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The sixth national communication of France to the United Nations Framework Convention on Climate Change

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EDITORIAL

"Tackling global warming is a world objective. It is a European commitment. It must be a "fervent" national obligation."

French President, François Hollande, 19 August 2013

A year ago, at the first Environmental Conference, François Hollande charted a course: to make France a nation of environmental excellence. Since then, the French President has committed France to a shared ecological transition bringing about a profound change in its development model and its individual and collective behaviour.

Of course, one of the main issues for such a transition is tackling global warming, an issue in which France is playing and will continue to play its part to the full.

France's objective is a four-fold reduction in greenhouse gas emissions by 2050. It is already fulfilling its commitments under the Kyoto Protocol. In the context of the EU Climate and Energy Package it is championing the setting of new greenhouse gas emission reduction targets, increased use of renewable energies and improved energy efficiency by 2020. **Since 2012 the French President has declared his support for a more ambitious European target of reducing greenhouse gas emissions by 40% by 2030 and 60% by 2040.** Of course, France intends to set an example in meeting these targets.

France also intends to devote the necessary resources to them, especially in those sectors which produce the most greenhouse gas emissions: construction and transport.

The residential energy efficiency renovation scheme aims to renovate 500,000 homes per year by 2017 in order to cut energy consumption by 38% by 2020. This scheme plans a single desk for advice on renovation to guide and support individuals and companies in their renovation works. It reinforces existing financial help to combat household fuel poverty. In the case of new buildings, the new thermal regulations RT 2012 which came into force on 1st January 2013 significantly increase the energy efficiency requirements.

With regard to transport, the progressive reinforcement of the bonus-malus scheme for cars will promote the use of more energy efficient vehicles with lower CO_2 emissions. The CO_2 cars labelling started on October 2013 provides information on the CO_2 content of transport that encourages more sustainable forms of transport.

These measures prepare for the future and aim to limit global warming. But climate change is already here. To combat its effects from now on, France set up a national adaptation plan in 2011. Its 84 actions containing 240 measures are an international frame of reference.

In the wave on its national objective France has an international ambition. Climate change is global. It has the greatest effect on the men and women in those countries which population are already facing many problems. France wants to include them in a collective project.
This is the spirit in which France proposed to host the 2015 United Nations Framework Convention on Climate Change, when ambitious new emission reduction targets for after 2020 are due to be decided.

I am convinced that we will make 2015 a successful meeting if, between now and then, with our European partners and the rest of the world, we move from a "burden sharing" attitude to emission reduction to one of "sharing opportunities" created by the development of new methods of production and consumption. By proposing an inspiring new road map we will bring about a positive vision of ecological transition based on solutions which will provide greener growth for the economic and social crises that most countries are facing.

I am convinced: by joining forces in a combined effort on ecological transition we will demonstrate that it brings the added benefit of well-being for all - for us today and also for future generations.

Philippe Martin
Ministry of Ecology, Sustainable Development and Energy

Analytical Summary

A. Country-specific conditions

A.1 A country rising to the climate change challenge

Tackling climate change is a priority target for France. The principle of a four-fold cut in emissions by 2050 has been written in French Law since 2005[1]. This imperative has since been reaffirmed and the measures to be implemented have been specified, particularly in terms of lowering the energy consumption of buildings and cutting greenhouse gas emissions from transport.

Since 2012 environmental conferences have become a new annual meeting place for all environmental stakeholders (NGOs, trade unions, employer organisations, local authorities, the State) with greater participation by members of parliament. One of the first projects after the conference in September 2012 was the launching of a debate on energy transition. The aim is to promote frugality and efficiency and also to develop renewable energies. The debates, which ended in July 2013, will act as a framework for investments to be made over the coming years through the energy framework law to be adopted at the end of it.

France is also very committed to the section on adaptation to climate change. It has adopted its first national adaptation plan which covers the period 2011-2015 and comprises 84 actions containing 240 measures.

As mitigation of climate change may only be effective if comparable actions are taken on a global scale France has decided to take a very active role in international climate discussions. It therefore made a bid to organise the 2015 Conference of Parties to the United Nations Framework Convention on Climate Change, the objective of which is to reach an attractive agreement for all States for the period beginning after 2020.

At European level France has already declared itself in favour of a greenhouse gas emission reduction target of 40% in 2030 and then 60% in 2040.

A.2 Recent social Changes

French population growth is moderate (annual increase of 0.5% between 1990 and 2013) but the number of households is increasing at a much faster rate (average of 1.2% per year over the period 1990-2009). This increase is explained by changes in the way people cohabit and by the ageing population. It has a direct influence on housing needs and energy consumption by homes and transport. If this trend continues the average number of people per household which fell from 2.6 in 1990 to 2.3 in 2009 will reach 2.1 in 2030 and 2.0 in 2050.

Urban areas occupied 22% of the country's land area in 2009 and housed 44.1 million people, i.e. 69% of the population. The influence of towns does not stop at the edge of large urban areas. Towns are centres of economic activity bringing in a large number of workers from the surrounding area on a daily basis. In 2010, 95% of the French population were living within the sphere of influence of a town.

In terms of land use the proportion of man-made landscapes is steadily increasing. In metropolitan France man-made areas covered 4.9 million hectares in 2010. This change is a continuation of trends observed since the 1990s and is largely at the expense of agricultural land and semi-natural environments.

Economically, France did not escape the serious economic downturn in the Euro zone in 2012, with zero growth in 2012 following 2.0% growth in 2011 and 1.7% in 2010.[2]

After a steep decline in 2009 followed by an upturn in the next two years the inland transport of goods fell again in 2012 (-4.4%).[3] Nevertheless, the 2012 level was considerably higher than that of 1990 (+35.1%). Between 2008 and 2012 car traffic increased by 1.7% and public transport increased by 4.5%.

1 *Loi POPE, Framework Law n° 2005-781 of 13 July 2005 on setting the directions of the energy policy*

2 *Source: INSEE (French national institute of statistics and economic studies)*

3 *Source: French National Transport Audit 2012*

For a number of years there has been a marked increase in the number of diesel cars (72.4% of new registrations in 2012). Average conventional CO_2 emissions per km from new cars has continued to fall significantly, reaching an average of 124.1 g/km in 2012. The share of electric and hybrid vehicle ownership is increasing and reached 1.8% of registrations in 2012 (compared with 0.8% in 2011), but it is not yet sufficient to have a significant effect on average and total consumption by the car stock.

With regard to housing, the average surface area per person is increasing. It grew from 32 m² to 36 m² between 1999 and 2011[4]. Since 2003 energy consumption in kWh per m² has declined by an average of -1.9% each year, compared with - 0.5% from 1984 to 2002. When taking into account climatic variations, this consumption fell significantly in 2011 (-1.7%). This progress is the result of changes in household behaviour, particularly due to volatile fossil fuel prices, but also to energy control measures (insulation, more economical equipment) in the existing housing stock and the successive implementation of thermal regulations in new builds. At the same time, specific energy consumption (lighting, household appliances, etc.) increased by 1.5 in kWh per m² between 1984 and 2011. This change is partly explained by the increased use of domestic appliances, hi-fi and office appliances.

Primary energy consumption adjusted by climate variations fell by 2.3% in 2012.[5] It therefore fell below the 260 Mtep mark, i.e. below the 2009 level, the year in which the economic crisis was particularly acute. Primary consumption increased by an average of +1.5% per year over course of the 1990s, but then reached a plateau. Recent changes have been adjusted due to the 2009 crisis and the recovery which followed. It is therefore difficult to confirm whether this is the start of a new underlying trend. Final energy consumption, all uses combined, fell slightly in 2012. It has fluctuated between 166 and 167 Mtep over the last three years, a level markedly less than the 175 Mtep of the first half of the first decade of this century.

As Europe's leading agricultural producer this sector accounted for 20.9% of French emissions in 2011. The total cultivated area has steadily decreased since 1950. This reduction has been to the benefit of wooded areas and uncultivated land which have increased by 75 and 51 thousand hectares on average per year respectively since 1950. The breakdown of agricultural land between arable land (63%), areas always under grass (33%) and permanent cultivation (4%) remains fairly stable. Between 1990 and 2011 the reduction of emissions reached 7.6%. France also had a forest sink of nearly 60 Mt CO_2 in 2011, compensating for 11.5% of the country's emissions in 2011.[6]

Total waste production, all types combined, is increasing (+2.9% between 2008 and 2010)[7]. 36.6% of household waste is recycled, 14.8% is incinerated with energy recovery and 40.8% is removed through storage or incineration facilities without energy recovery, the rest is spread or composted[8].

