traditional financing instruments, such as government subsidies, local taxes, green bonds or public-private partnerships are well suited to adaptation measures. However, they can only be used effectively if the finance providers can access reliable indicators as to the qualities of adaptation-related projects.

Green bonds in particular have taken off in a big way<sup>93</sup> and have established themselves in the climate change mitigation field, where the straightforward yardstick of tonnes of CO<sub>2</sub> provides an easy gauge of a project's qualities. Green bonds now hold great potential for adaptation measures, provided that the problem of assessing an adaptation project's qualities can be solved. Investors are looking for a reliable label because their own assessments do not have the capacity to examine every local situation in detail. Green bonds have the advantage of being more fully underwritten than traditional bonds and of offering the market greater security. They also carry more detailed information about projects and therefore have the benefit of guiding investors towards the best adaptation projects.

Financial risk insurance instruments will also be important, since the projects are being developed amid an uncertain environment and return on investment can take a long time. However, these instruments still need to be developed.

22. We recommend that the CGDD consult the financial sector, in conjunction with the Treasury department, as to the quality of information it requires in order to assess finance applications for adaptation projects.

### **Begin a strategic study to examine whether the funding accessible for climate change adaptation is sufficient to meet the needs.**

Although the assessment team found out information on the wider work being done on the subject by the General Commissioner for Sustainable Development (CGDD), such as the work on innovative funding tools for environmental protection projects<sup>94</sup>, we were unable to obtain sufficient information to assess the plan's overall funding requirements. The next plan could provide an opportunity to take a strategic look at whether the funding that can be accessed from the State, local authorities, the private sector or individuals is sufficient to successfully complete the necessary adaptation work.

23. We recommend that the CGDD include in the discussions on the next plan a strategic study to examine whether the funding that can be accessed for adaptation is sufficient to meet the needs, at least for the priority themes.

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<sup>92</sup> Carmin *et al.*, 2012.

<sup>93</sup> The Climate Bonds Initiative estimates that the French climate bonds market is worth approximately USD 49bn, making it the 4th largest market globally. Only a small proportion of the bonds carry a label at present. The French company Vigeo is the second largest green bond certification provider in the world.

<sup>94</sup> *Les mécanismes de financement innovants* ("Innovative funding tools"), CGDD, February 2013.

# Establish stronger, more strategic leadership of the new National Adaptation Plan

In Section 2, we discussed the fact that the first NAP suffered from a lack of political and strategic leadership, inadequate collective follow-up and patchy monitoring of the funding and expenditure aspects. It will be important to remedy these aspects in the next plan's governance and implementation system.

## Establish a body to provide strategic guidance for the plan

In order to assert the plan's importance and ensure it is recognised as being a high priority, it must be coordinated by a high-level governance body that brings together all the relevant parties.

The National Advisory Council on the Ecological Transition (CNTE) is chaired by the Minister of Environment and has representatives of central government, local authorities, Parliament and the private and voluntary sectors represented on it, and therefore seems to be the ideal body.

The plenary CNTE should issue an opinion on the plan before it is made official by the minister and would also be called upon for an opinion on the mid-way review and final assessment of the plan.

The CNTE could set up a special sub-committee to oversee the formulation of the plan and keep its strategic priorities on track while it is being implemented. This committee would be responsible for making recommendations on the new plan. Another alternative could be to entrust these monitoring activities, which is a fairly operational role, to an informal group set up on ad-hoc basis, or even the ONERC steering committee, whose membership would therefore need to be adjusted.

24. We recommend that the Ministry of Environment entrust the National Advisory Council on the Ecological Transition (CNTE) with the task of guiding the policy aspects of the next NAP, both at the drafting and at the mid-way and final assessment stages. A special sub-committee of the CNTE or the ONERC steering committee, comprising members chosen to fit in with the plan's new priorities, would be given the task.

Financial follow-up of the NAP must be improved, as must the awareness of the funds that have been set aside for adaptation-related measures<sup>95</sup>. This information would be passed on to the CNTE in the context of reporting on the plan's implementation.

## Ensure stronger operational leadership

The NAP needs a system of leadership, coordination, reporting and promotion.

The General Directorate for energy & climate would seem to be the best placed to take on most of these tasks, partly because it is already responsible for implementing the low-carbon strategy, which intersects with adaptation in some areas. Both policies are put into practice through the same planning tools at the local and regional levels. The department would ensure that the plan is promoted effectively and oversee coordination with local and regional levels via the regional environment departments. It would coordinate the work of the plan monitoring group set up within the CNTE (or the ONERC steering committee, depending on which option is chosen), in close liaison with the General Commissioner for Sustainable Development Commission.

The current leadership of the plan has proved inadequate from a strategy point of view, however, and the assessment team therefore suggests that as the main operational coordinator, the General Directorate of energy and climate should receive a commissioning letter, thus giving it genuine interministerial powers. In addition to the involvement of the department as a whole, it would also be desirable for the overall leadership of the plan to be entrusted to an individual who works in the department and has the necessary authority and availability. This would be a separate role from that played by ONERC.

The plan leader will need to set up an organisation and coordination system that will provide a more effective means of dealing with aspects such as areas of intersection between two or more themes. The action or theme leads would also be given a commissioning letter, which should be arranged or even co-signed by the plan leader in conjunction with the department to which the action and theme leads belong.

National indicators will need to be developed, along the lines of the indicators for assessing the effectiveness of adaptation policy adopted in the United Kingdom<sup>96</sup>. They could be devised by the ONERC and form part of the process of reporting to parliament. The type of indicators to concentrate on initially would be those that will help gauge whether adaptation policy is getting under way within the different sectors, while ensuring that outcome indicators are included as well as process indicators.

<sup>95</sup> The vast majority of funding for adaptation is taken from budgets that have not been specifically allocated to adaptation. Without necessarily aiming for comprehensive coverage, but at least for those measures that are the most critical and most beneficial for adaptation, it would be useful to set up a system for verifying that the funding has been properly implemented. This financial monitoring will follow up all the funding arrangements, including those that fall outside the remit of central government, such as European funds or local authority funds, and will also follow up the development of green finance in the adaptation field.

<sup>96</sup> Public Service Agreement 27.

25. We recommend that the Ministry of Environment strengthen both the operational coordination of the plan and inter-ministerial involvement in the plan, entrusting the DGEC with these aspects via a commissioning letter from the Prime Minister.

# Conclusion

The first National Climate Change Adaptation Plan (2011-2015) was developed very effectively, with the help of the National Observatory on the Effects of Global Warming (ONERC). The process took place in stages, starting out on the basis of the National Adaptation Strategy of 2006, which was supplemented with recommendations formulated by the working groups of the national consultation process coordinated by ONERC's chairperson in 2010. France was seen as one of the most advanced countries in Europe in terms of producing an adaptation plan.

The assessment team found that the approach used to develop the plan was appropriate for this first plan, as it focused predominantly on actions at central government level and ensured that the ministries and government General Directorates concerned would incorporate a climate change adaptation dimension into the appropriate public policies. It was thought that the desired ripple effect of the plan in the private sector would occur primarily via the public companies and organisations that the government would enter into service agreements with. The plan was centred around 20 themes, divided into 84 actions between them and over 230 measures of varying scope.

The assessment team's evaluation of the state of progress of the actions and the results obtained revealed a very mixed situation from one theme to the next, bearing in mind that this first plan was primarily aimed at producing scientific, regulatory and methodological frameworks. In terms of the science, this included translating the IPCC scenarios into national scenarios for France and producing climate change impact assessments; on the regulatory side it included risk prevention plans, water development and management plans, transport infrastructure guidelines and strategic local planning, while in terms of methodology it included developing vulnerability assessments.

The most encouraging results were obtained in the fields of science (with the transposition of the IPCC climate scenarios into national scenarios, effectively interpreted in volumes 4 and 5 of "The French Climate in the 21<sup>st</sup> Century"), energy (addressing concerns surrounding climate-related impacts on baseload nuclear power facilities), coastal zones (with the national integrated coastline management strategy and measures to address coastal risks such as identifying reference sea levels in the Coastal Risk Prevention Plans) and information & communication (with the data and studies made openly available by the DRIAS portal, the ONERC's information activities and getting local authorities and economic sectors involved in adaptation issues in the lead-up to COP 21).

Not all of this can be directly attributed to the existence of the NAP, and extreme weather events (heatwave and drought of 2003, storms and floods of 2010, etc.) are giving the process of adaptation to major risks much-needed momentum, as well as helping to boost the NAP process.

A wide-ranging cross-sector examination of the overseas territories was conducted by ONERC in 2013, though it has not yet been taken on board to any great extent within the themes. The scientific research still needs to be refined and a full-blown action plan developed.

In the three major areas of concern for Europe identified by the IPCC, which are damage caused by inland and coastal flooding, heatwaves and restricted water supply, France is now better prepared overall than it was before the start of the plan.

However, the anticipated knock-on effect from the public sector to the private sector does not seem to have occurred yet, with the exception of the energy industry.

In view of the process that has now got under way and the impetus that was provided by COP21, the assessment team feels that 2016 could be used to finish the most important actions that have not yet been completed and to prepare a new five-year plan for 2017-2021.

We are of the view that there is still much work to be done in order to develop an operational climate change adaptation strategy based on the regulatory, methodological and scientific foundations put in place through the first plan. We recommend that the second plan address the following three objectives:

- to continue the fundamental actions already under way (for example factoring climate change into the technical transport infrastructure guidelines or encouraging major water-saving actions);
- to translate the plan into practice at local and regional levels, while remaining consistent with national assumptions and methodologies. This will be done by the regions and also at interregional level and between the regions and local authority organisations and the process will be supported by central government (in the form of the regional environment departments and public agencies such as ADEME and CEREMA);
- to achieve the planned ripple effect on all areas of the private sector, including primary industries such as farming, forestry and fisheries, secondary industries and tertiary industries such as the insurance, finance and tourism sectors.

The assessment team is of the view that it would be beneficial to consult with all the stakeholders involved when developing the next plan, as was done for the first, but this time around they should also be much more involved in implementing the plan. We suggest that the plan be conducted on a project management basis, with full cross-sector coordination of the three essential priorities (water resource management, adaptation of coastal zones and adaptation of cities and public spaces).

To ensure the plan is consistent and all its objectives are achieved, we are of the view that the General Directorate for energy and climate should take on responsibility for the operational strategic coordination of the plan, while the Sustainable development commission should be responsible for ensuring the plan remains in line with the National Strategy for an Ecological Transition to Sustainable Development, in close liaison with the Advisory Council on the Ecological Transition (or possibly the ONERC Steering Committee).

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Part B

Opinions and recommendations of the various sectors

## Section 1

### Opinion of the Prevention and Precaution Committee. Adaptation to climate change: risk acceptability and governance

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The Prevention and Precaution Committee, chaired by Professor Alain Grimfeld, published its opinion on the acceptability and governance of climate-related risks in June 2013, in the context of the first National Climate Change Adaptation Plan 2011-2015, under the "Cross-Cutting Actions" theme. The full text of the opinion can be viewed online at: <http://www.developpement-durable.gouv.fr/Le-comite-de-la-prevention-et-de,15001.html>

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# Summary of the opinion

As we address the subject of climate changes<sup>97</sup>, the biosphere and human society over the coming decades, we will need to make a distinction between two different periods:

- Due to inertia in the atmospheric system, between now and roughly 2050 it is anticipated that changes in the climate will be influenced very little by any reductions in greenhouse gas emissions we manage to achieve. Significant climate changes are unavoidable during this period, regardless of the reduction efforts undertaken from now on. It is therefore vital that we organise the process of adapting French territory and French society as a whole to the impacts of these changes.
- After 2050, however, the way in which these changes progress will depend on the emissions reduction strategies that are put in place between 2013 and 2020. Policy decisions on this subject are referred to as mitigation policies and are not covered by this opinion.

The process of adapting to climate changes consists of a series of measures to modify both our infrastructures (transport, habitats, coastal defences, regulations, etc.) and the way we act, with a view to limiting the impact of these changes. It must begin immediately and could involve a governance system based on in-depth consultation. It would be unrealistic and dangerous to wait for the knowledge surrounding climate predictions to be refined before we take action, especially since some actions can take around ten years to take full effect. During the consultation and decision-making processes, it will be necessary both to keep several assumptions open and to take decisions amid a situation of uncertainty.

