

National plan

CLIMATE CHANGE *adaptation*



Resources, land, habitats and housing
Energy and climate
Sustainable development
Risk prevention
Infrastructure, transport and the sea

Present
for
the future



French National Climate Change Impact Adaptation Plan

2011 - 2015

Contents

1. Why is an adaptation plan required?	4
1.1. Introduction	4
1.2. The cost of climate change impacts	4
1.3. The principles of adaptation	5
1.4. Government activity	6
1.5. Consultation prior to the National Plan	6
2. Climate scenarios for France in the 21st century	8
2.1. Two models – two scenarios	8
2.2. Significant results	8
2.3. Results characterised by uncertainty	11
2.4. Additional elements and future prospects	11
2.5. Concrete results	12
3. The content of the plan	13
3.1. Guiding principles	13
3.2. National Climate Change Adaptation Plan Action Sheets	14
3.3. The National Plan and regional actions	15
3.4. The National Plan and French overseas territories	16
4. Governance of the Plan	17
4.1. Monitoring	17
4.2. Evaluation	17
Presentation of the action sheets	18
CROSS-CUTTING action sheet	19
HEALTH sheet	21
WATER RESOURCES action sheet	24
BIODIVERSITY action sheet	27
NATURAL HAZARDS action sheet	30
AGRICULTURE action sheet	33
FOREST action sheet	35
FISHERIES AND AQUACULTURE action sheet	37
ENERGY AND INDUSTRY action sheet	38
INFRASTRUCTURES AND TRANSPORT SYSTEMS action sheet	40
URBAN PLANNING AND THE BUILT ENVIRONMENT action sheet	42
TOURISM action sheet	44
INFORMATION action sheet	45
EDUCATION AND TRAINING action sheet	47
RESEARCH action sheet	49
FUNDING AND INSURANCE action sheet	52
COASTLINE action sheet	55
MOUNTAIN action sheet	58
EUROPEAN and INTERNATIONAL ACTION sheet	60

GOVERNANCE action sheet	62
<i>ANNEXE I: Abbreviations and Acronyms</i>	<i>64</i>

1. Why is an adaptation plan required?

1.1. Introduction

Members of the Intergovernmental Panel on Climate Change (IPCC) are unanimous: “Warming of the climate system is unequivocal” (Synthesis Report, IPCC, 2007). Climate change is already underway and its effects are beginning to be felt: “many natural systems are being affected by regional climate changes”. The message from scientists concerning the significance of these changes is unambiguous, although there is still some uncertainty surrounding their scope. Profound changes are now inevitable, whatever means are employed to reduce greenhouse gas emissions, because of the inertia inherent in climate systems. These changes will affect a number of sectors: agriculture, forestry, tourism, fisheries, spatial planning, construction and infrastructure, population protection, etc. In this respect, climate change is no longer a purely scientific issue focusing on the distant future, but has become a pressing, contemporary, global, political challenge.

Fighting climate change is a national priority and the measures required to limit its scope by reducing greenhouse gas emissions (i.e. climate change mitigation) are the focus of the French Climate Plan adopted in 2004 and regularly updated¹.

Adapting French territory to climate change has also become a major issue requiring national mobilisation. Adaptation should be viewed as an indispensable addition to the mitigation activities already being undertaken.

Programme law 2009-967 of 3 August 2009, relating to the implementation of the Grenelle Environment Forum, makes provision in Article 42 for “*the preparation of a National Adaptation Plan for a variety of areas of activity by 2011*”.

The Plan will cover a five-year period. A mid-term review will be carried out in 2013, and this will allow checks to be made for alignment between the National Plan and regional guidelines and actions defined in Regional Climate, Air and Energy Programmes and Regional Climate-Energy Programmes under the provisions of Law 2010-788 of 12 July 2010 relating to the national environmental commitment.

France is one of the first EU member states to produce a climate change adaptation plan. Germany is due to publish its plan in the summer of 2011 and the United Kingdom will produce its five-year plan in 2012. The European Union published a White Paper on adaptation in 2009 and will draw up a European strategy in 2013.

1.2. The cost of climate change impacts

The interministerial group report entitled “Impacts of climate change, associated costs and adaptation strategies”, published in September 2009, presented evidence demonstrating not just the significance of the impact of climate change and associated costs, but also the opportunities for France.

It therefore predicts for France based on horizons of 2050 and 2100:

- losses in the agricultural sector due to heatwaves and drought which will cancel out the positive effect of increased plant productivity associated with higher levels of atmospheric CO₂;
- a decline in water resources in areas already experiencing difficulties;
- in the Languedoc Roussillon, thousands of homes and businesses will be directly affected by a one-metre rise in sea levels;
- national assets in the form of main roads estimated to be worth 2 billion euros would be affected by a one-metre rise in sea levels;

¹ In accordance with Article 2 of Programme Law 2005-781 of 13 July 2005 setting the guidelines for energy policy.

- an extension of the zones affected by shrinkage-swelling of clay, produced by drought causing damage to homes, would multiply the actual cost of damage by a factor of between 3 and 6;
- energy-saving benefits, although increased air conditioning would reduce these savings.

Man and Nature are undoubtedly able to adapt spontaneously to some extent to the upheavals brought about by climate change, but it is clear that if we do not prepare for this change, it will entail costs which are significantly higher than those incurred in anticipating it. We must therefore reduce our vulnerability to climate change now in order to avoid severe environmental, infrastructural, financial and also human damage. According to the economist Nicholas Stern, the cost of inactivity lies somewhere between 5 and 20% of global GDP and the cost of taking action lies between 1 and 2%.

1.3. The principles of adaptation

Adaptation is defined in the IPCC Third Assessment Report 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”*.

A variety of actions can reduce negative impacts or build adaptive capacity:

- anticipating and limiting potential damage by acting pre-emptively on factors which will determine the scope of the damage (e.g. urban development in areas considered at risk);
- organising resources for rapid restoration after exposure to impacts connected to climate change (e.g. rapid restoration of electrical power after an extreme event);
- developing lifestyles which avoid risks (e.g. reducing and/or rationalising water consumption).

Spontaneous adaptation entails responding immediately and without prior strategic consideration to a climatic pressure, whereas planned adaptation is the product of deliberate strategic decisions based on a clear understanding of conditions which will change and on the appropriate measures required to achieve the desired outcome. Spontaneous adaptation can lead to conflict with other policies (e.g. widespread uptake of air conditioning increases energy consumption and GHG emissions), and can even lead to inappropriate adaptation, i.e. a situation in which vulnerability to climate hazards is paradoxically increased.

Inappropriate adaptation takes one of the following forms:

- ineffective use of resources compared to other options available (widespread uptake of active air conditioning rather than investment in insulation materials);
- unregulated transfer of vulnerability from one system to another and also from one period to another (e.g. infrastructure to protect a motorway from flooding should not increase the risk of flooding on the neighbouring main road);
- reduction in the scope for future adaptation (measures which restrict potential flexibility, for example the construction of dykes, and urban development in new protected zones);
- calibration errors: over-adaptation (costs are too high) or suboptimal adaptation (individual risk is too significant).

It is therefore imperative to avoid any incidence of inappropriate adaptation.

An adaptation policy is essentially a pre-emptive policy: a pre-emptive approach by stakeholders to future problems and to society's perception of these changes (although the climate fluctuates unpredictably from one year to another, the general trend towards global warming is undeniable). Lastly, it is a pre-emptive approach to the measures required to solve these problems in order to avoid hasty design or implementation incurring the risk of potentially costly mistakes for the future.

There are several types of adaptation measures:

- physical measures, such as raising protective dykes;

- institutional measures, such as crisis management plans or the implementation of specific regulations;
- strategic measures, such as the decision to relocate or settle populations, or the implementation of measures to facilitate reconstruction after a disaster;
- increasing knowledge and setting up research programmes;
- informing the public and decision-makers in order to facilitate decision-making and apportionment of responsibility.

An adaptation policy must combine these various aspects.

Moreover, adaptation to future climate hazards invites reflection on what constitutes an acceptable level of risk. This threshold could be crucial in determining the choice between two adaptation options. This complex issue was raised during the preparatory consultation and a study on decision-making methods for this risk has been launched². The initial scoping paper is provided in the Adaptation Plan annexes.

1.4. Government activity

The creation of a National Observatory for the Effects of Global Warming (ONERC) in 2001, tasked specifically with adaptation to climate change, followed by the adoption of the National Adaptation Strategy in 2006, marked the beginning of French government activity in this field.

This National Strategy asserts that adaptation aimed at reducing vulnerability to the effects of climate change must pursue four main goals which must underlie all the measures to be implemented:

- protecting people and property by acting in favour of safety and public health;
- taking social aspects into account and avoiding inequality of exposure to risk;
- limiting costs and exploiting benefits;
- preserving French natural heritage.

The following principles must be adhered to when implementing an adaptation policy:

- concern for fairness which involves bringing together all local authorities and socio-professional groups likely to be affected by climate change impacts or adaptation to their effects;
- pre-empting crisis situations wherever possible;
- although reliance on private or public insurance mechanisms is an important tool in managing climate risk, it should be supplemented by the adaptation decisions required to reduce these risks in order to avoid delaying essential adaptation decisions;
- financial aid and subsidies must not encourage situations to persist unresolved; instead, public action should promote change and economic diversification as part of a sustainable development approach;
- alignment with mitigation (i.e. reductions in greenhouse gas emissions);
- seeking actions offering alternative advantages, aside from climate change adaptation.

1.5. Consultation prior to the National Plan

A substantial consultation exercise was carried out in 2010 prior to the drafting of the National Climate Change Adaptation Plan (PNACC) bringing together panels from the Grenelle Environment Forum (elected representatives and local authorities, the state, employers, employee unions and non-profit associations). The consultation had two aims:

² The Committee for Prevention and Precaution was tasked with exploring this topic in 2010 by the Ministry for Ecology.

- to mobilise all public authorities, and private and civil society stakeholders so that adaptation is perceived as having the same status as mitigation and to increase their awareness of the issues involved;
- to canvas opinions and recommendations for defining the National Climate Change Adaptation Plan.

The report by the national groups which came together for this consultation³ was submitted on 15 June 2010. It contained 202 recommendations and put forward four actions in advance of the public contribution to decision-making:

- firstly, to improve understanding of the mechanisms involved through basic and applied research, notably relating to our awareness of hazards and how to evaluate them right down to the local scale, to methods for assessing their direct or indirect effects, and to the reduction of vulnerability to extreme events;
- secondly, it is important to enhance observation through long-term collection of data which is made available to all stakeholders and regions;
- thirdly, it is necessary to establish mechanisms and methods for evaluation and lessons learned in order to benefit from past experiences in France or abroad, which could help to predict future changes in climate (heatwaves, flooding, fires, etc.);
- lastly, citizens must be brought together and involved in making and implementing decisions.

Reports from French overseas regions were submitted to the Minister in early July 2010. These reports emphasised that the recommendations formulated by the national working groups often covered the need for adaptation in overseas territories. However, certain measures would require adaptation for implementation in overseas territories.

Specific requirements resulted in the proposal of nine recommendations in addition to those made by national groups.

Reports from interregional meetings were submitted in early November 2010. These meetings demonstrated a strong commitment to the proposals made by national groups and French overseas regions. None of the recommendations relating to the importance of information and training, increased research or risk management, tourism or urban development, were challenged. In general, only minor criticisms were expressed and these were intended to modify wording and offer additional information, details or comments about difficulties relating to implementation.

The report on the public Internet consultation showed a high level of commitment to the fight against climate change, with most Internet users stating that they were prepared to work to reduce greenhouse gas emissions. Overall, most respondents were primarily concerned about the impact of climate change on their daily lives, especially as regards lifestyle and health. Respondents represented all French *départements*, although they were not evenly distributed. Paris and mountain or coastal areas had the highest number of respondents.

The National Adaptation Plan is based on the 211 recommendations produced by the different studies making up the consultation.

³ The consultation reports can be downloaded from the Ministry website: <http://developpement-durable.gouv.fr/adaptation>

2. Climate scenarios for France in the 21st century

During the national consultation process, it proved necessary to set out the reference values and climate scenarios to be considered so that stakeholders could benchmark their decisions, particularly with regard to long-term investments (urbanisation, energy, infrastructures or the forestry sector).

The Minister for Ecology tasked Jean Jouzel, Vice chairman of IPCC Working Group I “The physical science basis”, along with the main stakeholders in the French climate community, with producing criteria for the choice of climate projections for use in defining a climate change scenario in line with IPCC studies.

A team of climatologists from the Institut Pierre-Simon Laplace (IPSL) and Météo-France was formed to produce two climate change scenarios.

2.1. Two models – two scenarios

Future climate change on a French scale is simulated using the ARPEGE-Climat and LMDZ French regional climate change models developed by CNRM-Météo-France (*National Centre for Meteorological Research*) and IPSL (*Institut Pierre-Simon Laplace*) respectively.

The simulations selected for the scope of this mission, which were created for the IPCC Fourth Assessment Report, are based on two greenhouse gas emission scenarios:

- scenario B2, which is quite optimistic;
- scenario A2, which is quite pessimistic.

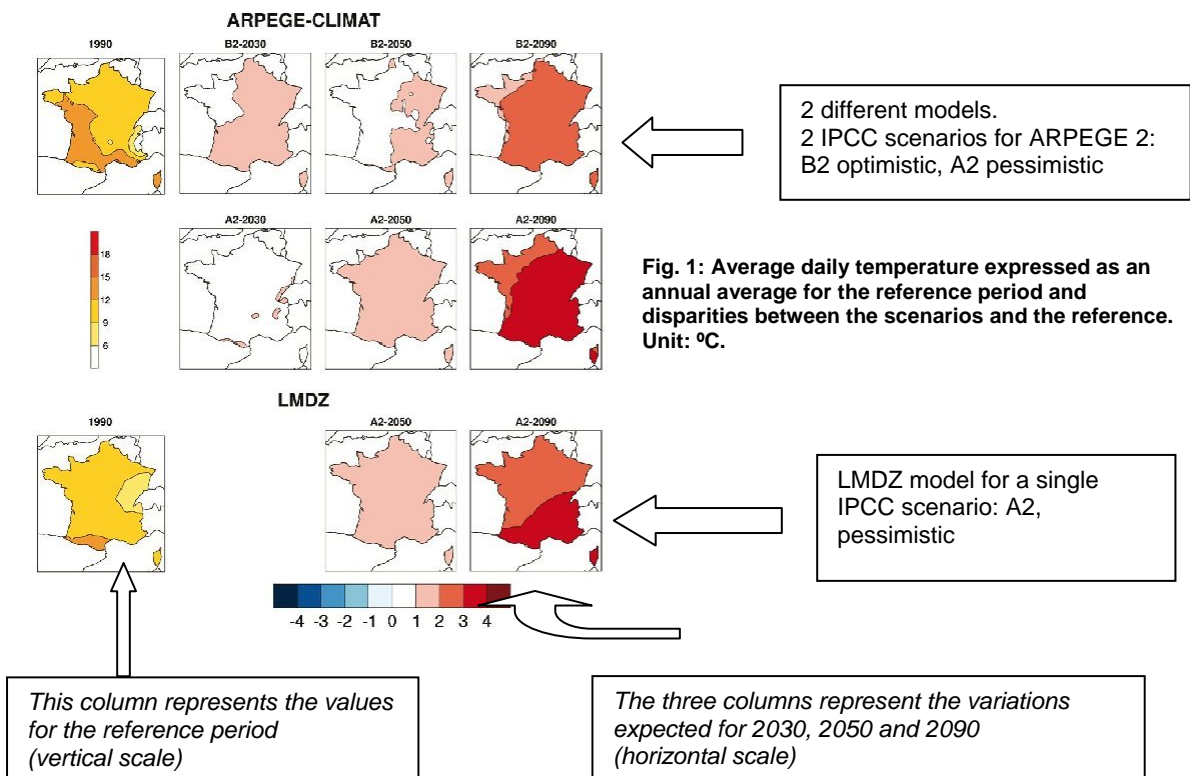
Using tables and figures, this report presents the projected values for 19 climate indices covering both climate averages and extremes (temperature, precipitation, soil moisture and extreme winds). The values of these indices are presented separately by reference period (1980-1999 or 1970-1999, depending on the model) for horizons of 2030, 2050 and 2100 respectively. The indices presented cover continental France and 5 major regions.

2.2. Significant results

Temperatures

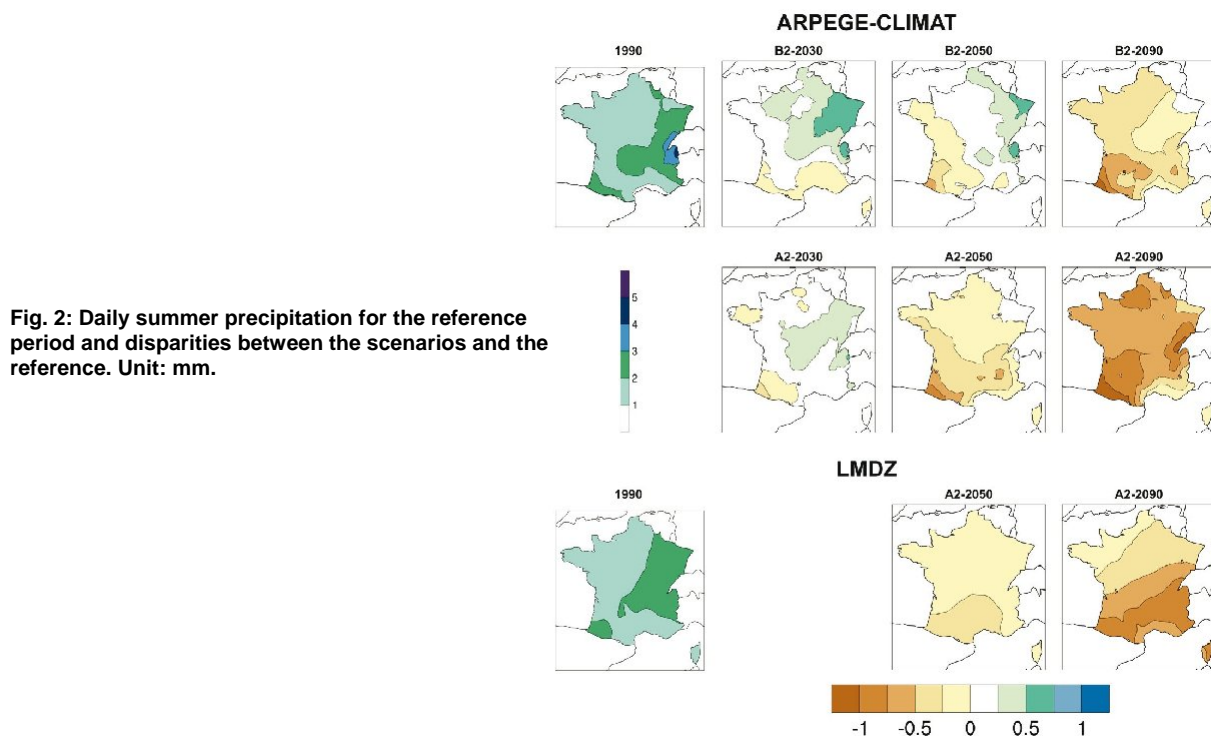
According to scenario B2, the average temperature in France would increase by approximately 2 to 2.5°C between the late 20th century and the late 21st century. The increase would be approximately 2.5 to 3.5°C for scenario A2. The rise in temperature is similar for both scenarios for 2030 and 2050 horizons, at approximately 0.5°C and 1.5°C. However, it is slightly higher for scenario A2 in 2050.