4 Source Housing Report 2011, December 2012
5 Source: MEDDE/CGDD/SOeS, Energy Balance 2012
6 CITEPA/MEDDE Inventory, 2013 submission, April 2013
7 MEDDE/SoeS, Figures and Statistics, n° 385, January 2013
8 MEDDE/SOeS, last waste statistics regulations, 2012

B. Information on the GHG emissions inventory including information on the French national inventory system and national register

B.1 Trends

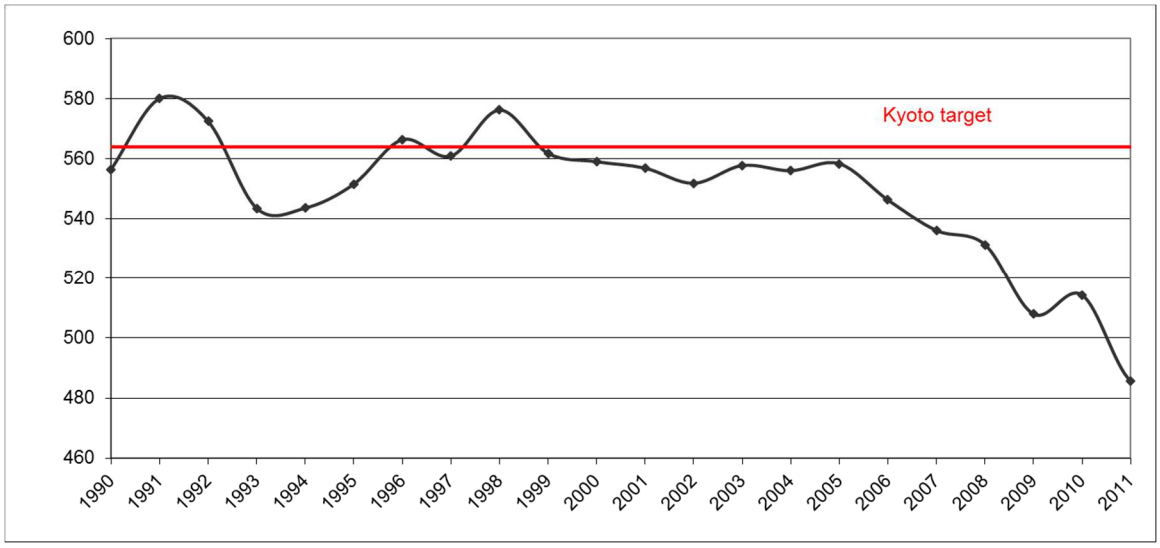
Reference emission levels of French commitments under the Kyoto Protocol (Metropolitan France and Overseas Departments) have been set at 563.9 Mt CO_2 eq. Between 1990 and 2011 greenhouse gas emissions fell by 13.9% to 485.5 Mt CO_2 eq. in 2011 (cf. Figure 1). In tons per capita this is a reduction of 26% between 1990 and 2011 (9.6 t CO_2 eq./capita in 1990 and 7.5 t CO_2 eq. /capita in 2011), the population having increased by 12 % since 1990.

On the basis of an estimate for 2012 [9], the reduction in GHG emissions in relation to the Kyoto target is 50 Mt CO_2 eq. per year over the period 2008-2012 (average difference between recorded emissions and the Kyoto target).

This reduction is essentially explained by better industrial processes and policies enabling the upward trend linked to population increase to be overtaken.

Calculated on the basis of the Kyoto framework, CO_2 accounts for 358.2 Mt or 74% of France's GHG emissions. In 2011, methane emissions were 51 Mt CO_2 eq. and accounted for 10 % of French GHG emissions. N_2O emissions were 59.6 Mt. CO_2 eq. and accounted for 12 % of French GHG emissions. F-gas was 17 Mt CO_2 eq. and accounted for 3 % of France's total GHG emissions. CO_2 emissions fell by 9.8 % between 1990 and 2011, N_2O and CH_4 emissions fell by 30 % and 17 % between 1990 and 2011 respectively. F-gas emissions increased by 66 % between 1990 and 2011 despite implementation of the existing European regulations (European regulations no. 2037/2000 and no. 842/2006, Directive 2006/40/EC). In France, this legislation was supplemented in 2011 by Decree 2011-396 which specifies regulatory provisions on use other than in refrigeration and air-conditioning. In addition, a new regulation on f-gases is under discussion at European level. This legislation will strengthen further the stage of the maintenance, filling and end of life stages of equipment.

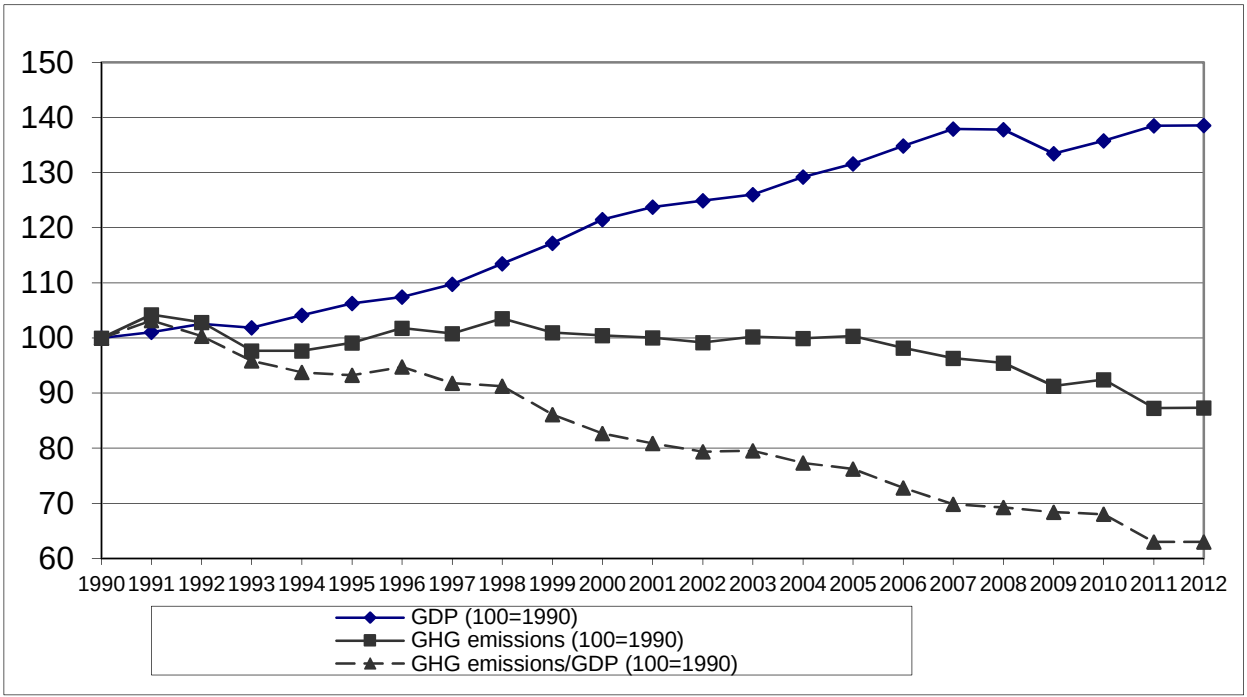
Figure 1: Trend of GHG emissions between 1990 and 2011 in Mt CO_2 eq



Source: 2013 Submission, French National Programme on Tackling Climate change format to the Kyoto framework, CITEPA / MEDDE

9 *CITEPA/MEDDE Estimate, Secten report, May 2013*

Figure 2: Separating economic growth and greenhouse gas emissions (GDP change by volume; GHG emissions and GHG intensity - 100 = 1990)



Sources: INSEE, emissions inventory, PNLCC format to the Kyoto framework, CITEPA, 2013 submission, DLCES/General Directorate of Energy and Climate calculation – 2012 emissions are estimates

The graph of the Figure 2 shows increased separation between GHG emissions and the growth of France's GDP. The French economy is therefore becoming more carbon-friendly despite the economic crisis.

Analysis by sector of activity

Transport accounted for 27% of France's total emissions, i.e. 138 Mt CO_2 eq., in 2011, with a sharp increase between 1990 and 2001 (+22%) followed by stabilisation. Road transport is responsible for 95% of these emissions, 57% of which is from cars alone.

Direct emissions from residential and tertiary sectors account for 17.5% of France's greenhouse gas emissions (2011), 90% of which is CO_2 and 7% f-gases. When the share of emissions associated with electricity production and urban heating is taken into consideration the building sector accounts for 23.5% of France's total emissions[10].

In 2011, the manufacturing sector accounted for 90.8 Mt CO_2 eq., i.e. 18.6 % of France's total greenhouse gas emissions. These emissions are 38.3% below their 1990 level.

Emissions from the energy production sector (electricity generation, urban heating, oil refining, solid mineral fuel transformation) were 57.3 Mt CO_2 eq. in 2011, i.e. 11.7 % of France's total emissions. That is over 96 % of CO_2 emissions. This sector's contributions to France's national emissions is less than in other countries due to the dominance of nuclear and hydroelectric power stations in French electricity production. Wind power accounted for 18.9 % of French renewable energy production in 2011[11].

The agricultural sector is the third largest producer of greenhouse gas emissions, with over 21% of France's emissions in 2011. Methane (CH_4) and nitrous oxide (N_2O) emissions caused by biological processes linked to nitrogen fertilisation of agricultural soil (47 % of the sector's emissions), as well as enteric fermentation and

10 DGEC calculations from Citepa and Base Carbone (Carbon database) data

11 MEDDE/CGDD/SOeS, Key renewable energy figures, 2013 edition

livestock manure (41 %), account for the sector's main emissions. Between 1990 and 2011 the reduction in agricultural emissions (including energy consumption) reached 7.6 %. This is mainly due to less use of nitrogen fertilisers, the reduction in the cultivated area, a drop in the number of cattle and a fall in energy consumption.

Emissions linked to waste treatment (apart from energy recovery) accounted for 12.8 Mt CO_2 eq. in 2011, i.e. about 2.6 % of France's total greenhouse gas emissions.

In 2011, transport was the sector with the largest CO_2 emissions with a 36.4 % share of CO_2 emissions. The agricultural sector contributes 74% of methane emissions. Agriculture is also the greatest producer of N_2O with a share of France's total emissions estimated at 89%.

B.2 National inventory system

France has created a national inventory system: SNIEBA (National system for air emissions inventories and GHG balance) defined by an inter-ministerial decree dated 24 August 2011 in accordance with Article 5.1 of the Kyoto Protocol.