Climate changes will have a wide range of effects in both mainland France and French Overseas Territories and these will vary greatly according to a number of factors, in particular geographical location. Local-level discussion and decision-making processes will be essential. The choice of administrative level is crucial when addressing both the local effects of climate changes and local aspects of preventive measures.

In addition, the areas directly affected cannot be expected to bear the costs of adaptation measures alone.

Central government, in liaison with the European Union, must ensure fairness and solidarity in dealing with the situation. The discussion process surrounding adaptation actions must therefore be coordinated and ongoing and must include several levels:

- a local or regional level, with the appropriate consultation bodies for each situation;
- a national level, responsible for coordinating the various processes taking place at local level and making national-level decisions on a limited number of subjects, in liaison with international bodies (for example, electricity supply, transport infrastructure, hospital infrastructure, climate crisis management).

## Between acceptable and unacceptable risk

An analysis of previous experiences of risk management reveals stakeholders to be in agreement in identifying two levels of acceptability that mark the boundaries between three zones:

- a zone where the risk is below a threshold widely considered to be “acceptable”, subject to appropriate insurance and immediate response provisions (e.g. a 20cm flood every 20 years);
- at the opposite end of the spectrum, a zone where the risk is above a threshold that is unanimously seen as “unacceptable” (e.g. fatalities from flooding every year in a particular area), for which all the parties concerned would agree that prevention programmes need to be deployed, even if the cost is high;
- a level of risk between these two zones, which could be classed as “worrying”. This level gives rise to the widest differences in opinion and it is neither possible nor necessary to try to eliminate these differences.

In this zone are situated events that are rare but could have serious consequences and, conversely, events of more moderate severity but which could occur more frequently. For both these types of impact, the issue of the level of resources that should be deployed for prevention is the most difficult to provide an opinion on.

In these situations, the quality and scope of the adaptation measures envisaged can vary greatly. For example, should we design sea walls to withstand events that have a 1 in 1,000 chance of occurring every year in the worst-case scenario? Or should we plan them only to cope with moderate events instead and organise safeguarding, alert, evacuation and crisis management measures to deal with more rare events? Centralised assessment and decision-making processes will not suffice on this issue and consultation between the various stakeholders and local residents and their representatives will be necessary.

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<sup>97</sup> We talk about ‘climate changes’ in the plural here, to emphasise the differences in the effects, such as geographical differences.

### *Recommendation 1: Consultation and decision-making bodies*

In the Prevention and Precaution Committee's opinion, decisions should not be imposed by a central body, but would benefit from ongoing consultation with the stakeholders concerned. The precise local effects of climate changes cannot be assessed purely on the basis of expert assessments carried out at a distance and therefore local-level discussion and decision-making processes are essential. Nonetheless, the individual local authorities cannot be expected to find the necessary solutions and resources to adapt to these changes alone. Areas that are subject to the same impacts may not be close together either geographically or administratively and an identifiable national-level structure is therefore needed. This structure would liaise with international partners involved in developing similar solutions and central government would guarantee fairness and solidarity in dealing with the situation.

The governance system for the adaptation process would therefore be coordinated and ongoing and would involve two levels:

- a national level, which would be responsible for:
  - designating the coordinators for the different schemes carried out at local and regional levels;
  - providing resources, such as methodologies;
  - coordinating the national-level themes (for example electricity supply, transport or hospital infrastructures, climate-related crisis management);
  - guaranteeing fairness and solidarity;
  - liaising with international bodies.
- a local or regional level, comprising:
  - coordinating and decision-making bodies overseen by the theme coordinators. The appropriate bodies would be chosen for each situation.

The consultation and decision-making processes must take into account the need to consider several different scenarios.

The consultation model we propose is not based on a one-off, time-limited process. Due to the wide-ranging nature of the issues that need to be addressed and the fact that forecasts will probably be adjusted, an ongoing discussion process will need to be organised. Periodic reviews will take place of the state of progress of adaptation measures, developments in knowledge and changes in the situations themselves. The implementation of the prevention measures and their effectiveness will also need to be followed up.

### *Recommendation 2: new guidance needed for the consultation process*

To support these consultation processes, data, models and analyses of probable climate changes and their impacts at the relevant geographical scales will need to be produced and passed on to the parties involved ("climate services"). This will involve more than simply supplying information, as contacts will need to be set up to enable the parties concerned to understand the inevitable uncertainties and refine their analyses. This contact system could also allow the parties involved to call upon the researchers for assistance and could trigger new research, for example in response to local management issues or issues surrounding the themes themselves. This will require training to be developed and the intervention of knowledge translators, who are both sufficiently trained in about climate-related risks and impacts (including health issues) and sufficiently skilled in humanities and social sciences, for example in the area of social representations and consultative change management.

To enable the adaptation measures to be organised, work will need to be done in the social and economic fields, and laws and regulations will need to be brought in line on various aspects. For example, new schemes to cover local development will need to be introduced.

## Definition Issues associated with the notion of “risk”

There are various different, sometimes contradictory definitions of “risk” in different fields.

It would be unrealistic to try to impose a standard vocabulary of risk, as words have taken on tangible meanings in different fields. It would mean changing standards governing action, scientific practices, social representations and legal rules that have been in use for a long time.

For example, it is not feasible to oblige insurers to rename a policy covering “theft risk”, as the word is used to describe a specific type of damage. Similarly, the word “hazard” is used to describe types of damage in the field of chemicals, plant protection products or biocidal products in European directives.

Within the meaning of these directives, risk is the combination of a level of exposure with the likelihood of a particular effect occurring at that level.

In other areas, risk is neither the type of damage nor the likelihood of its occurrence, but the extent of a particular damage multiplied by the likelihood of its occurrence, or the mathematical expectation of the damage in relation to a set of similar events, all of which have a given likelihood and damage level.

In epidemiology, “lifetime risk” (i.e. of suffering an illness) means cumulative incidence of the disease over one’s lifetime.

The most reasonable approach, therefore, is to refrain from using the word “risk” whenever an alternative, unambiguous term can be used.

The word risk would then only be used in expressions referring to general matters, such as “risk management”.

We will therefore use the following terms here:

- Damage, taking care to specify whether it is damage to the environment, human health, lifestyles, property, etc. It is also important to distinguish between damage affecting individuals and damage affecting society as a whole.
- Hazard, when referring to events that can cause damage.
- Likelihood, ensuring that the event in question is mentioned of course.
- Unforeseeable event, when referring to the possible occurrence of an event beyond human control (at least in the short-term), such as storms, earthquakes, etc.

## Section 2

### France's adaptation to global climate change (Economic, Social and Environmental Council)

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Opinion of the Economic, Social and Environmental Council on the report submitted by Mr Antoine Bonduelle and Mr Jean Jouzel on behalf of the section for Environment, chaired by Mrs Anne-Marie Ducroux. The full text of the opinion adopted during the session of 14 May 2014 and published on 23 May 2014 is available to view at: <http://www.lecese.fr/travaux-publies/ladaptation-de-la-france-au-changement-climatique-mondial> (vf)  
[http://www.lecese.fr/sites/default/files/travaux\\_multilingue/2014\\_13\\_adaptation\\_changement\\_climatique.pdf](http://www.lecese.fr/sites/default/files/travaux_multilingue/2014_13_adaptation_changement_climatique.pdf) (v uk)

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## Summary of the opinion<sup>98</sup>

In the face of climate change linked to human activity, adaptation is essential. There is, of course, still a critical and urgent need to limit global warming to less than 2°C by reducing greenhouse gas emissions (see IPCC report). Even at this level, detrimental consequences will be felt in the overseas territories and then in mainland France. For this reason, France must prepare for the changes and increased risks associated with the challenge of climate change.

The already noticeable changes to the climate will continue to have increasingly detrimental consequences. Each region will face its own challenges, be these new diseases or allergies, coral mortality, risks to peatlands and vulnerable rainforests, or fires in areas already made fragile by coastal urbanisation and the degradation of natural zones. In addition to the threat of sea level rises and flooding, the impacts will be felt in the form of increased drought in the Mediterranean basin, more frequent heat waves and extreme rainfall.

This ESEC opinion focuses on adaptive measures for humans, particularly in their interactions with water, biodiversity, land and marine ecosystems, agriculture, fisheries, forestry and health in mainland France and the overseas territories. It takes into account the Climate Change Action Plan, prepared and steered by France's National Observatory on the Effects of Global Warming (ONERC), currently undergoing its mid-term review. This plan has been put into action very unequally from sector to sector. To progress further, this «Adaptation» opinion insists on the need for dialogue and learning at the regional and supra-regional level. This is the natural level at which climate change responses should be planned (II-I). Credible climatic projections and arbitration systems will be needed to ensure that public interests continue to be served, despite crises and changes (ii-ii). Finally, research will be required in order to increase the theoretical and practical knowledge needed to cope with a climate that is very different from the current climate (II-III).

### Create a shared vision for climate action in the regions

To tangibly involve all actors in adaptation, data and studies will need to be popularised and made accessible. Each actor must be in a position to help develop informed responses to changes that are certain, but of as yet undetermined extent and scope.

The implementation of concrete, targeted services for each sector or region will be a key requirement for this mobilisation. This will involve the generalisation of observatories in the major regions, which will need to work jointly with citizen and professional networks. In addition, scientific teams should be asked to formulate regional indicators.

Furthermore, risk factors must be the object of consultation between the State, the communities and representatives of economic, social and environmental actors, with support from experts. Specific work needs to be conducted with the insurance sector.

- Health. Adaptation will need to be taken into account in the National Health-Environment Plan and in national health and research strategies. The idea is to adapt the framework of regional health strategies to global warming priorities, in particular Regional Health-Environment Plans, and to involve the hospital and research sectors in the formulation of Territorial Climate-Energy Plans.
- Agriculture. The aim is to harmonise different adaptation and action time frames, from short-term consultancy to medium and long-term changes. Production systems for each region will also need to be improved, with priority given to agronomic solutions to prevent soil impoverishment and to combat erosion in the face of extreme rain and drought.
- Forestry. The grouping of private owners and the creation of sustainable management plans must go hand in hand with the development of a vision for adaptation that is shared by private landowners and public-sector forestry managers.
- Biodiversity. The priority is to safeguard ecological continuity as identified in national and local government plans. Reflection will need to begin on policies for protected spaces with regard to currently observed or future climate change. Emerging know-how will need to be developed in terms of the integration of plant and animal biodiversity in urban planning, in light of the heightened risk of heat waves.
- Seas, oceans and fisheries. Priority must be given to ecosystem preservation and restoration, and in particular to remarkable ecosystems such as mangrove forests, coral reefs and wetlands, and to the reduction of artificial coastal

<sup>98</sup> The full text of the draft opinion was passed by 161 votes and 2 abstentions in an open ballot.

development. There is a need for reflection on coastline vulnerability and management, and on the reappraisal of all built-up infrastructure and areas as regards potential climate change.

## **Incorporate climate adaptation into public action based on common rules**

For the planning and implementation of adaptation policies, the ESEC is firmly committed on the one hand to national-regional regulatory frameworks, and on the other hand to operational local climate plans centred around appropriately-sized inter-municipal programmes. These policies must be coordinated with mitigation actions. The strategy must be coherent, ambitious and link all areas of the country. In particular, future risk prevention must be the object of a higher degree of enforcement.

The ESEC also proposes that reference projections and vulnerability maps for climate change be incorporated into planning documents. These reference climate projections and vulnerability studies must be accessible to all prior to the formulation of climate plans.

As regards Civil Security, the Council recommends incorporating available knowledge on future climates and their impacts into risk prevention and management documents, specifically by updating local urban planning plans. To reflect this, the term «natural risk» could be removed from their titles.

Public adaptation policies will require a high level of national solidarity, particularly as regards the Overseas Territories.

## **Develop basic and applied knowledge**

The scientific community must be supported, particularly in the formulation of climate projections with an emphasis on the regional level, and in impact modelling for territories, natural areas and professional sectors.

These objectives will require the development of new calculation models and codes and associated methods, and of climate services for assessing impacts and the vulnerability of economic, environmental and societal activities to climate change. Particular attention will need to be given to extreme phenomena and the risks associated with the most pessimistic scenarios. In order to do so, basic and applied interdisciplinary research will need to be conducted both in terms of integrated climate-impact modelling and socio-economic and cultural issues.

Moreover, health-environmental research must be given greater priority through clear policy decisions and the corresponding budgetary resources. These choices must be reflected in the priorities of the French National Research Agency (ANR).

Finally, agronomic research and agricultural innovation must be consolidated in order to promote the development of better-adapted and more resilient agriculture: by anticipating the development of diseases and pests, and by reaffirming the centrality of the food safety objective.