The minor difference between these two results for 2030 and 2050 horizons reflects the inertia inherent in the response of the climate system to greenhouse gas emissions. It also demonstrates the importance on these timescales of the impact of natural climate variability which partially conceals the slow trend towards global warming which is anthropic in origin. Beyond 2050, the gap between the “optimistic” and “pessimistic scenarios becomes significantly wider.



Precipitation

Signs of changes in average precipitation are relatively uncertain for winter and autumn, where there are variations according to horizon, scenario and region.



By contrast, both scenarios demonstrate a trend towards a drop in rainfall in spring and summer.

This drop, which can only be detected at the end of the century in scenario B2, occurs earlier and is more pronounced in scenario A2, at approximately -10% circa 2050 and -30% circa 2090 in the summer season. The South-West of France would be the region worst affected by this drop.

Changes in extremes

Contrasts exist relating to changes in extremes. However, where a trend exists, it is more pronounced for scenario A2. For example the maximum extreme daily temperature for a 2050 horizon in the South-West of France would be 2.7°C higher than the current value for the optimistic scenario and 3.7°C higher for the pessimistic scenario. In 2090, the corresponding disparities would be +4.8°C and +6.7°C respectively.

For indices relating to extremes of heat, both scenarios display an upward trend in the frequency and intensity of these extremes. There is a significant increase in the annual number of days where the daily maximum temperature would be abnormally high. For example, for a 2030 horizon, the number of days would increase by between 8 and 38 days from the current annual average of 36 days.

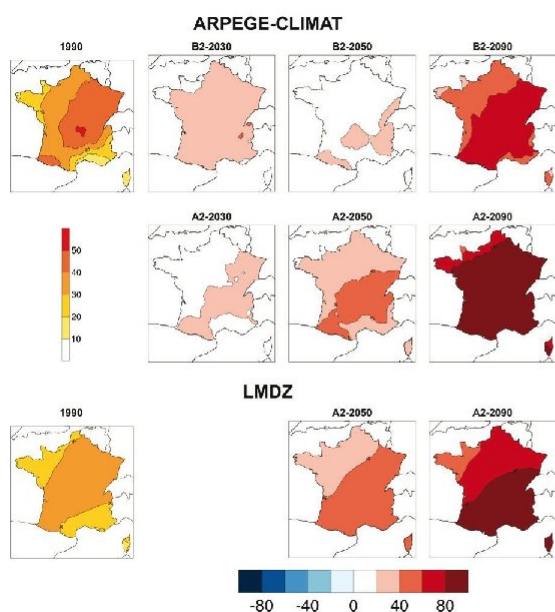


Fig.3: the number of days in the year where T_{max} is higher than the 5°C reference figure for the reference period and the disparities between the scenarios and the reference. Unit: days.

Analysis of this illustration reveals that on approximately twenty days temperatures in the South-East of France currently exceed the usual average by 5°C. For a 2090 horizon, the two models project that this frequency will increase by at least 80 extra days in the case of the pessimistic scenario (A2). By contrast, extreme cold in all areas and at all times of year will tend to decrease.

Similarly, the trend towards an increase in the duration of summer droughts is pronounced in all regions. However, the maps displaying changes in extremes of precipitation show greater contrasts between regions, which is often reflected in a lack of precision concerning signs of change on the scale of continental France.

There is a slight downward trend in extreme winds in the south of the country, but signs of change are unclear in the north.

2.3. Results characterised by uncertainty

Uncertainty surrounding climate projections is linked to several factors:

- natural climate variability;
- the ability of numerical models to reproduce the way in which the climate functions;
- GHG emissions which will actually be produced during this period.

In order to address natural climate variability, the report has established confidence intervals of 90%, in addition to extreme values simulated for each parameter (as outlined in the full report).

In relation to the issue of imperfect numeric models, a decision has been taken to use the projections simulated by the two French models. The addition of some twenty other models which are used in IPCC studies would make it possible to be more specific about the element of uncertainty.

Lastly, as regards emissions scenarios, uncertainty concerning emissions scenarios is associated with the GHG emission reduction policies which will be adopted by French companies.

2.4. Additional elements and future prospects

Rising sea levels

According to the latest IPCC report, average sea levels could rise by between 23cm and 51cm between the end of the 20th century and the end of the 21st century in scenario A2, and by between 20cm and 43cm in scenario B2.

These IPCC projections do not take into account the potential acceleration in the melting of ice caps suggested by recent observations. They should therefore be considered cautious. Projections attempting to reproduce these results indirectly have recently been published, and state a potential rise in excess of 1m in 2100. However, the methods employed for these projections do not try to reproduce the physical processes in question, but merely to extend current trends, and they should therefore be treated with considerable caution.

The regional distribution of changes in sea levels is even more difficult to assess as it depends on local changes to a number of parameters. The forecast changes in the regions under study here are particularly uncertain, especially for the Mediterranean, for which the IPCC does not provide any value. The rise in Mediterranean sea levels is actually difficult to evaluate using global models as they do not consider the exchange of water between the Mediterranean and the Atlantic ocean in the Straits of Gibraltar realistically.

An ONERC summary paper published in 2010 recommends retaining the same values in future studies on the impact of rising sea levels on French coastlines, including the Mediterranean and French overseas territories, as for the global rise in sea levels, and not rejecting the extreme hypothesis of 1m.

Projections for French overseas territories

French Overseas *départements* and collectivities (DOM-COM) are too small geographically for global models to provide detailed climate change simulations. However, an ARPEGE-Climat configuration has enabled global high-resolution simulations to be achieved with a 50x50km² mesh size. These simulations show that rises in temperature are higher over the continental masses (or large islands such as Madagascar), as is the case in the rest of the world, than over the oceans.

In the case of the island of La Réunion, a specific study using the results of these simulations was carried out. Close to La Réunion, the model predicted global warming of between 1.4°C and 3.0°C, depending on the scenario and season, by the end of the century. The highest level of global warming would however take place during the hottest months of the year. By contrast, there would be a relatively small rise in the coolest months of June, July and August.

The majority of climate indicators display a trend towards drier weather in the period 2041-2070. The increase in the maximum number of average consecutive dry days per year would suggest that periods of drought will be more prolonged in the future climate situation on the island of La Réunion. It would also seem that in a future climate, the contribution of extreme precipitation to the annual total will be higher.

Within the framework of the EXPLORE 2070 project, climate simulations will be carried out based on the ARPEGE-Climat model for the French West Indies, La Réunion and Guyana. The simulations will be produced in 2012 and incorporated into the IPCC Fifth Assessment Report.

Watercourse flow in continental France

Predicting changes in river flow in France is a difficult exercise requiring the use of models with a high degree of spatial resolution, such as French catchment areas, as well as consideration of a number of hydrological processes.

There are few hydrological simulations in existence using regional scenarios B2 and A2. However, the report was able to draw on several studies, which despite not using these scenarios, can give an indication of the changes predicted. The first study⁴ indicates a widespread sharp decrease in average flow across France in summer and autumn, earlier and more severe low water levels across the country, but an increase in winter flow in the Alps and the South-East of France and much more moderate changes in high flow than in average water flow.

In a further study on the Seine basin⁵, all the models used simulate significant drying up between now and the end of the century, with a drop in groundwater levels and average annual flow. This global drop of between 20 and 40% in current flow is robust in the light of the uncertainties analysed, which come mostly from large-scale climate models, followed by hydrological models and downscaling methods. On a seasonal level, the drop in flow is felt more particularly in high rather than low water, where the drop is less robust. Extreme values display greater contrasts. Across all the water stations analysed, the characteristic low water level flow drops sharply and the duration of the sequence of low flows increases. By contrast, extreme rises in water would not change significantly.

2.5. Concrete results

Amongst all the projections made, there are particular features of note which can inform thinking on impacts and ways of adapting to climate change:

- an increase in heatwaves and a drop in the number of extremely cold days, which will have negative and positive effects on health respectively;
- an overall drop in the number of snowy days, although this phenomenon will not disappear;
- a clear downward trend in the number of heating degree days which corresponds to a drop in future energy demand (a reduction of nearly 1,000°C in the Alps corresponds to a one third drop in heating demand in these regions);
- an upward trend in the number of cooling degree days which corresponds to a rise in the use of cooling equipment in the summer.

⁴ J. Boé, thesis (2007)

⁵ RexHYSS Project

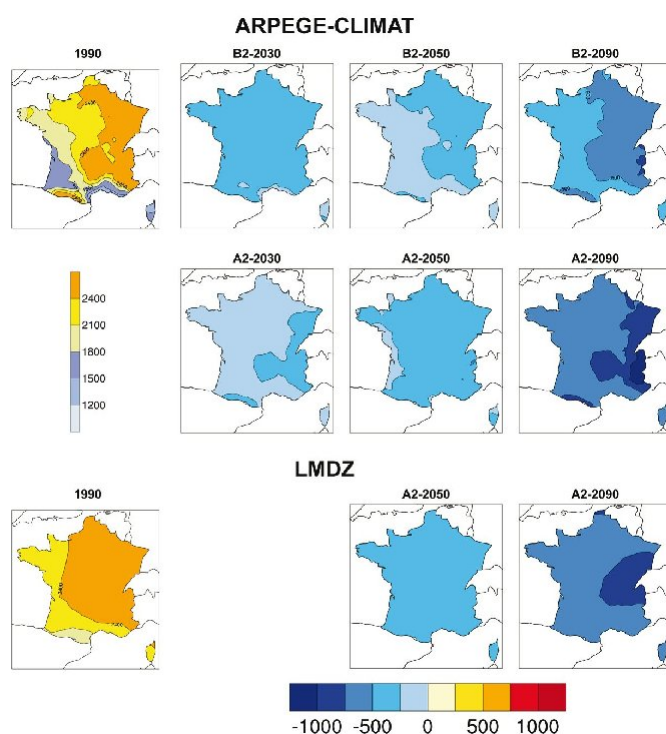


Fig. 5: annual heating degree days for the reference period and disparities between the reference and scenarios. Units: °C /day

J. Jouzel's full report can be downloaded on the Ministry of Ecology website:

http://www.developpement-durable.gouv.fr/Les-outils-de-l-adaptation_18908.html

3. The content of the plan

The first French National Adaptation Plan aims to plan adaptation actions, prevent inappropriate adaptation and ensure consistency across public policy measures relating to adaptation.

3.1. Guiding principles

The measures in the National Plan are based on the 211 recommendations which emerged from the consultation phase held in 2010. A few recommendations were not taken up for the following reasons:

- the recommended measures have already been introduced and have been completed;
- the recommendation contradicts other regulations;
- the recommendation is not sufficiently precise to allow a measure to be defined in response to it;
- the recommendation requires preparatory work and its translation into a measure has been deferred until the next version of the Plan.

The National Plan was developed according to the following principles:

- improve understanding of the effects of climate change in order to inform public decision-making relating to adaptation
Example: a measure in the Water action sheet: Implement the Explore 2070 project on changes in water resources and adaptation measures;
- integrate adaptation into existing public policy in order to ensure overall consistency and to reflect the cross-cutting nature of adaptation
Example: a measure in the Funding action sheet: Identify and disseminate criteria, methods and data sources so that inappropriate adaptation can be assessed in public investment choices;

- provide society with information about climate change and adaptation so that everybody can become aware of the issues and take action. An adaptation policy can only be effective if the relevant stakeholders are involved and adopt the measures advocated. This involves sharing knowledge about the risks posed by the impacts of climate change and fostering understanding of the adaptation measures required. Acceptance of public decisions is a key factor for success so that timely and sufficiently substantive action can be taken
Example: a measure in the Information action sheet: Raise awareness among elected representatives and decision-makers by providing regular information to support decision-making;
- consider interactions between activities
Example: a measure in the Energy action sheet: Promote the use of more efficient cooling equipment;
- signpost responsibilities in relation to implementation and funding
All measures have a lead and output indicators.

The First National Adaptation Plan is also based on the climate scenarios described above. Therefore a pessimistic scenario may be taken into account through measures promoting greater safety margins, whereas other measures may be scaled around a more optimistic scenario such as those proposing *the integration of a climate change adaptation strategy into Massif Programmes*. However, it will be appropriate to consider several hypotheses in preliminary studies, as was the case in the Explore 2070 study on future changes in the availability and use of water resources.

3.2. National Climate Change Adaptation Plan Action Sheets

Twenty fields have been selected based on the principles set out in the National Adaptation Strategy. These fields take up the themes raised during the national consultation and additional fields have been added covering coastlines and mountains, which are especially vulnerable to climate change, as well as European and international action. An action sheet containing actions which cut across all the fields has also been added by way of introduction to the thematic sheets.

- | | |
|-------------------------------|--|
| 1/ Cross-cutting actions | 11/ Urban planning and the built environment |
| 2/ Health | 12/ Tourism |
| 3/ Water | 13/ Information |
| 4/ Biodiversity | 14/ Education and training |
| 5/ Natural hazards | 15/ Research |
| 6/ Agriculture | 16/ Funding and insurance |
| 7/ Forests | 17/ Coastlines |
| 8/ Fisheries and aquaculture | 18/ Mountains |
| 9/ Energy and industry | 19/ European and international actions |
| 10/ Transport infrastructures | 20/ Governance |

There is still a great deal of uncertainty surrounding the scope of the changes and the decision was taken to implement certain types of measures in the first instance:

- “no regrets” measures which are of benefit even in the absence of climate change, **such as the measure to promote water saving across all sectors, or the adaptation of the French shellfish sector to climate change (through disease monitoring and an evaluation of the genetic potential for adaptation of oysters and mussels);**
- reversible measures, **such as mainstreaming climate change in public service contracts;**
- measures increasing “safety margins”, **such as the measure to review the mapping of areas which are potentially vulnerable to forest fires in order to extend the vigilance area ;**
- measures requiring long-term implementation, **such as integrating climate change into regional forestry guidelines;**

- measures which can be adjusted and reviewed periodically for various stakeholders as knowledge advances, **such as more stringent requirements for comfortable summer temperatures in buildings**. Adaptation must be a dynamic and reviewable process.

A decision has been taken to include 5 or 6 actions per theme, each of which will comprise several practical measures. Most of the sheets contain at least one research-related action.

The measures can be classified according to four areas of activity:

- production and dissemination of information;
- adjustment of standards and regulations;
- institutional adaptation;
- direct investment.

The detailed nature of some recommendations which emerged from the consultation in 2010 means that they may give rise to several different types of measure. By contrast, a single measure may respond to several points within a recommendation, or even to several different recommendations.

Lastly, new, practical measures which do not correspond to an initial recommendation have been added. Actions or measures which are already included in other policies, but which are adaptation measures, have been included in the National Climate Change Adaptation Plan, with the proviso that they be at least partially carried out during the implementation period of the Plan.

Given the uncertainty surrounding climate change predictions and evaluations of the anticipated impacts of climate change, several priorities have informed the drafting of the plan:

- increasing current knowledge in all fields, including the use of a socio-economic approach;
- defining methodologies for mainstreaming adaptation;
- reinforcing observation and alert mechanisms.

This first National Plan therefore contains a large number of actions and measures relating to research and observation. However, this uncertainty should not be an impediment to action and the plan also contains a number of practical measures, such as those aimed at saving water resources or the measure to integrate climate change into the frame of reference for the fields analysed in the Plan for Careers in the Green Economy (*Plan métiers de l'économie verte*).

Ultimately, the plan is a set of 84 actions expressed in 230 measures. These actions span the entire duration of the plan from 2011 to 2015. The vast majority of these actions will begin in 2011 or 2012. It has not been possible to evaluate the financial cost for all of the measures. However, it should be noted that funding for the plan should be approximately 171 million euros, excluding civil service staff costs. To this €171 million allocated directly to the new measures should be added an additional €391 million in Future Investments (*Investissements d'Avenir*) which will contribute in varying degrees to adaptation. Moreover, several measures have already been funded within the framework of the Drought Plan (*Plan sécheresse*) and the Rapid Flooding Plan (*Plan submersion rapide*) (500 million euros for the period 2011-2016) which also contribute to funding the plan.

The final document is available on the Ministry for Ecology website under the heading *Effet de serre et changement climatique, impacts et adaptation*⁶.

3.3. The National Plan and regional actions

The National Climate Change Adaptation Plan only deals with measures on a national scale. Regional responsibility for adaptation lies with Regional Climate, Air and Energy Programmes (SRCAE) and Regional Climate-Energy Plans (PCET) which are currently being developed at a local level.

⁶ <http://www.developpement-durable.gouv.fr/adaptation>

Consistency between national actions and regional guidelines and actions for adaptation will be examined as part of the mid-term review in 2013.

In order to encourage climate change adaptation initiatives, a process for awarding quality labels to exemplary approaches will be launched with the support of ADEME. This quality label initiative will be open to all continental French regions and overseas territories.

3.4. The National Plan and French overseas territories

The geographical location and special geomorphologic features of French overseas territories means that their climate is very different from continental France, as are also the hazards which they face, with very significant exposure to sometimes violent hydrometeorological hazards (cyclones, storms, drought, etc.), depending on the nature of the territory. The topography of these territories and their reliance on the sea, especially for subsistence, have led to a rise in coastal populations, thus increasing their vulnerability to rising sea levels and erosion/sedimentation phenomena which could affect these areas which have a high concentration of issues.

Natural hazards are one of the three barriers to the economic development of French overseas territories mentioned by the preliminary report for the law of 27 May 2009 relating to the economic development of French overseas territories, along with their geographical isolation and their small economies in market terms. Fishing is a crucial to their economic and social balance and an increase in temperature and a rise in sea temperatures and ocean acidification will have a profound impact on this activity. Tourism is a major asset linked to the wealth of species and landscapes which it is essential to preserve in order to sustain this activity.

The main projections, notably those made by the IPCC, show widely differing responses in the overseas territories. Therefore, significant work is still required to create regional responses to climate change in French overseas territories and to evaluate their impact prior to the definition of adaptation strategies.

Climate projections for tropical storms and cyclones are still uncertain. Nevertheless, several studies predict an increase in force related to climate change, but also a drop in frequency. These trends should be treated with caution, but serve as a reminder that this phenomenon should not be underestimated.

Although many people are aware of the lack of accurate data on the scope of changes and their consequences, the issues already identified should be sufficient to encourage awareness and prompt action.

The consultation exercise carried out in French overseas regions in mid-2010 revealed that most of the recommendations put forward in the report produced by the national working parties could respond to adaptation issues in French overseas territories.

During the discussions, it was emphasized that a number of proposals relating to adaptation would require a prior technical research phase (in particular for an understanding of future climate scenarios, hydrological mechanisms, etc.).

Given these observations, there is no specific action sheet devoted to French overseas territories, but individual measures are flagged if they need to be specially adapted for these territories. However, there are several specific measures to be found in the thematic action sheets: one measure in the Funding and insurance action sheets concerns an increase in insurance cover and there are others measures in the Health action sheet. It should also be noted that the Biodiversity action sheet focuses in particular on French overseas territories.