The French deposits and consignment fund (Caisse des Dépôts) was designated holder of the French national register by Decree n° 2004-1412, and was given responsibility for developing information systems designed to use the register and taking care of system security. The French national register has undergone some changes since the fifth French national communication. Decree n° 2004-1412 was amended by decree no. 2012-343 of 3 December 2012 in order to include changes in European Directives, in particular the replacement of national registers by a single system developed by the European Commission. This amended decree confirms the national register public service concession awarded to the Caisse des dépôts for the period 2013-2020.

Since migration to the European Union register in June 2012, the European Commission is now responsible for supplying, maintaining and securing the national register information system concerning the commitments of European Member States as Parties to the Kyoto Protocol (KP register) and as participants in the European Union Emissions Trading System (EU-ETS Register)

C. Policies and measures

The policies aiming at reducing greenhouse gases emissions have been gathered in the "Climate Plan", corresponding to the French action plan for complying with its European (Climate and Energy Package) and international (Kyoto Protocol) commitments. The Climate Plan has been revised every two years in accordance with article 2 of the French framework law setting the directions to be followed by the energy policy of 13 July 2005. In the same law, France has set itself the target of a four-fold cut in emissions by 2050 (article 2 of the Law of 13 July 2005).

In accordance with UNFCCC guidelines the policies and measures implemented by France are classified according to two categories in the sixth French national communication:

- Existing measures, which are policies implemented before 1st January 2012;
- And additional measures, which encompass policies decided since 1st January 2012 and sectoral policy targets that have been introduced in a framework law even if they are not yet backed by sufficient policies to be reached.

In this summary we present the existing measures which taken alone, enable French commitments under the Kyoto Protocol and France's European commitments under the Climate and Energy Package to be achieved.

In order to assess the impact of policies and measures the French Ministry of Ecology, Sustainable Development and Energy (MEDDE) has developed its own tool. It enables the evaluation by comparison with a business as usual scenario by changing technical input data (e.g.: changes in road traffic, housing stock, building insulation) in accordance with planned policies and measures. This tool (known as SceGES for Scénarisation des Emissions de GES or GHG emissions scenario writing) has been developed with the Ecole des Mines in Paris, CITEPA, Energies Demain and Solagro engineering and design firms and INRA (French National Institute for Agricultural Research). Evaluations made through SceGES are based on three principles:

- Methodologies used for calculating emissions are compatible with those used for carrying out the French national inventory, sent by France to the United Nations under its international climate change commitments;
- Calculation methodologies are updated at the same time as those of the French national inventory to ensure consistency of assessments over time;
- Emission calculations are based on the highest possible quality description of technical data in the majority of sectors (description of the housing stock according to year of construction, description of the vehicle stock according to capacity, vehicle age, rate of car ownership, description of the livestock in agriculture, etc.).

Except explicitly indicated, the assessments presented below have been calculated with the aid of this tool.

C.1 Transport

France has set itself the target of bringing transport sector emissions down to their 1990 level by 2020 under framework law no. 2009-967 of 3rd August 2009 on implementing Grenelle Environment Round Table.

Various measures have been implemented or reinforced to reach this target.

Development of alternative modes of transport: there are plans to modernise and in certain cases to create new infrastructures to encourage the use of rail, river or sea transport for the carriage of goods. An **HGV eco-tax**, from January 2014, for use of the main non-conceded road network will enable the external costs of road transport to be better managed.
Impact: the implementation of this eco-tax will reduce GHG emissions of 0.26 to 0.6 Mt CO_2 per year[12].

Energy efficiency of cars: the European Union has set itself the target of cutting unit CO_2 emissions from new cars with a first stage of reduction to 130 g CO_2/km progressively applicable from 2012 to 2015 and a target of 95 g CO_2/km in 2020. A French national target of cutting the CO_2 emissions of the entire car stock has been set at 120 g CO_2/km in 2020. These targets will be achieved by implementing the European regulation on car emissions which provides penalties for manufacturers which do not meet their obligations and through national provisions aimed at encouraging people to buy the most low-carbon vehicles, including the bonus-malus system for cars.

The **bonus-malus system for cars** that has been implemented since January 2008 is a progressive provision. It encourages people to buy vehicles that produce the lowest CO_2 emissions by paying a bonus to cars emitting less than a certain threshold (less than 105 g of CO_2/km in 2013) and subjecting cars with the highest emissions (over 135 g of CO_2/km in 2013) to a purchase tax adjusted according to vehicle emissions (purchase tax of 100 to 6000).
Impact: –9 Mt CO_2 eq. in 2020 for all measures aimed at cutting emissions from cars[13].

Development of biofuels: as part of its European commitments France has a target biofuels take-up rate of 7% since 2010. To achieve this target, the General Tax on Pollution-generating Activities (TGAP) has to be paid by operators not meeting these targets. This component of the TGAP[14] was instituted by the French Finance Law of 2005 and the tax changes each year. Since 1st January 2012 only biofuels meeting sustainability criteria can be taken into account for calculating the deduction from the TGAP rate. Partial exemption from the TICPE compensates for the extra costs of producing biofuels compared with fossil fuels (article 265 bis A of the Customs Code).
Ex-post impact: –6.3 Mt CO_2 eq. in 2009 for all the bioethanol and biodiesel consumption[15].

C.2 Residential and tertiary

Policies and measures put in place since 1990 have enabled emissions from the residential and tertiary sector to be stabilised. Improvements to the energy efficiency of the existing housing stock, new thermal standards for

12 *French report to the European Commission (in respect of article 3 of decision 280/2004/EC) on the inventory of mitigation policies and measures, March 2013. Page 140 http://www.developpement-durable.gouv.fr/IMG/pdf/Fr_RMS_2013__.pdf*
13 *id. pages 143-144*
14 *Article 266 -15 of the Customs Code*
15 *Transport in 2010: 48th report of the National Transport Auditors, volume 2. http//www.developpement-durable.gouv.fr/IMG/pdf/Ref_CCTN_2010_tome_2.pdf*

new buildings (in particular RT 2012 in force since January 2013) and use of a greater share of low-carbon energy sources (coal has almost disappeared and heating oil has fallen dramatically in favour of gas and electricity) have been able to compensate the greater nominal surface area of housing, which increased from 32 m² to 36 m² per person between 1999 and 2011, and to the increase in the number of homes (+10 %).

Thermal regulations: a new thermal regulations (RT2012) have come into force with the aim of strengthening the thermal requirements for buildings for which planning permission applications were filed after 1st January 2013.
Impact: -3.5 Mt CO_2 eq. per year in 2020 for the residential sector alone[16].
The average primary energy consumption of new buildings must now be under 50 kWh/m²/year. From 2020 the primary energy consumption of all new buildings will have to be less than the quantity of renewable energy produced in these buildings (positive energy buildings).

Thermal regulations for renovations also contribute to energy performance improvements. The regulations define minimum performances for replaced or installed parts, as well as a total performance target for extensive renovations to buildings of over 1000 m² built since 1948.

Energy performance labels: certification measures (energy labels) are recognised in order to promote the use of the most efficient building systems and techniques (high and very high performance buildings) and prepare professionals for the progressive strengthening of the thermal regulations (e.g. the Low Consumption Building label, with criteria similar to those of RT2102, which made public support provisions eligible during the years preceding the entry into force of the regulation).

Financial support for renovations: a "sustainable development" tax credit has been available to individuals since 2005 to help them buy the most energy efficient materials or equipment (in existing buildings only) or renewable energy production units (in new and existing buildings). These provisions were widened to include landlords and extended until the end of 2015. To encourage extensive redevelopment, an adjustment to the sustainable development tax credit (CIDD) according to the extent of works was introduced from 2012.
Impact: The implementation of this measure between 2009 and 2012 will bring about an annual reduction in 2020 of 3.76 Mt CO_2 eq.[17]

A **zero rate eco-loan** (for a maximum of 10 years and for up to 30,000) is also aimed at encouraging owner occupiers and landlords to finance extensive renovation work. It is conditional upon a range of work that has to be carried out and a total energy efficiency level being reached after the renovation and can be combined with other support provisions subject to resources.
Impact: The implementation of this measure between 2009 and 2011 will permit an annual reduction of 0.33 Mt CO_2 eq. to be achieved by 2020[18].

From 1st July 2014 the main support measures (CIDD and zero rate eco-loans) will be subject to eco-conditionality criteria.

The distribution of **energy performance contracts** (supplier's guarantee of energy saving volumes) was particularly promoted by the law of 12 July 2010 which introduces the obligation to study such a contract after the mandatory joint-owners' audit. The Investment Plan (2013) for housing provides for the implementation of a third party investment system and other household support measures for carrying out renovation work (one-stop shop, energy renovation ambassadors, etc.).

Renovation of the social housing stock: France aims to renovate the 800,0000 highest energy consuming social housing units by 2020. In this context the subsidised rate social housing eco-loan (eco-PLS) was implemented between February 2009 and May 2011 for social housing landlords. A second generation social housing eco-loan has been distributed since February 2012. The implementation of the March 2013 Housing Investment Plan will reinforce the system for improving the energy performance of France's building stock.

16 *French report to the European Commission (in respect of article 3 of decision 280/2004/EC) on the inventory of mitigation policies and measures, March 2013. Page 132 http://www.developpement-durable.gouv.fr/IMG/pdf/Fr_RMS_2013__.pdf*

17 *id., page 135*
18 *id. page 133*

Impact: in total, 123,000 social housing eco-loans were distributed up to 1st January 2013, permitting an annual reduction of 0.29 Mt CO_2 eq. to be achieved by 2020[19].