We need to espouse the idea of a future that is significantly different from the present and factor this parameter into all studies of production sectors, conditions governing the exercise of occupations, professional practices and the anticipatory management of jobs and skills at all levels.

Inset at end of section B.2

### **Recommendations for the overseas territories**

*Summary report by Mr Eric Brun (ONERC)*

The assessment report on the National Climate Change Adaptation Plan for 2011-2015 highlights the fact that no specific adaptation actions were developed for the overseas territories (OTs) and only through the individual themes were actions concerning them possible. The assessment team is of the opinion that it was due to this initial choice of approach that the first NAP yielded limited results for these territories. The assessment report goes on to recommend that a specific discussion topic be devoted to them in the preparations for the next plan.

In keeping with Objective 2 of the roadmap produced by the 2014 Environment Conference – “To strengthen the national adaptation strategy” – discussions on the OTs must focus special attention on biodiversity. A fairly natural way to do this would be to consider the services these ecosystems can provide to help the territories’ adaptation to climate change, for example by increasing their resilience to extreme weather events. This approach would seem even more logical given that the OTs are particularly rich in both marine and terrestrial biodiversity.

The discussions on the overseas territories could use as a basis various initiatives that have been carried out over the last few years. These initiatives have yielded a large amount of scientific knowledge about both actual and anticipated global warming impacts and a few major priorities for the territories’ adaptation have been identified.

The 2012 ONERC report “The Challenge to French Overseas Territories from Climate Change” identified several major avenues for adaptation in the sectors of biodiversity, tourism, fisheries and fish farming, agriculture and forestry.

More recently, three conferences have been held on the subject:

- The International Conference on Biodiversity and Climate Change<sup>99</sup>, organised in Guadeloupe in 2014. During the conference, 34 local authorities from European overseas territories worked on five themes: enhancing resilience, halting the loss of biodiversity, promoting green and blue economies, improving knowledge and finding innovative funding mechanisms.
  - The conference <sup>100</sup> organised by the ministry responsible for French Overseas Territories on 15 October 2015, in preparation for COP21. During the conference, 16 climate change adaptation actions were identified for the OTs, many of them relating to ecosystems and biodiversity. Among these were monitoring and protecting mangroves and protecting coral reefs by creating coral nurseries (IFRECOR work programme).
  - The conference organised by the Association of Overseas Territories Town Councils and Local Authorities on 14 and 15 October 2015 in Porte de Versailles. One of the subjects discussed was the fact that climate changes have highlighted the extreme vulnerability of the territories for which these councils and authorities are responsible, in terms of coastal flooding, coastal erosion, increased intensity and frequency of cyclones, drought, etc.
- Politicians have also engaged with the issue of climate change and the overseas territories and two reports were published on the subject in 2015:
- The information report on the effects of climate change in the overseas territories, produced on behalf of the Lower House Overseas Territories Delegation. The report was written by Members of Parliament Maïna Sage, Ibrahim Aboubacar and Serge Letchimy.
  - The information report on the proceedings of the round tables on “The biodiversity of the overseas territories and climate change”, produced on behalf of the Committee on Local Planning and Sustainable Development and the Upper House Overseas Territories Delegation. The report was written by Senators Jérôme Bignon and Jacques Cornano.
- All of these initiatives are valuable sources of information for identifying the priorities for action in the overseas territories within the framework of the next climate change adaptation plan.

<sup>99</sup> <http://www.developpement-durable.gouv.fr/Segolene-Royal-en-Guadeloupe-pour.html>

<sup>100</sup> <http://www.outre-mer.gouv.fr/?colloque-outre-mer-et-les-changements-climatiques-vers-un-agenda-des.html>

## Section 3

### **Executive summary of the European Environment Agency's report "National monitoring, reporting and evaluation of climate change adaptation in Europe"**

This report provides new insights into adaptation monitoring, reporting and evaluation (MRE) systems at the national level in Europe and constitutes the first attempt to consolidate emerging information across European countries. It aims to offer reliable and targeted information to support the effective and efficient implementation of climate adaptation policies and actions at the national level in Europe.

The intended users are policymakers and experts coordinating, developing, implementing, monitoring or evaluating adaptation across or within particular sectors. It is also of relevance to practitioners such as public authorities and businesses, including utility providers for various sectors such as water, energy, and transport.

The Expert Workshop on 'Monitoring, reporting and evaluation of climate change adaptation at national level' (held by the European Environment Agency (EEA) on 24–25 March 2015) was a key source of information from which the findings in this report were elaborated. Experts from the European countries that have a system for MRE of adaptation in place, or are currently developing one at national level, were invited to the workshop. This report has also benefited from the excellent cooperation with and contribution from the EEA's member countries, particularly in connection with country examples. However, it should be noted that this report seeks to consolidate the emerging information available across European countries and not to collect the countries own official positions on MRE of adaptation.

Collecting and analysing information on adaptation policy processes in European countries is essential in order to evaluate the extent to which actions are effective, efficient and equitable. It allows to better understand which adaptation actions work, in which contexts, and why, and to share experiences of countries from a dynamic field of practice. However, measuring progress in adaptation is challenging for several reasons: adaptation is context specific and cross-cutting all sectors, is characterised by long time-frames and uncertainty, does not have common or aggregated metrics and is commonly integrated into other sectoral policies rather than being a stand-alone activity. Therefore, adaptation policy targets at European, national, regional or local levels cannot usually be monitored with a single or limited numbers of indicators or sources of information like in other policy domains such as climate change mitigation. Finally, monitoring is usually undertaken on an on-going basis while reporting and evaluation activities are typically only conducted at specific, usually strategic, points in time.

#### **Overall key messages**

An increasing number of European countries are now taking action on MRE of adaptation at the national level. So far, 14 countries have systems for monitoring, reporting and/or evaluation of adaptation in place or under development

Across European countries progress on adaptation strategies and plans varies considerably and the same is true for MRE of adaptation. Despite these differences, early insights from this dynamic field of practice can be valuable to countries with established approaches as well as those just beginning to consider MRE of adaptation. These experiences contribute to an essential information base for countries to learn from.

Most countries have focused so far on monitoring and reporting activities. The evaluation of adaptation policies is at an early stage often because the implementation of adaptation has only just

begun.

- Literature on MRE of adaptation highlights that it can serve multiple purposes including improving our understanding of policy effectiveness and efficiency, providing accountability, and enhancing learning in order to improve policy and practice.

## **Thematic key messages**

### Drivers and purposes

- In most countries, the momentum for initiating monitoring, reporting or evaluation of adaptation was provided by national adaptation strategies and plans, along with European policies and international processes.
- The main purposes of national MRE systems include tracking and reporting the progress and effectiveness of adaptation policy implementation; enhancing the knowledge base; accountability; and learning to improve adaptation policies, policymaking and practices.
- Most countries have so far concentrated their efforts on adaptation monitoring and reporting activities.
- The development of specific evaluation activities is still at an early stage, even in countries that have a relatively greater experience in implementing adaptation policies.

### Governance and participation

- Overall responsibility for MRE of adaptation often lies with ministries or government agencies coordinating adaptation policy.
- Horizontal and vertical coordination of MRE activities is often organised through committees involving multiple administrative levels and sectors.
- In some countries, the requirement for monitoring, reporting and/or evaluation is formalised in legislation, while in other cases it is voluntary.
- Understanding progress of adaptation policies and actions benefits from the engagement of a broad range of stakeholders.
- In many countries, it is a challenge to involve the municipal level in MRE of national adaptation policies.

### Methodological approaches

- National-level MRE systems benefit from being flexible and pragmatic, using methods that are appropriate to the national context (including needs, priorities, resources and data availability).
- A mixed-methods approach to MRE, which combines multiple sources of information, provides a strong basis for assessing adaptation progress and performance.
- Qualitative methods complement quantitative approaches and reveal critical contextual information that can help to explain the narrative behind the numbers.
- Indicators play a key role in national MRE systems. In a number of countries, they have been created through an iterative and interactive process involving experts and other stakeholders.
- It is not necessarily the value of an individual indicator that needs to be considered, but whether or not the set of indicators provides a coherent and robust picture of adaptation progress.

## **Informing adaptation policy and practice**

- Experience of applying monitoring and evaluation results to improve adaptation policy and practice is limited, as only a few countries have MRE systems in place, and these have only been established recently.

- Some evidence is available that monitoring and evaluation results inform the revisions of adaptation strategies and plans. However, little is known about the influence of these results on adaptation practice.
- Countries have started to use various methods to communicate monitoring and evaluation results. Communicating results to the intended target groups is largely focused on published reports.
- Sharing experiences and learning about the use of monitoring and evaluation results will further improve adaptation policy and practice.

Beyond these findings, this report briefly reviews a number of issues that will shape the future of MRE of adaptation at national levels across Europe. Specific and dedicated attention is needed to strengthen the knowledge base about MRE in European countries and to foster learning from the evaluation of adaptation policies. In addition, there is a need to further coordinate the development of adaptation policies and MRE systems, and to better understand how MRE results can or do influence policymaking. Finally, there is a need to better use the variety of existing data sources to help develop adaptation indicators and evaluate policies, and to develop and update MRE of adaptation policy and practice to take into account risks, vulnerability and resilience.

Use of monitoring and evaluation results : moving towards a full policy cycle in France

### Key messages

- The inclusion of indicators and their definitions in the NAP supports focused monitoring of its implementation.
- A formalised process and structural involvement of high-level agencies and committees in MRE improves the uptake of conclusions and recommendations in the next round of policymaking.

### Approach

The French National Adaptation Plan for 2011–2015 includes actions and measures designed to help France prepare for, and exploit, new climatic conditions. Annual monitoring of the NAP's implementation is carried out by the National Observatory on the Effects of Global Warming (Observatoire national sur les effets du réchauffement climatique, ONERC) based on indicators defined in the plan. Results are published on the ONERC website. The annual review informs theme leaders (usually the Directorate-General of a ministry) of progress. The NAP had also secured the budget needed to go on with the adaptation measures.

In addition, a mid-term review of the NAP based on a self-assessment process was carried out in late 2013 and was presented in early 2014 to the National Council of Ecological Transition (Conseil National de la Transition Ecologique, CNTE), which is composed of members of parliament, members of the European Parliament, local and regional government representatives, members of the Economic, Social and Environmental Council, NGOs, civil service representatives and representatives from the scientific community. Based on the results, the CNTE made recommendations to improve the implementation of actions suggested in the NAP, and defined priorities for the remaining implementation period. These priorities include the need to strengthen the adaptation activities in the fields of education, communication and dissemination and to extend adaptation activities into new sectors. The mid-term review also assessed the degree of alignment between local-level adaptation actions (within regional strategies or local plans) and the National Climate Change Adaptation Plan actions.

The final evaluation of the NAP 2011–2015 is conducted in two phases: first, a diagnosis (end of October 2015) and, second, the preparation of the second NAP. The diagnosis was more comprehensive and included recommendations for actions on climate change adaptation. It was carried out as an external evaluation independent of the stakeholders. In June 2015, the General Council of the Environment and Sustainable Development (Conseil Général de l'Environnement et du Développement durable, CGEDD) was appointed to conduct the first part. Results of the diagnosis was presented directly to the minister of the environment and will be presented to the CNTE by the end of 2015 or early 2016. The synthesis report is intended to be<sup>101</sup> available publicly online in the MRE section of the ONERC website and included in an ONERC annual report to the prime minister and the parliament in 2016. In addition to the evaluation report, the preparation of the second NAP (due in 2016) will be informed by the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report and outcomes of the Conference of Parties (COP21) in Paris.

Links to additional information: French National Action Plan (in English): <http://www.developpement-durable.gouv.fr/The-national-climate-change.html>; MRE section of NAP (in French): <http://www.developpement-durable.gouv.fr/-Suivi-et-evaluation-.html>; Mid-term review (in French): <http://www.developpement-durable.gouv.fr/Plan-national-d-adaptation-au.37066.html>; Final Evaluation summary (in English) : <http://www.developpement-durable.gouv.fr/document162302>; Wiklimat (in French): <http://wiklimat.developpement-durable.gouv.fr/index.php/Wiklimat:Accueil>

<sup>101</sup> The report is available since december 2015

## Section 4

# Report on the scientific task force led by Jean Jouzel

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Summary by Mr Éric Brun (ONERC) with help from Jean Jouzel (CEA, IPSL/LSCE) and Serge Planton (Météo-France, CNRM)

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# The climate information that is needed for adaptation measures

The climate has already begun to change as a result of man-made greenhouse gas emissions, which have accumulated in the atmosphere. Due to inertia in the climate system and the very long atmospheric lifetime of most greenhouse gases, we now know that climate change will continue to occur throughout the rest of this century.