4. Governance of the Plan

The National Adaptation Plan aims to present measures designed to help France prepare for and exploit new climatic conditions in France for the next five years, covering the period 2011-2015.

4.1. Monitoring

An annual monitoring exercise to review actions will be carried out by ONERC within the Directorate General for Energy and Climate (DGEC) based on indicators defined in the Plan. The balance sheet will be published.

4.2. Evaluation

The Director General for Energy and Climate is responsible for convening the Adaptation Plan Evaluation Committee. It will comprise civil service representatives tasked with implementing the Plan and representatives from the Grenelle Environment Monitoring Committee specialising in adaptation issues, as well as representatives from the scientific community.

This committee will be responsible for producing a mid-term report evaluating the Plan in late 2013. It will state the results achieved and can make recommendations to improve the implementation of actions or suggest implementation priorities for the remaining implementation period of the Plan. This appraisal will also outline adaptation actions supported at a local level within the framework of SRCAE and PCET programmes and assess their alignment with National Climate Change Adaptation Plan actions.

Finally, the Evaluation Committee will be responsible for producing an overall evaluation of this initial plan by 2015. The report produced will provide a basis for carrying out the next phase of the Plan, which will also benefit from the knowledge acquired, especially with regard to study and research activities carried out as part of the first plan.



Presentation of the action sheets

CROSS-CUTTING action sheet

Illustration. The IPCC Fourth Assessment Report recalls that change will affect a number of sectors and that several impacts will be cross-cutting in nature.

Climate change adaptation must include all public policy to ensure coherent implementation of adaptation measures. Although some adaptation measures are specific to a particular sector, others are key to adaptation across all sectors. These cross-cutting actions are grouped together below.

Key measure

Action 2

Systematically mainstream climate change in delegated public service contracts and public service contracts let by the government

Climate change could increase the frequency of certain types of disruption affecting the delivery of public services. Therefore, when delegated public service contracts or public service contracts are reviewed by the government during the National Climate Change Adaptation Plan implementation period, issues relating to the vulnerability of a service to climate change and any potential service disruption will be mainstreamed in the provisions of the contract. Delegated service providers will be required to carry out a climate change vulnerability study for the service and to inform the government, if required, of any actions which will be undertaken to guarantee service delivery.

Lead: DGEC

Timetable: 2012-2015

Action n°1: Define climate change reference scenarios

Many sectors of the economy require benchmarks so that they can scope their long-term actions and decisions more accurately.

The uncertainty inherent in climate change projections, as well as the range of climate change projection models, means that there is no single value available for climate change over a given time period. The range of values produced is often too broad to form the basis for technical scaling. Therefore public authorities will produce "simplified" climate reference scenarios in response to the requests expressed during the consultation exercise.

Lead: DGEC

Partners: Environment Alliance⁷

Action n°2: Systematically mainstream climate change in delegated public service contracts let by the government

(cf Key measure)

Lead: DGEC

Partners: Government departments responsible for drafting delegated public service contracts

Action n°3: Mainstream climate change projections in risk assessments over the life expectancy of classified installations

Risk management procedures must remain in operation whatever changes occur in the climate. It is therefore necessary to ensure that Classified Installations for Environmental Protection (CIEP), and those covered by the SEVESO directive, mainstream climate change in their mandatory risk assessments, if this is appropriate for their anticipated life expectancy. The extension of this measure to nuclear power plants will also be examined.

Leads: DGEC and DGPR

Partners: Decentralised government departments

Action n°4: Facilitate thinking in order to define the notion of acceptable risk

Adaptation choices are often determined by the level of risk against which protection is required. It is therefore necessary to define a method for setting an acceptable level of risk. Defining this threshold will make it possible to choose between several adaptation options or to scale the level of protection required appropriately. An initial study has already been submitted.

Lead: Prevention and Precaution Committee

⁷ See Research action sheet for a list of Alliance partners

Partner: CGDD

Action n°5: Increase research into adaptation in the context of Future Investments

The concept of climate change has been backed for several years by the entire national scientific community, which has made a significant contribution to achieving recognition for it in national and international political bodies, notably the IPCC. Expert teams are working at the highest level to analyse this phenomenon and a number of programmes are currently exploring adaptation and mitigation mechanisms. By way of illustration, under the French organic budget law, Programme 187 alone (which brings together BRGM, EMAGREF, CIRAD, IFREMER), INRA and IRD) received a total of €1.309 million, after being broken down in the Initial Finance Law 2011. It involves more than 18,000 full-time equivalent staff.

Work on climate change adaptation will benefit from significant research funding within the context of Future Investments (*Investissements d'avenir*). At the end of the first call for tenders, over €391 million was committed to projects relating directly (GEOSUS) or indirectly (IRT Lyon Biotech) to climate change adaptation.

Lead: MESR

Timetable: 2011-2015

HEALTH sheet

Illustration. Sample climate change index for health: the number of days in the year on which the maximum daily temperature is abnormally high.⁸ This index is set to rise sharply in the coming decades.

Since the IPCC First Assessment Report, observations and modelling have increased understanding of observed and projected climate change and its impacts on the environment and society. These changes are emerging against a general background of environmental, demographic, social and economic disruption, as well as global communications and travel. It is now accepted that they will affect human health through direct or more indirect mechanisms.

Several classic health risks and environmental events likely to be exacerbated by climate change have been identified in French, European and international reports: the emergence or re-emergence of infectious diseases, an increase in the frequency and intensity of extreme events and significant environmental changes.

Key measure

Measure in Action 3

Create a “Health-Climate” monitoring group within the HCsp

A permanent multidisciplinary team comprising experts in climate change science and health and also expert social economists, teachers and researchers – notably in the biodiversity and ecotoxicology fields – will be set up within the High Committee for Public Health (HCsp). This “Health-Climate” group will carry out periodic reviews of climate change literature, assess data, alert the authorities and produce various management recommendations such as research or studies, training, monitoring measures, or in-depth risk analysis by health agencies, for example.

Lead: HCsp

Timetable: 2011-2012

Action n°1: Consolidate “Health-Climate” research

The Health-Climate research structure will be reinforced by the creation of a working group as a result of the consultation with Interministerial Groups for Research and Innovation (GIMRI), created as part of the SNRI by the MESR. The following GIMRIs are involved:

- Life sciences and technologies
- Sciences and technologies for the environment and global ecology
- Human and social sciences

The working group will develop recommendations for Health-Climate research and define research guidelines. It will ensure the monitoring and implementation of the guidelines defined and update them if required.

A study programme will be defined to support public decision-making, notably regarding the behaviour of people in vulnerable groups in the case of extreme climate events.

This action has one measure.

- **Consolidate “Health-Climate” research.**

Leads: MESR and MTES/DGS

Partners: GIMRIs, High Committee for Public Health

Action n°2: Introduce or increase monitoring of risk factors likely to be influenced by climate hazards (extreme events)

In order to track trends associated with climate change, monitoring of pollen, moulds, vectors and host reservoirs for disease, as well as toxin-producing microorganisms, will be increased.

This action generates three measures:

- **Monitor pollens and moulds**
- **Monitor vectors and reservoir hosts**

⁸ J.Jouzel, climate scenario assignment, report, January 2011

- **Monitor the development of toxin-producing microorganisms**

Leads: DGS, InVS, RNSA, Anses, Ifremer

Partners: MEDDTL, CNRS, INRA, ARS, CNEV, EID

Action n°3: Evaluate the risks to human health associated with extreme events and assess the health impacts of adaptation measures, notably by creating a “Health-Climate” monitoring group

A specific “Health-Climate” monitoring group will be created within the High Committee for Public Health. ANSES will provide a statement on recycling grey water as well as water intended to artificially replace groundwater. Work will also be carried out to improve the resilience of the cold chain in the context of climate change.

This evaluation will be carried out via three measures.

- **A “Health-Climate” monitoring group within the High Committee for Public Health (HCsp) (cf Key measure)**
- **Evaluate the health risks associated with quantitative conservation of water resources**
- **Reinforce food safety**

Leads: DGS, HCsp, Anses, Cemagref

Partners: DGEC, DGPR, DGAL, DGALN

Action n°4: Develop preventive health actions taking into account the consequences of extreme events and adapt vigilance and alert mechanisms

As part of this action, there will be training implemented on UV indices in French overseas *départements*, consultation with Anses on the identification and prevention of occupational risks associated with climate change, a review of technical standards in health establishments to guard against the future effects of climate change, the development of national heatwave and cold weather plans (*Plan Canicule* and *Plan Grands Froids*) in the context of climate change, as well as mapping of bathing areas which present a risk due to extreme temperatures (microorganisms, leptospirosis, etc.).

This action comprises five measures.

- **Extend the calculation of UV indices to French overseas territories**
- **Reinforce management of occupational risks caused by climate change**
- **Analyse and adapt tools relating to the built environment and technical facilities in health, social care and community health centres**
- **Mainstream climate change in national preventive and care plans**
- **Map bodies of surface water at risk of degradation in quality in the event of extreme temperatures**

Lead: DGALN

Partners: Government departments, water agencies, Onema, Cemagref

Action n°5: Raise awareness among all stakeholders and provide education via targeted training, information and communications initiatives

Several actions have been identified targeting specific stakeholders. Communication tools on UV protection will be adapted for use in French overseas territories. Health impacts of climate change will be integrated into medical training. There will be broadcast public service messages about the harmful effects of climate change on health. Lastly, information and facts to raise consumer awareness of cold chain management best practice will be broadcast.

This action comprises four measures.

- **Provide information about protection against UV rays in French overseas territories**
- **Mobilise professional stakeholders, raise awareness and provide education about the health impacts of climate change**

- Mobilise the public, raise awareness and provide education about the health impacts of climate change
- Make consumers and their representatives aware of food safety

Leads: DGS, ARS, Anses, Inpes

Partners: DGOS, DGS, DGCIS, EHESP, InVS

WATER RESOURCES action sheet

Illustration. Sample climate change index for water: the duration of periods of intense drought. There is a pronounced increase in the duration of summer drought in all regions.

One of the main challenges, if not the biggest, is to match dwindling supply to a demand which is already not being met in some areas and which will increase as a result of climate change and other factors such as population growth.

Integrated water resource management by catchment basin must form part of a global management process which takes into account different water requirements, including environmental requirements, and currently aims to achieve the targets of the European Framework Water Directive, within the framework of programmes for development and water management approved in 2009 for the period 2010-2015. Predicted climate change impacts will initially affect regions which are currently experiencing pressure on water resources. It is therefore necessary to prevent any form of scarcity of water resources immediately and to promote a strategy for saving water and optimising its use.

Key measure

Measure in Action 3

Develop water-saving and ensure more efficient use of water - Make 20% savings in water abstracted, excluding winter water stocks, by 2020

Each water user has a water saving potential which can be exploited. Everybody can use water more sparingly, adapt patterns of use and thus contribute to building the national capacity to adapt to climate change. We can make savings of 20% on current water consumption.

Leads: DGALN/DEB, MTES, water agencies, EDF

Timetable: 2011-2015

Action n°1: Improve understanding of the impacts of climate change on water resources and the impacts of various potential adaptation scenarios

The Explore 2070 project aims to develop appropriate adaptation strategies by taking into account the impacts of climate change and human activities on water resources for a 2070 horizon in continental France and French overseas *départements*. Studies, notably modelling studies, are also underway on a national and major hydrographic basin level in order to achieve a more accurate assessment of the vulnerability of aquatic environments to climate change.

The following six measures are planned:

- **Identify, via a national study in continental France and French overseas *départements* – Explore 2070 – the costs and risks associated with various climate, demographic and sociological scenarios for a 2070 horizon and evaluate the ability of different adaptation strategies to minimise them**
- **Evaluate the impact of climate variability on rates of low-flow regimes, based on past observations**
- **Map the vulnerability of bodies of groundwater to climate change**
- **Evaluate the conditions for implementing active groundwater resource management**
- **Acquire new knowledge on the scale of major hydrographic basins, notably by modelling hydrosystems integrating climate change impacts**
- **Disseminate the knowledge acquired via a portal**

Leads: DGALN – ONEMA - water agencies

Partners: Environment Alliance⁹

Action n°2: Provide effective tools for monitoring structural imbalance phenomena, resource scarcity and drought within the context of climate change

It is necessary to increase our ability to monitor water resources in the medium and long term. Four measures respond to this requirement:

⁹ Cf Research action sheet for the composition of the Alliance

- Implement a piezometric reference network for monitoring the impact of climate change on groundwater
- Optimise existing meteorological networks (meteorological, hydrological, water temperature) in order to build vigilance and alert capability regarding the status of aquatic environments and to adapt usage to the available resources, including in French overseas *départements*
- Create a National Low Water Observatory (ONDE), coordinated at a national level
- Track changes in water demand by setting up a national abstraction database

Leads: DGALN/DEB, AEAG, ONEMA

Partners: DGPR, catchment area DREALs, BRGM

Action n°3: Develop water saving and ensure more efficient water use – Reduce water abstraction by 20%, excluding winter water stocks, by 2020

(cf Key measure)

The measures corresponding to these actions are:

- Promote water-saving across all sectors and uses, particularly in regions experiencing shortages. Support rainwater recycling
- Support treated waste water recycling for crop or green space irrigation, particularly in regions experiencing shortages. This should be carried out in accordance with strict precautionary measures and various forms of environmental, agronomic and health monitoring
- Improve efficiency in the energy sector in terms of abstraction and water consumption for existing and future power stations in the energy sector
- Optimise existing water storage in the agricultural sector and implement the creation of artificial reservoirs in accordance with environmental constraints, in addition to efficiency optimisation measures for water use (linked to measure 4.2)

Leads: DGALN/DEB, MTES, water agencies, EDF

Partners: MAAPRAT, local authorities

Action n°4: Support the development of activities and land use which are compatible with locally available water resources

This involves identifying potential adaptation scenarios for activities which have heavy water consumption in regions currently experiencing shortages, optimising water storage, developing water-efficient agricultural activities and reducing the impermeability of soils thus promoting rainwater infiltration.

This action is divided into the following four measures:

- Identify potential adaptation scenarios for activities which use water in regions already experiencing shortages
- Based on a multi-use rationale and in compliance with SDAGE programmes, optimise existing water storage and create water storage if required, notably by replacing abstraction during low-flow periods with winter abstraction. The use of water storage must be conditional on the implementation of measures to optimise efficient water use
- Develop water-efficient activities within the agricultural sector
- Make soil less impermeable, thus promoting rainwater infiltration

Leads: DGALN/DEB, MAAPRAT, DATAR, local authorities, INRA

Partners: Water agencies, Environment Alliance

Action n°5: Reinforce the integration of climate change issues into water planning and management, in particular in the next water agency intervention programmes (2013-2018) and programmes for development and water management (2016-2021)

This action aims to integrate the expected impacts of climate change and the adaptation measures required into water agency intervention tools and water management planning tools on a major hydrographic basin scale. It will therefore entail adequate mainstreaming of climate change issues in future water agency intervention programmes and SDAGE programmes. This action is not divided into measures.

Leads: DGALN/DEB, water agencies

BIODIVERSITY action sheet

Illustration. Sample climate change index for biodiversity: average daily temperatures. The increase by 2100 is approximately 2.5 to 3.5°C for scenario A2.

In accordance with the targets and guidelines defined in the National Biodiversity Strategy 2011-2020 (SNB), the proposed actions aim to preserve or restore the potential for nature to adapt by reducing human pressures on species and environments, where required, and by promoting ecological variety and continuity at a local level.

These are reversible, “no regret” measures so that decisions can be adapted as scientific knowledge improves understanding of the impacts of climate change on biodiversity.

Key measure

Study the current and potential future consequences of climate change for biodiversity by pursuing and promoting the approaches already initiated in networks of protected areas.

There are two defined targets: 1) identify species and environments which are especially sensitive and which would act as good monitoring indicators for climate change in protected areas (work is currently underway in the Pyrenees with the MNHN); 2) produce an inventory of all the sites where observations are taking place into the effects of climate change (funded by the Ministry for Ecology) in order to set shared parameters and ensure that natural environments are well represented.

Lead: DGALN/DEB

Timetable: 2012

Measure in Action 2

Action n°1: Integrate biodiversity issues associated with climate change adaptation into research and experimentation

Of the three priority themes of the National Research and Innovation Strategy (SNRI), two are particularly affected by global changes: “environmental urgency and ecotechnologies” and “health, well-being, food and biotechnologies”. These priority themes are the benchmark for defining the allocation of funds from the state budget and for planning thematic research in France.

This research calls for a complementarity between observation, experimentation and modelling and simultaneous support for these three major areas. Research development must be backed by stronger networks, notably by organising Ministry for Ecology programmes and providing resources for biodiversity research. The expertise emerging from this research must be actively stimulated and used.

This action is divided into 8 measures.

- **Include in the contracts of agreed objectives for major research organisations research into the interaction between climate change, change of use and biodiversity, and into the impacts of climate change on ecosystem services and the adaptation issues they raise**
- **Promote research into biodiversity and climate change within the framework of calls for tender for Future Investments (*Investissements d’Avenir*)**
- **Improve understanding of biological adaptation processes via co-funded international programmes, such as ERA-Net, dealing notably with biodiversity in relation to climate change**
- **Improve understanding of the viability and adaptation of ecosystems, territories and resources to global change via calls for national research proposals led by the ANR and MEDDTL**
- **Reinforce research via modelling and scenario-setting for biodiversity, notably in relation to the effect of environmental changes, by incorporating the socio-economic dimension**
- **Create a permanent Centre for Biodiversity Synthesis and Analysis (CESAB) where biodiversity experts can pool their data sets and ideas**
- **Set up permanent Major Research Infrastructures (including TGIR) for biodiversity and its interactions with climate change**

- **Support and contribute to the establishment of the Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES) to provide the crucial scientific expertise required for policy-making relating to biodiversity within the framework of global change**

Leads: MESR/DGRI

Partners: ANR, Environment Alliance¹⁰, Cemagref, CIRAD, CNRS, FRB, IFREMER, INRA, IRD, MEDDTL, MNHN, universities

Action n°2: Reinforce existing monitoring tools to take into account the effects of climate change on biodiversity

A biodiversity monitoring network is required in order to detect changes, understand their underlying causes and take appropriate action. Using the data collected in this way, indicators can be defined integrating biodiversity changes with climate change observed to inform debate among decision-makers and citizens.

This action comprises six measures.

- **Reinforce mechanisms for monitoring species**
- **Create a structured network of volunteer observers of the impact of climate change on biodiversity and changes in biodiversity**
- **Improve understanding of land use and plant life**
- **Map habitats in continental France and French overseas territories on a 1/25 000 scale with regular updates, so that changes in the distribution and size of habitats can be monitored**
- **Pursue and promote existing approaches in protected areas networks relating to the study of current and potential future consequences of climate change on biodiversity (cf Key measure)**
- **Provide robust and regularly updated indicators for the effects of climate change on biodiversity**

Leads: MEDDTL/DGALN/DEB

Partners: National Botanical Conservatoires (CBN) and their federation (FCBN), ONCFS, ONF, non-profit nature associations, FNC, FNPF, protected areas network, IGN-IFN, MEDDTL/CGDD/SOeS, Environment Alliance, MAAPRAT/DGPAAT, INRA, MNHN, ONERC, ONEMA

Action n°3: Promote integrated land management, mainstreaming the effects of climate change on biodiversity

Integrated land management taking into account the effects of climate change on biodiversity must preserve or restore the majority of the potential which will enable nature to adapt. This implies notably managing resources sustainably to ensure continuity of delivery of ecosystem services in the face of climate change, promoting variety quality and functionality in natural environments and safeguarding viable populations of the largest possible number of species.

