

Climate Change Strategy of the Basque Country to 2050



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EUSKO JAURLARITZA



GOBIERNO VASCO

Eusko Jaurlaritzaren Argitalpen Zerbitzu Nagusia

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INDEX

PRESENTATION	7
Iñigo Urkullu Renteria. The Basque Premier	
Arantxa Tapia Otaegi. Minister for Economic Development and Competitiveness	
Ricardo Gatzagaetxebarria Bastida. Minister for the Treasury and Finances	
Ana Oregi Bastarrika. Minister for the Environment and Territorial Policy	
1. INTERNATIONAL TRANSITION TOWARDS A LOW-CARBON ECONOMY AND ADAPTED TO THE CLIMATE	10
1.1. International commitment: to limit the temperature increase	13
1.2. Leadership of the European Union	13
2. A CHANGING SOCIETY. THE STARTING POINT AND FUTURE PROSPECTS IN THE BASQUE COUNTRY	16
2.1. The Basque Country's contribution to climate change	20
2.2. Evolution of the climate and vulnerability in the Basque Country	22
2.3. Perception of Basque society regarding climate change	26
2.4. Climate Change Strategy of the Basque Country to 2050: preparation and participation process	26
3. THE STRATEGIC APPROACH REGARDING CLIMATE CHANGE TO 2050	27
3.1. Vision	28
3.2. The Climate Change objectives to 2050	30
3.3. The Climate Change Goals and Lines of Action of the Basque Country.	32
3.4. Basque Country's Road Map for mitigation to 2050	43
4. ACTION TO 2020. THE PATH TO TRANSFORMATION	44
5. GOVERNANCE, ECONOMIC ANALYSIS AND MONITORING	55
5.1. Governance. The management model of the Basque climate policy	55
5.2. Economic analysis of the Climate Change Strategy of the Basque Country to 2050	57
5.3. Monitoring and assessing the Strategy	60
ANNEXES	63
I. Glossary	64
II. Summary of the strategic diagnosis	68
III. Related sectoral planning	70
IV. Synthesis of the participation process to prepare the Strategy	72
V. Detailed analysis of adaptation needs	74
VI. Emissions scenarios 2050 summary report	98
VII. Scorecard of the 2020 actions per Ministries	101
Summary of the economic impact of the Climate Change	
VIII. Strategy of the Basque Country to 2050 in its first implementation period (2015-2020).	108



KLIMA
2050
BASQUE COUNTRY



Climate change is one of the most pressing and complex environmental challenges that we are facing and it requires all our focus and initiative.

The UN's Intergovernmental Panel on Climate Change has unreservedly stated that the warming observed since the mid-20th century is caused by greenhouse gas emissions, due to human activity.

Over the last 150 years, the world's temperature has increased by around 0.8°C and it is estimated that it may continue to rise. This year has broken all existing records so far and it is already considered as the warmest in history. The effects of this change are being noted and they are being felt in sectors such as agriculture or forestry, energy production, tourism or infrastructures in general.

One of the most vulnerable regions to the direct impacts of climate change is Southern Europe, which is experiencing rises in temperature, floods or droughts. The Basque Country only contributes 0.5% of the total emissions of the European Union, but in any event, the Basque Government has assumed the principle of shared responsibility that underpins international policies to cut emissions.

This responsibility involves implementing a climate change adaptation and mitigation policy with a deep and unwavering commitment.

We have progressed with initiatives such as limiting greenhouse gases, increasing the capacity of the carbon sinks, evolving towards more efficient electricity generation and with less emissions, lowering industrial energy consumption, fostering mobility with lower emissions, energy efficiency at home, leverage of the livestock and agriculture biomass and stabilising waste generation. These are some of the achievements obtained in recent years. The Basque Country continues to be committed in this regard and Basque society is advancing towards a low-carbon economy.

KLIMA 2050 is the Basque Climate Change Strategy, an instrument shared by all the Ministries of the Government to strengthen and extend the measures implemented so far. KLIMA 2050 is in line with the vanguard Europe and is the Basque Country's pledge to sustainable human development.