Global efforts to reduce future greenhouse gas emissions, formally agreed in the Paris Agreement produced during COP21 in December 2015, will not halt the progress of climate change, but will limit its speed and extent. For this reason France, like other countries, must gradually adapt to the changes that are going to happen. This is the whole purpose of the National Climate Change Adaptation Plan.

Implementing a systematic climate change adaptation policy is a highly complex process. It covers many different fields and in all of them the right balance must be struck between the costs of adapting to climate change and the benefits that adaptation will bring. These benefits can be difficult to assess, as they are often expressed in terms of reducing the potential costs that climate change will generate if we do not implement adaptation measures.

In order to make rational choices about whether or not to adapt a particular system or socioeconomic activity, and if so to what extent, we obviously need to have as accurate an idea as possible of the nature of the expected climate changes and their impacts, especially at spatial and temporal scales that are relevant to the activities in question. For example, different climate data are needed for the adaptation of winter tourism, which is based on snow cover over the next few decades, as this is the timespan involved when investing in ski lifts or accommodation facilities, while adaptation of certain farming activities centres around changes in availability of water during the summer months over the next few years.

# The general objectives of the “Jouzel Task Force”

It was to address this need for climate data at relevant spatial and temporal scales that the NAP for 2011-2015 included the objective of requesting the scientific community to produce regional-scale climate projections in keeping with the current state of international knowledge and to make them available to everyone, including the stakeholders involved in adaptation. The aim was also to identify which scenarios and indicators should be used as the national reference for adaptation actions. The task force was also asked to look specifically at projections concerning the rise in sea levels, so as to address the specific needs of coastal zone adaptation.

The Ministry of Environment therefore entrusted climate scientist Jean Jouzel with a scientific mission funded by the ministry. His mission consisted in coordinating a task force made up of a large number of scientists from organisations such as the French Meteorological Office (Météo-France) and the Pierre Simon Laplace Institute of Environmental Science Research (IPSL), to produce the knowledge and data described above. Researchers and experts from other organisations and several universities also contributed to the mission, including the national centre for scientific research (CNRS), the alternative and atomic energies commission (CEA), the office for geological and mining research (BRGM), the centre for studies and expertise on risk, environment, mobility and development (CEREMA), the national centre for space studies (CNES) and the national water and aquatic environments office (ONEMA).

The series of reports “The French Climate in the 21<sup>st</sup> Century” was publicised in various ways throughout its publication period. In addition to publicity in the form of statements and reports of varying levels carried in the printed press and on the internet, the publication of Volumes 4 and 5 respectively received significant attention. Volume 4 was presented by the authors to the Environment Minister at a press conference attended by politicians and experts during the minister’s visit to the Refuge du Goûter mountain retreat on Mont-Blanc in September 2014; while the main findings of Volume 5 were presented in front of a special gathering of over 200 people, including the Environment Minister, held for the occasion at Hôtel de Roquelaure. Summary sheets explaining the key messages were also produced, with a view to providing a wide audience with a step-by-step guide to the more technical information contained in the reports.

## The climate knowledge and data that were produced and disseminated

The task force produced several reports and data sets between 2011 and 2015, which can be found in the five successive volumes of the series “The French Climate in the 21<sup>st</sup> Century”<sup>102</sup> (see Figure B.1).

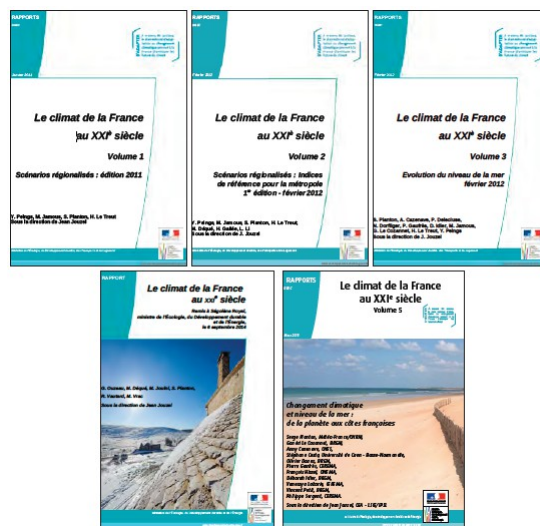


Figure B.1 Covers of the five volumes in the series “The French Climate in the 21<sup>st</sup> Century”.

Volumes 1, 2 and 4 contain projections of certain climate variables at regional scale for mainland France and some overseas counties and communities. Temperature and rainfall trends are the main focus of attention, but there are also projections of trends in strong winds and more sophisticated variables such as numbers of heatwave days and extreme rainfall indices.

The publication of these three volumes in 2011, 2012 and 2015 respectively addressed the need for climate projections based on regular updates in scientific knowledge on climate change:

- Volume 2 updated the regional projections from Volume 1, vastly improving the spatial resolution of the IPSL and Météo-France regional models that had previously been used, by a ratio of more than 5:1. Further projections based on a regional model

<sup>102</sup> [www.developpement-durable.gouv.fr/-Rapports-climat-de-la-France-au-.html](http://www.developpement-durable.gouv.fr/-Rapports-climat-de-la-France-au-.html)

produced by the Water Cycle and Environment Research Laboratory (LTHE) were added, which provided a clearer picture of the uncertainties for the projections. This work was carried out under the SCAMPEI research project<sup>103</sup>, funded by the National Research Agency (ANR);

- Volume 4 updated the data from Volumes 1 and 2, developing the regional projections on the basis of the new climate scenarios and projections used in the 5th assessment report of the Intergovernmental Panel on Climate Change (IPCC). A new regional downscaling technique was then used to produce these projections on a spatial grid with one point every 8 kilometres, in order to take local climate conditions into account more. Figure B.2 illustrates the progress this led to in refining the projections and hence meeting the needs of the stakeholders involved in adaptation more fully.

The climate information also included some results from the international regional climate simulation sets produced as part of the EURO-CORDEX project, which allowed the uncertainties inherent in these projections to be described more clearly. The regional projections published in 2014 in Volume 4 were therefore in line with all the new global and regional climate projections available at the time and based on the most recent regional downscaling methods.

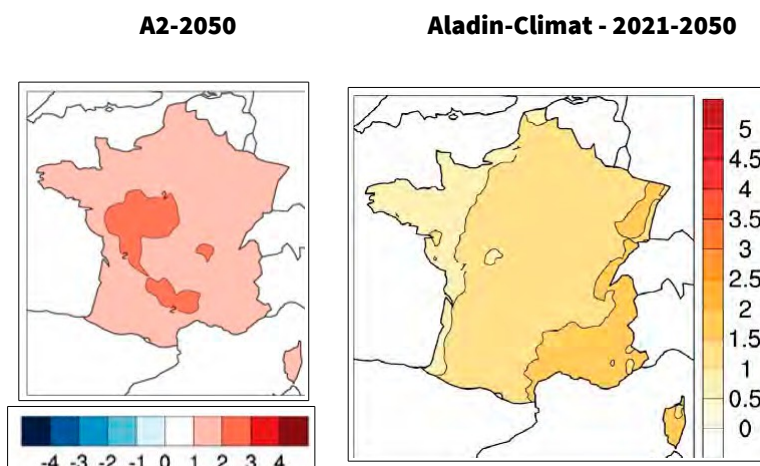


Figure B.2 Projected changes in average daytime summer temperature in Volumes 1 and 4 respectively. NB: the data represented in both charts do not relate to the same periods or the same emissions rates scenario.

One of the major innovations of Volume 4 of the series “The French Climate in the 21<sup>st</sup> Century” was to make the regional projections available on the DRIAS future climates open access portal<sup>104</sup>, under a partnership between Météo-France, IPSL and the European Centre for Research and Advanced Training in Scientific Computing (CERFACS). This action had been planned in the first NAP (2011-2015). It put into practice the results of the DRIAS project funded from 2008 to 2012 by the Ministry of Environment’s GICC programme. With the provision of fine-scale multi-model regional climate projections online, not only in the form of maps but also in the form of electronic data, France positioned itself as an international frontrunner in terms of facilitating adaptation measures by a wide variety of stakeholders. Figure B.3 illustrates the type of graphics that are openly accessible via the DRIAS portal.

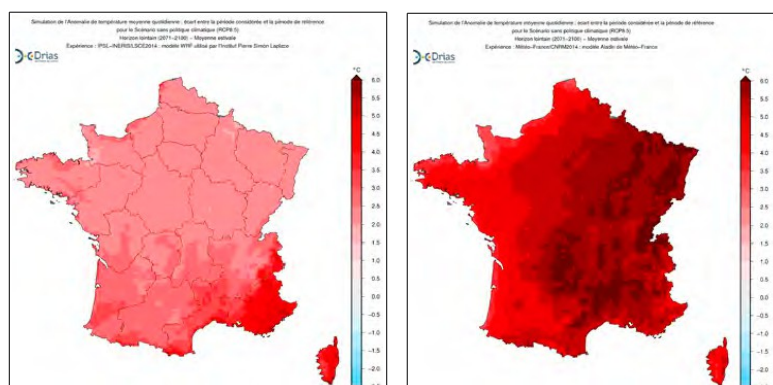


Figure B.3 Illustration of data that can be accessed via the DRIAS future climates portal. This example shows trends in average summer temperatures at the end of the 21<sup>st</sup> Century using the IPSL and Météo-France models under worst-case scenario RCP8.5.

Volumes 3 and 5 of the series, published in 2012 and 2015 respectively, were devoted to knowledge on rising sea levels, taking into account the analyses presented in the 4<sup>th</sup> and 5<sup>th</sup> IPCC reports respectively. Neither of these volumes presents results of regional-scale simulations of future sea level rises, as this cannot yet be done with the scientific knowledge currently available. However, they do deal with many local aspects specific to coastal zones in both the French mainland and French Overseas Territories, including erosion and coastal flood defences. It was following the publication of the 5<sup>th</sup> Volume that the ONERC chose

<sup>103</sup> SCAMPEI: Scénarios climatiques adaptés aux zones de montagne: phénomènes extrêmes, enneigement et incertitudes (Climate scenarios adjusted for mountain regions: extreme events, snow cover and uncertainties).

<sup>104</sup> <http://www.drias-climat.fr/>

the theme of coastal zones for its 2015 annual report. This annual report, entitled “Coastal zones in the context of climate change” (ONERC, 2015)<sup>105</sup>, summarises the main messages of Volume 5 and places them in the context of adapting the French coastline to climate change and sea level rise in particular. The report contains many of the elements that would go on to be developed in the National Integrated Coastline Management Strategy.

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<sup>105</sup> <http://www.developpement-durable.gouv.fr/Le-littoral-dans-le-contexte-du.html>

## Future prospects

While the National Adaptation Plan for 2011-2015 led to considerable progress in producing and disseminating the regional climate projections needed in order to implement climate change adaptation measures, they only partially meet the need, given the huge range of fields affected by adaptation issues.

Several avenues could be considered for supplementing the data sets that are relevant for regional-scale adaptation and to make them easily available:

- it will still be necessary to continue increasing the spatial resolution of the projections. This will be done step by step as computational power increases and high resolution climate simulation models and techniques are developed. This will lead to the production of data that come closer to meeting the needs, by taking into account factors such as specific climate conditions in cities, the coast or mountains, all of which are affected by various adaptation issues;
- adding to data sets based on other variables and indicators than those presented in Volume 4 of “The French Climate in the 21<sup>st</sup> Century”. An exhaustive study of the development of impacts within a much wider range of sectors than those covered by Volume 4 would definitely make a large body of knowledge that is currently restricted to a small group of scientists and experts more accessible;
- using wider regional climate simulation ensembles, based on different models. This would be one way of addressing the uncertainties surrounding future changes. The DRIAS portal already provides access to statistical distributions produced from such ensembles, however a fairly high level of expertise is still required to understand them;
- making a wider range of variables and information available on the DRIAS portal, in a format that better meets the needs of a wide range of users and sectors. This last point is very important and the VIADUC multidisciplinary research project is studying it as part of the GICC programme. It involves both scientists and system users and designers. To make the service more appropriate for specific sectors and users, the following avenues could be followed:
  - expanding the information available by including access to past data and showing the links between them and the projected variables and indicators for the 21<sup>st</sup> century;
  - ensuring consistency between the scenarios developed at international level to support the work of the IPCC, those published in the series “The French Climate in the 21<sup>st</sup> Century” and those made available via the DRIAS portal. The National Adaptation Plan should identify actions that will tie in with these future possibilities. At the same time, we can expect the rapid development of climate services developed to address adaptation needs, both nationally and internationally. The European Union has launched a “Climate Change Service” as part of the Copernicus programme and has entrusted its implementation to the European Centre for Medium-Range Weather Forecasts. Several studies are under way within the Copernicus service to look at how best to address the needs in many different sectors. They will lead to the establishment of prototypes demonstrating the climate services of the future.