This action comprises three measures.

- **Implement and preserve the Blue and Green Infrastructure (TVB) and identify and preserve an environmental network in French overseas territories (REDOM - BEST) in order to improve adaptation to climate change of the environmental structure as set out in the Grenelle laws**
- **Mainstream climate change in the strategy for creating protected areas and in the terms and conditions governing the management of existing and future protected areas**
- **In compliance with the Grenelle laws, standardise planning documents which relate to integrating sustainable development within a region and aim to preserve biodiversity in the context of climate change**

¹⁰ Cf Research action sheet for the composition of the Alliance

Action lead: MEDDTL/DGALN/DEB

Action n°4: Integrate climate change adaptation into strategies and plans implemented by the government to preserve biodiversity

The approach selected in order to mainstream climate change impacts in government conservation policies is based on:

- organising scientific expertise in order to capitalise on and pool existing information and increase collaboration between the various conservation policy stakeholders,
- developing an approach prioritising flexibility and reversibility,
- gradually integrating appropriate measures into government regulations, strategies and plans.

This action comprises four measures.

- **Establish scientific monitoring relating to the current state of available knowledge on the impacts of climate change on biodiversity**
- **Mainstream climate change in regulations, strategies and national action plans for species protection and the fight against alien invasive species**
- **Mainstream the effects of climate change in assessments of the environmental impacts of plans submitted which infringe stringent protection of species**
- **Carry out collegiate studies mainstreaming climate change with stakeholders affected by ex situ conservation policies relating to plant species**

Leads: DGALN/DEB

Partners: Environment Alliance, FRB, MNHN, GIPECOFOR, FCBN, ONCFS, ONEMA, MAAPRAT, decentralised services

NATURAL HAZARDS action sheet

Illustration. Sample climate change index for natural hazards: extreme daily precipitation values. Maps of extreme precipitation changes show regional contrasts.

Where natural hazards are concerned, climate change will mainly be reflected in widespread pressure on low-lying coastlines, an increased risk of forest fires and a rise in damage caused by shrinkage-swelling of clay soils. Mountain areas, which are very sensitive to changes in temperature and precipitation, are already being affected by changes which are likely to alter the phenomena which trigger natural hazards. Current policy for the prevention and management of natural hazards provides an appropriate framework to respond to these issues if certain aspects are strengthened and future changes are foreseen.

Key measure	Measure in Action 2
Establish an infrastructure designed to acquire, process, archive and distribute sea level data in order to observe and understand long-term sea level variations The review of policy relating to coastline risk prevention plans must immediately take into account the anticipated rise in sea level caused by climate change. <u>Leads:</u> DGPR, SHOM <u>Timetable:</u> 2011-2015	

Action n°1: Develop knowledge (hazards, issues, methods) in the various sensitive areas

The seven measures proposed involve improving awareness of natural hazards today and projections for the future, detecting trends for change and developing methods to analyse and evaluate natural risks.

- **Consolidate understanding of extreme sea flooding and evaluate the impact of climate change on coastal hazards**
- **Improve understanding of shrinkage-swelling phenomena in clay soils and gravitational landslides in relation to climate conditions**
- **Consolidate understanding of flood risks and evaluate the impact of climate change on the scale of large hydrographic basins**
- **Inventory flood prevention measures and develop a decision-support tool**
- **Improve understanding of avalanche activity and its development**
- **Develop knowledge relating to cyclone activity in French overseas territories**
- **Develop methodological tools to analyse and evaluate the potential domino effects and adverse configurations associated with climate change**

Leads: DGPR, CGDD, MESR

Partners: DGALN, Cemagref, CERTU, SHOM, CETMEF, BRGM, LNHE, IFREMER, Météo-France, CEN, CSTB, IFSTTAR, INERIS, ISTERRE, universities, ONF, RTM

Action n°2: Extend observation and make data available

The seven measures proposed aim to establish a natural hazard reference baseline prior to measuring changes associated with climate change. They will attempt to organise monitoring and availability of data, in association with developing a natural hazard observatory.

- **Establish an infrastructure designed to acquire, process, archive and distribute sea level data in order to observe and understand long-term sea level variations (cf Key measure)**
- **Maintain and develop the interministerial French forest fire database and improve public access to it**

- Consolidate mapping of areas, which are potentially vulnerable to summer forest fires in the medium term
- Carry out a feasibility study for introducing long-term monitoring of the evolution of natural hazards in mountain areas based on existing networks
- Set up an observation network for shrinkage-swelling of clay soils and gravitational landslides based on existing experimental sites (global monitoring, data-sharing, making information available to the research community)
- Map flood risks for territories at significant risk of flooding within the framework for implementing the European Floods Directive
- Explore the idea of long-term monitoring of the evolution of hazards associated with rises in water levels and flooding

Leads: DGPR, MAAPRAT, SHOM

Partners: LEGOS, LIENSs, MIOMCTI, IFN, ONF, Météo-France, PARN, INERIS, BRGM, CSTB, IFSTTAR, Cemagref, IGN, universities

Action n°3: Standardise the concept of vigilance, alerts and the associated mechanisms and make systematic provision for lessons learned feedback

This action makes provision for three measures: monitoring the evolution of forest fire risk, gradual standardisation of weather monitoring, and the definition of a reliable lessons learned feedback process following major incidents (floods, forest fires, landslides, etc.).

- Monitor changes in the forest fire weather index
- Make provisions to extend the weather watch system to “tidal wave and flooding” hazards
- Establish a global and reliable lessons learned feedback process after major events

Leads: MIOMCTI/DSC, DGPR

Partners: SHOM, Météo-France, MAAPRAT, IFN, ONF, CGDD, CGEDD, CETMEF, IFSTTAR, CERTU

Action n°4: Mainstream the impact of climate change on natural hazards in urban development management

The five measures proposed involve defining the terms for mainstreaming potential risks associated with climate change in urban planning documents, on the one hand, and in specific natural hazard prevention documents, on the other hand.

- Mainstream the potential impacts of climate change in urban planning documents such the SCOT or PLU
- Integrate climate change into information documents produced by the government to enable mayors to develop municipal information documentation relating to major risks (DICRIM)
- Specify the terms and conditions for reviewing natural hazard prevention plans (PPRN) in order to mainstream the impacts of climate change when statutory reference hazards are defined
- Mainstream the impact of climate change on sea levels in reviews of policy relating to coastal risk prevention plans
- Make provision for a strategic “climate change adaptation” component in local strategies within the framework of the implementation of the European Floods Directive

Lead: DGPR

Partners: DGALN, DGEC/ONERC, MIOMCTI



Action n°5: Reduce vulnerability and improve resilience and climate change adaptation

The main focus is methodological studies: producing reference guides relating to adapting urban developments and coastal defences, forest stands, construction measures to fight shrinkage-swelling of clay soils and sustainable development tools.

This action comprises six measures.

- **Suggest adaptation measures for existing coastal defences**
- **Explore the potential for natural regeneration of various types of forest stand following forest fires**
- **Evaluate construction recommendations and current professional practice and quantify their degree of adaptation to the anticipated impacts of climate change in areas subject to shrinkage-swelling of clay soil**
- **Produce an inventory of second-generation damage to structures affected by shrinkage-swelling of clay soils with regard to practical remedies for this damage**
- **Produce technical guides relating to clay soil characteristics, foundation design and repairs to structures affected by shrinkage-swelling of clay, in addition to summary information documents for professionals**
- **Develop a methodological tool to assess the robustness (resilience) of regions to natural hazards**

Leads: DGPR, DGALN, CGDD

Partners: MIOMCTI, MAAPRAT, INRA, Cemagref, CETMEFBRGM, CSTB, IFSTTAR, INERIS, AQC

AGRICULTURE action sheet

Illustration. Sample climate change index for agriculture: soil moisture index. This index is falling for a 2100 horizon, irrespective of scenario.

The agricultural sector is especially sensitive to the effects of climate change. In the context of adaptation to climate change, agriculture will retain its primary function of providing food. Despite certain inertial factors specific to the agricultural sector, adaptation must form part of a strategic vision, including environmental, economic and social issues as a whole, both at a French and a European level, in order to function efficiently.

Key measure

Measure in Action 4

Promote water-efficient agriculture

Water management is a major factor in view of a potential drop in rainfall levels. In parallel to actions to increase supply, there are two complementary options available for adaptation to scarcity of water resources: reducing water requirements for crops and improving the efficiency of water resource use.

Lead: DGPAAT

Timetable: 2011-2015

Action n°1: Pursue innovation via research and lessons learned and facilitate its transfer to professionals and teachers

The main aim is to develop ways of adapting equipment, technical approaches and cultural practices with all stakeholders and to facilitate their dissemination.

This action comprises three measures.

- **Create and make available online annually updated summaries of agricultural research programmes on a European, national and regional scale relating to climate change impacts and adaptation**
- **Integrate climate change adaptation into contracts of agreed objectives and research programmes undertaken in the period 2011-2015**
- **Facilitate innovation and knowledge transfer (including lessons learned) by promoting cooperation between farmers, all agricultural development stakeholders, and the basic and applied research community**

Leads: DGER, DGR

Partners: Environment Alliance

Action n°2: Promote spatial planning relating to local vulnerabilities and the new opportunities available

Regional public policy must take adaptation to climate change of agricultural systems and associated areas of activity into consideration. There are two measures relating to this target.

- **Integrate climate change adaptation into regional agricultural policy**
- **Improve the implementation of targets for reduced absorption of agricultural land in urban planning policy**

Lead: DGPAAT

Action n°3: Adapt monitoring and alert systems to new health risks

In order to understand and monitor the impacts of climate change, it is necessary to be able to anticipate threats as they develop. Alert and monitoring systems must be designed as flexible tools which can be adapted rapidly to new situations.

This action comprises four measures.

- **Increase expertise relating to vectors**



- **Increase studies on interactions between climate change, plant biology and health**
- **Reinforce the structure of animal disease monitoring mechanisms**
- **Reinforce the structure of plant disease monitoring mechanisms**

Lead: DGAL

Partners: DGS, DGPR, ANSES, DGPAAT, etc.

Action n°4: Manage natural resources sustainably and in an integrated manner to reduce the pressures caused by climate change and prepare for ecosystems adaptation

Adaptation will be all the more straightforward if the overall environment is in a good state generally. This action aims not just to preserve the status quo, notably via incentives, but also to create new resources wherever possible. It comprises four measures.

- **In public policy, promote natural resource management aimed at limiting the effects of climate change**
- **Preserve genetic resources for future adaptation**
- **Promote water-efficient agriculture (cf Key measure)**
- **Optimise water storage**

Lead: DGPAAT

Action n°5: Manage the risks inherent in variability and climate change in agriculture

Upstream, it is crucial to provide a structure and make references as well as genetic material available to stakeholders so that better adaptation of crops and animal husbandry to climate change can be achieved. In addition, incentive mechanisms for insurance or mutual funds encourage farmers to take adaption measures and to incorporate risk factors into their decisions.

This action comprises two measures.

- **Improve farmers' cover against climate hazards by developing insurance mechanisms (both in quantity and quality)**
- **Create a new tool, in the form of a mutual fund, to enable farmers to qualify for compensation in the event of an outbreak of an animal or plant disease or an environmental disaster**

Lead: DGPAAT

Partners: MINEFI, MEDDTL, professional agricultural organisations, etc.

FOREST action sheet

Illustration. Sample index for climate change in forests: soil moisture. This index is falling for a 2100 horizon, irrespective of the scenario. It should be noted that the trend for strong winds cannot be determined for France.

The forest sector is particularly sensitive to the effects of climate change, which is an additional or aggravating risk factor. In addition to an increase in the frequency of exceptional events, there are also fundamental changes which must be taken into account immediately, given the length of forest cycles. These events and developments can present advantages (an increase in productivity in certain areas, for example) or cause problems (changes in the range of distribution of tree species, aggravation of risks) which could lead to the decline of some stands on the fringes of a range of distribution.

Key measure

Measure in Action 3

Conserve, adapt and diversify forest genetic resources

Forest genetic resources constitute the potential for the forests of the future. In tandem with reinforcing the network for conserving existing genetic resources, it is crucial to select new forest varieties which are better adapted to future climatic conditions. The widest possible genetic diversity should be ensured when forest stands are replaced.

Lead: DGPAAT

Timetable: 2012-2015

Action n°1: Pursue and increase research and development on adaptation of forests to climate change

The variety of subjects to be addressed and the funding which needs to be mobilised require coordinated research activity in order to promote synergies between stakeholders. This coordination is based on a prior summary of existing studies and proposals for areas to be explored in greater depth. The effective transfer of advances made by research to development stakeholders should allow decision-support tools to be introduced rapidly to meet forest managers' requirements.

This action comprises four measures.

- **Mobilise resources to fund completed research on priority topics**
- **Integrate a strategic component devoted to research and development on adaptation to climate change into forestry institution contracts of agreed objectives**
- **Establish, update annually and disseminate a summary of research activities carried out on the impacts of climate change and adaptation of forests to climate change**
- **Provide RMT AFORCE with funding to extend and reinforce its actions**

Lead: MAAPRAT (DGPAAT/DGER)

Partners: MEDDTL, GIP ECOFOR, RMT AFORCE

Action n°2: Collect environmental data, promote it and make it accessible and ensure monitoring of impacts on ecosystems

To ensure that all stakeholders in the sector understand how to adapt their activity to climate change and thus foster the emergence of initiatives suitable for regional use, it is crucial to promote and organise access to essential ecological and climate data.

This target generates four measures.

- **Develop geomatic tools to improve data gathering and processing**
- **Draw up and make available a standardised description of forest data sources, particularly those containing data relevant to climate change, prioritising freely accessible data**
- **Make climate change impact indicators for forests available online**

- **Promote and adapt forest monitoring to track the way in which ecosystems respond to climate change**

Lead: MAAPRAT (DGPAAT)

Partners: MEDDTL, GiP ECOFOR, ONERC, Cemagref

Action n°3: Promote the adaptive capacity of forest stands and prepare the timber sector for climate change

Forest management must promote the adaptation of forest stands in order to preserve as much of the potential of forests as possible and to safeguard their various associated goods and services. This action comprises five measures.

- **Integrate the theme of climate change adaptation into the review of regional forestry strategies (ORF)**
- **Evaluate existing experiments in order to provide accurate guidance for establishing new mechanisms aimed at studying various management options**
- **Conserve, adapt and diversify forest genetic resources (cf Key measure)**
- **Support foresters' actions by initiating a measure (or measures) in the forthcoming Rural Development Regulations (RDR 2014/2015) to provide funding for actions to help forest stands to adapt**
- **Pre-empt quantitative and qualitative changes in timber industry supplies**

Lead: MAAPRAT (DGPAAT)

Partners: DRAAF, INRA, FCBA

Action n°4: Preserve biodiversity and services delivered by forests facing natural hazards

Forest environments constitute major biodiversity reservoirs, notably in tropical forests, which must be preserved. Furthermore, in some areas forests play a crucial role in providing protection from various natural hazards and specific measures are required to perpetuate this role in the long term in the changing climatic environment.

This action is expressed in the following measure:

- **Produce a diagnostic report of Natura 2000 forest sites in France**

Leads: MAAPRAT (DGPAAT), MEDDTL

Action n°5: Anticipate and manage extreme climate events

Climate change heralds increasingly frequent, powerful or protracted extreme events. Such events give rise to exceptional circumstances which require new management techniques deviating from standard practice.

This action comprises two measures.

- **Improve protection for foresters against climate hazards by developing insurance systems (both in terms of quantity and quality)**
- **Develop crisis management plans for various extreme events (storms, health crises)**

Lead: MAAPRAT (DGPAAT)

FISHERIES AND AQUACULTURE action sheet

Illustration. Example of a climate change index for fisheries and marine aquaculture: ocean acidification will upset the current biological balance. The higher incidence of droughts and heatwaves will increase pressure on continental French aquaculture.

Climate change impacts fisheries and aquaculture by increasing sea temperatures and raising sea levels, melting glaciers, causing modifications in ocean salinity and acidification and changing the distribution and abundance of fish stocks. Climate change jeopardises the sustainability and productivity of a basic economic and environmental resource, but it can also provide opportunities, in particular in the field of aquaculture. The response of the marine fisheries and freshwater or marine aquaculture sectors to climate change is largely dependent on the adaptation strategies which will be put in place.

Key measure

Action 3

Adapt the French shellfish sector to climate change issues

The implementation of studies on the natural adaptation capability of shellfish and mussels to a rise in temperature and increased vigilance with regards new diseases are the primary issues which the sector must address in order to adapt to the effects of climate change.

Leads: DPMA, DGAL

Timetable: 2012-2015

ENERGY AND INDUSTRY action sheet

Illustration. Sample climate change index for energy: heating degree days and cooling degree days. There is a clear downward trend for heating degree days and an upward trend in the number of cooling degree days.

Climate change will have contrasting impacts on the energy sector: demand and pressures in hot periods will increase and, by contrast, winter consumption should decrease.

As outlined in the IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation, climate change could lead to a growth in water, solar and wind power, but the future impact of these developments at a national and local level is still unknown.

Key measure

Action 2

Promote the use of more efficient cooling equipment (air conditioning) or equipment using renewable or recoverable energy

Pursuing mechanisms for Energy Saving Certificates (ESC) and the adoption of a 3rd period will encourage people to replace the most energy-intensive cooling equipment and promote renewable energy sources such as geothermal energy.

The Heating Fund will back collective cooling projects using renewable or recoverable energy, which will mean fewer pressures on the network during hot weather.

Lead: DGEC

Timetable: 2011-2015

NB: These actions are treated as measures.

Action n°1: Manage the emergence of peaks in summer energy consumption via an electrical capacity obligation mechanism

Cold spells usually trigger consumption peaks. A planned capacity obligation established in this context would also be adapted to peaks in hot spells (linked to cooling requirements). It would safeguard continuity of supply available for use.

Lead: DGEC

Action n°2: Promote the use of more efficient cooling equipment (air conditioning) or equipment using renewable or recoverable energy

(cf Key Measure)

Action n°3: Make all hydrogeological and climate data available

This request, which emerged from the consultation exercise, will be met by the implementation of a national water data plan. This will improve the quality of data available online on the Eau France knowledge-sharing portal.

Climate data and regional projections will be available from 2012.

Leads: ONEMA and Météo-France

Partners: Government departments, water agencies, Cemagref, BRGM

Action n°4: Integrate climate change into the monitoring indicators of the Framework Water Directive

Long-term monitoring of the status of bodies of water within the FWD is an important tool for observing the effects of climate change. This permanent observation process should be able to isolate disruptions attributable to global warming from those caused by industrial activities using water for cooling (notably electricity generation plants). The permanent network, which will be introduced in 2012, will integrate this aspect of climate change into the indicator monitoring process.