C.3 Energy

Alongside sectoral energy consumption management policies (particularly in the residential and tertiary and transport sectors) a number of cross-sectoral measures are helping to reduce energy demands. This includes the following actions in particular:

➔ **Energy saving certificates (CEE)**: implemented since 2006, this system is under-pinned by a requirement imposed on the main energy suppliers (vendors of electricity, gas, domestic heating oil, etc.) to make energy savings. The system was substantially reinforced for the second period, between 2011 and 2013 (255 TWhcumac compared with 54 TWhcumac for the period between July 2006 and June 2009), and extended to car fuel suppliers (up to 90 TWhcumac). It principally supports insulation work and distribution of the most efficient heating systems in renovations. It also serves as a support for professional training and provides information for individuals.
Impact: Measures which have benefited from CEE issued during the first two periods will permit an annual reduction of 6.2 Mt CO_2 eq. to be achieved by 2020[20].

➔ **Eco-design and energy labelling:** the progressive withdrawal of incandescent light bulbs over the period 2010 to 2012, limitation of standby mode on appliances, reduction of street and office lighting, improved performance of chargers, external supply and electrical chargers are examples of energy efficiency advances which have been achieved through the implementation of the eco-design directive. Energy labelling will add to the measure by helping to direct the consumer to the lowest-carbon products. The range of products subject to such requirements is being steadily expanded (in 2011 and 2012 European regulations defined the rules to be applied to air-conditioning units and tumble-driers).

Impact: total of −4.05 Mt CO_2 eq. by 2020 in France purely from the withdrawal of incandescent light bulbs[21].

➔ **Development of renewable energies:** France's target is to increase the share of renewable energies in energy consumption to at least 23 % by 2020, by an increase of 21 million tons oil equivalent (Mtep) of the annual renewable energy production compared with 2005 as part of its climate and energy package commitments. Implemented measures should enable renewable energy production to be doubled in 12 years, especially increasing the contribution from wood by more than 45%, and changing the scale of solar power and heating networks.

The France uses a wide range of instruments to support the development of renewable energies:

- Budgetary expenses, especially in support for thermal renewable energies. A billion euro "Fonds chaleur renouvelable" (Renewable Energy Heating Fund) for the period 2009 to 2013 has enabled considerable development of heat production in the tertiary and manufacturing sectors from renewable sources such as wood, geothermal energy and solar power while improving and diversifying heating sources in multiple dwelling units. It will enable 2.7 Mt of CO_2 emissions to be cut per year from 2015.[22]
- Tax expenses. The "sustainable development" tax credit in particular, which helps individuals to buy renewable energy equipment: solar powered water heaters, heat pumps, solar panels, etc., has been extended until 2015;
- Consumer financing measures: implementation of electricity buy-back tariffs to make investment in the various renewable energies profitable. A considerable increase in the number of wind pumps in Metropolitan France is due to these measures. In this sector alone annual emission reductions in 2020 will be 5.37 Mt CO_2 eq.[23]
- Regulatory measures such as the use of solar heating to cover at least 50% of the hot water requirements of new homes built in Overseas Departments from 1st May 2010.

19 *id., page 135*
20 *id., page 147*
21 *id., page 149*
22 *id., page 152*
23 *id., pages 154-155*

- **Considerable research efforts** in the energy sector have been agreed as part of the Investissements d'Avenir (Future Investments) (budget of 3.6 billion euros.).

C.4 Manufacturing

France's policy on energy efficiency and cutting greenhouse gas emissions in the manufacturing sector is based on five key areas:

- Market instruments and in particular implementation of European Directive 2003/87/EC establishing an emissions trading system with the European Union. The review of the system by Directive 2009/29/EC specifies the arrangements for the period 2013-2020 (quota ceiling dropping by 1.74 % per year, progressive move to a quota bidding system, etc.);
- Financial incentive packages such as ADEME'S call for Manufacturing, Agriculture and Tertiary Biomass Heating (BCIAT) proposals since 2009;
- Regulatory measures and in particular Directive 2010/75/EC on industrial emissions (IED)
- Support for standardisation processes in the field of energy efficiency (European standard EN 16247 on energy audits published in September 2012 reiterating the main criteria of the French term of reference, etc.) and classification of stakeholders, particularly in the use of f-gases (Decree 2011-396 which specifies the regulatory provisions relating to their use other than in refrigeration and air-conditioning, etc.);
- Support for the development of strategic sectors of the green economy in terms of growth and employment potential, particularly through the (Investissements d'Avenir) Future Investments system.

C.5 Agriculture and Forestry

Agriculture

While fertilizer deliveries have fallen in France in the last 20 years (at an average rate of 0.5 % per year, i.e. more than 10 % in total), as have provisions of organic fertiliser of animal origin (-9 %), the reduction of N_2O emissions through better control of nitrogen fertilisation and tackling organic nitrogen surpluses, remains a priority issue for the agricultural sector. Of particular help here are nitrates action programmes, some actions of the Plan végétal pour l'environnement (plant plan for the environment) and aid allocation measures under the common agricultural policy.

Several actions are bringing about a reduction of emissions caused by livestock, in particular the livestock buildings modernisation scheme, launched in 2005 which helped to modernise more than a third of cattle farms before the end of 2012. The Plan énergie méthanisation autonomie azote (methane recovery and use scheme) (EMAA) launched in 2013 provides for recovery of one of the largest constituents of effluent. The setting up of a thousand methane recovery units by 2020 should bring about a reduction of 0.95 Mt CO_2 eq./year by that time. This one of the sections of renewable energy development based on agricultural sources, alongside the development of biofuels.

While greenhouse gas emissions associated with energy consumption account for only 10% of emissions from the agricultural sector they are also the subject of specific measures in the sector (in particular the farm energy performance plan for the period 2009-2013).

Finally a number of provisions and measures of the common agricultural policy contribute indirectly to the maintenance and growth of carbon stores on parcels of land and in soils (especially measures promoting soil cover in autumn and winter, measures promoting hedges and agroforestry, or the agro-environmental grassland payment)

Forestry

Mitigation in forestry is different from other sectors.

Firstly, mobilisation of the biomass means it can bring about emissions reductions in other sectors through the effects of substitution. Secondly, it can, as now, make a net overall positive contribution to climate change mitigation, with emissions (originating in particular from the oxidisation of dead wood and felling) lower than sequestration. France's forest sink is nearly equal to 60 Mt CO_2 per year, corresponding to 11.5 % of the country's GHG emissions in 2011.

Schematically, forestry's contribution to the greenhouse gas emissions reduction policy is based on three sections:

- The forestry policy which ensures the sustainability of carbon stores in forests and their mobilisation. The current forest sink is due to the fact that French forestry is not balanced, due in particular to its relative youth from a global perspective. The over capitalization of older populations should however be noted as this makes accrued mobilisation possible from a sustainable management perspective.
- Carbon storage in wood products. In France this amounts to about 4 Mt per year. This storage is likely to increase with the development of green technologies and in particular the use of wood in the construction of buildings, encouraged by labels such as the bio-sourced building label. These uses also have the positive effect of substituting for materials of fossil origin or energy consuming.
- Substitution of wood for fossil fuels. Already the primary renewable energy source in the French energy mix (41% of final energy produced from renewable sources in 2011 was from wood). Its increased mobilisation is planned to contribute significantly to the national target of 23% of energy production from renewable sources in 2020.

The forthcoming Agriculture Bill, subject of stakeholder consultation between April and September 2013, the implementation of which will coincide with that of the reform of the common agricultural policy, will add to and reinforce these measures.

C.6 Waste

In law no. 2010-788 of 12 July 2010 on the national environmental commitment France has set itself the targets of:

- Cutting annual production per head of population by 7% within 5 years;
- Increasing recycling to achieve a rate of household waste recycling of 35% by 2012 and 45% by 2015;
- Directing 75% of household packaging waste and ordinary commercial waste to recycling;
- Cutting the amounts of incinerated and stored waste by 15%.

The 2009-2012 waste action plan defines the guidelines for implementing these targets per treatment sector. Prevention is the priority of the European waste policy. France is fully signed up to this view point and wants to bring about the necessary disconnections to reverse waste production trends. Numerous measures have been implemented from this perspective.

All local authorities that collect or treat household or similar waste are required to carry out a household or similar waste prevention scheme. This scheme lays down the waste reduction targets and details the measures implemented to achieve them. Generalisation of a public service incentive tariff for waste elimination by 2014 was also introduced in the law. Local authorities can institute such a system by introducing a variable portion of the household waste collection tax. A tax incentive has been possible since its institution in 1999. This variable portion can be calculated according to the type, weight and volume of waste or the frequency of collections.

The general tax on pollution-generating activities (TGAO) is an important lever of action. It was amended in 2012 to encourage waste prevention and recycling. It was also adjusted according to the environmental and energy performance of storage and incineration facilities. In 2013 discussions are in progress under the environmental conference to define new targets for each treatment sector by 2020.

C.7 Public authorities and local authorities

The **regional section** of France's climate policy is based in particular on:

- The implementation of regional climate, air and energy schemes (SRCAE) which connect regional targets to national targets and ensure that actions taken by local authorities in the fields of climate and energy are consistent across regions.
- Regional climate and energy plans (PCET) which are compulsory for all local authorities of more than 50,000 inhabitants.

SRCAE are developed jointly by the chief administrative officer of the region and the chairman of the regional

council, in liaison with local stakeholders. They are available to the public before a final decision is made by the chief administrative officer for the region. SRCAE define regional scenarios to 2020 and 2050, compatible with European and national commitments, concerning greenhouse gas emissions reductions, adaptation to climate change and air quality.