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Part C  
Opinions and recommendations by theme

## Section 1

# Biodiversity and climate change adaptation – Scientific Advisory Council on Natural Heritage and Biodiversity (CSPNB)

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The Scientific Advisory Council on Natural Heritage and Biodiversity, chaired by Mr Yvon Le Maho, published the opinion reproduced below on 9 October 2015. The opinion can be viewed online at: <http://www.developpement-durable.gouv.fr/Le-conseil-scientifique-du,15002.html#3>

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**The Scientific Advisory Council on Natural Heritage and Biodiversity (CSPNB) is of the view that the current National Climate Change Adaptation Plan does not pay sufficient attention to biodiversity and the complex interactions between biodiversity and climate. We wish to stress the need for the strategies put in place to develop our knowledge on the response mechanisms of biodiversity to climate disruption, which in turn have knock-on effects on the climate, and on the limitations of these processes. It is important to ensure that climate change adaptation and mitigation policies are compatible with preserving biodiversity.**

This adaptation plan is important for biodiversity because it is greatly affected by the climate. Temperature and rainfall play a vital role on the geographical range and dynamics of animal and plant populations, both directly and indirectly, although the climate is not the only factor behind the current loss of biodiversity.

Because damage to biodiversity disrupts the functioning of terrestrial and marine ecosystems, this has a knock-on effect in turn on local, regional or continental climate, thereby influencing climate change.

The responses of biodiversity to climate change are complex processes involving numerous feedback loops at different spatial and temporal scales and operating at different levels, from genes to ecosystems. The interactions between the effects of climate disruption and the influence of human activities complicate the process of identifying their respective impacts. For example, in overexploited fisheries zones, the respective effects of climate and overfishing on the collapse of fish populations, plus their combined effects, must be identified, in order to develop operational management models that meet sustainable development criteria.

Biodiversity is neither a mega-organism that functions as a single unit, nor simply a series of species that function independently of each other. Each species assemblage operates in a particular way depending on the characteristics of the species in it. It is therefore important to carry out research that factor in the plurality and complexity of biodiversity responses to climate change. For example, studies of ecosystem responses to increased atmospheric CO<sub>2</sub> levels must take into account both the species' responses and the interactions and feedback loops at ecosystem community level. The diversity of functions and their interactions within species assemblages must be taken into account, considering that this functional diversity is a major component of the ecosystems' properties and the services that human societies derive from them.

We still do not have a clear understanding of the role played by socio-ecological system flexibility and adaptation mechanisms in the response of biodiversity to climate change and it is therefore difficult to take them into account in the processes to plan ahead for these changes. The challenge for scientists is to narrow down the uncertainties surrounding the pressures and threats themselves, in order to establish the best strategies and procedures to put in place.

## Section 2

# Potential contributions of agriculture and forestry to combating climate change - General Advisory Council on Food, Agriculture and Rural Areas (CGAAER)

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This section comprises Chapter 5 of the report published by the General Advisory Council on Food, Agriculture and the Rural Areas (CGAAER) in February 2015 (Report No 14056), which has been edited by the authors. The report was drawn up under the coordination of Mrs Laurence Madignier, Mr Guillaume Benoît and Mr Claude Roy. The full text of the report can be viewed at: <http://agriculture.gouv.fr/ministere/les-contributions-possibles-de-lagriculture-et-de-la-foret-la-lutte-contre-le-changement>

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# Climate-related risks, avenues for adaptation and strategies for the sectors and regions

## Risks threatening the future of French agriculture and forestry

The three principal risks the IPCC has identified for Europe are flooding (which ties in with poor urban planning), heatwaves (affecting health) and **the relationship between agriculture and water**.

Agriculture and forestry will be among the first economic sectors to be affected if France's whole climate turns Mediterranean as anticipated. The climate in the country's southern regions will quickly become like that of Andalusia in Spain and all the regions, including those north of the River Loire, will experience changes that will have major impacts on the water cycle, the water requirements of plants and agriculture and forestry. Global warming will lead to reduced rainfall in southern Europe (with increased rainfall in northern Europe), and most importantly, **a radical change in the water cycle** and more frequent **extreme weather events**, such as flooding, droughts and heatwaves.

The first effect of higher temperatures in both northern and southern France will be a much higher level of evapotranspiration and as a result, plants will have a much greater need for water. At the same time as this increased water requirement, there will be a marked drop in flow rates, estimated at between 20% and 40% in France by 2050. The drop in low-flow rates will be even greater, as there will be longer and more frequent droughts. Conversely, the risk of flooding is likely to increase, especially in the south of the country. This means that the risks linked to extreme weather events will increase.

**Agriculture** will therefore be greatly affected by global warming. The main risk to European agriculture highlighted in the IPCC report is **a significant reduction in the suitability of our land for rain-fed agriculture**. The impacts of climate change are already very noticeable in France. For example, the Montpellier region has recorded an increase of 2.3°C in average summer temperature over the last 30 years (+0.8°C in winter), which has shifted the area out of the "Subhumid Mediterranean climate" category to the "Semiarid Mediterranean climate" category. Over those 30 years, evapotranspiration on the plain has increased by 240mm (+20-30%) and the National Institute for Agricultural Research (INRA) has estimated the total loss of agricultural output at 0.9 tonnes of dry matter per hectare, or 11%.

**Forests** will also be significantly affected by the anticipated higher frequency of both droughts and storms. There is a risk of dieback and significant loss of economic value, with worsening risk of major fires, disease and storm damage. In the southern Alps, for example, a mass dieback of pines has already been witnessed due to the increased severity of recent droughts.

The number of hectares burned in Europe could be multiplied by a factor of between 3 and 5, with significant greenhouse gas emissions into the bargain (release of carbon with no substitution effect). Given the long timeframe of woodland growth cycles, various forestry practices could be considered as avenues for adaptation, such as shorter production cycles, species diversification, breeding programmes and, in some areas, promoting silvopastoral and/or agroforestry systems.

Climate changes are also going to be a factor in increased health risks for both livestock and plants.

## Changing the way we look at water and adaptation

As the 2014 IPCC report stresses very clearly, the issue of water and water management is going to be of the utmost importance and we will need to change the way we approach it. One of the aspects the report emphasises is that **water storage** and **irrigation** will be more important than ever. It estimates that \$225bn of investment will be needed in 200 countries between now and 2030 if we are to adapt successfully (simply maintaining the services already provided by water). The chapter on Europe underlines the need to create new water infrastructures in some regions in order to meet new demands for water and prevent conflicting demands. Water management must therefore evolve and storage must be seen as a major component of climate change adaptation and a risk management tool.

A vision of adaptation based on "restraint" is therefore no longer appropriate. For example the Garonne 2050 long-range planning document, produced by the Adour-Garonne water authority, demonstrates that implementing the "restrained" scenario in isolation (significantly reducing the amount of water allocated to agriculture) would lead to a collapse in the number of farm holdings (80-90% fewer), irrigated area (50% less) and agricultural output, whereas under the "local" and "storage" scenarios, the needs would be met and the number of holdings maintained, although low-flow periods would still be in place in the summer months in order to protect aquatic environments and their uses. Another scheme, the Languedoc-Roussillon regional sustainable farming project (PRAD), adopted by the French Government in 2012, emphasises the specific features of the Mediterranean climate, which warrant storing excess winter rainfall and saving it for use in agriculture in the spring, as the need to save for dry periods will increase with climate change. Other measures have also been proposed, such as including an aridity index in the criteria for classifying "natural handicap" zones, adapting planting stock, promoting less water-intensive farming practices and carrying out the AquaDomitia project (to transfer water from the River Rhône).

France is fortunate in that overall, it has an abundant supply of water, which will remain so in spite of climate change. However, at

present water is not stored to any great extent and is not harnessed as much as it could be. Storage capacity in the catchment areas with the highest demand is often equivalent to only a few per cent of annual runoff volumes, as opposed to 50% in the River Ebro catchment in Spain, or 200% in the Oum er Rbia catchment in Morocco. To take a more balanced, sustainable approach, more water could therefore be stored and harnessed in order to meet demand during low-flow periods and contribute to the adaptation of the agriculture sector. It would preserve the services provided by water and protect jobs also. By adapting and thus reducing the risks that threaten it, French agriculture could play its part in mitigation efforts, while at the same time contributing to global food security. We therefore need to move on from our current approach of focusing solely on “restraint” and adopt a view of adaptation that strikes a balance between supply (through storage and transfer systems, etc.), demand (through efficient use) and agroecology, while of course taking the environmental impact of storage structures into consideration. This will require an active, well thought-out policy towards hydro-agricultural infrastructures and development. Local authorities need to prepare for this and society needs to understand and get behind this necessary change so that we can make climate change mitigation and adaptation work.

While agriculture needs better access to water in order to become resilient and play its part in mitigation, it must also put other adaptation methods into practice, for example using less water-intensive crop varieties and farming practices and using water more efficiently.

Nonetheless, French **agriculture** will still be predominantly **rain-fed**. This means that it will need to adapt successfully even if increased usage of water storage and irrigation systems is not possible. In view of the strong increase in hydrological stress that is expected, this means we will need to achieve a successful transition towards agroecology. It is by adopting innovative agroecology practices such as no-till farming and permanent soil cover that agriculture will strengthen its resilience. The issue of water storage should also be looked at in terms of storing water in the ground and hence in terms of conservation of both water resources and the soil.

### **Choosing a constructive way forward at local level and adopting new adaptation and/or mitigation approaches and projects**

Since adaptation is necessary in the agriculture and forestry sectors in order to reduce the risks they face, if it does not succeed they will not be able to play their part in mitigation, and vice versa. Adaptation and mitigation issues must therefore be considered together, not separately, in the agriculture, forestry and other land uses (AFOLU) sector.

However, the risks, challenges and possible avenues in the areas of both adaptation and mitigation differ from one locality to the next. Like environmental science, agriculture is first and foremost a science of place and each locality has its own strengths /resources, constraints, opportunities and threats. For example, some areas have abundant water resources that have not yet been harnessed, while others are already experiencing problems of groundwater overuse. In other places, perhaps the greatest threat to the future of agriculture and its ability to play an important role in mitigation is urban sprawl, while in others still, the greatest threat could be failure to harness forest resources.

Addressing climate issues in the AFOLU sector therefore means finding solutions that fit in with the needs of the area in question. **Action must be taken at all the relevant levels to make sustainable development choices** that will help to find co-benefits, synergies and compromises, while also taking food security and jobs into consideration.

Due to the significant economic factors and the social structure of the parties involved in implementing climate change adaptation and mitigation actions for agriculture and forestry, the kind of approach required is one of joint strategies between local authority organisations and economic sectors, developed specifically for the local context. Although a growing number of French local and regional authorities are now taking action to address more general climate change issues, especially in urban areas, little attention is devoted at present to specific issues affecting agriculture and forestry. It is therefore vital for **new approaches to the issues and action plans tailored to the individual locality** to be developed at the appropriate levels. This calls for long-range assessments that cover both economic sectors and geographical areas and their areas of intersection and cater for the diversity of situations and challenges involved.

### **Animal and plant diseases – heightened health risk**

The links between climate change, farming and animal and plant diseases are now a genuine concern that is being studied by scientists and the international organisations that deal with climate, agriculture, animal health and human health (the IPC, FAO, OIE and WHO respectively).

Two issues are under consideration in relation to stepping up both the prevention of and the fight against animal and plant diseases at international level:

- the need to reconcile the goal of reducing greenhouse gas emissions with that of feeding the world’s population, as loss of livestock due to disease reduces the quantity of methane emissions per unit of product of animal origin. In this respect, combating animal diseases is both an adaptation issue and a mitigation issue. Maximising crop yields through disease management also falls under both adaptation and mitigation;
- the need to combat both the spread and the emergence of infectious animal diseases, as the vast majority can be passed on to humans and can cause major pandemics. The preparations for the risk of a human bird flu pandemic in 2009 and the public health disaster of ebola in Africa are both illustrations of this. Apart from the overriding obligation to protect human health, dire situations such as epidemics must be avoided, as they tend to follow on from each other and can even aggravate climate disruption.