Lead: DGALN



Partners: Government departments, water agencies, Onema, Cemagref

Action n°5: Identify French industrial sectors which are vulnerable to climate change and potential opportunities (2030-2050)

Several economic sectors (agriculture, forestry, energy generation, tourism, transport, etc.), are positively or negatively affected by changes in the climate, depending on the case. The industrial sector is very important for the national economy and the balance of trade, but to date there is little evidence available about its vulnerability to future climate change.

This action aims to evaluate the sensitivity of this sector to climate change and the implications in terms of economic intelligence at a national level for a 2030 and a 2050 horizon.

Lead: DGCIS

Partner: DGECC

INFRASTRUCTURES AND TRANSPORT SYSTEMS action sheet

Illustration. Sample index for transport infrastructures: the number of days in the year when temperatures are abnormally high. The increase is appreciably higher in the summer than during the rest of the year.

All forms of transport are affected by the impacts of climate change on transport networks. Adaptation has become vital due to the long functional lifespan of networks and transport equipment. Various methods have been identified. These make it possible to analyse the impact of climate change, to anticipate transport system vulnerabilities and make preparations to improve the resistance and resilience of existing and future infrastructures to ensure the continuity and safety of transport services for goods and passengers.

Key measure

Action 1

Review and adapt technical standards for the construction, maintenance and operation of transport networks (infrastructures and equipment) in continental France and overseas territories.

This involves ensuring that infrastructures built several decades ago to last for a long time (up to a century or more) according to technical standards developed between thirty and fifty years ago (or even more in the case of some structures, even if they have been revised, notably to take into account safety aspects and the infrastructure reinforced accordingly) can satisfy the requirements for potential moderate and extreme conditions expected as a result of climate change. The same applies to transport equipment. For new transport projects, it is of course essential that national and European technical standards (e.g. Eurocodes) are adequate for a revised set of hazards. This review will require in-depth local knowledge of climate hazards and parameters.

Leads: DGITM, DGAC, DGEC, CGDD, DGPR

Timetable: 2011-2015

Action n°1: Review and adapt technical standards for construction, maintenance and operation of transport networks (infrastructures and equipment) in continental France and French overseas territories

(cf Key measure)

This action is divided into three measures.

- **Inventory technical standards referring to climate variables affected by climate change scenarios and identify the information required about climate hazards**
- **Make specific information relating to climate parameters and values available via the government (DGEC), to technical departments and contracting authorities so that standards can be adapted**
- **Propose modifications to reference standards documents and review them**

Leads: DGITM, DGAC, DGEC, CGDD, DGPR

Partners: SETRA, CETMEF, STAC, IFFSTAR, CERTU, SHOM, IPSL, BRGM, infrastructure managers

Action n°2: Study the impact of climate change on transport demand and the consequences for reshaping transport provision

Climate change may alter travel demand: changes in departure points/destinations linked notably to temporal distribution of flows, geographic distribution of populations and activities, and the appeal of tourist destinations, etc. It is necessary to address potential changes in mobility for passengers and freight in relation both to prospects for transport demand and to their impact on reshaping transport provision. The impact of changes in urban morphology will also be the focus of study.

This action is divided into measures relating to modal, geographic and temporal transport distribution.

- **For interurban travellers, initiate research into changes in population location choices and tourist destinations**
- **For urban travellers, study the link between urban development policy and transport**



- In the aviation sector, follow up the analysis into developments in air transport carried out within the ICAO framework
- Study developments in the location of economic activities and major freight corridors

Leads: DGITM, CGDD, DGAC

Partners: SETRA, CETMEF, IFFSTAR, CERTU, infrastructure operators and managers, VNF and RFF, DATAR, Tourism Department, DGALN, DREAL, ICAO, research organisations.

Action n°3: Define a harmonised methodology to diagnose the vulnerability of infrastructures and land, sea and airport transport systems

Methods used for assessing the vulnerability of transport networks to climate change are not yet well developed since climate change is still a recent issue. Methods for use in analysing risks associated with certain types of extreme event have however been developed, but they are specific to the sections of networks studied.

The scientific and technical research community, in liaison with network managers, must provide methodological resources to facilitate local studies on an individual network scale to allow a vulnerability statement for the various networks to be produced so that comparisons can be made based on criticality indices.

This action comprises two measures.

- **Develop an appropriate vulnerability analysis framework methodology for transport networks**
- **Develop a vulnerability analysis methodology designed for networks and specific points (highway, port, river or rail engineering structures, etc.)**

Leads: CGDD, DGAC, DGITM, DGPR

Partners: SETRA, STAC, CETMEF, IFFSTAR, CERTU, infrastructure managers

Action n°4: Establish a statement of vulnerability for land, sea and air transport networks in continental France and in French overseas territories and prepare appropriate and phased response strategies to local and global climate change issues

The climate change situation necessitates an analysis of the extent to which transport infrastructures, engineering structures, carriageways and railway lines or river, port and airport engineering structures could resist the impact of natural forces for their allotted lifespan (without repairs, heavy maintenance or removal). Local road networks and all decentralised infrastructures are also affected by these analyses of risks associated with climate hazards. French regions in which there is only one major high-capacity transport service should be the focus of particular attention. In these cases, the vulnerability of the infrastructure concerned (airport, port, bridge, etc.) is in fact critical. This is mainly an issue in French overseas territories, but also potentially in isolated regions in continental France (islands, valley floors in mountainous areas, etc.). Changes in average climate conditions and a rise in the number of extreme events, with an increase in the frequency and duration of undesirable events and the size of the areas affected by them, raises questions about responsibility and priorities when choosing a response strategy (withdrawal inland, reinforcement, acceptance of temporary loss of service with a shift in transport services to another mode of transport, etc.), about acceptable levels of risk (to be established or reviewed) and about the choice of timing for investing in and introducing adaptation strategies.

This action comprises two measures.

- **Carry out vulnerability studies**
- **Set up a network of contacts in order to share experiences and provide methodological support to infrastructure managers and transport operators**

Leads: DGAC, DGITM, DREAL, construction contractors and infrastructure managers

Partners: SETRA, STAC, CETMEF, CETE, CERTU

URBAN PLANNING AND THE BUILT ENVIRONMENT action sheet

Illustration. Sample index for climate change in urban planning: maximum daily temperatures. For indices relating to extremes of heat, scenarios A2 and B2 show a rising trend for the frequency and intensity of these extremes.

Buildings have a lifespan of a number of decades, a timescale during which global warming will probably occur. Adaptation to climate change does not come naturally to stakeholders and initiatives must be launched immediately to pre-empt undesirable phenomena before they become more widespread. These include a spontaneous rise in air conditioning use, new urban development on land which is liable to flood in the future, new urban developments likely to exacerbate the effects of heatwaves, the construction of new buildings which are energy-efficient but do not provide adequately comfortable summer temperatures in the context of climate change.

The existing built environment must be adapted systematically and gradually with research input.

Key measure

Measure in Action 4

Reinforce comfortable summer temperature requirements in buildings

The target for this action is to develop the criterion relating to comfortable summer temperature in heating regulation requirements in order to provide a more accurate indicator which takes into account both the scale and duration of overheating and a homogenous requirement calculated on the same basis other as performance requirements in heating regulations, i.e. expressed as an absolute value. This approach aims to target the systematic use of air conditioning to achieve a comfortable temperature in the summer.

Lead: DHUP

Timetable: 2012-2014

Action n°1: Incorporate climate change into urban planning documents

The Grenelle II law made provision for Regional Environmental Coherence Programmes (SCCE) by the end of 2012, co-produced at a regional level by the government and the region. The law requires urban planning documents to take these schemes, which normally include the Green and Blue Infrastructure into account. Preserving this ecological continuity will facilitate adaptation to climate change.

A guide will be produced outlining lessons learned for mainstreaming these programmes and also Regional Climate-Energy Plans in urban planning documents. Lastly, several SCOT programmes will be the focus of a study into vulnerability to climate change in 2012.

This action comprises two measures.

- **Mainstream biodiversity in urban planning documents**
- **Mainstream the risks and effects associated with climate change in urban planning documents**

Lead: DHUP

Partners: DGEC, ADEME and DGALN/DEB

Action n°2: Adapt nature management and green space management in cities

The "Nature in the City" plan presented on 9 November 2010 is a response to this recommendation. Several of the actions inventoried fall within the sphere of the Ministry for Ecology, Sustainable Development, Transport and the Sea.

This action is divided into three measures.

- **Set up a cycle of national biodiversity conferences on mainstreaming nature in planning, urban planning and development practices**
- **Establish a "Nature in the City" prize as part of the "EcoQuartiers 2011" awards for Eco- districts, following requests for issues relating to Nature in the City to be reflected in the call for EcoQuartiers proposals**

- **Produce methodology components for mainstreaming biodiversity in EcoQuartiers project engineering**

Lead: DHUP

Partner: DGALN/DEB

Action n°3: Combat heatwaves in cities and reduce the heat island effect

This action comprises two measures.

- **Produce a balance sheet of adaptation best practice within the framework of the “Sustainable Cities” plan**
- **Make diagnosis of vulnerability to climate change one of the assessment criteria for the award of the EcoQuartier 2012 label**

Lead: DHUP

Action n°4: Take steps to improve comfortable temperature levels in buildings in the context of a global rise in temperatures

Comfortable summer temperature levels are an increasingly pressing issue in the context of comfortable temperatures in buildings in general. Little is known about this subject, which is dominated by pressures relating to comfortable levels of winter heating, but it will assume greater importance in years to come.

The proposal is to reinforce requirements for comfortable summer temperatures in the heating regulations.

Research and experimentation into comfortable summer temperatures will be included in research programmes for the period 2012-2014.

Lastly, a baseline reference will be set for indoor air quality so that the health impacts of adapting buildings to climate change can be evaluated.

This action comprises three measures.

- **Reinforce comfortable summer temperature requirements in heating regulations (cf Key measure)**
- **Carry out research and experimentation work on comfortable summer temperatures**
- **Improve understanding of the status of air quality inside existing buildings in order to factor health constraints into measures designed to improve energy efficiency in existing buildings**

Lead: DHUP

TOURISM action sheet

Illustration. Sample climate change index for tourism: number of days of snowfall. There is an overall drop in the number of days of snowfall in 2100, although it has not disappeared altogether.

Climate change will have an influence on competition between tourist regions, their production factors (water resources), business activities and the secondary economy. Although we can expect significant changes for tourism as a market, understanding the implications of climate change is a very complex process due to the nature of tourist demand which involves a large number of parameters.

Key measure

Action 2

Refresh the brand image of cross-country skiing and trekking by mainstreaming sustainable development in ski resorts

Cross-country skiing in France is experiencing a major image makeover backed by the Ministry of Sport, with the DGCIS providing a one-off grant of 10,000 euros in 2011 (with DATAR at an institutional level) for the CNSNM.

Cross-country skiing creates an even greater feeling of well-being than Alpine skiing. It allows skiers to discover natural environments and open spaces, which reflects a basic sociological trend to combine sporting, economic and tourist activities, and demonstrate greater respect for the environment (and biodiversity) in relation to climate change.

Leads: DGCIS – Ministry of Sport

Timetable: From Autumn 2011

Action n° 1: Promote and develop cycle tourism provision

Description:

Cycle tourism entails significant rail travel to gain access to trip destinations (in approximately one third of cases), it takes place over an extended season (April to October) and generates above average economic returns. This niche market can reinforce the activities pursued by tourism professionals and tourist destinations against a backdrop of pressures on energy resources and climate change: an earlier start to the season, redevelopment of mountain tourism with cycle routes in the valleys, competitiveness with the introduction of zero carbon tourism provision, relocation of better-off customers to rural regions, etc.

The DGCIS is organising the France Vélo Tourisme initiative to promote this type of sustainable tourism to French customers and geographically close European markets, whilst pursuing the development of national cycleways and green route networks to support this activity.

The main activity is to set up a shop window website for these destinations - francevelotourisme.com - which will go live in 2012. Developing provision will include setting and disseminating new reference standards for service providers (accommodation providers, tourist offices, etc.) and supporting the development of structured major itineraries (Paris - le Mont Saint-Michel, the Vélodyssée, London - Paris, etc.).

Lead: DGCIS

Partners: Regional authority networks, economic stakeholders, user groups, ministries (ecology, sport)

Action n°2: Refresh the brand image of cross-country skiing and trekking by mainstreaming sustainable development in ski resorts

(cf Key measure)

This forms part of the cross-cutting project to promote regional attractions by the Tourism Division, which also involves a variety of operators (e.g. Grandes Traversées du Jura, and also incorporates the activities of the CNSMNN in a networking capacity).

Associated leads: DGCIS – Ministry of Sport

Partners: DATAR - National Council for Cross-country Skiing in Mid-altitude Mountain Areas (CNSNM)

INFORMATION action sheet

Illustration. A survey published in March 2011 shows that more than 6 out of 10 French people (63%) express concern about the impacts of global warming on their lifestyles.

In recent years, France has become far more sensitive to climate change issues on account of recent extreme weather events such as the exceptional storms in December 1999 and January 2009, numerous episodes of flooding, and some events with tragic consequences such as the storm of February 2010 or the heatwave in the summer of 2003, which, although they cannot be directly attributed to climate change, nevertheless serve to increase sensitivity and highlight the vulnerability of contemporary society.

A successful climate change adaptation policy depends on informed commitment on the part of decision-makers, who are aware of the complexities and new forms of vulnerability caused by climate change, and also by the adoption of measures by the population as result of their involvement in democratic debate, education, awareness raising, training, information and a critical approach. Information is a major issue in all forms of adaptation policy and it will be even better received and understood if citizens are given the means to appropriate it.

Key measure

Measure in Action 3

Develop a reference website to disseminate scientific information

Given the continuous flow of new information emerging from climate research, the Internet would seem to be the most appropriate medium for disseminating the knowledge gathered. A reference website is required to disseminate information validated by the scientific community.

Lead: ONERC

Timetable: 2011-2015

Action n°1: Increase communications aimed at the general public, elected representatives and business, using as many methods as possible

Communications relating to climate change must be organised and structured around clear shared objectives. The first measure involves defining and implementing a communications strategy. The action includes four other measures using several communications media: the internet, exhibitions and direct contact with the public.

- **Define a communications strategy**
- **Develop the Ministry's adaptation website**
- **Set up a climate change and adaptation touring exhibition**
- **Produce or update communications resources, especially audiovisual materials**
- **Ensure representation at climate change and adaptation events which are open to the public**

Leads: MDDTL/DICOM and ONERC

Partners: MAAPRAT/DICOM

Timetable: 2011-2015

Action n°2: Organise the dissemination of sectoral impacts to prepare the public for adaptation measures

Not all actions relating to the dissemination of information and communications in the various sectors are detailed in this action sheet. In some instances they are more appropriate to other thematic action sheets. This action refers to the sustainable city, water and biodiversity sectors.

The scope of this action entails:

- **Incorporating an "adaptation" element into existing or future communications tools**

Lead: DICOM

Partners: All ministerial directorates general, ADEME, MAAPRAT/DICOM



Timetable: 2011-2015

Action n°3: Collate and disseminate basic information on climate change, its effects and the adaptation required

There is a great wealth and variety of scientific research relating to climate change, but the results are complex and often appear in a form which it is difficult for the general public to understand. It is therefore necessary to collate this knowledge in summarised form and possibly undertake additional studies in areas where there is insufficient information.

This action comprises two measures:

- **Collect scientific information in summarised form**
- **Develop a reference website to disseminate scientific information** (cf Key measure)

Lead: ONERC

Partners: French researchers, Universcience, MAAPRAT/DICOM

Timetable: 2011-2015

Action n°4: Raise awareness among decision-makers and provide relevant information to assist them in decision-making

It is necessary to inform stakeholders responsible for drafting public or private policy and strategies about adaptation issues. The measures in this action are targeted at political decision-makers, government departments with a scoping and information provision role, and local authorities. This information will be produced using ONERC and ADEME resources (publications and websites).

This action is divided into four measures.

- **Raise awareness among political decision-makers**
- **Define adaptation principles and methodologies and disseminate them to government departments**
- **Disseminate adaptation principles and methodologies to local authorities**
- **Share examples of best practice**

Leads: ONERC, ADEME

Partners: DICOM and MEDDTL Directorates General

Timetable: 2011-2015

EDUCATION AND TRAINING action sheet

Illustration. Climate change scenarios for France show that change will be perceptible for 2030 and 2050 horizons, at which points current generations will still be engaged in professional activities.

Education component: sustainable development issues and themes are already represented in primary, junior and senior school curriculums in general, technological and vocational streams. Sustainable development education is therefore an integral part of every stage of pupils' educational progress.

Training component – vocational skills: recommendations formulated during the consultation exercise fall within the national mobilisation plan for jobs and careers in the green economy, led by the MEDDTL Directorate General for Sustainable Development since autumn 2009, which aims to integrate useful “green” skills into the careers arena as a whole by adapting training, careers and careers guidance to the current situation and to future prospects for the green economy.

Key measure

Action 1

Make teaching resources available to the educational community

A partnership between the French Ministry of Education and Météo-France has led to the creation of a website about the atmosphere, the climate and climate change relating to primary, junior and secondary general, technological and vocational education curricula. The website will develop as climate change research produces new knowledge.

Leads: French Ministry of Education and Météo-France

Timetable: 2011-2012

Action n°1: Make teaching resources available to the educational community

(cf Key measure)

Action n°2: Gain a more accurate understanding of the impact of adaptation to climate change in each of the areas studied within the framework of the Plan for Careers in the Green Economy and disseminate the results

The aim is to produce action sheets, validated by the chairs of area committees for the Plan for Careers in the Green Economy, providing a detailed statement for each area and also highlighting fields such as governance, risk, civil protection, safe operation of infrastructures and installations, which are covered by cross-cutting aspects of adaptation to climate change.

These action sheets will be distributed to all partners in the Plan for Careers in the Green Economy, and will be made available on the MEDDTL website at: <http://www.developpement-durable.gouv.fr/Les-metiers-et-l-economie-verte.html> as supplementary resources for use in creating initial or continuing education initiatives relating to these areas or their broader aspects, and for training trainers.

Lead: CGDD

Partners: Plan for Careers in the Green Economy domain committees

Action n°3: Incorporate health, public health, environmental and occupational health professionals, etc. into the Plan for Careers in the Green Economy in order to provide them with professional training on issues relating to sustainable development in the broad sense of the term and to climate change in particular

This sector has already undertaken relevant actions (cf Health action sheet in this plan). This action aims to study the feasibility of creating - or actually creating - a domain committee similar to the eleven existing committees.

Lead: CGDD

Partners: Ministry of Health and stakeholders in this sector, adopting the five-way governance process

Action n°4: Provide additional training for business start-up advisors so that climate change is incorporated into analyses of business start-up opportunities

The aim of this action is to create an additional topic or module for incorporation into existing training.

Lead: CGDD

Potential partners: French Association of Chambers of Commerce and Industry (ACFCI), Adult Vocational Training Agency (AFPA), Job centres, Association of French Regions (ARF)

Action n°5: Improve ADEME's climate change adaptation external training resources for Regional Climate-Energy Plans (PCET)

The topics which need to be enhanced in this training relate to mainstreaming the adaptation component in PCETs, producing vulnerability assessments, new and additional types of cooperation, etc.