Regional climate and energy plans (PCET) are compulsory for about 500 authorities. At the same time, about 200 smaller authorities have committed to development of voluntary PCET or Agenda 21.

In addition, since 31st December 2012 the State, regions, departments, urban communities, large towns and municipalities or groups of municipalities of over 50,000 inhabitants as well as other public corporations employing over 250 people have to draw up an assessment of their greenhouse gas emissions.

C.8 Businesses

For businesses, new environmental requirements, particularly in relation to climate change, have been instituted.

The new economic regulations law (NRE) of 2001 had already introduced a requirement for businesses quoted on the stock exchange to include information on the social and environmental consequences of their activities in their annual report. These requirements were reinforced by the law of 12 July 2010 on the French national commitment for the environment which broadens the scope of businesses concerned (businesses employing more than 500 people and with an annual turnover of over 100 million euros). Compulsory information includes impacts relating to climate change.

In addition, since 31 December 2012 businesses of over 500 employees are required to draw up an assessment of their greenhouse gas emissions and an action plan for cutting them.

Since 1st October 2013 businesses selling or organising a transport service must give their customers information on the quantity of CO_2 emissions.

D. Projection of GHG emissions and quantification of the impact of policies and measures

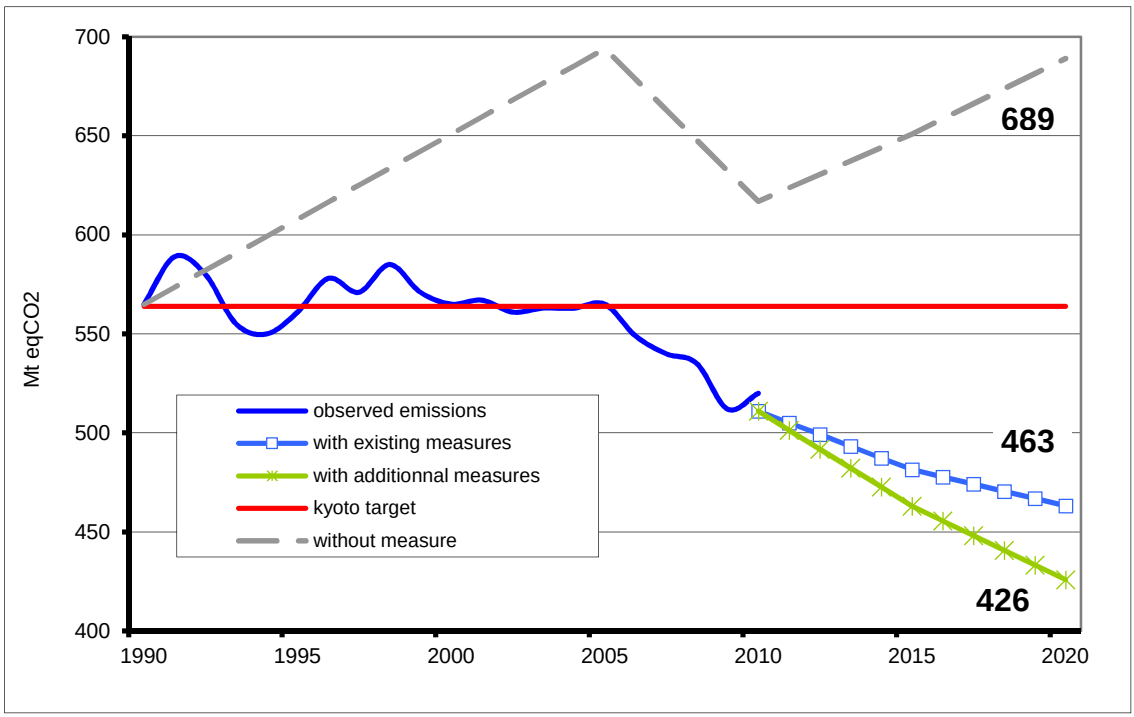
D.1 Results of projections for 2010 and 2020

The government has built three projection scenarios for 2010 and 2020 in order to assess the impact of policies and measures:

- A "without measure scenario" (WM) which represents the change in French emissions if no policy had been implemented since 1990. It will be used, in accordance with UNFCCC guidelines to estimate the total effect of policies and measures;
- A "with existing measure scenario" or WEM which takes into account all polices and measures decided and implemented before 1st January 2012;
- A "with additional measure scenario" or WAM scenario which, in addition to policies already considered in the WEM scenario, also considers new policies decided since 1st January 2012 and, above all, planned policies even if they have not yet been implemented.

In the context of the WEM scenario (cf. Figure 3), France's emissions in 2020 (Convention perimeter, Metropolitan France, Overseas Departments and Overseas Collectivities) are 463 Mt CO_2 eq., i.e a reduction of 18.1 % compared to 1990 (565.4 Mt CO_2 eq. – Convention perimeter). In the results of the WEM scenario the Kyoto targets for the period 2008-2012 are met. In the WAM scenario they achieve 426 Mt CO_2 eq. in 2020, i.e. a reduction of 24.6 % compared with 1990. According to the without policy scenario the level of emissions would be 617 Mt CO_2 eq. in 2010, and 689 Mt CO_2 eq. in 2020.

Figure 3: Projections of GHG emissions (in Mt CO_2 eq.) for France, in the Convention framework in 2010 and 2020 for WEM and WAM scenarios and for a "without measure" since 1990 scenario



Sources: UNFCCC inventory, CITEPA/MEDDE, 2013 MEDDE submission and emissions projections, 2013

The surprising change in emissions between 2005 and 2010 for the no policy scenario is due to the fact that the time interval used for modelling is only 5 years. As emissions are linearized between 2005 and 2010 the fall in emissions due to the crisis over the period 2008-2010 is shown from 2005. Modelling with an annual time interval would certainly have allowed a better representation of the change in emissions to have been obtained in the context of the no policy scenario.

An analysis of the change in emissions projected by sector shows that:

- Policies existing before 1st January 2012 have allowed the increase of emissions to stabilise or slow down in all sectors with a pronounced decline in emissions from the energy sector;
- The implementation of new policies as well as policies existing before 1st January 2012 permit an even greater reduction of emissions from the energy sector and a reduction of emissions from the agriculture (other than energy), industrial processes and waste treatment sectors of 37%, 20% and 10% respectively compared with 1990.

D.2 Projection sensitivity analysis

Sensitivity of the New Policies scenario

In the context of the WAM scenario there is a reduction of 24.6 % of total GHG emissions between 1990 and 2020. These results reflect France's ambition in terms of combating climate change and in particular the ambitious nature of national targets. It is also in line with the EU's ambition to reduce its GHG emissions by – 20 % as specified in the Energy Climate Package, and even to reach its GHG emissions to – 30 % between 1990 and 2020 in the event of a satisfactory international agreement; and the French President's determination to see the EU set a new a target of cutting GHG emissions by – 40 % by 2030 and – 60 % by 2040.

It should also be emphasised that effective achievement of this ambitious outcome is conditional upon the adequate treatment of several "vigilance points" and in particular:

- **The actual pace of thermal renovations of the existing building stock over the whole period.** Achieving the target of a 38% reduction of consumption by the

existing building stock by 2020 requires a very ambitious pace of renovations, supported over the whole period. Like the WEM scenario, this scenario provides for a rate of 500,000 buildings per year, implementation of thermal regulation 2012 from 2013 and extending the sustainable development tax credit (CIDD) and zero rate eco-loan until 2015. The WAM scenario also presupposes a sustained rate of 900,000 extensive renovations per year between 2013 and 2020;

- **Maintenance of powerful incentive tools supporting this rate of renovations over the entire period, in an increasingly constrained budgetary situation**: even if residential energy efficiency improvement work is often identified as having low, or even negative, allowance costs there are many other restraints (access to credit for households, imperfect information, loss of use caused by the works) on the effective execution of work which make it necessary to put incentive tools in place for the renovation of houses. This is the purpose of the zero rate eco-loan and the sustainable development tax credit;
- **Reinforcement of the modal shift for goods.** The very ambitious target of a non-road and non-aviation modal share of 25% by 2022 is confronted by a change in industrial structure unfavourable to heavy goods rail transport by full train (which declined from 13% to 10.9% between 2005 and 2010 and only started to recover in 2011 to 11.7%);
- **Effective adaptation capacity of fields and sectors** (innovation, technological disconnections, etc.);
- **The level of mobilisation of all stakeholders and the effectiveness of the support provisions** (training, changing behaviour,...).

Sensitivity to the economic situation

France's "WEM" and "WAM" GHG emission projection scenarios are based on the hypothesis of Gross Domestic Product (GDP) growth of +2.1% per year over the 2015-2020 period and on the 2020 fossil fuel price hypotheses from the International Energy Agency's (IEA) World Energy Outlook "Current Policy" scenario. A sensitivity study was carried out to see the impact of lower growth hypotheses (+1.6% per year over the 2015-2020 period) or high fossils fuel prices for gas and coal (scenario issued by the European Commission in September 2012). Thus, in these two variants, the levels of GHG emissions obtained for the Current Policies scenario in 2020 is less than –3 Mt CO_2 to –11 Mt CO_2 compared with emissions for the year 2020 in the reference WEM scenario.

For the WAM scenario the impact is the same but with a further reduction by 2020 within range of between –3 Mt CO_2 and –10 Mt CO_2 compared with the reference New Policies scenario.

D.3 Quantification of policies and measures

The impact of all GHG emissions in 2020 under existing measures is 226 Mt CO_2 eq. compared with the level of emissions achieved with the no policy scenario. The impact of new policies in 2020 is equal to 37 Mt. CO_2 eq. compared with emissions level reached by the WEM scenario. These assessments are conditional upon the points of vigilance and sensitivities stated above.