The following figures estimated by the World Organisation for Animal Health (OIE) illustrate the extent of the problems:

- between 20% and 30% of livestock production is lost as a result of animal diseases. However, climate change is altering environments ever more rapidly and making livestock more vulnerable and this figure could therefore increase significantly over the coming years;
- 60% of pathogens capable of infecting humans and hence causing zoonoses (human diseases of animal origin) originate from domestic or wild animals, while 75% of emerging diseases originate in animals.

These health aspects are indirect effects of climate change, but there are also direct effects such as loss of productivity, and their prevention therefore falls under the area of mitigation measures also.

**The direct effects** of climate change on productivity in both livestock and crop farming are down to the following factors:

- higher temperatures, leading to climate stress;
- increased shortage of water for drinking or watering;
- extreme weather events (rain, flooding), causing accidental deaths, drop in production linked to the upkeep conditions and the spread of epidemics.

**Indirect effects:** as climate change brings with it changes in the environment, the two operate in an interconnected way to bring about changes in the ecology of diseases and their transmission patterns. These are complex interactions, involving factors such as microbe evolution and adaptation, the spread of insect vectors into more northerly latitudes, the proliferation of wild animals which then come into contact with livestock, population movements, greater livestock density and the vulnerability of some insufficiently regulated farming systems that are moving towards greater intensification.

Bacteria and viruses are flexible and can adapt to new geographical areas, acquire greater resistance and virulence through genetic changes and become communicable to other species, thereby spreading and causing the appearance of what are termed “emerging” diseases. The growth in insect-borne infectious diseases and parasitic diseases in particular is linked to global warming, as has been witnessed with the gradual spread of diseases such as blue-tongue disease in sheep (2006) and Schmallenberg virus in cattle, sheep and goats (2011) to Europe, where they have remained.

Lastly, climate change is one of the factors that are disrupting wild animals’ ecosystems and these animals are pathogen reservoirs. Some wild birds have altered their migration paths, for example, creating new risks for certain countries in the process. One illustration is the spread of bird flu, which has left hovering over us the threat of a human flu pandemic through mutation of the virus responsible for the disease.

#### *Adaptation and mitigation measures*

**Direct effects:** this will involve promoting the adaptation of both crop and livestock farming practices, in line with the climate-smart agriculture approach. This will build production capacity and help mitigate impacts on the climate at the same time.

It would be beneficial to carry out more in-depth applied research in the livestock farming field: biosafety in buildings, layout of pasture land (drinking areas, systems for protecting animals from extreme temperatures, rotation management, livestock density), controlling animal movements, animal nutrition, protection against wild animals, genetic selection, etc.

**Indirect effects:** the recommendations issued by the OIE and the European Commission on human, animal and plant health in relation to climate change focus on the coordinated development of robust, flexible strategies for disease surveillance, prevention and management at international level.

These systems will need to be organised and coordinated by government authorities. In France’s case, this will be the Ministry of Agriculture, in coordination with the ministries responsible for health and ecology respectively.

They will need to develop and build on targeted action plans covering aspects such as:

- making exports and imports safe through health certification;
- gathering and exchanging epidemiological surveillance data between countries and between departments responsible for human and animal health;
- the international system for declaring animal diseases to the OIE;
- setting up epidemiological surveillance networks involving teams of experts;
- developing diagnosis and research skills and facilities in the areas of entomology and wild animals;
- developing screening tests;
- guaranteeing sufficient vaccine production capacity in an emergency;
- developing interdisciplinary research bringing together experts on ecosystems, climate, animal and human infectious diseases and public health policy.

## What is the insurance situation in relation to worsening risks?

### *Risk associated with adapting agriculture to new climate situations*

Not only will the anticipated climate changes make the conditions producers have to work in more difficult, in terms of temperature and water supply, but climate variability will also increase the number of extreme weather events they will have to cope with. Climate-related risk will therefore increase greatly over the next few decades and farmers will need as much protection as possible.

Insurance cover for climate-related risks is becoming even more necessary given the climate of market deregulation and cuts in aid. At present, the main uninsurable risks, such as drought, storms or excessive frosts, are covered by public agricultural disaster schemes. In addition, the European Union allows Member States to subsidise farmers' climate-related harvest insurance premiums, subject to certain conditions (partial coverage, limitations on the risks covered and payment of excesses). France introduced this scheme in the health review and wishes to expand it.

There is also a risk-sharing scheme, funded by joint state funding and contributions by the trade associations, which is intended to cover certain plant and animal health risks. However, at this stage the work on introducing insurance to cover loss of revenue or business has not been finalised with respect to the cost and the scope.

Plans were set out in the 2013 common agricultural policy to begin discussions on developing insurance schemes under the 2020 CAP, while in the US a large proportion of the Farm Bill is devoted to publicly support insurance schemes.

### *Risk associated with changes in farming practices or growing systems that will contribute towards climate change mitigation*

Various agricultural practices have been identified as contributing to reducing emissions or storing carbon in the soil or biobased products. These were covered in the previous chapter, which frequently referred to more rigorous technical practices and greater risk-taking by producers, especially during the transition to these new practices. Farmers who control their agricultural inputs (landowners) have little personal motivation to change their routine technical procedures, especially as it could entail extra costs and/or loss of revenue. It would therefore be beneficial if public funds could at least compensate them for any loss of earnings. This is one of the purposes of the Agro-environmental and Climate Measures (MAEC).

However, although these practices are seen as bringing a dual economic and environmental benefit, they involve a technical risk and the ensuing economic uncertainty, which farmers would have to bear during the transitional phase. Beyond any reassurance by fellow farmers and technical guidance, this raises the issue of how to cover the economic risk. In order to encourage the adoption of these “dual benefit” practices, therefore, innovation must also focus on social and collective aspects and local government involvement and look at collaboration, training, support, work organisation and investment processes:

- introducing targeted public policies to support investment (e.g. adapting buildings under the ‘PMBE’ plan/biogas production, less energy-hungry equipment/environmentally-friendly crops under the ‘PVE’ plan<sup>106</sup>, effluent management, etc.);
- looking into innovative insurance schemes that will provide the best possible cover for risks during the transitional phase;
- promoting joint trials in a specific areas, (farmers and advisors), so as to share the risk between several producers;
- developing joint advice schemes and encouraging operators to take technical solutions on board, with the backing of recognised scientific bases that have been discussed at local level and tailored to the local situation;
- developing new local “agricultural solidarity” systems – reconnecting livestock and crop farming and the trade associations, taking a collective approach to transitional projects (e.g. European economic interest groups), conducting trials along the lines of the alfalfa industry project.

To conclude this chapter, it is apparent that:

- the climate-related risks threatening French agriculture and forestry are high;
- adaptation and mitigation must be addressed together, under a framework of projects tailored to the local level and a broad approach to agriculture, forestry, water and other land uses.
- we must change the way we look at water and adaptation, which will mean adopting a proactive storage and irrigation policy and communicating widely on the issues;
- health issues will require vigilance;
- a large-scale transition to agroecology practices must be carried out;
- insurance and reinsurance systems will be needed.

**Only if these objectives are met will agriculture and forestry be able to play their vital role in mitigation efforts.**

Inset at end of Section 2

<sup>106</sup> PMBE: Plan de modernisation des bâtiments d'élevage (“livestock building modernisation plan”), PVE: Plan végétal pour l'environnement (“plants to help the environment”).

## Local and regional level translation of agriculture and forestry adaptation policies

The information presented here is taken from a study conducted in 2014 within the Agriculture Ministry's department of private sector economic and environmental performance. The study was carried out by Bertille Fages as part of a master's degree, under the supervision of Maryline Loquet then Vincent Dameron, and was based on analysing regional planning documents with a view to describing the emergence of a regional climate policy for agriculture<sup>107</sup>.

### Method

26 Regional Climate, Air & Energy Master Plans (SRCAEs), 19 Regional Sustainable Agriculture Plans (PRADs) and 10 regional Local Climate & Energy Plans (PCETs – which later became Local Climate, Air & Energy Plans) were studied in order to identify all the objectives relating to climate and agriculture. In addition to this analysis, an online questionnaire was completed by the bodies involved in drafting the documents and a survey was conducted of the regional food, agriculture and forestry departments (DRAAFs), regional environment, development and housing departments (DREALs), regional divisions of the Environment Agency (ADEME), regional chambers of agriculture, the French agricultural cooperative society and the regional councils. Of the 162 bodies approached, 54 completed the online survey.

The various documents examined were based on different input information, which was not always easy to correlate. This made it more difficult to assess whether an overall regional policy was emerging and whether it was consistent. In addition, the implementation of the policy in practice remains to be studied.

### The characteristics of the regional agricultural policies formulated in the documents

1133 agriculture-related objectives also linked to climate change adaptation or mitigation or energy were listed and divided into 51 different categories.

	SRCAEs	PRADs	Regional PCETs
<i>Agriculture objectives</i>	418	381	115
<i>Forestry objectives</i>	88	3	19
<i>Land development objectives</i>	26	75	0
General objectives (not targeting a specific field)	5	2	0
Total number of objectives	537	461	134

Table C.1: Overview by type of objective identified

Across all of the documents, there are more objectives concerning climate change adaptation (67%) than mitigation. The adaptation-related objectives are formulated in more general terms, which are often explained by the scarcity of data available on local-scale climate impacts. The majority of the adaptation-related objectives that were identified are in the area of research and development.

Type	SRCAEs	PRADs	Regional PCETs
Mitigation	Energy efficiency, fertilisation, local economy	Local economy, fertilisation, energy efficiency	Local economy, energy efficiency, carbon sinks
Adaptation	Adaptation, R&D, management of water demand	Development, R&D, management of water demand	R&D, management of water demand, management of water supply, disease surveillance
Energy	Wood fuel, biogas production, biomass	Biogas production, biomass, wood fuel	Biogas production, biomass, wood fuel

Table C.2: Recurrence of objectives by type and by planning document

No pattern of objectives emerged on the basis of the production catchment areas, with the exception of areas where perennial crops are grown, for which a greater variety of adaptation-related objectives was proposed.

Lastly, the organisations surveyed mentioned certain contradictions between the goals stated in the documents and the reality on the ground. Very often when these regional documents are drawn up, the issue of combating climate change in the field of agriculture entails an overhaul of entire sectors, which is difficult to put into practice.

### Consistency between the documents

The bodies that responded to the survey felt that the issues identified in each document are given adequate coverage, but they point to a lack of any regional-scale vulnerability assessments in the agricultural sector. Only 37% of them thought that these documents provide a basis for a proper cohesive regional climate policy for agriculture.

Management of water with a view to adaptation stood out as one of the main issues (24% of responses). Where agriculture was not dealt with as a priority, it was approached in other contexts, such as land management.

The various bodies mentioned certain obstacles they had encountered when drawing up these documents, in particular the problem of different objectives and different timeframes. These discrepancies meant that the goals for the agricultural sector were somewhat scattered.

<sup>107</sup> According to the boundaries before the "NOTRe" Act was passed.

## **Do the planning documents have sufficient scope?**

The survey responses suggested that the objectives established in the planning documents are being partially implemented. The main actions being carried out at local level are: certain agroenvironmental and climate measures; translating national plans into practice, carrying out the *ClimAgri* assessment, securing and maximising farming output through water management, with off-stream reservoirs and works aimed at creating local water storage capacity; setting up local study centres and conducting studies into local-level adaptation to climate change.

The bodies that responded found that these regional planning documents enable the various parties involved to get to grips with agriculture issues and thereby get past certain differences of approach. However, at the time the documents were being drafted, responsibility for managing rural development policy had not yet passed to the regions and local authorities therefore did not have the necessary powers to take direct action in the field. In addition, because the subject of climate covers many different themes, the departments concerned often found that they had to go through various obligatory 'checkpoints', such as energy efficiency in buildings, development of biogas production, organic farming areas, or the development of wood as a fuel. Certain inputs (economic inputs) were also widely favoured over others in the formulation of the objectives).