Lead: ADEME

RESEARCH action sheet

Illustration. Sample climate change index: extreme daily precipitation values. For a 2100 horizon, this index shows a slight increase in all regions, but these results still contain a great many uncertainties which need to be confirmed by new studies.

Society's adaptation to climate change will involve the provision of an array of tools, some of which do not yet exist. There will be great demand for the research community to develop them in the fields of climate forecasting, spatial planning, agriculture, the economy, transport, biodiversity, coastlines, mountains etc. Adaptation to climate change would therefore seem to be a major issue for research in years to come.

Key measure

Measure in Action 2

Set up an "Adaptation to climate change" Wiki

This involves developing a tool for storing and producing new knowledge in the field of adaptation to climate change, with information supplied by the scientific community, which can be accessed by the general public. This tool, which will act as a reference standard, will provide a means of storing, and enriching knowledge and bringing it to life. This Wiki will be combined with the IGN GEOPORTAIL to provide geolocalisation for contributions and with DRIAS.

Leads: ONERC – CGDD/DRI

Timetable: Kick-off in 2012

Action n°1: Improve understanding of climate change and its impacts

Research must be carried out focusing simultaneously on the following three themes: more localised information for climate change adaptation, a ten-year timescale, and a better understanding of impacts. The resources required to carry out this research (calculation capability, in situ data) must also be mobilised and shared; knowledge acquired, results or publications should be accessible to all stakeholders. Support in using these tools must also be implemented in parallel.

A multidisciplinary approach will become standard practice in research projects on the impacts of adaptation. This action comprises six measures.

- **Evaluate interannual to decadal predictability based on observations and models**
 - o **Complete the EPIDOM feasibility study launched after the GICC programme call for research proposals in 2010**
 - o **Support French involvement in JPI Climate**
- **Regionalise global climate projections**
 - o **Study regional projections for global climate in France: results of the ongoing ANR SCAMPEI project which focuses on mountain regions in particular**
 - o **Exploit the results of Cordex and in particular the MED-CORDEX 10km resolution project, which will mobilise coupling of climate, ocean and regionalisation models for the Mediterranean region**
- **Disseminate the results widely**
 - o **Provide access to regionalised French climate impact scenarios for adapting societies and environments: DRIAS1 Service climatique**
 - o **Organise annual one-day seminars centrally (at an interministerial level) and between regional DREALs to present ongoing research studies relating to climate change and its impacts on specific regions**
- **Mobilise observation, modelling and analysis resources**
 - o **Develop the calculation potential of climate modelling centres**
 - o **Reinforce in situ ocean observation to monitor and forecast climate change**
 - o **Preserve meteorological documents in old archives**

- ***Strengthen and exploit capability pooled at a European level within the framework of the GMES Climate Service currently being defined and support French involvement in this service***
- **Develop prospective socio-economic research**
- **Improve understanding of the impacts of climate change and disseminate information**
 - ***Capitalise on existing and future research programmes on climate change and its impacts***
 - ***Make research results available***
 - ***Initiate a 3-year climate change research programme***

Leads: CGDD, MESR

Partners: Environment Alliance¹¹, CEMPT, the French National Archives, the BNP Paribas Foundation, ADEME, MAAPRAT, FRB, ONEMA, GIS Climat, CETMEF, Shapi, CETE méditerranée, LGGE, CERFACS, Météo-France

Action n°2: Support research

This action combines three measures to support research.

- **Draw up an inventory of climate change research programmes**
- **Use satellite observations to monitor the impact of climate change applied to the water cycle (continental component) and its management**
- **Set up an "Climate change adaptation" Wiki (cf Key measure)**

Leads: ONERC, CGDD, UVSQ, GEOSUD, Cemagref, OVSQ

Partners: GIS Climat, Fondaterra, Météo-France, ECONOVING, IGN, CETMEF, ENTE Aix, CETE Nord-Picardie, CVRH network, Environment Alliance

Action n°3: Develop thematic research projects

The four measures proposed in this action sheet relate to infrastructures, cities, mountain areas, extreme risks and health and complement proposals developed in other relevant action sheets. Measures relating to biodiversity, water, coastlines, etc. are not represented here, to avoid to avoid undue complexity.

- **Develop research to build or improve facilities/infrastructures to an adequate standard**
 - ***Study the effect of climate change on the way materials behave***
 - ***Initiate research into adaptation strategies for facilities and infrastructures***
 - ***Take service quality and use value into account***
- **Develop research into climate modelling in cities and the role of geometry in urban morphologies**
- **Develop research into mountain areas**
 - ***Become involved in ERA-NET CIRCLE 2***
 - ***Utilise the results from SCAMPEI***
- **Establish a system for characterising extreme events**

¹¹ The Alliance comprises the following organisations: BRGM, CEA, Cemagref, CIRAD, CNRS, Conference of University Vice Chancellors, IFREMER, INRA, IRD, IFSTTAR, Météo-France, MNHN, in association with Agreenium, ANDRA, ANSES, CEDEFI, CGE, CNES, FRB, IFP, IGN, INERIS, INRIA, IPEV, IRSN, LNE and SHOM

Leads: CGDD, DGITM, DGALN, DGPR, ANSES, GIS Climat

Partners: SETRA, IFSTTAR, CSTB, CETE, DERTU, ENPC, Cemagref, BRGM, CNRS/IPSL, Météo-France, INRA

Action n°4: Promote research

Adaptation to climate change is a major concern in the regions. The research community must provide qualified local intermediaries to support and guide stakeholders in regions which request this. Initiating local pilot schemes will facilitate the organisation of training and/or the launch of targeted action-research programmes to transmit and promote research.

This action comprises three measures.

- **Create a network of experts on themes relating to climate change adaptation**
- **Provide organisation for competitiveness clusters affected by climate change adaptation**
- **Set up local adaptation experiments in the regions**

Leads: CGDD, CETE

Partners: Météo-France, RST, Climate KIC competitiveness clusters, FONDATERRA

FUNDING AND INSURANCE action sheet

Illustration. The Stern Report states that the cost of doing nothing about climate change could amount to between 5 and 20% of GDP, whereas the cost of taking action would be as little as 1 to 2%.

The funding required for climate change adaptation could be reduced by adopting certain key principles: anticipating climate change at the planning document stage, choosing “no regret” measures, making up lost ground in terms of adaptation, attaching conditions to investment, phased investment, choosing flexible solutions, etc. These principles and the associated methodological tools should be widely disseminated to public and private stakeholders. It is a priority to mobilise funds to finance or co-finance the production and dissemination of information relevant to local and sectoral issues on climate change, its impacts and adaptation methods. Training and the use of specialist technical expertise for stakeholders with the tightest budgets should also be supported in order to promote innovation and informed forecasting. Some existing funding programmes could legitimately contribute to funding adaptation. Mobilising this funding is a priority.

Thought must be given to mobilising additional funding either via contributions from activities which generate greenhouse gases, or by imposing a levy on activities or people locating to high risk areas. Insurance mechanisms and provisions can be reinforced to make a greater contribution to risk prevention and to anticipating future investment, whilst ensuring that the financial tools offered to do not incentivise risk-taking.

Key measure

Measure in Action 2

Identify and disseminate criteria, methods and data sources so that inappropriate adaptation can be detected.

Some climate change impacts in France remain largely undefined (e.g. local rises in sea levels) and these will need to be taken into account. ONERC will suggest criteria, methods and data sources which will help to avoid inappropriate projects. These recommendations will be presented in a practical, usable form by non-specialists (guides, checklists) and regularly updated to take new knowledge into account.

Lead: ONERC

Timetable: 2012-2013

Action n°1: Adapt policies, plans, programmes and corporate strategies using sustainable development integration tools

An adaptation policy should make it possible to avoid pointless investments (seeking to perpetuate investments which are not viable in the medium to long term because of climate change, for example). Forecastable impacts of climate change should therefore be taken into account upstream of investment programmes, in the planning phase where decisions are made. Sustainable development integration tools will be mobilised in public policy and corporate strategy to achieve this. This action is divided into two measures.

- **Revise methodological guides and circulars relating to sustainable development integration tools**
- **Expand the list of planning documents subject to an environmental assessment**

Lead: CGDD

Partners: DGALN /DHUP

Action n°2: Introduce eligibility criteria into the relevant public and private funding mechanisms to avoid inappropriate adaptation projects

Climate change adaptation should be an eligibility criterion for funding investments whose lifespan is of the same order as climate change. This involves identifying criteria, methods and data sources to facilitate identification of inappropriate adaptation, promoting the use of these criteria and imposing conditions within the relevant financial systems.

This measure identifies two actions.

- **Identify and disseminate criteria, methods and data sources so that inappropriate adaptation can be detected.** (cf Key measure)
- **Promote the use of these criteria**

Leads: ONERC, DATAR, MAAPAT, DGCIS

Partners: MEDDTL directorates

Action n°3: Mobilise resources for adaptation

It is necessary to identify the funding mechanisms which could already be used to finance adaptation, or which could do so with a small amount of adjustment, and to publicise the opportunities which they offer. A proportion of the resources which are available need to be specifically redirected towards adaptation either by using funding mechanisms which already allow for this, or by adapting other mechanisms.

This action is divided into three measures.

- **Inventory existing resources which can be mobilised for adaptation**
- **Allocate available resources**
- **Undertake studies into additional resources**

Leads: CGDD, DATAR, MAAPRAT, MINEFI, DGCL, DGCIS

Action n°4: Provide funding for specialist expertise for small local authorities and SMEs

As far as local authorities are concerned, the proposed action consists of adjusting the annual rural area facilities grant (DETR) circular beginning in 2012 in order to invite prefects and committees of elected representatives to give priority to specialist technical assistance relating to climate change. This action fits into the general guidelines for supporting regional engineering.

The most effective form of technical support for adaptation by SMEs would be to produce sectoral analyses on a regional level and to use these as the basis for technical standards. This action comprises two measures.

- **Support the mobilisation of specialist expertise by small local authorities**
- **Support the mobilisation of specialist expertise by SMEs**

Leads: DGCL, DGCIS

Action n°5: Adapt incentive mechanisms to individuals

The technical solutions which should be promoted for adaptation in the building sector must be examined and their cost clearly specified, with a cost-benefit analysis, if required. Certain types of costly investment could easily be integrated into other programmes of works (ventilation, etc.). Other investments are already covered by existing mechanisms, notably if they relate both to mitigation and adaptation, but specific communication tools or greater incentives may be required to take into account the dual challenge of mitigation and adaptation.

Leads: DHUP, DGEC, CGDD

Action n°6: Improve insurance cover whilst tying it in more effectively to preventive policies

French natural risk management policy aligns prevention and compensation. The compensation system for natural catastrophes includes provision for preventive mechanisms which form part of the national climate change adaptation initiative. This action explores options for improvements to this system.

This action sets out areas for improvement to the system in two measures.

- **Adjust insurance premiums to encourage greater responsibility on the part of stakeholders in relation to risks incurred**
- **Improve home insurance uptake in French overseas *départements***

Leads: Treasury Directorate General, CGDD

Partners: DGOM, DGPR

Action n°7: Evaluate the costs and benefits of adaptation actions

In-depth analysis of the costs and benefits of adaptation actions should be carried out, notably in relation to a small number of targeted problems.

Leads: MAAPRAT, DATAR, MEDDTL

COASTLINE action sheet

Illustration. Sample climate change index for coastlines: rising sea levels. According to the IPCC, this rise could be between 23 and 51cm by the end of the century, but other studies conclude that the values could be higher.

Climate change for coastlines will manifest itself principally by increased general pressure on low-lying coasts, and by the erosion or submersion of coastlines due to the anticipated rise in sea levels and more violent winter storms. Coastal zones where coastal risk, urban development, tourism and social acceptance all coincide will have to ensure that their adaptation strategies across these different areas are consistent.

Key measure

Measure in Action 1

Develop coastal observation networks

Reinforcing coastal observation through long-term collection of data which is made available to stakeholders and regions is essential. It will be carried out by creating a national sea and coastline observatory and by developing coastal observation networks.

This action aims to improve long-term understanding of natural coastal phenomena and to ensure that observation networks for monitoring changes in the coastal margin are coordinated.

Lead: DGALN

Timetable: 2011-2015

Action n°1: Adopt a national coastal margin management strategy and develop coastal observation networks

The coastline, which represents the transition between land and sea is a vulnerable area which is subject to strong natural and anthropic pressures and to their interactions. This causes changes in the coastal margin which must be predicted, especially in the context of climate change.

Initially, the working group led by French deputy Alain Cousin, within the framework of the Grenelle Seas Forum, will suggest a national coastal margin management strategy.

Within this framework, increased observation via long-term collection of data which is available to all stakeholders and regions is therefore crucial. This will be achieved by the creation of a national sea and coastline observatory and by developing a coastal observation network.

This action aims to improve understanding of natural coastal phenomena for the long term and to ensure that observation networks for monitoring changes in the coastal margin are coordinated.

Lead: DGALN

Partners: BRGM - CETMEF, DGITM, CGDD

Tools: adoption of the strategy and setting up of observatories along the entire coastline by making actions by various operators permanent and ensuring that they are coordinated by defining the different bodies working on the coastline, the type of data to be collected and how interoperability can be achieved.

Output indicators: a balance sheet on how data sharing has developed and accessibility of data – delivery of a specification for a methodology for interoperability of data and making the observatories permanent – an implementation schedule – the implementation of measures by local authorities – annual reports from observatories detailing problems encountered and expectations – an improvement in the national vision for changes in the coastal margin.

Action n°2: Improve understanding of the coastline: the environment, natural phenomena and physical and anthropic development

It is crucial to explore the future of this aspect of the country which is particularly vulnerable to climate hazards both from an economic and social point of view and from the point of view of its natural wealth, notably its ecosystems. Furthermore, particularly difficult situations are often the product of a combination of several factors, hence the need to **develop integrated approaches**. The first priority is to improve understanding, which will entail basic and applied research activity, notably focusing on understanding hazards, methods for evaluating direct and indirect effects, vulnerability reduction and resilience to extreme events.

There are seven measures relating to this action which involves research, data acquisition, vulnerability assessment and the effectiveness of dunes as a form of protection.

- **Reinforce the network of measures to deal with swell climates**
- **Obtain data on changes in the coastal margin via an aerial photography operation at low tide**
- **Improve understanding of the transit of marine and river sediment**
- **Study the physical vulnerability of the French coast to coastal hazards (erosion and flooding) in the context of climate change, with a comparison between its current (2010) and future (2070) status**
- **Evaluate the effectiveness of dune belts against the risk of sea flooding and introduce monitoring and a management plan for these dune belts**
- **Study the role of coral reefs and mangrove swamps in providing natural defences against coastal erosion**
- **Obtain comprehensive, high-quality information about marine leisure activities on the French coastline**

Leads: DGALN, DGPR, MESR

Partners: DGITL, Surfrider Foundation, Environment Alliance

Action n°3: Adapt regulations and forms of governance

Following the Grenelle Seas Forum, integrated sea and coastline management (GIML) needs to be introduced by integrating climate change into Sea Enhancement Programmes (SMVM) along all French coastlines.

Sea Enhancement Programmes are a spatial development and public information tool under French law, designed to achieve better integration and promotion of the coastline as part of a global sustainable development approach. This tool must be standardised by encouraging the systematic inclusion of an SMVM component by coastal municipal consortia in SCOTs.

It is crucial to have an indicator against which to monitor SCOTs and SMVMs in coastal municipalities to achieve integrated coastal zone management.

The measure corresponding to this action aims to:

- **Make the inclusion of SMVM elements a standard component in the SCOT and establish a monitoring indicator for SCOTs and SMVMs in coastal municipalities to achieve integrated sea and coastal management.**

Lead: CGDD – SoeS

Partners: DGALN

Action n°4: Reinforce coastal strip management methodology and adapt the various management strategies

The aim of this action is to develop appropriate strategies for coastal management:

- use cost-benefit analysis (CBA) and multi-criteria analysis (MCA) methodologies to evaluate the relevance of coastal margin management options within the framework of all coastal development plans,
- assess current coastline issues and their development,
- study the circumstances and issues arising from the implementation of coastal margin management options,
- inform decision-makers about the impacts of climate change on their daily coastal management.

This action comprises four measures.

- **Assess coastal population and housing issues**



- **Produce a multi-criteria analysis (MCA) methodology to evaluate the relevance of coastal margin management options**
- **Develop the use of cost-benefit analysis (CBA) to assess the relevance of coastal margin management options within the framework of all coastal development projects**
- **Study the circumstances and issues arising from the implementation of coastal margin management options**

Leads: DGALN, CGDD, DGPR

Partners: Cetmef, CETE, DGALN, DGPR

MOUNTAIN action sheet

Illustration. Sample climate change index for mountains: number of days of snowfall. There will be an overall drop in snowfall in 2100.

The physical characteristics of mountains divide massifs into different climate zones; mountain systems generate their own climates and their topographic characteristics play a crucial role in determining the local climate. Furthermore, the location of massifs makes them climate boundaries and therefore they are subject to many influences. These specific characteristics also contribute to the fragmentation of natural habitats and the vulnerability of ecosystems. Moreover, all the observations made in various massifs and at a European level in the Alps demonstrate that mountains are particularly vulnerable to climate change with direct consequences for these territories, but also for adjacent territories as a whole. These conditions mean that it is necessary to pay specific attention to the adaptation of mountain areas to climate change.

Key measure

Measure in Action 2

Integrate a climate change adaptation component into Massif Programmes

Massif Programmes (*schémas de massif*), for which provision was made in the rural development law (DTR) of 23 February 2005, are drawn up by massif committees and approved by regional councils and departmental councils. These strategic documents outline priorities for each massif.

Given the future impact of climate change on the general economy of mountain territories, it would seem necessary to integrate this aspect into thematic priorities for each Massif programme.

Lead: Prefect responsible for massif coordination

Timetable: 2011-2015

Action n°1: Mountain agriculture and forests

Support must be provided for research into the conditions which will allow forest stands to carry on playing a major role in preventing hazards (avalanches, landslides, rock falls, etc.), whilst continuing to deliver vital ecosystem services such as logging and carbon storage.

The main forage area represents on average 90% of the usable agricultural area in the mountains, although there are wide disparities between massifs. Livestock farmers have to ensure relatively steady food supplies for their herds, despite the absence of vegetation growth in winter and in summer. The drop in grass production and its irregularity have short-term consequences for adaptation and diversification of forage systems.

This measure comprises four actions:

- **Extend to local authority forests in mountain areas a diagnostic approach to the protective role played by forests in relation to natural risks to property and people**
- **Identify priority requirements for forest stand renewal under the Mountain Land Restoration scheme (RTM) in publicly-owned forests in high risk areas**
- **Pursue and increase agricultural research and development, especially relating to mountain areas. Ensure the dissemination of reference standards and knowledge acquired**
- **Put forward action plans with regional stakeholders to facilitate shared management of regional resources**

Leads: MAAPRAT

Partners: Cemagref, INRA, ONF, ECOFO, CNPF, FCBA, CRGF, APCA

Action n°2: Governance

(cf Key measure)

Massif Committees are the appropriate forum to explore issues concerning the developments associated with climate change in each massif and also to disseminate analyses and best practice so that populations in different massifs can develop adaptation strategies.