E. Impacts, vulnerability and adaptation

E.1 Impacts of climate change

Annual average temperature changes in France have the same characteristics as on the global scale: the average temperatures are markedly warmer. Until the mid 1980s the average annual temperature was lesser than the average for the period 1971-2000. Since the 1980s average temperatures have increased rapidly. 2011, at +1.8 °C above the average for 1961-1990, was the warmest year recorded in Metropolitan France since 1900, beating the previous record set in 2003 (+1.7°C). French overseas departments have experienced a similar trend, although less marked due to thermal inertia of the sea. Over the last forty years the temperature has increased from + 0.65 °C to + 1.5 °C depending on the region over.

The consequences of changing climate conditions are being felt in many areas. The glaciers of the French Alps and Pyrenees have seen a large decline in their mass balance over the years. This trend has speeded up considerably since the end of the 1980s.

Flora and fauna have also been affected by these changes. Vines and fruit trees are experiencing variations in their vegetative cycles (flowering dates on average 7 to 8 days earlier for apple trees and 10 to 11 days for pear trees since the end of the 1980s). Changes have been seen in the behaviour of birds, especially in migration. The Greylag Goose Anser now makes shorter migration journeys causing it to winter in France instead of Spain. Only a few geese were seen during the sixties but there were over 28,000 in January 2011.

E.2 Expected impacts of climate change

The "Drias, Climate Futures" project, in France's National Climate Change Adaptation Plan (2011-2015), meets an urgent need expressed by all adaptation stakeholders in that it provides easily accessible information and support for supplying impact studies and identifying climate change adaptation measures.

Published in September 2009 the French National Observatory on the Effects of Global Warming (ONERC) report entitled "impacts of climate change, associated costs and adaptation measures" shows that annual costs linked to climate change could reach several billion euros per year for Metropolitan France if no adaptation measures are taken. The majority of adaptation measures are however largely dependent upon regional characteristics and must therefore be defined on a case by case basis at local level. For 2050 and 2100 the report puts forward losses for the agricultural sector, a decline in water resources in zones already under pressure, a sea-level rise, an extension of areas affected by shrinkage and swelling of clay soils and potential saving in energy consumption unless the use of air-conditioning in the residential and transport sectors increases.

Water

An impact study on all the watersheds in Metropolitan France carried out as part of the Explore 2070 project indicates an almost general decrease in water recharging of between 10 and 25%. Two areas are more severely affected: the Loire Basin with a decrease of 25 to 30% over half its area and South West France with decreases of 30 to 50%. Conversely, winter recharging could increase in some northern basins.

Heatwaves

Heatwaves could increase greatly to the point that the heatwaves of 2003 and 2006 could become the norm in summer at the end of the 21st century.

Sea-level rises

The world's sea-level rose about 120 meters over the millennia which followed the end of the last glacial period (about 21,000 years ago) and then stabilised about 2000 to 3000 years ago. Sea-level indicators show that the world's sea-level did not change much between then and the end of the 19th century. Measuring instruments for observing the current sea-level show that sea-levels began to rise again during the 19th century. Recent estimates indicate that the world sea-level rose at a rate of 1.7 mm per year during the 20th century[24].

24 *Planton S. et al, The climate of France in the 21st century Volume 3, Changes in sea-level, February 2012*

Vulnerability assessment

On the national scale the population's exposure to climate risk is considered moderate for 30% of municipalities and high for 16% of municipalities. But the regional situation is very varied. With a high risk index for all their municipalities Guadeloupe and Mayotte are the departments most at risk.

The average number of climate risks per municipality is 1.3. Depending on the municipality this number varies between 0 and 5. The vulnerability of a risk is likely to increase with climate change because some events and extreme weather conditions (heatwaves, soil dryness, marine submersion, forest fires) will become more frequent, more widespread and/or more intense. The extent of future risks is strongly linked to development and town and country planning choices.

E.3 Adaptation

Adaptation policy was set in motion at national level by the Ministry of Ecology at the end of the 1990s particularly under the impetus of the Climate Change Impacts and Management (GICC) research fund. This fund has financed research projects on emerging subjects relating to impacts of climate change and adaptation.
Tackling the intensification of the greenhouse effect and prevention of risks related to global warming were acknowledged as national priorities by a law voted unanimously by Parliament in 2001 (article L229-1 of the French Environmental Code).

Knowledge developed by the research community has enabled the development of a national climate change adaptation strategy in 2006 on the basis of collection set of robust information and analysis.

The French national climate change adaptation plan adopted in 2011 after an extensive consultation process extends this strategy by scheduling operational measures aimed at:

- Public safety and health;
- Prevention of risk inequalities;
- Limiting costs, seizing opportunities and preserving the national heritage.

Adaptation is considered in the context of regional climate, air and energy plans (SCRAE) and also, increasingly, as part of local climate and energy plans (PCET) which are compulsory for local authorities of over 50,000 inhabitants (cf. section C8 for presentation of SCRAE and PCET).

Alongside these strategic planning documents cross-border (mountain ranges, drainage basins, marine basins) and inter-regional (5 large zones identified in Metropolitan France) studies were carried out with the aim of investigating the consistency of global measures (AMICE, ACClimate, Alpine Convention, etc.).

Governance and assessment issues are important subjects for iterative improvement of the adaptation process. Initial studies have revealed some partial elements that can be looked at in more detail in the coming years.

F. Financial resources and technological transfer

In respect of its commitments (articles 4.3 and 4.5 of the climate convention) France has undertaken to facilitate technological transfers to emerging and developing countries, especially by supplying "new and additional" financial resources. In order to achieve this objective France provides financial aid and technological cooperation through a several of bilateral and multilateral channels, particularly through development aid. France's financing and technological transfer actions operate on several levels and involve many stakeholders, multilateral institutions, local authorities, businesses and the private sector.

F.1 Development aid - bilateral cooperation

France is a major player in bilateral development aid within the climate field with a very extensive sphere of influence, a recognised level of expertise and substantial financial commitment. In total, over the period 2009-2011, France has granted over 9 billion euros to activities with a positive shared benefit on the issue of climate change (help with cutting emissions, adaptation or implementation of new policies to tackle climate change) through the French Development Agency (AFD), a key operator of French bilateral development aid. For its financial contribution to tackling climate change over the period 2012-2016 the AFD has committed to a target of 50% of its grants to foreign countries and 30% of grants from PROPARCO, its subsidiary in the private sector. Furthermore, in October 2012 the AFD adopted a new energy strategy which lays down a target commitment of 2 billion euros to renewable energy and energy efficiency projects in developing countries for the next three years. In addition, 45% of commitments of the French Global Environment facility (FFEM), which is strongly inspired by the Global Environment Facility (GEF), for which the FDA provides the secretariat, is for projects with a positive shared benefit for the climate. This French fund has already committed 86 million euros since its creation in 1994.

F.2 Development aid – multilateral cooperation

Sustainable development and climate are two of the five sectoral priorities for French development aid. For several years France has strengthened its international action in this area and also mobilised large and increasing funds to tackle climate change in developing countries through the main climate funds (Global Environment Facility, the World Bank's Climate Investment Funds, the Montreal Protocol) and is one to the world's 5 biggest contributors to the climate.

France committed 3.2 billion euros of financial resources in multilateral development aid in 2011. This aid was allocated through multilateral development banks, the European Union and the United Nations. France is therefore the 4th largest backer of the world in volume and is in the second rank of G7 countries in terms of share of Gross National Income. It was one of the States behind the creation of the Global Environment Facility, the main multilateral instrument for protection of the global environment. France is the fifth largest contributor to the GEF and is providing funds of 215 million euros over the period 2011-2014 (including participation to less developed countries found- LDCF - managed by the GEF) which represents an increase of 57% of the French contribution compared with the previous reconstitution (2007-2010). On 30th June 2011 the GEF had financed 784 emission cutting projects in 154 developing countries for a total amount of 3.2 billion dollars since its creation in 1991. Over the period 2011-2014 the GEF has planned to devote a total of 1.35 billion dollars to tackling climate change (150 billion dollars had already been paid out in 2011). France has also contributed 203 million euros to the clean technology funds created in 2008 by the World Bank (which places it in 5th position over all backers).

Moreover, the General Directorate of the Treasury is financing the FASEP (Private Sector Aid and Studies Fund), which helps emerging countries with their development, in the form of donation, for services carried out by French companies (feasibility studies, technical help, pilot projects) linked to infrastructure projects. It also finances the Emerging Countries Reserve (RPE) which grants concessional loans to emerging countries for infrastructure projects (supply of French goods and services).

F.3 Technological cooperation

In addition to bilateral and multilateral channels for public aid for development, France is also involved in many international projects and forums which generate extensive technological cooperation with a large number of stakeholders. This cooperation is intended as a transfer, in the broadest sense of know-how, methods or tools necessary for implementing low-carbon transition technologies.

Since the fifth French national communication the technological situation has strongly evolved. Low-carbon sectors have been developed and deployed on a large scale especially in the renewable energy sector. More and more countries want to implement these technologies, in the North and in the South, as the number of countries with a renewable energy production target is estimated at 120[25], half of which are developing countries.

Bilaterally, this cooperation is carried out through work with Africa in particular but also large emerging countries such as Brazil or China. Similarly, French local authorities are very active in technological cooperation and are involved in many projects and initiatives.
Bilaterally, France is developing strategic cooperation with an increasing number of fossil fuel producer and consumer countries in the field of renewable energy and energy efficiency.