## **Conclusion**

Tackling the subject of climate, whether through cross-sector or theme-based documents, highlights the difficulty of deciding on objectives for short-term actions that will contribute towards achieving a long-term goal, amid a context of high uncertainty over the effects and impacts we should expect. Many of the bodies surveyed flagged up the hybrid nature of these documents, as they are half intended as guides and half as directives. In order to evaluate whether the declarations of intent stated in the documents had sufficient scope, it will now be important to follow up how they are put into practice and what financial backing they are given.

## Section 3

# Health impacts of the climate change adaptation strategy – Public Health Council (HCSP)

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This section comprises part of the health & climate watch report (summary, recommendations and arguments) published by the Adaptation and Long-Term Planning Group of Le Haut Conseil de la santé publique (Public Health Council), coordinated by Professor Jean-François Toussaint, in March 2015. The full text of the report<sup>108</sup> can be purchased at: [www.ladocumentationfrancaise.fr/ouvrages/9782110101082-impacts-sanitaires-de-la-strategie-d-adaptation-au-changement-climatique](http://www.ladocumentationfrancaise.fr/ouvrages/9782110101082-impacts-sanitaires-de-la-strategie-d-adaptation-au-changement-climatique)

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<sup>108</sup> *Impacts sanitaires de la stratégie d'adaptation au changement climatique* (Health impacts of the climate change adaptation strategy), Haut Conseil de la santé publique, La Documentation française, Paris 2015.

# Research and evaluation method, observations and recommendations

## Summary

The National Climate Change Adaptation Plan established certain general strategies and stipulated that their potential impacts on the lives and health of the French population would be assessed under the framework of the plan itself. This report is based on a long-term planning model and is therefore not restricted to simply predicting the impacts of climate change on people's health, but also highlights the direct and indirect health effects of the actions that have been planned and identifies measures that will require in-depth evaluation within the framework of the actions.

It aims to provide a summary of our current knowledge about climate change and projections of how it will progress, with a view to obtaining an idea of the context in which any repercussions on human health will be set. It also suggests a method for planning remedial or adaptation strategies to deal with the changes that are happening and a procedure for evaluating new technologies in terms of individual health and collective lifestyles.

### Three important points came out of our examination:

1. Human action relies far more on the cyclical repetition of standard behaviour (as described in the "business as usual" scenarios) than on reasoning on the basis of the huge amount of knowledge that has been built up over the last few decades.
2. Any hopes of modifying this standard behaviour can only be based on anthropological studies and understanding the fundamental reasons why humanity acts in the way it does. In this field, very long time series are needed in order to highlight the significant technical, sociological and physiological variations that will reveal our capacity for adaptation. It is therefore in this field that knowledge and skills bases need to be rapidly expanded.
3. Our understanding is still based far too often on linear models, which reductionist analyses tend to over-simplify. We will probably need to start taking advances in the fields of natural algorithms and complexity into account and develop a science of interactions that can provide us with useful keys to our dependencies and wake us up to the realities of the world.

## Recommendations & Arguments

### 1 Governance & Interdisciplinary Work

Set up a joint ministerial group to monitor the implementation of climate-related health measures and devise health indicators that can be used in this monitoring process.

*The nature and quality of this consultative work between previously distant fields are essential if important issues are to be addressed at the highest governance level, such as: the concept of non-linear complex phenomena and the laws of complexity (a multi-level approach could be a beneficial way of studying this recursivity); b. the work that is needed in order to reduce (but not remove) uncertainty and abandon the illusion that we have control over events (while hoping that this will be an acceptable governance objective) and c. the need to coordinate wide-ranging action of this nature on a consultative basis, along the lines of intergovernmental processes such as the IPCC and IPBES. The impact that the alteration of the nitrogen cycle has had on the quality of coastal zones, or the effect that antibiotic use in human and animal health has had on the development of multi-resistant bacteria, underline the need for policies centred around the ecology of health, while reminding us of the work that still needs to be done in areas such as understanding interdependencies, effective preventive action, advance planning and ongoing adaptation management.*

Incorporate monitoring of climate-related health indicators more widely into the public health plans' objectives (National Plan on Environment-Related Health) and the process of devising and monitoring indicators (Department of research, studies, evaluation and statistics) and establish a very long-range governance plan with assistance from the Parliamentary Office for the Evaluation of Scientific and Technological Choices (OPECST).

*In view of the potential long-term impacts (worsening food security, plateauing then lowering of life expectancy, extinction...), once we have obtained a clear picture of these interdependencies through epidemiology and ecotoxicology research or by determining the fundamental mechanisms, they will need to be monitored. It will be beneficial to establish indicators similar to those used for monitoring the development of illnesses linked to deterioration of the environment. These new effects will come on top of the age-old health repercussions that any deterioration of economic factors will have. The bodies seen as being most appropriate to fulfil these roles must therefore be able to extend both the scope and the timeframes of their objectives.*

## 2 Action at local level

Take vulnerability factors into account, such as the ageing of the population and people's level of resilience, when planning ahead with lower capacity for adaptation in mind.

*With increased pressures combined with greater vulnerability, it is likely that the population's resilience will become ever weaker. Given that we are discovering all our limitations at the same time, all of these areas of fragility must be recognised, so that we can plan ahead for common impacts. What will happen to the most fragile centenarians in an economy in recession? How will we be able to manage multiple conditions when fewer beds will be available in hospitals? What decisions will our societies make when economies are stagnant and choices must be made between investing in the increasingly unaffordable cost of treating rare diseases or terminal failure from more common degenerative conditions such as neurological diseases, cancer or cardiovascular disease, and more rapidly aggressive diseases (caused by microbes that have developed cross-resistance through gene transfer)?*

Work on architecture and infrastructures in town planning and health contexts, in order to reduce the worse impacts (e.g. through building design and management and tackling heat islands) and reduce the impact and use of carbon-based energies, through initiatives such as developing active means of mobility in both urban and rural settings.

*These initiatives should be able to take advantage of the immediate environment, by developing active modes of transport (walking, cycling, non-motorised driverless transport, etc.), supported by special urban travel plans covering travel from home to other venues such as school, university or work. These would be incorporated into the general urban transport planning documents.*

*The work done to factor these aspects into town planning should in turn lead to the development of solutions to air flow and water flow problems and solutions to reduce the effects of heat islands during heatwaves, even in old suburbs, bearing in mind that they can only change very slowly (capacity for renewing built-up urban areas is estimated at around 1% per year).*

## 3 Surveillance and communication

Create cross-disciplinary study centres on climate, biodiversity and health risks

Include surveillance of interactions between climate and health in the objectives of the new prevention body formed by merging the National institute of health prevention and education (INPES), the National public health surveillance institute (InVS) and the Organisation for public health emergency preparation and response (EPRUS);

Include these risks as objectives in the future programmes of the new body's communication and health prevention departments respectively.

*The INPES-InVS reorganisation plan should take into consideration the objectives of both short- and long-term surveillance of interactions between climate and health, including in its communication goals, so as to identify newly emerging risks linked to these interactions as early as possible.<sup>109</sup>*

## 4 Research

Develop research on adaptation and targeted programmes to study non-linear interactions within complex systems.

Promote knowledge-building research on ecosystem services and interactions between climate, biodiversity and human health.

Propose cross-disciplinary programmes for the national research agency (ANR) combining health, climate, technology, pollution and economics.

Develop tools and studies for measuring health-related impacts; clearly define the economic impacts by assessing the cost/benefit ratio, after taking the non-linearity of interactions into consideration.

Include studies on ecology and health in university courses.

*These possibilities should take into consideration, or even form part of the Future Earth programme, which has not been sufficiently developed in France. As we saw in Chapter II, all of these avenues must be carefully targeted and backed with appropriate funding so that rapid progress can be made in the science of complex systems and our understanding of the tipping points, thereby enabling us to avoid their critical effects without waiting for the literature to prove the science [right(?) – word omitted]<sup>110</sup>*

## Conclusions

Risk reduction must now be looked at from an overall perspective<sup>111</sup>, so that we can mitigate climate change if possible and give ourselves time to adapt. Policies on alternative management approaches (ecological transition, energy transition, technology

<sup>109</sup> The recently launched first communication campaign by the World Meteorological Office (WMO), which shows a weather forecast for 18 August 2050 by Évelyne Dhéliat, the current presenter of this short sequence followed by millions of French viewers every day, could contribute to national awareness-raising <http://www.meteo-paris.com/actualites/le-bulletin-meteo-du-18-aout-2050-03-decembre-2014.html>.

<sup>110</sup> Meyronnis F: *Proclamation sur la vraie crise mondiale* ("Manifesto on the true global crisis"), Les Liens qui Libèrent, 2014 and Cormac McCarthy: *The Road* (French translation *La Route*, Éditions de l'Olivier), 2009.

<sup>111</sup> Rockström J, et al. A safe operating space for humanity. *Nature* 2009; 461: 472-75.

transition, sustainable development, etc.) must be integrated with all the targets as far as possible. It will therefore be important over the next few years to encourage an examination of national policies that take account of the direct and indirect impacts of climate change on human, animal and plant health and are in keeping with European and international policies.

To support policy discussions, it will be important to progress quickly with the development of exploration and modelling strategies that take the various factors into account on the basis of the most likely variations. It is likely that, in the course of these variations, certain thresholds will be reached that will have major health impacts; however it is difficult to establish these on a theoretical basis. These models must provide us with an ongoing means of considering the repercussions of decisions that simultaneously affect several factors.

In the field of public health, continuous surveillance will be needed in order to ensure that appropriate public action is taken, amid increasingly unstable climate, economic and public health conditions.

As the 2015 conference approaches, which may well be the last in the present format, we feel it is vital to interpret the interactions between climate, biodiversity and health within the framework of a global approach to the ecology of health, to coordinate our efforts at the highest levels (an essential prerequisite for effective, long-term governance) and to gain a clearer understanding both of the non-linearity of phenomena and the progressive nature of our vulnerability.

These factors will enable us to foresee our adaptation capacities more effectively amid a context of increasing pressures and may enable us to maintain our energy goals and our standard of living (though this is a difficult equation to solve). The positive approach we will need in order to achieve this need not mask the reality of the emerging situations but instead will enable us to tackle all of these problems with greater determination.

## Conclusion

The assessment of the National Climate Change Adaptation Plan (NAP), produced by the General Advisory Council on the Environment and Sustainable Development, has highlighted the plan's flagship achievements and identified areas in need of improvement and the most significant shortcomings. Since much of this first plan was exploratory and therefore concentrated primarily on developing knowledge and experience in newly emerging subjects, it helped to provide a clearer picture of the issues involved in climate change adaptation in many different fields. It also pinpointed certain aspects that France will need to focus its efforts on, both in terms of the themes that are given attention and in terms of the work of local and regional authorities and public bodies. One of the areas that will need to be worked on is to bring the way economic sectors are structured into line with future climate-related issues.

Some of the cross-sector work carried out under the framework of the NAP, such as the opinion on risk acceptability and governance produced by the Prevention and Precaution Committee, or the five volumes of "The French Climate in the 21<sup>st</sup> Century" written by the task force led by Jean Jouzel, have themselves provided material for discussions about France's adaptation process and contributed to highlighting the newly emerging area of climate services. The opinion issued by the Advisory Council on Economic, Social and Environmental Affairs in 2014 offers further general insights, both from the point of view of the various sectors concerned and in terms of translating the adaptation process into practice at local and regional levels. One of the aspects it flags up is the specific issues affecting the French Overseas Territories.

The action taken by France can also be viewed in the European context and the work of the European Environment Agency, underlining the positive effects of sharing experience and methods between Member States and the benefits of cross-border cooperation between neighbouring EU countries. The international cooperation aspect that is so necessary in the field of adaptation has been reflected in Article 7 of the Paris Agreement, produced in the closing stages of the 21<sup>st</sup> Conference of the Parties to the United Nations Framework Agreement on Climate Change.

In addition to the cross-cutting evaluations, several of the actions led to examining the plan or making recommendations for adaptation actions from the point of view of specific subjects. For example, the Scientific Advisory Council on Natural Heritage and Biodiversity stressed that the plan did not pay sufficient attention to biodiversity and the complex interactions between biodiversity and climate. The General Advisory Council on Food, Agriculture and Rural Areas highlighted the need to address climate change adaptation and climate change mitigation together, within a framework of local-level projects and a broad vision of the agriculture, forestry and other land uses sector. Meanwhile, the Public Health Council pointed to the fact that the health issues surrounding adaptation of the population tie in closely with the subject of individual and collective behaviour.