Seminars organised in each massif led by Massif Committees would help to support the process of raising awareness among mountain populations.
This action comprises three measures.

- **Incorporate a climate change adaptation component into Massif Programmes**
- **Make the National Mountain Council and Massif Committees a forum for information and analysis of the positive and negative consequences of climate change**
- **Raise awareness among mountain populations and provide education**

Leads: DATAR, Prefects acting as massif coordinators

Partners: Regional Councils, professional trade unions, representative non-profit associations, associations of elected representatives, NGOs

Action n°3: Natural hazards

Natural hazards in mountain areas have specific characteristics related mainly to relief. This plays a crucial role as gravity accelerates phenomena and creates trajectories which do not vary, making these phenomena easier to predict than others.

This action is divided into two measures.

- **Make mapping of areas exposed to one or more hazards standard practice**
- **Trial integrated risk management strategies**

Leads: DGPR, Massif Commissioners, DREAL

Partners: Alpine cluster for studies and research into natural hazard prevention (PARN), regional authorities, NGOs.

Action n°4: Tourism and leisure

It is difficult to relate a macro-regional predictive analysis to regions as a whole at massif level. It is therefore necessary to construct models so that analysis of the impacts of climate change can be refined by mountain massif and then by valley sub-system.

Tourism in mountain areas is not restricted to winter tourism and skiing; summer and low-season tourism also offer development opportunities if tourism professionals integrate climate change into their thinking and anticipate changes in the behaviour and expectations of future customers. Surveys and forward studies must be carried out to provide public and private decision-makers with the analysis tools required to drive strategic developments.

This action comprises four measures.

- **Carry out a research programme to model forecastable changes in snow cover**
- **Draw up an accurate inventory of vulnerability to climate change in mountain municipalities**
- **Provide guidance for public actions in a new climate environment**
- **Identify opportunities for summer and low-season tourism**

Leads: DATAR, Grenoble University and Météo France,

Partners: Massif Commissariats, DGCIS, DGALN, ATOUT FRANCE

EUROPEAN and INTERNATIONAL ACTION sheet

Illustration. Developed countries collectively are involved in mobilising 30 billion dollars over the period 2010-201, reaching 100 billion dollars per year by 2020, to help developing countries fight climate change.

Climate change adaptation is a relatively new field of activity in which knowledge and expertise are developing worldwide. Although France can make a major contribution by virtue of its geographic diversity and commitment, it also benefits from increased levels of communication with its international partners. France recognises the problems posed by the challenges associated with adaptation and would like to develop its skills in cooperation with French overseas territories and neighbouring territories.

France is involved in activities ranging from support for the creation of reliable meteorological and climate databases right through to the implementation of projects.

Key measure

Measure in Action 4

Support climate change adaptation in West Africa in the water and agriculture sectors

The project aims specifically to:

- create a sub-regional platform for climate change adaptation information-sharing in the agriculture and water sectors and to contribute to the production and dissemination of new knowledge;
- carry out and disseminate new climate change adaptation initiatives relating to agriculture and water in two pilot countries;
- raise awareness among the relevant stakeholders and provide training in relation to integration and adaptation in these sectors.

Lead: FGEF, MESR

Timetable: 2011-2013

Action n°1: Contribute to developing European adaptation policy and improving regional climate knowledge

France already has a strategy and the current adaptation plan, and will also contribute to the implementation of the European White Paper on adaptation to climate change.

France will also be involved in improving knowledge relating to predicting extreme hydrological events in the Mediterranean Basin.

This action involves two measures.

- **Contribute to European studies within the framework of the White Paper on climate change adaptation**
- **Support regional cooperation on hydrological functioning and changes in the Mediterranean Basin**

Leads: DGEC and Météo-France, MESR

Partners: MAAPRAT, Environment Alliance (including HyMeX)

Action n°2: Increase international cooperation to improve understanding of climate and meteorological and hydrological events

Support will be provided for improving knowledge about climate and the effects of climate change in the Caribbean area and gaining an understanding of African monsoons.

Support will also be provided for preserving and disseminating historical French data of international interest.

France will continue to support the work of the Intergovernmental Panel on Climate Change (IPCC).

This action is divided into three measures.

- **Contribute to the acquisition of knowledge relating to hydrological and climate systems at a regional level:**
 - **Achieve a better understanding of the water cycle in the Caribbean**
 - **Achieve a better understanding of African monsoons**



- **Recover, preserve and disseminate historic French meteorological and climatology data which is of international interest**
- **Provide financial support for the Intergovernmental Panel on Climate Change (IPCC)**

Leads: DGEF, IRD, CNRS-Insu, Fonds Pacifique, MAEE, MESR

Partners: Météo-France, meteorological services in third-party countries, IFREMER

Action n°3: Build the capacity of developing countries to prevent the socio-economic risks and impacts linked to climate variability and climate change

France will support actions in Africa to establish climate change vigilance mechanisms, develop decision- support within the framework of seasonal climate forecasting and reinforce stakeholders' capacity to adapt to climate change through sustainable land management.

This action comprises three measures.

- **Support the creation of vigilance mechanisms for climate change in Africa**
- **Support seasonal forecasting in West Africa**
- **Support sustainable management of land and climate change adaptation in the Sahel region**

Leads: FGEF, Météo-France

Partners: MAEE, EU, ACMAD, IRI, CILSS, IDRC

Action n°4: Provide support for local and regional institutions to promote the integration of adaptation into development planning

Adaptation is a cross-cutting theme which should be incorporated into development strategies. Actions will be supported in the agriculture and water sectors at a regional level in relation to understanding and shared management of resources in the Niger river basin. At a national level, adaptation will be incorporated into strategies for managing national parks and support will also be provided for improving water distribution networks.

This action comprises four measures.

- **Support climate change adaptation in West Africa in the water and agriculture sectors** (cf Key measure)
- **Contribute to improving water resource monitoring and management tools in the Niger river basin**
- **Support mainstreaming of climate change adaptation in the management of protected areas**
- **Support efficient water management actions in urban areas**

Leads: AFD, FGEF, IRD, CIRAD

Partners: EU, NBA, CILSS, WWF, city of Oujda (Morocco)

GOVERNANCE action sheet

Illustration. The IPCC Fourth Assessment Report recalls that regional climate change impacts will vary according to the regions and stakeholders concerned.

Within the framework of studies carried out during the consultation process, Working Group 3 "Methods" was tasked with identifying the conditions required in order for sectoral approaches to be successful. It refers in particular to the introduction of genuine public policy evaluation. Thus the various stakeholders (economic, social, environmental, etc.) demonstrated their commitment to this approach, whilst stressing both a shared approach and the need for equalisation. Everybody is prepared to contribute, recognising their share of the responsibility, but in the current situation, individual resources are limited.

In the field of regional governance, the complexity of the system, especially as regards the distribution of skills, responsibilities and resources, has been perceived as a potential source of difficulties for the implementation of adaptation policies.

In the corporate sphere, conflict between companies' own interests (production, development or survival) and the general interest often leads to a profitability analysis based purely on economic criteria over a relatively short timetable. The system must develop on a global scale. The main issue is therefore to integrate an understanding of adaptation into the system.

Some of the actions responding to these issues are outlined in the "Funding and Insurance" action sheet.

Key measure

Action 1

Support the development of regional climate change adaptation strategies

The National Sustainable Development Strategy has demonstrated that the success of a national approach depends on its uptake and implementation in the regions as part of an extended governance framework. The Grenelle 2 Law relating to climate change adaptation made provision for Regional Climate, Air and Energy Plans (SRCAE) and Regional Climate-Energy Plans (PCET) which must contain an adaptation component.

Drafting these documents requires methodological support, especially in the case of the SRCAE, which entails a new drafting framework and extremely tight deadlines set by the legislative authorities. For PCETs, this methodological support will need to take into account the experiences of local authorities which have already implemented such measures.

Leads: DATAR, ADEME, DGEC

Timetable: 2011-2013

Action n°1: Support the development of regional climate change adaptation strategies

(cf Key Measure)

This action comprises three measures.

- **Facilitate thinking about the alignment between regional strategies**
- **Integrate adaptation and extended governance into the materials of the PCET resources centre**
- **Reinforce the inter-regional coherence framework for adaptation strategies**

Leads: DATAR, ADEME, DGEC

Partners: ONERC, CGDD

Action n°2: Support experience sharing in relation to mainstreaming climate change in regional development strategies

To date, few regions are as yet actively involved in implementing climate change adaptation measures. However this will change in the next few years, notably with the introduction of a legal obligation. Feedback on measures to produce a guide based on lessons learned (Local Agenda 21, PCET, etc.) have shown them to be of benefit for the uptake of national tools by local authorities.


Furthermore, it is necessary to ensure the coherence of regional approaches within the framework of a national approach. Approaches in neighbouring regions must not come into conflict over resource management, especially where water is concerned.

This action comprises two measures.

- **Disseminate and update the guide to analysing regional vulnerability**
- **Evaluate consistency between national approaches (national plan) and regional approaches (SRCAE, PCET)**

Leads: CGDD, ONERC

Partner: DATAR



ANNEXE I: Abbreviations and Acronyms

AAMP	Agence des aires marines protégées - Marine Protected Areas Agency
ACFCI	Association des chambres françaises de commerce et d'industrie - Association of French Chambers of Commerce and Industry
ACMAD	African Centre of Meteorological Applications for Development
ACTA	Association de coordination technique agricole - Association for Agricultural Technical Coordination
ADAGE	Adaptation au changement climatique de l'agriculture et des écosystèmes anthropisés - Adaptation to Climate Change of Agriculture and Anthropised Ecosystems
ADB	African Development Bank
ADEME	Agence de l'environnement et de la maîtrise de l'énergie - Agency for the Environment and Energy Management
AEAG	Agence de l'eau Adour-Garonne - Adour-Garonne Water Agency
AELB	Agence de l'eau Loire-Bretagne Loire-Brittany Water Agency
AEM	Agri-Environmental Measures
AERM	Agence de l'eau Rhin-Meuse - Rhine-Meuse Water Agency
AERM&C	Agence de l'eau Rhône-Méditerranée et Corse - Rhône-Mediterranean and Corsica Water Agency
AESN	Agence de l'eau Seine-Normandie - Seine-Normandy Water Agency
AFD	Agence française de développement - French Development Agency
AFNOR	Association française de normalisation - French Standardisation Association
AFPA	Agence pour la formation professionnelle des adultes - Adult Vocational Training Agency
AGREENIUM	Consortium national pour l'agriculture, l'alimentation, la santé animale et l'environnement - National Consortium for Agriculture, Food, Animal Health and the Environment
ALLENVI	Alliance nationale de recherche pour l'environnement - National Environmental Research Alliance
AMF	Association des maires de France - Association of French Mayors
AMMA	African Monsoon Multidisciplinary Analyses
ANACT	Agence nationale pour l'amélioration des conditions de travail - National Agency for Improvement of Working Conditions
ANAH	Agence nationale pour l'amélioration de l'habitat - National Agency for Housing Improvement
ANEMOC	Atlas numérique d'États de mer océaniques et côtiers - Digital Atlas of the Status of Oceans and Coastlines
ANR	Agence nationale de la recherche - National Research Agency
ANRU	Agence nationale pour la rénovation urbain - National Agency for Urban Renewal
ANSES	Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail - National Agency for Food, Environmental and Occupational Safety
APCA	Assemblée permanente des chambres d'agriculture - Permanent Assembly of Chambers of Agriculture
AQC	Agence qualité construction - Construction Quality Association
ARF	Association des régions de France - Association of French Regions
ARGO	Array for Real time Geostrophic Oceanography (global network of profiling floats)
ARPEGE	Modèle de prévision numérique du temps de Météo-France - Météo-France digital weather forecasting model
ARS	Agences régionales de santé - Regional Health Authorities
ASFA	Association des sociétés françaises d'autoroutes - Association of French Motorway Companies
ATEN	Atelier technique des espaces naturels - Natural Areas Technical Organisation
AVIESAN	Alliance nationale pour les sciences de la vie et de la santé - Alliance for Life Sciences and Health
BDHI	Base de données historique sur les inondations - Historic Flood Database
BDIFF	Base de données sur les incendies de forêts en France - French Forest Fire Database
BFR	Bureau de la finalisation de la recherche - Research Finalisation Office
BGF	Biodiversité, gestion forestière et politiques publiques - Biodiversity, Forest Management and Public Policy
BPPC	Bureau de la pisciculture et de la pêche continentale - Office for Fish Farming and Continental Fisheries
BRGM	Bureau de recherches géologiques et minières - Geological and Mining Research Office
C2D2	Concevoir et construire pour le développement durable - designing and building for sustainable development

CAP	Common Agricultural Policy
Ca-SIF	Catalogue des sources d'information sur la forêt - Catalogue of Forest Information Resources
CBA	Cost-benefit analysis
CBN	Conservatoires botaniques nationaux - National Botanical Conservatories
CCR	Centre commun de recherche de la Commission européenne - European Commission Joint Research Centre
CDC	Caisse des dépôts et consignations - Deposit and Consignment Office
CEA	Commissariat à l'énergie atomique - French Atomic Energy Commission
Cemagref	Institute for Research in Environmental Science and Technologies (formerly the national centre for agricultural mechanisation, rural, water and forest science)
CEP&S	Programme changements environnementaux planétaires et sociétaux (ANR) - Social, Environmental and Global Change Programme (National Research Association)
CERFACS	Centre européen de recherche et de formation avancée en calcul scientifique - European Centre for Research and Advanced Training in Scientific Computation
CERL	Conservatoire de l'espace littoral et des rivages lacustres - Conservatory for Coastlines and Lake Banks
CERMES	Centre d'enseignement et de recherche en mécanique des sols - Geotechnical Teaching and Research laboratory
CERTU	Centre d'études sur les réseaux, les transports, l'urbanisme et les constructions publiques - Centre for Network, Transport, Urban Planning and Public Building Studies
CESAB	Centre de synthèse et d'analyse sur la biodiversité - Centre for Biodiversity Synthesis and Analysis
CESBIO	Centre d'études spatiales de la biosphère - Centre for Spatial Study of the Biosphere
CETE	Centre d'études techniques de l'équipement - Technical Research Centre for Infrastructure
CETE Med	Centre d'études techniques de l'équipement Méditerranée - Mediterranean Technical Research Centre for Infrastructure
CETMEF	Centre d'études techniques maritimes et fluviales - Institute for Maritime and Waterway Studies
CETU	Centre d'études des tunnels - Tunnel Studies Centre
CFPPA	Centre de formation professionnelle et de promotion agricoles - Centre for Vocational Training and Agricultural Promotion
CGAAER	Conseil général de l'agriculture, de l'alimentation et des espaces ruraux - General Council for Agriculture, Food and Rural Areas
CGDD	Commissariat général au développement durable – General Commissariat for Sustainable Development
CGEDD	Conseil général de l'environnement et du développement durable - General Council for the Environment and Sustainable Development
CIEP	Classified Installations for Environmental Protection
CILSS	Comité permanent inter-Etats de lutte contre la sécheresse dans le Sahel - Permanent Interstate Committee for Drought Control in the Sahel
CIMH	Caribbean Institute for Meteorology and Hydrology
CIPA	Comité interprofessionnel des produits de l'aquaculture - Inter-trade Committee for the Products of Aquaculture
CIRAD	Centre international de recherche agronomique et du développement - National Centre for Agronomic Research and Development
CIRCLE	Climate Impact Research Coordination for a Larger Europe
CIRED	Centre international de recherches sur l'environnement et le développement - International Research Centre for the Environment and Development
Climate-KIC	Climate Knowledge and Innovation Community
ClimDev-Africa	Climate for Development in Africa
CNAM	Conservatoire national des arts et métiers - French National Conservatory of Arts and Crafts
CNES	Centre national d'études spatiales - National Space Studies Centre
CNEV	Centre national d'expertise des vecteurs - National Centre for Vector Expertise
CNPF	Centre national de la propriété forestière - National Centre for Forest Ownership
CNPN	Conseil national de protection de la nature - National Nature Conservancy Council
CNRM	Centre national de recherches météorologiques - National Centre for Meteorological Research
CNRS	Centre nationale de la recherche scientifique - National Centre for Scientific Research
COFIL	Comité de pilotage - Steering Committee
COREAMR	Commission régionale de l'économie agricole et du monde rural - Regional Committee for Agriculture and Rural Affairs
CPER	Contrat de projet État-Région - State-Region Project Contract
CPF	Comité de politique forestière - Forestry Policy Committee

CPP	Comité de la prévention et de la précaution - Prevention and Precaution Committee
CREAFOR	Coordination des activités de recherche sur l'adaptation des forêts au changement climatique - Coordination of Research Activities into the Adaptation of Forests to Climate Change
CRFPF	Commission régionale de la forêt et des produits forestiers - Regional Commission for Forestry and Forest Products
CRGF	Conservation des ressources génétiques forestières - Conservation of Forest Genetic Resources
CSFPFTB	Conseil supérieur de la forêt des produits forestiers et de la transformation du bois - High Council for Forest Trees, Forest Products and Wood Processing
CSTB	Centre scientifique et technique du bâtiment - Scientific and Technical Centre for Building
CTPS	Comité technique permanent de la sélection - Permanent Technical Committee for Plant Selection
DATAR	Délégation interministérielle à l'aménagement du territoire et à l'attractivité régionale - Interministerial Delegation for Development and Regional Appeal
DBSN	Délégation de bassin Seine Normandie - Seine-Normandy basin delegation
DDI	Directions départementales interministérielles - Interministerial <i>département</i> directorates
DDTM	Direction départementale des territoires et de la mer - Departmental Directorate for Territories and the Sea
DEB	Direction de l'eau et de la biodiversité - Directorate for Water and Biodiversity
DETR	Dotation d'équipement des territoires ruraux - rural areas facilities grant
DGAC	Direction générale de l'aviation civile - Directorate General for Civil Aviation
DGAL	Direction générale de l'alimentation - Directorate General for Food
DGALN	Direction générale de l'aménagement, du logement et de la nature - Directorate General for Development, Housing and Nature
DGCIS	Direction générale de la compétitivité, de l'industrie et des services - Directorate General for Competition, Industry and Services
DGCL	Direction générale des collectivités locales - Directorate General for Local Authorities
DGCS	Direction générale de la cohésion sociale - Directorate General for Social Cohesion
DGEC	Direction générale de l'énergie et du climat - Directorate General for Energy and Climate
DG Env	European Commission Directorate General for the Environment
DGER	Direction générale de l'enseignement et de la recherche - Directorate General for Teaching and Research
DGITM	Direction générale des infrastructures, des transports et de la mer - Directorate General for Infrastructure, Transport and the Seas
DGOS	Direction générale de l'offre de soins - Directorate General for Care Provision
DGPAAT	Directorate General for Agricultural Policy, Agri-food and Regions (Ministry for Agriculture, Food, Fisheries, Rural Affairs and Development)
DGPR	Direction générale de la prévention des risques - Directorate General for Risk Prevention
DGRI	Direction générale pour la recherche et l'innovation - Directorate General for Research and Innovation
DGS	Direction générale de la santé - Directorate General for Health
DHUP	Direction de l'habitat, de l'urbanisme et des paysages - Directorate General for Development, Housing and the Countryside
DICOM	Direction de la communication – Directorate for Communications
DICRIM	Document d'information communal sur les risques majeurs - Major risk information document for municipalities
DIDD	Délégation interministérielle au développement durable - Interministerial Commission for Sustainable Development
DIF	Droit individuel à la formation - Personal Training Allowance
DIRECCTE	Directions régionales des entreprises, de la concurrence, de la consommation, du travail et de l'emploi - Regional Directorates for Business, Competition, Work and Employment
DOM	Département d'Outre-mer - French overseas <i>département</i>
DPMA	Direction des pêches maritimes et de l'aquaculture - Fisheries and Aquaculture Directorate
DRAAF	Direction régionale de l'alimentation, de l'agriculture et de la forêt - Regional Directorate for Food, Agriculture and Forests
DREAL	Direction régionale de l'environnement, de l'aménagement et du logement - Regional Directorate for Environment, Development and Housing
DRI	Direction de la recherche et de l'innovation – Directorate for Research and Innovation
DRIAS	Donner accès aux scénarios climatiques régionalisés français pour l'impact et l'adaptation de nos sociétés et environnements - Providing access to regionalised French climate impact scenarios for adaptation by societies and environments
DROM	Départements et régions d'outre d'Outre-mer - French overseas <i>départements</i> and regions