In this public policy implementation phase the private sector and decentralised cooperation are playing a particularly important role as operational stakeholders developing the necessary capacities on the ground to support low-carbon projects and supporting these technological transfers. French businesses and local authorities are particularly active in the matter and are developing mature and innovative projects in an increasing number of countries.

Multinationally, France's technological cooperation is made through large international energy partnerships such as the International Energy Agency (IEA) and in particular within the IEA's international low-carbon technologies platform set up in October 2010, CEM (Clean Energy Ministerial) or even IPEEC (International Partnership for Energy Efficiency Cooperation). In the wider context of operationalization of the SE4All (Sustainable Energy for All) scheme, the increasing power of the IRENA (International Renewable Energy Agency), a recent agency with a strong vocation of providing support to countries, to which France is the 6th largest contributor, deserves recognition. Extensive multilateral treaties should also be mentioned. The most important of these is the United Nations Framework Convention on Climate Change (UNFCCC) enabling technological transfer and the sharing of experiences to be supported and speeded up. It created and is in the process of operationalizing a technological mechanism promoting technological transfer to support developing countries in mitigation and adaption to climate change. The work of the UNEP (United Nations Environment Programme) or the FAO (Food and Agriculture Organisation) also encourages the sharing of experience and useful tools for low-carbon transition.

The thematic spectrum of France's technological transfer has expanded since the last national communication. This sixth French national communication is an opportunity to point out the progress made in terms of exchanges and sharing on frameworks and tools for adaptation to the effects of climate change, even if there is still much to do before this dimension is successfully integrated. France shares its own experience in the planning of adaptation policies. France has participated in several projects including one on the islands of the Indian Ocean, particularly through the ACClimate project which aims to strengthen its Members' capacity to adapt to climate change.

G. Research and observation

G.1 Research

French climate research contributes significantly to the advancement of knowledge in many areas: understanding climate mechanisms for refining climate models in order to produce information at relevant scales for the various activities concerned by the impacts (confirmed or potential) of climate change and their management,

25 *REN 21, 2012*

technological research, which develops measures for adapting to and/or mitigating climate change. All these areas now benefit from a central place in French research priorities both for long term objectives and for the implementation of relevant short term responses.

The French national strategy for research and innovation

At the government's initiative, the French Ministry for Higher Education and Research (MSER) has developed a national strategy for research and innovation (S.N.R.I.) which enabled the main research themes to be defined for the period 2009-2012 (including environmental crisis and eco-technologies) as well as five guiding principles for long term research. The theme of "environmental crisis and eco-technologies" are found on the following broad objectives:

- Understanding and modelling climate and biodiversity change with the aid of measuring instruments, especially satellites, and simulation;
- Understanding how living things react to external aggression (toxicology and eco-toxicology) linked to human activities and provide them with greater protection;
- Developing eco-technologies and eco-design to design products and competitive services with low or even no environmental impact throughout their life cycle;
- Ensuring a carbon-less energy future by a balance between research on nuclear and research on renewable energy in order to protect the environment.

The implementation of this strategy was entrusted to the Alliances, including AllEnvi (National Environmental Research Alliance) and Ancre (National Energy Research Coordination Alliance).

Financial Commitment by the French State

France's financial commitment to climate research can be assessed at 1 billion euros for 2011 and 2012[26], through all the public aid to the various aspects of climate research. The framework law of 3rd August 2009 on the implementation of the Grenelle Round Table, followed by law of 12th July 2010 on the national commitment to the environment, enabled various financial instruments to be set up including a new tool illustrating the strength of France's commitment to environmental research: the Research Demonstrator Fund. This fund managed by ADEME was given a budget of 325 million euros over the period 2009-2012 and its purpose was to bring new projects linked to new energy technologies to the fore. A very great deal of research effort in the energy field (new technologies, renewable energies, vehicles of the future, etc.) has also been agreed as part of Investissement d'Avenir (Future Investments) (Budget of 3.6 billion).

In energy management a research programme financed by the Ministry of Ecology, Sustainable development and energy and the Ministry for Higher Education and Research on energy in buildings (PREBAT) was set up in 2005 for a period of 5 years. Focused on energy management in buildings this programme deploys its efforts in two directions: modernisation of existing buildings and construction of high performance new buildings. The budget allocated to PREBAT was 6 million euros in 2006, 15 million euros from 2007 to 2010. The French national research agency's (ANR) Sustainable Towns and Buildings programme (2011-2013) which aims to explore the ability of towns and buildings to mutate in order to transform today's environmental burdens into an asset while ensuring economic viability and social cohesion, supports and supplements this programme[27].

The structure of French Research

One of the original aspects of the French research system is a very diverse organisation of participants, consisting of university teams, agencies, national research and applied research bodies. The structure of the landscape of Alliances is a force for bringing together the skills of research bodies, universities and schools and creating a dynamic of excellence in France and taking it into Europe through involvement in Shared Planning Initiatives. The AllEnvi alliance, created in 2010, brings bodies together on the Environment, and the ANCRE alliance on energy.

To stimulate innovation in the climate field France has developed a research system, since 2005, based on a regional structure around competitiveness clusters

26 *Source: Cross-department policy document, Climate, MEDDE/DLCES, 2013*

27 *French national research agency's plan for 2011-2013, 2012 edition*

which bring together businesses, laboratories and training establishments as part of performance contracts with the State and regional authorities. In 2010 it also launched Investissements d'Avenir (Future Investments) to create critical mass and target facilities of excellence. This system is based on the action of the French National Research Agency (ANR) created in 2005 and OSEO-ANVAR[28]. It supplements the joint action of the French Environment and Energy Management Agency (ADEME), the Ministry of Ecology, Sustainable Development and Energy (MEDDE) and the Ministry of Higher Education and Research (MESR).

The large national operators (ANR , ADEME, OSEO, etc,) play a central role in the climate research system. The ANR has launched some thirty calls for projects, selected nearly 1,500 files and committed nearly 540 million eurs in credits. [29]It also intervenes as part of calls for projects that contribute to European and global exchanges (ERA-NET set ups, involvement in Shared Planning Initiatives). The ANR was able to commit 739 million euros in 2012 of which 98 million euros was devoted to climate change research.

ADEME is responsible for managing financial resources from renewable heating development (223 million euros in 2012), waste management and the polluted sites treatment plan funds. It leads programmes on "Sustainable Consumption and Production" and "Sustainable Towns and Regions". ADEME's total budget devoted to "Energy and Climate"[30] for 2012 is estimated at 644.9 million euros, of which 236 million euros[31] was devoted to research.

Furthermore, on the subject of adaptation, ONERC (French National Observatory on the Effects of Global Warming), created in 2001 through the desire of Parliament and the Government to understand the issues relating to the effects of climate change, was given the task of collecting and disseminating information on risks and making recommendations on adaptation measures to be considered in order to limit the impacts of climate change. The IPCC's focal point in France, it works in a network with scientific bodies. In 2010 the ONERC piloted national consultation on adaptation to climate change and coordinated the preparation of France's first national adaptation plan, which was made public in July 2011. In line with this plan the DRIAS project (Giving access to regional French climate scenarios for the Impact and Adaptation of our Societies and the Environment) received huge support from the MEDDE. It was developed by Météo-France in collaboration with research from the French laboratories (CERFACS, IPSL), in close partnership with users from the regional authorities, the research world, large manufacturing groups or SMEs, design and engineering agencies or associations.

Private research is provided by businesses through their own research organisations. The State supports private research initiatives through 4 main systems:

- The research tax credit (CIR) which aims to stimulate expenditure on R&D by French companies. In 2009 the operation of this driving force for finance was as follows: the rate of tax credit applied to the volume of R&D expenditure was 30% for up to 100 million euros (40% the first year and 35% in the second). After this, businesses benefit from a tax credit of 5% with no upper limit. This credit is managed by OSEO and the budget dedicated to innovation assistance was 569 million euros in 2011.
- Support for competitiveness clusters has enabled a total of 645 projects to be rolled out since 2005. These projects represent an expenditure of 3.6 billion euros on R&D, mobilising 13,000 researchers and about 1.3 billion euros in public finance (including over 830 million from the French State).
- Support for industrial foundations, following the example of the Building Energy Foundation founded by the four major stakeholders from the construction and energy sector (Arcelor, Edf, GDF Suez and Lafarge), has the aim of financially supporting research operations for a minimum of five years, as well as financing the assessment and development of the supported work. It has a budget of 8 million euros, half of which is provided by the French State;
- Support for innovation in small and medium-sized enterprises (SMEs) and very small enterprises through

28 OSEO was integrated in the Public Investment Bank (BPi) on 12/07/2013
29 NRA Assessment Report – September 2012
30 According to the framework defined in the Source document: Key data and figures 2009-2012, Activity Report, ADEME, 2013
31 Source: Key data and figures 2009-2012, Activity Report, ADEME, 2013

the OSEO agency[32]. New finance for medium-sized enterprises amounts to 300 million euros, thus enabling more than 10 research projects to be selected each year.

G.2 Systematic Observation

France participates in the Global Climate Observing System (GCOS). This climate observation programme operates under the aegis of the World Meteorological Organisation (WMO, www.wmo.int/pages/prog/gcos), the International Council for Science (ICSU), the Intergovernmental Oceanographic Commission (IOC) and the United Nations Environmental Programme (UNEP). The purpose of the French national GCOS communication is to verify that the French system enables the climate to be monitored (spatial resolution, temporal frequency, working condition) and complies with specific aspects relating to the Climate Convention (Rio, 1992) and the Kyoto Protocol (1997).

Observation Services

On the national scale, the Observation Services are services approved by the French National Institute of Universal Sciences (INSU) and managed by the Universal Sciences Observatories (OSU).