By giving a significant amount of feedback on public policy, identifying a wide range of issues and making well-supported recommendations, this report provides the public bodies with a springboard for strengthening France's adaptation process. All the stakeholders concerned will be able to take it on board in detail with the help of the in-depth analyses.

## Annex II

### Acronyms and abbreviations

AdCF	Association des communes de France – Association of French town councils
ADEME	Agence de l'environnement et de la maîtrise de l'énergie – Environment and energy management agency
AEE	Agence européenne de l'environnement – European environment agency
AFB	Agence française de la biodiversité – French biodiversity agency
AFD	Agence française de développement – French development agency
AFOLU	Agriculture forestry and other land uses
ALUR	Accès au logement et urbanisme rénové – Accessible housing and new approaches to town planning
AMO	Assistance à maîtrise d'ouvrage – Project management assistance
ANR	Agence nationale de la recherche – National research agency
BRGM	Bureau de recherches géologiques et minières – Office for geological and mining research
CAP	Common agricultural policy
CAT NAT	Garantie catastrophes naturelles – Natural disaster insurance
CCR	Caisse centrale de réassurance – Central reinsurance fund
CDC	Caisse des dépôts et consignations (a publicly-owned investment bank)
CEA	Commissariat à l'énergie atomique et aux énergies alternatives – Alternative Energies and Atomic Energy Commission
CEDD	Conseil économique pour le développement durable – Economic advisory council on sustainable development
CEREMA	Centre d'études et d'expertise sur les risques, l'environnement, la mobilité et l'aménagement – Centre for studies and expertise on risk, environment, mobility and development
CERFACS	European Centre for Research and Advanced Training in Scientific Computing
CESE	Conseil économique social et environnemental – Economic, Social and Environmental Council
CESER	Conseil économique social et environnemental régional - Regional Economic, Social and Environmental Council
CETMEF	Centre d'études techniques maritimes et fluviales – Centre for technical maritime and river studies
CFADS	Conseil franco-allemand de défense et de sécurité – Franco-German defence and security council
CGAAER	Conseil général de l'agriculture, de l'alimentation et des espaces ruraux – General advisory council on food, agriculture and the countryside
CGDD	Commissariat général au développement durable – General commission for sustainable development
CGEDD	Conseil général de l'environnement et du développement durable – General council for the environment and sustainable development
CMIP	Climate models intercomparison project
CNDDGE	Comité national du développement durable et du Grenelle de l'environnement – National committee on sustainable development and Grenelle de l'Environnement
CNES	Centre national d'études spatiales – National centre for space studies
CNEV	Centre national d'expertise sur les vecteurs – National centre for expertise on disease vectors
CNRM	Centre national de recherches météorologique – National centre for meteorological research
CNRS	Centre national de la recherche scientifique – National centre for scientific research
CNTE	Conseil national de la transition écologique – National council for ecological transition
COP	Conference of the parties
CORDEX	Coordinated regional climate downscaling experiment
CPER	Contrat de plan État-région – Central-regional government agreements
CPP	Comité de la prévention et de la précaution – Prevention and precaution committee
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAEI	Direction des affaires européennes et internationales – Department of European and international affairs
DATAR	Direction de l'aménagement du territoire et de l'attractivité régionale – Joint ministerial regional development department
DEB	Direction de l'eau et de la biodiversité – Directorate for water and biodiversity
DGALN	Direction générale de l'aménagement, du logement et de la nature – General Directorate for development, housing and nature
DGCIS	Direction générale de la compétitivité de l'industrie et des services – Department of competition, industry and services
DGEC	Direction générale de l'énergie et du climat – General Directorate for energy and climate
DGPE	Direction générale de la performance économique et environnementale des entreprises – Department of private sector economic and environmental performance
DGPR	Direction générale de la prévention des risques – General Directorate for risk prevention
DHUP	Direction de l'habitat, de l'urbanisme et des paysages – General Directorate for habitats, town planning and the countryside
DiCom	Direction de la communication – Directorate for communication
DIRM	Direction inter-régionale de la mer – Interregional department of marine affairs
DOM-COM	Département d'outre-mer – Collectivité d'outre-mer – Overseas départements and communities
DREAL	Direction régionale de l'environnement, de l'aménagement et du logement – Regional directorates for the environment, development and housing
DREES	Direction de la recherche des études et évaluation et statistiques – Department of research, studies, evaluation and statistics
DRIAS	Donner accès aux scénarios climatiques régionalisés français pour l'impact et l'adaptation de nos sociétés et environnements – 'Access to French regional-scale climate impact scenarios and adaptation of our societies and environments'
EAFRD	European Agricultural Fund for Rural Development
ECMWF	European centre for medium-range weather forecasts
EDF	Électricité de France (a majority state-owned electricity company)
ENMOD	Environmental modification techniques
EPCI	Établissement public de coopération intercommunal – Joint local authority organisation
EPRUS	Établissement de préparation et de réponse aux urgences sanitaires – Organisation for public health emergency preparation and response
ERA-Net	European research area network
ERDF	European regional development fund
EU	European Union
EURO-CORDEX	European coordinated regional climate downscaling experiment
FAO	UN Food and agriculture organization

FFEM	Fond français pour l'environnement mondial – French fund for world development
GEMAPI	Gestion des milieux aquatiques et prévention des inondations – Aquatic environment management and flood prevention
GES	Gaz à effet de serre – Greenhouse gases
GICC	Gestion et impacts du changement climatique – Climate change management and impacts
GIEE	Groupements d'intérêt économique et environnemental – Economic and environmental interest groups
GIZC	Gestion intégrée des zones côtières – Integrated coastal zone management
GRDF	Gaz réseau distribution France (the national gas distribution network)
I4CE	Institute for climate economics
ICPE	Installation classée pour la protection de l'environnement – Environmental protection classified facility
IFREMER	Institut français de recherche pour l'exploitation de la mer – French institute for research on marine uses
IGA	Inspection générale de l'administration – General inspectorate for administrative affairs
IGAS	Inspection générale des affaires sociales – General inspectorate for social affairs
IGBP	International Geosphere-Biosphere Programme
IGF	Inspection générale des finances – General inspectorate for financial affairs
IGN	Institut national de l'information géographique et forestière – National geographical and forestry information institute
INPES	Institut national de prévention et d'éducation pour la santé – National institute of health prevention and education
INRA	Institut national de la recherche agronomique – National institute of agricultural research
INSEE	Institut national de la statistique et des études économiques – National institute of statistics and economic studies
InVS	Institut de veille sanitaire – National public health surveillance institute
IPBES	Intergovernmental science-policy platform on biodiversity and ecosystem services
IPCC	Intergovernmental Panel on Climate Change
IPSL	Institut Pierre-Simon Laplace – Pierre-Simon Laplace Institute
IRD	Institut de recherche pour le développement – Institute of development research
IRSTEA	Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture – National institute of research on science and technology for the environment and agriculture
LEGOS	Laboratoire d'études en géophysique et océanographie spatiale – Laboratory on geophysics and oceanography from space
LSCE	Laboratoire des sciences du climat et de l'environnement – Climate and environmental science laboratory
LTHE	Laboratoire d'étude des transferts en hydrologie et environnement – Water cycle and environmental studies laboratory
MAEC	Mesures agroenvironnementales et climatiques – Agroenvironmental and climate measures
MAEDI	Ministère des Affaires étrangères et du Développement international – Ministry of foreign affairs and international development
MAPTAM	Modernisation de l'action publique territoriale et d'affirmation des métropoles - Law on 'modernisation of local and regional public action and the status of big cities'
MEDDE	Ministère de l'Écologie, du Développement durable et de l'Énergie – Ministry of Ecology, Sustainable Development and Energy
MEEDDM	Ministère de l'Écologie, de l'Énergie, du Développement durable et de la Mer – Ministry of Ecology, Energy, Sustainable Development and Marine Affairs
MEEM	Ministère de l'Environnement, de l'Énergie et de la Mer – Ministry of the Environment, Energy and Marine Affairs
MENESR	Ministère de l'Éducation nationale, de l'Enseignement supérieur et de la Recherche – Ministry of State Education, Higher Education and Research
MRE	Monitoring, reporting and evaluation
MRN	Mission risques naturels – Natural risk assessment
NOAA	National oceanic and atmospheric administration
NOTRe	Nouvelle organisation du territoire de la République – Law on the 'new organisational structure of central, regional and local government'
OECD	Organisation for economic cooperation and development
OIE	World Organisation for Animal Health
ONEMA	Office national de l'eau et des milieux aquatiques – National office for water and aquatic environments
ONERC	Observatoire national sur les effets du réchauffement climatique – National observatory on the effects of global warming
ONRN	Observatoire national des risques naturels – National observatory on natural risks
OPECST	Office parlementaire de l'évaluation des choix scientifiques et techniques – Parliamentary Office for the Evaluation of Scientific and Technological Choices
PAPI	Plan d'action de prévention des inondations – Flood prevention action plan
PCAET	Plan climat-air-énergie territorial – Local climate, air & energy plan
PCET	Plan climat-énergie territorial – Local climate, & energy plan
PGRI	Plan de gestion des risques d'inondation – Flood risk management plan
PLU	Plan local d'urbanisme – Local authority town planning document
PLUi	Plan local d'urbanisme intercommunal - Joint local authority town planning document
PMBE	Plan de modernisation des bâtiments d'élevage – Livestock building modernisation plan
PNACC	Plan national d'adaptation au changement climatique – National climate change adaptation plan
PNR	Parc naturel régional – Regional natural park
PNSE	Plan national santé environnement – National plan on health and the environment
POPSU	Plate-forme d'observation des projets et stratégies urbaines - Study platform for urban strategies and projects
PPRL	Plan de prévention des risques littoraux – Coastal risk prevention plan
PRAD	Projet régional d'agriculture durable – Regional sustainable agriculture plan
PRU	Projet de renouvellement urbain – Urban renewal plan
PSR	Plan submersions rapides – Rapid coastal flooding plan
PVE	Plan végétal pour l'environnement – 'Plants to help the environment' plan
RCP	Representative concentration pathway
RGCU	Réseau génie civil et urbain – Civil and municipal engineering network
ROLNP	Réseau d'observation du littoral normand et picard – Observation network for the Normandy and Picardy coasts
SAGE	Schéma d'aménagement et de gestion de l'eau – Water development and management plan
SBSTA	Subsidiary body for scientific and technical advice
SCAMPEI	Scénarios climatiques adaptés aux zones de montagne: phénomènes extrêmes, enneigement et incertitudes – Climate scenarios adjusted for mountain regions: extreme events, snow cover and uncertainties
SCoT	Schéma de cohérence territoriale – 'Local planning continuity' documents
SDAGE	Schéma directeur d'aménagement et de gestion de l'eau – Water development and management master plan
SDOs	Sustainable development objectives
SHOM	Service hydrographique et océanographique de la marine – Navy hydrography and oceanography service
SNGRI	Stratégie nationale de gestion des risques d'inondations – National flood risk management strategy
SNTEDD	Stratégie nationale de transition écologique vers un développement durable – National strategy for a green transition to sustainable development
SOeS	Service de l'observation et des statistiques – Observation and statistics service
SPM	Summary for policy makers

SRADDET	Schéma régional d'aménagement, de développement durable et d'égalité des territoires – Regional plan for local development, sustainable development and geographical equality
SRCAE	Schéma régional du climat de l'air et de l'énergie – Regional climate, air and energy master plan
SRCE	Schéma régional de cohérence écologique – Regional ecological continuity plan
SRES	Special report on emissions scenarios
SRNH	Service des risques naturels et hydrauliques – Natural and water risks service
TGN	garantie 'Tempête, Grêle, poids de la Neige sur les toitures' – Insurance for damage due to storms, hail or heavy snow on roofs
TRI	Territoire à risque inondation – Flood risk area
TSU	Technical support unit
TVB	Trame verte et bleue – Blue-green grid
UKCIP	United Kingdom climate impact programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
URL	Uniform resource locator
VIADUC	Valoriser Drias et innover sur l'adaptation grâce au design, avec des usagers concernés par le climat – 'Enhancing DRIAS and innovating in the adaptation field through design, together with users concerned by climate'
VITECC	Club Ville, territoire, énergie et changement climatique – 'Cities, local authorities, energy and climate change' (a project 'to pool the results of academic and applied research on the economics of climate change by making that research comprehensible to and usable by local authority decision-makers and their service providers)
WG	Working group
WHO	World Health Organisation
WMO	World Meteorological Organisation
ZAC	Zone d'aménagement concerté – Concerted development zone