DSC	Direction de la sécurité civile du MIOMCTI - Civil Protection Directorate of the Ministry for the Interior, Overseas Territories, Territorial Collectivities and Immigration
DSF	Département santé des forêts - Forest Health Department
DTR	Développement des territoires ruraux - Rural Land Development
EAFRD	European Agricultural Fund for Rural Development
ECMWF	European Centre for Medium-Range Weather Forecasts
ECOFOR	Groupe d'intérêt public - écosystèmes forestiers - Forest Ecosystems Public Interest Group
ECOWAS	Economic Community of West African States
EDF	Electricité de France
EFD	European Floods Directive
EFSA	European Food Safety Authority
EHESP	Ecole des hautes études en santé publique - Institute of Higher Education in Public Health
EID	Entente Interdépartementale de démoustication - Inter-département Mosquito Control Agreement
ENPC	Ecole nationale des ponts et chaussées Paris Tech - French civil engineering institute
ERDF	European Regional Development Fund
EQUIPEX	Equipements d'excellence - "Equipment excellence" scheme (to enable French laboratories to acquire cutting-edge scientific equipment)
ESC	Energy Saving Certificate
ESCo	Expertise scientifique collective - Collective Scientific Expertise
ESF	European Social Fund
FACCE- JPI	Joint Programming Initiative Agriculture, Food Security and Climate Change
FAO	Food and Agriculture Organization of the United Nations
FCBA	Institut technologique forêt, cellulose, bois-construction, ameublement - Forest, Cellulose, Construction, Timber and Furniture Institute of Technology
FCBN	Fédération des conservatoires botaniques nationaux - Federation of National Botanical Conservatories
FFA	Fédération française d'aquaculture - French Aquaculture Federation
FGEF	French Global Environment Fund
FNADT	Fonds national d'aménagement et de développement du territoire - National Development and Spatial Planning Fund
FNC	Fédération nationale des chasseurs - National Hunting Federation
FNPF	Fédération nationale de la pêche en France - French National Fishing Federation
FONDATERRA	Fondation européenne pour des territoires durables - European Foundation for Sustainable Territories
FPF	Fédération des forestiers privés de France - French Federation of Private Forestry Workers
FPNRF	Fédération des parcs naturels régionaux de France - French Regional Parks Federation
FRB	Fondation pour la recherche sur la biodiversité - Foundation for Biodiversity Research
FRISBEE	Food Refrigeration Innovation for Safety consumers' Benefit, Environmental impact and Energy optimisation
FRMP	Flood Risk Management Plan
FWD	Framework Water Directive
GBPH	Guides de bonnes pratiques d'hygiène - Food Safety Guides
GDF	Gaz de France
GEF	Global Environment Fund
GDP	Gross Domestic Product
GENCI	Grand équipement national de calcul intensif - National High Performance Computing Body
GHG	Greenhouse gas
GICC	Programme Gestion des impacts du changement climatique - Climate Change Impacts Management Programme
GIE SFA	Semences forestières améliorées - Economic Interest Grouping for Improved Forest Planting
GIML	Gestion intégrée de la mer et du littoral - Integrated Sea and Coastal Management
GIMRI	Groupe Interministeriel pour la Recherche et l'Innovation - Interministerial Group for Research and Innovation
GIP ECOFOR	Groupe d'Intérêt Public - ECOsystèmes FORestiers - Public Interest Grouping for Forest Ecosystems
GIS Climat	Groupe d'intérêt scientifique Climat – Environnement- Société – Climate-Environment and Society Scientific Interest Group

GIS	Geographic Information System
GIS-MU	Groupe d'intérêt scientifique pour la modélisation urbaine - Special Interest Group for Urban Modelling
GLOSS	Global Sea Level Observing System
GMES	Global Monitoring for Environment and Security
GOSS	Groupe d'orientation et de suivi scientifique - Scientific Orientation and Monitoring Group
GRECO	Grandes régions écologiques - Major Ecoregions
HCsp	Haut Conseil de la santé publique - High Committee for Public Health
HEQ	High environmental quality
HFDS	Haut fonctionnaire de défense et de sécurité - Senior Defence and Security Official
HSDS	Hôtel des sciences pour le développement soutenable - French sustainable development research institute
IASG	Impact and Adaptation Steering Group
ICAO	International Civil Aviation Organisation
IDAE	Sous-direction de l'intégration des démarches de DD par les acteurs économiques - Division for economic stakeholder sustainable development approach integration
IDDRI	Institut du développement durable et des relations internationales - Institute for Sustainable Development and International Relations
IDF	Institut pour le développement forestier - Institute for Forest Development
IDPP	Sous-direction de l'intégration des démarches de développement durable dans les politiques Publiques - Division for the integration of sustainable development approaches into public policy
IDRC	International Development Research Centre
IEED	Instituts d'excellence énergies décarbonées - Excellence Institutes for Carbon-neutral Energy
IFN	Inventaire forestier national - National Forest Inventory
IFRECOR	Initiative française pour les récifs coralliens - French Initiative for Coral Reefs
IFREMER	Institut français de recherche pour l'exploitation de la mer - French Research Institute for Exploration of the Sea
IFSTTAR	Institut français des sciences et technologies des transports, de l'aménagement et des réseaux - French Institute for Transport Science and Technology and Network Development
IGN	Institut géographique national - National Geographic Institute
INERIS	Institut national de l'environnement industriel et des risques - National Institute for the Industrial Environment and Risk
INPES	Institut national de prévention et d'éducation pour la santé - National Institute for Health Education
INPT	Institut national polytechnique de Toulouse
INRA	Institut national de recherche agronomique - National Institute for Agronomic Research
INRS	Institut national de recherche et de sécurité - National Institute for Research and Security
INSEE	Institut national de la statistique et des études économiques - National Institute for Statistics and Economic Studies
INSMET	Instituto de Meteorologia de Cuba
INSU	Institut national des sciences de l'Univers - National Institute for the Science of the Universe
InVS	Institut de veille sanitaire - French Health Monitoring Institute
IOWater	International Office for Water
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IPSL	Institut Pierre-Simon Laplace (environmental sciences research institute)
IRD	Institut de recherche pour le développement - Institute for Development Research
ISTERRE	Institut des sciences de la Terre - Earth Sciences Institute
ITAVI	Institut technique avicole - Technical Institute for Poultry
IUEM	Institut universitaire européen de la mer - European Institute for Marine Studies
JPI	Joint Programming Initiative
Labex	Laboratoires d'excellence - Excellence Laboratories
LEADER	European Community rural development programme which allows France to support 140 regions developing a strategy based around a shared theme
LEGOS	Laboratoire d'études en géophysique et océanographie spatiale - Laboratory for Geophysical and Spatial Oceanography Studies
LFACA	Less favoured areas compensatory allowances
LGGE	Laboratoire de glaciologie et de géophysique de l'environnement - Laboratory for

	Environmental Glaciology and Geophysics
LIENSs	Unité mixte de recherche " Littoral, environnement et sociétés " - "Coast, environments and societies" Joint Research Unit
LMD	Laboratoire de météorologie dynamique - Dynamic Meteorology Laboratory
LNHE	Laboratoire national d'hydraulique et d'environnement - National Environmental Hydraulics Laboratory
LOCEAN	Laboratoire d'océanographie et du climat - Oceanography and Climate Laboratory
LSCE	Laboratoire des science du climate et de l'environnement - Laboratory for Climate Science and the Environment
LSV	Laboratoire de la santé des végétaux - Plant Health Laboratory
LTHE	Laboratoire d'études des transferts en hydrologie et environnement (Grenoble) - Laboratory for Hydrological and Environmental Transfers (Grenoble)
MAAPRAT	Ministère de l'agriculture de l'alimentation, de la pêche, de la ruralité et de l'aménagement du Territoire - Ministry for Agriculture, Food, Fisheries, Rural Affairs and Development
MAEE	Ministère des affaires étrangères et européennes - Ministry for Foreign and European Affairs
MCA	Multi-criteria analysis
MEDCIE	Mission d'études et de développement des coopérations interrégionales et européennes Commission for studies and development in interregional and European cooperation projects
MEDDTL	Ministère de l'écologie du développement durable, du transport et du logement - Ministry for Ecology, Sustainable Development, Housing and Transport
MERCATOR	French inter-organisational project for high-resolution global ocean modelling with assimilation
MESR	Ministère de l'enseignement supérieur et de la recherche - Ministry for Higher Education and Research
MinEFI	Ministère de l'économie, des finances et de l'industrie - Ministry for the Economy, Finance and Industry
MIOMCTI	Ministère de l'Intérieur, de l'outre-mer, des collectivités territoriales et de l'Immigration - Ministry of the Interior, Overseas Territories, Regional Collectivities and Immigration
MNHN	Muséum national d'histoire naturelle - French National Natural History Museum
MOM	Ministère de l'Outre Mer - Ministry for French Overseas Territories
MSA	Mutualité sociale agricole – mutual agricultural fund
MTES	Ministère du travail, de l'emploi et de la santé - Ministry for Work, Employment and Health
NGO	Non-Governmental Organisation
NIWA	National Institute of Water and Atmospheric Research
NOAA	National Oceanic and Atmospheric Administration
NOME	Nouvelle organisation du marché de l'électricité - New Electricity Market Organisation
NRE	New Renewable Energies
OECD	Organisation for Economic Cooperation and Development
OJEU	Official Journal of the European Union
ONB	Observatoire national de la biodiversité - National Observatory for Biodiversity
ONCFS	Office national de la chasse et de la faune sauvage - National Office for Hunting and Wildlife
ONDE	Observatoire national des étiages - National Low Water Observatory
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 for the Effects of Global Warming
ONF	Office national des forêts - National Forestry Service
ONVAR	Organismes nationaux de vocation agricole et rurale - National Organisations for Agriculture and Rural Affairs
OPUR	Observatoire des polluants urbains - Urban Pollution Laboratory
OQAI	Observatoire de la qualité de l'air intérieur - Observatory for Interior Air Quality
ORF	Orientations régionales forestières - Regional Forest Guidelines
OSEO	A government institute, under the supervision of the Ministry for the Economy, Finance and Employment, the Ministry for Higher Education and Research, which is able to make a significant contribution to sharing upstream risks via partnership agreements signed with the regions
OVSQ	Observatoire de Versailles Saint-Quentin-en-Yvelines
PACA	Région Provence Alpes Côtes d'Azur - Provence Alps Côte d'Azur region
PAPI	Programmes d'actions de prévention des inondations - Programmes of Preventive Actions for Flooding
PARN	Pôle alpin d'études et de recherche pour la prévention des risques naturels - Alpine cluster for studies and research into natural hazard prevention

PCET	Plan climat-énergie territorial - Regional Climate-Energy Plan
PCI	de compétence et d'innovation au sein du RST (MEDDTL) - Skills and innovations clusters within the scientific and technical networks of the Ministry for Ecology, Sustainable Development, Transport and Housing
PCRD	Programme cadre recherche et développement - Research and Development Framework Programme
PDR	Plan de développement rural - Rural Development Plan
PDRH	Programme de développement rural hexagonal - Rural Development Programmes in continental France
PLU	Plan local d'urbanisme - Local Urban Planning Schemes
PNACC	Plan national d'adaptation au changement climatique - National Climate Change Adaptation Plan
PNF	Parcs nationaux de France - French National Parks
PPRDF	Plan pluriannuel régional de développement forestier - Multiyear Regional Forestry Development Plan
PPRL	Plans de prévention des risques littoraux - Coastal Risk Prevention Plans
PPRN	Plan de prévention des risques naturels - Natural Hazard Prevention Plans
PRAD	Plans régionaux de l'agriculture durable - Regional Sustainable Agriculture Plans
PREBAT2	Programme de recherche et d'expérimentation sur l'énergie dans le bâtiment - Research and Experimentation Programme for Energy in Buildings
PRESAO	Prévision saisonnière en Afrique de l'Ouest - Regional Climate Outlook Forum for West Africa
PRM	Protection des races menacées - Protection of Endangered Species
PRV	Préservation des ressources végétales menacées de disparition - Preservation of Endangered Plants
PSR	Plan submersions rapides - Rapid Flooding Plan
PUCA	Plan urbanisme, construction et architecture - Urban Planning, Construction and Architecture Plan
RATP	Régie autonome des transports parisiens - autonomous Parisian public transport company
RBI	Réserve biologique intégrale - Integral Biological Reserve
RDR	Règlement de développement rural - Rural Development Regulations
REFMAR	Réseaux de référence des observations marégraphiques - Tidal Observation Reference Network
RExHySS	Impact of Climate Change on Water Resources and Hydrological Extremes in the Seine and Somme basins
RFF	Réseau ferré de France - French Rail Network
RM&C	Rhône-Méditerranée et Corse - Rhône-Mediterranean and Corsica
RMT AFORCE	Réseau mixte technologique sur l'adaptation des forêts au changement climatique - Mixed Technology Network for the Adaptation of Forests to Climate Change
RNF	Réserves naturelles de France - French Nature Reserves
RNSA	Réseau national de surveillance aérobiologique - National Aerobiological Surveillance Network
RST	Réseau scientifique et technique du ministère (MEDDTL) - Scientific and Technical Network of the Ministry for Ecology, Sustainable Development, Transport and Housing
RT	Réglementation thermique - heating regulations
RTM	Restauration des terrains en montagne - Mountain Land Restoration
SAGE	Schémas d'aménagement et de gestion des eaux - Plan for Development and Water Management
SCA	Sociétés concessionnaires d'autoroutes - Association of motorway concession holders
SCAP	Stratégie de création d'aires protégées terrestres et métropolitaines - Strategy for the Creation of Terrestrial and Continental French Protected Areas
SCHAPI	Service central d'hydrométéorologie et d'appui à la prévision des inondations - French National Hydrometeorological and Flood Forecasting Centre
SCOT	Schéma de cohérence territoriale - Regional Coherence Programme
SDAEP	Sous-direction de l'aquaculture et de l'économie des pêches - Division for Aquaculture and Fisheries Economy
SDAGE	Schémas directeurs d'aménagement et de gestion des eaux - Programme for Development and Water Management
SDI	Sous-direction de l'innovation - Innovation Division
SEEIDD	Service de l'économie, de l'évaluation et de l'intégration du développement durable (CGDD) - Department for the Economy, Evaluation and Integration of Sustainable Development (General Commissariat for Sustainable Development)
SER	Sylvoécorégions - silvo-environmental regions

SESRI	Service de l'enseignement supérieur, de la recherche et de l'innovation - Department for Higher Education, Research and Innovation
SETE	Sciences de l'environnement, du territoire et de l'économie - Environmental, Regional and Economic Sciences
SETRA	Service d'études sur les transports, les routes et leurs aménagements - Technical Department for Transport, Roads, Routes and Development
SFSE	Société française de santé et environnement - French Society for Health and the Environment
SFSP	Société française de santé publique - French Society for Public Health
SGAR	Secrétariats généraux pour les affaires régionales - General Secretariats for Regional Affairs
SHOM	Service hydrographique et océanographique de la marine - Naval Hydrographic and Oceanographic Service
SIE	Système d'information sur l'eau - Water Information System
SIG	Service d'information du gouvernement - Government Information Service
SINP	Système d'Information sur la Nature et les Paysages - Nature and Landscapes Information System
SMVM	Schémas de mise en valeur de la mer - Sea Enhancement Programmes
SNB	Stratégie nationale pour la biodiversité - National Biodiversity Strategy
SNCF	Société nationale des chemins de fer français - French national railway company
SNDE	Schéma national des données sur l'eau - National Water Data Programme
SNRI	Stratégie nationale pour la recherche et l'innovation - National Research and Innovation Strategy
SoeS	Service de l'observation et des statistiques - Statistics and Observation Service
SONEL	Système d'observation des variations du niveau de la mer à long terme - Observation System for Long-Term Variations in Sea Level
SRCAE	Schéma régional du climat, de l'air et de l'énergie - Regional Climate, Air, Energy Programme
SRCE	Schéma régional de cohérence écologique - Regional Environmental Coherence Programme
SSRI	Service Stratégie de la recherche et de l'innovation - Research and Innovation Strategy Department
STAC	Service technique de l'aviation civile - French Civil Aviation Technical Centre
STRMTG	Service technique des remontées mécaniques et des transports guidés - Ropeway and Guided Transport Technical Service
SYSAAF	Syndicat des sélectionneurs avicoles et aquacoles français - Union of French Poultry and Farmed Fish Breeders
SYSSO	Syndicat des sylviculteurs du Sud-Ouest - South-West France Foresters' Union
TGIR	Très grandes infrastructures de recherches - Major Research Infrastructures
TVB	Trame verte et bleue - Green and Blue Infrastructure
UAA	Utilised Agricultural Area
UAOM	Union des aquaculteurs d'outre-mer - Union of French Overseas Territories Fish Farmers
UBO	Université de Bretagne occidentale
UC	Unités conservatoires - tree conservation areas
UHI	Urban Heat Island
UVSQ	Université de Versailles St-Quentin
VATE	Valeur agronomique, technologique et environnementale - Agronomic, Technological and Environmental Value
VNF	Voies navigables de France - French Inland Waterways
WFD	Water Framework Directive

**Ministère de l'Écologie, du Développement durable,
des Transports et du Logement**
Direction générale de l'Énergie et du Climat
Arche Nord
92 055 La Défense cedex
Tel. 33 (0)1 40 81 21 22

Resources, land, habitats and housing
Energy and climate Sustainable development
Risk prevention Infrastructure, transport and the sea

**Present
for
the future**



DICOM-DGEC/BR0/11004-GB – October 2011 – Photos : Dianem/Fotolia ; A. Clausen/Fotolia ; A. Bouissou/MEDDTL ; B. Suard/MEDDTL – Printing : MEDDTL/SG/SPSS/ATL2 – Printed on European eco-label certified paper



National climate change adaptation plan

MINISTRY OF ECOLOGY, SUSTAINABLE DEVELOPMENT,
TRANSPORT AND HOUSING