Since 2010 MESR has developed the concept of SOERE (Observation and Experimentation and Environmental Research Services). The purpose of this initiative is to encourage the creation of a network of multiple agency observation systems and the dissemination of available information. AllEnvi is responsible for their evaluation, organisation, approval and monitoring. The SOEREs are systems supported by one or more financial backers including research bodies and establishments and/or the MESR. The French systematic observation system has therefore improved its organisation since 2010.

The system is be progressive and aims to make existing observation systems permanent.

Observation systems

Météo-France occupies a central place in the systematic observation system due to its history, its links with WMO and its location. This body represents France on a number of European and international forums due to its climate observation role. At the same time as managing its networks the establishment does important work in finding and restoring long series of climate data from written archives.

The meteorological observation system managed by Météo-France comprises 6 surface GPS stations in Metropolitan France (daily data is regularly supplied to the world climate centre in Asheville (United States) in the form of CLIMAT messages) and 19 for the Overseas Departments and Territories. In altitude the network includes 9 GUAN stations Overseas. GCOS monitoring principles have been incorporated in the Météo-France quality monitoring system ("observation" task).

Over the last few years France has developed the measurement of new variables for the terrestrial area such as the chemistry of rivers for which data is collected in the SOERE "drainage basin network". Observation of peat bogs is now organised around the measurement of carbon flows and for the development of permafrost (PEAT BOG network). Concerning the chemistry of the atmosphere, RAMCES (French Network of Atmospheric Greenhouse Monitoring Network) developed by the Climate and Environment Science Laboratory (LSCE) and the French Atomic Energy Commission (CNRS) enables the CO_2 balance to be calculated over a region or a continent. The MACC (Monitoring Atmospheric Composition and Change) project following on from GEMS has the objective of building a system for comparison and forecasting of atmospheric pollutants, CO_2 and aerosols. Finally, France is part of the pan European ICOS composite GHG observation project (towers, aeroplanes, satellites) which should enable daily maps of concentrations of CO_2 and other GHGs to be drawn up.

For the oceanic component, its contribution is through the MERCATOR project, with its observational Coriolis component which includes databases from various sensors (buoys, ARGO profilers – EURO-ARGO project, XBT probes, etc.). Finally, France participates in the sea-level observation network GLOSS and in the PIRATA moored arrays in the tropical Atlantic. In the terrestrial domain, France is part of the international Fluxnet programme

32 *OSEO is a public establishment responsible for supporting innovation and growth of SMEs by simplifying their access to public and private finance. Its activities consist of allocating direct aid to innovation for risk taking linked to the development of innovation programmes with a technological component. It became BPi on 12/07/2013*

with 6 CO_2 flow measurement sites in ecosystems, the custodians of which are Meteo-France, CNRS, CEA, etc. Finally, concerning space observation, the French National Centre of Space Study (CNES) has made important commitments in specific response to CEOS (Committee on Earth Observation Satellites) in terms of the implementation of GCOS. In addition, France has invested in the European GMES project which aims to federate and rationalise European Earth observation activities consisting of an collection of thematic services, the first components of which should be progressively put in place between now and 2013.

Cooperation projects concerning observation

In relation to GCOS in Africa, AMMA's international experience was extended from 2010. AMMA-CATCH, the observation system for long term monitoring of the impacts of the monsoon in West Africa has been kept. It was initiated by the MESR and receives support from the IRD (French Institute for Development Research) and INSU (French national institute for universal science).

In addition, France has invested in the international MISTRALS programme. Launched in 2008 and expected last until 2020 MISTRALS was spread across the area in 2010. This is an international meta-programme of basic interdisciplinary and systematic research and observations dedicated to understanding how the environment in the Mediterranean Basin operates and develops under the pressure of global human-generated change in order to predict future change. In addition to its academic vocation, MISTRALS is also intended to transform the research objectives and results into concepts and data accessible to decision-makers, regional stakeholders and managers, in order to identify national and transnational needs and to respond to societal, environmental and economic issues for the sustainable development of countries and populations sharing the Mediterranean sphere.

H. Education, training and raising public awareness

To continue on from the enormous increase in public awareness to the issue of climate challenge in 2007/2008, a wide range of public awareness, information and participation programmes continue to be carried out by all stakeholders involved in meeting this challenge. Climate change has become an unavoidable issue: it circulates through the political classes, mobilises business, citizens, associations, jurists and artists, etc. Initiatives are taken in schools, businesses, universities and the media. Local action is taken by associations and local authorities involving young people, citizens and families, etc. The largest number of people, in the whole range of situations of daily life, must be given the keys to understanding the issues so that each person can act according to his or her own level and abilities. And even be able to create new prospects for our world. New development from this mobilisation: cutting emissions is not the sole purpose of this mobilisation and a special place is now reserved for the challenge of adapting to the impacts of climate change.

State of public opinion

Although several surveys agree that the French people are aware of climate change and are interested in questions relating to energy, it must be acknowledged that in the current economic crisis the French people are concerned first and foremost by socio-economic problems while still reserving a degree of attention to the quality of their environment. Personal concerns such as health, safety, purchasing power and quality therefore predominate, pushing collective environmental concerns into the background.

ADEME conducts an annual opinion poll. Recent surveys[33] have shown:

- From a list of subjects, pollution, which was given top priority in 2006, fell to third position in 2012 (behind unemployment and social inequality);
- The years 2010 and 2011 were marked by a decline in French people's interest in climate issues and relative defiance towards scientific experts;
- Nevertheless, in 2012 there was a reversal in this trend: 41% of people interviewed considered that not enough is said about global warming compared with 48% in 2011.

33 ADEME, ADEME and you, Strategy and Studies n° 35, Dec. 2012

H.1 Education-Training

In this context, sustainable development education assumes a special place. It brings together a variety of complementary actions ranging from raising public awareness across the board to training in higher education or continuous professional development. Education aims to produce subject specialists in order to define a set of cross-curricular skills to be achieved by pupils in response to environmental challenges. Another shared outcome: enabling individual, group and professional activities to support change in society. Environmental and sustainable development education (EEDD) has been on the timetable in French schools since 2004. The key concept of sustainable development is given priority over the environment, according to an international trend of applying this notion to the design of educational systems, such as the United Nations decade for education for sustainable development (2005/2014). Since 2008 science, humanist culture and geography programmes in primary schools have included sustainable development concepts as a basis for pupils to tackle "protection of the environment". Since 2009 climate and energy have been introduced in secondary schools. The theme of climate change is also enjoying success in higher education establishments. But it is in the field of training above all that development is significant In order for France to have competent professionals to ensure the energy transition the President wants, numerous training courses have come into being so that building, energy, agriculture and town and country planning professionals can acquire the necessary new skills to steer their trade in a green direction. They also provide conversion courses for employees from sectors experiencing economic problems.

H.2 Raising awareness

Information campaign

Recognising the French people's strong motivation "to do something" provided they have concrete information on the type of action to take and in the light of the good results of the first part of the campaign in 2008 and 2011, the French government relaunched the national energy management and climate change awareness campaign, but with more emphasis on tax benefits such as tax credits. A number of regional versions have appeared on the subject, also promoting incentives for economic and regional stakeholders. This new campaign has strengthened the crucial role played by Energy Information Points in getting the public to actually take action for the first time. Energy labelling has been extended, even going as far as an experimental phase of environmental labelling on consumer products. In the case of transport services, businesses are required to tell their customers and users how much CO_2 is emitted.

Public participation, civil society, access to information

In view of the complex nature of the climate challenge and the considerable issues it raises for society, the principle of public consultation and participation has always guided the development of French national mitigation or adaptation policies. The development of the French National Adaptation Plan was subject to an enormous consultation exercise in 2010 which resulted in over 200 recommendations which were used as a basis for its creation. The year 2012 saw the launch of a new way: a law encouraging public participation by strengthening public involvement in decision-making when decisions affecting the environment was voted on, as provided by the Environmental Charter. In the same vein, the French President's desired energy transition began in 2013 with an enormous national debate involving the whole of civil society. This debate prompted all economic, social and individual stakeholders to take up the subject. Non-governmental organisations with a wide variety of outlooks such as the environment, science and trade unionism have become key intermediaries for reinforcing messages and directly involving people. All these stakeholders now act by carrying out greenhouse gas assessments before putting their own plans into action.

Numerous sources of scientific information are available to help these stakeholders understand the physical phenomenon of climate change in a way that is accessible to the largest number of people. French national mitigation and adaptation measures and policies are the subject of transparent debates and implementation monitoring.

Consequently, climate change is everywhere. The physical phenomenon has become a social phenomenon. While it continues to be relayed by the traditional media, but more moderately, the social networks constitute a new intermediary and source of information for an increasingly important subject. With books, films, ex-

hibitions, theatre, video games, Internet games, etc. climate change now comes in many forms. New developments: the adaptation section is getting more coverage and the tone is changing. After the catastrophic anxiety-inducing predictions humour is a new weapon for championing the cause of the climate challenge. Its off-centre stance makes an original impression.

H.3 Cooperation

Due to its experience at national and regional level France is also acting at international level, through cooperation mainly with all French-speaking countries and in order to provide expertise in the field of information and training on the climate challenge. This cooperation takes the form of training workshops on key aspects of this challenge or providing French translations of essential information for understanding the challenge and international discussions on the subject. In particular, France helped to strengthen the capacity of the government of the Maldives by organising a training session on the French national inventory system in 2010. It also participated in and supported training on reducing the use of fuel and limiting deforestation organised by the NGO Geres in Benin in November 2012. The MEDDE plans to support the second part of this training in 2013.

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