**ARANTXA
TAPIA OTAEGI**
Minister for Economic Development
and Competitiveness

**IT IS OUR
OPPORTUNITY
TO ACHIEVE A
COMPETITIVE
LOW-CARBON
ECONOMY THAT
IS INNOVATIVE
AND ADAPTED
TO THE IMPACTS
OF CLIMATE
CHANGE**



**RICARDO
GATZAGAETXE
BARRIA
BASTIDA**
Minister for the Treasury
and Finances



**ANA OREGI
BASTARRIKA**
Minister for the Environment
and Territorial Policy

Climate change is without doubt the great environmental challenge of the 21st century. The Basque Country's key objective is to check greenhouse gas emissions, the main cause of the global warming of the planet, and to establish strategies that allow us to adapt to the social, economic and environmental impacts caused.

We are rising to this challenge with a new vision set out in the 'Climate Change Strategy of the Basque Country to 2050. KLIMA 2050'. It is our opportunity to achieve a competitive low-carbon economy that is innovative and adapted to the impacts of climate change.

All the ministries of the Basque Government have been involved in defining and drafting the strategy in order to integrate all the climate change sectoral policies into a single planning instrument. The KLIMA 2050 strategy has been designed as a cross-cutting tool of the Basque Country, in keeping with the policies in place in the provinces of Araba, Bizkaia and Gipuzkoa as well as in the municipalities of the Basque Country.

In line with the commitment acquired by the European Union, the KLIMA 2050 Strategy of the Basque Country sets a target of cutting greenhouse gas emissions by 40% in 2030 compared to 2005, and by 80% by 2050. Furthermore, the goal is to achieve 40% energy consumption from renewable sources out of total consumption by 2050.

The roadmap that this strategy lays out from now for 2050 is broken down into shorter time periods, which will allow the actions that must be carried out in the different lines of action specified. The first of those periods runs until 2020 with a series of 70 actions to be implemented.

The approval of the 'Climate Change Strategy of the Basque Country to 2050. KLIMA 2050' is an environmental milestone for the Basque Country as it has its own tool to tackle future climate challenges.



1.

INTERNATIONAL TRANSITION TOWARDS A LOW-CARBON ECONOMY AND ADAPTED TO THE CLIMATE

“Human influence on the climate system is clear and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural spaces.”

IPCC, 2014

In 2014, the Intergovernmental Panel on Climate Change (IPCC) published its latest Assessment Report, the 5th since it was founded. It stated in the report that climate change is unequivocal and that it is extremely likely that greenhouse gases (GHG) due to human activities have been the dominant cause. The current atmospheric concentrations of the most common GHG (carbon dioxide, methane and nitrous oxide) are unprecedented in at least the last 800,000 years and have increased exponentially from the pre-industrial era to the present.

Between 1970 and 2010, global GHG emissions rose from 27 to 49 Gigatonnes¹ of carbon dioxide equivalents a year, which is up over 80%. The different annual average growth rates of the emission in this period²

are due to the cutting of the emissions of the so-called “transition economies” in the early 1990s and to the rapid increase in Asia from the year 2000³.

The IPCC warns that the current climate change and their associated impacts will continue for centuries, even should a very significant limit be achieved regarding emissions. Continued GHG emission will cause further global long-lasting changes to the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for the natural and socio-economic systems. All the GHG emission scenarios assessed by the IPCC to prepare its latest report foresee that the surface temperature will continue throughout the current century. It is very likely that heat waves will occur more often and last

¹ 1,000,000 million tons.

² 2.0% in the 1970s; 1.4% in the 1980s; 0.6% in the 1990s and 2.2% in the first decade of the 2000.

³ IPCC, 2014.

longer and that extreme precipitation events will become more intense and frequent. The oceans will continue to warm and acidify, and global mean sea level will rise.

Future prospects depend to a great extent on the roadmap that is established internationally. If economic development integrating mitigation (cutting GHG emissions) and adapting to the now obvious changes is ensured, the effect of climate impact will manage to be reduced, cutting the associated costs

and enabling resilient and low-carbon economic development (see Figure 1).

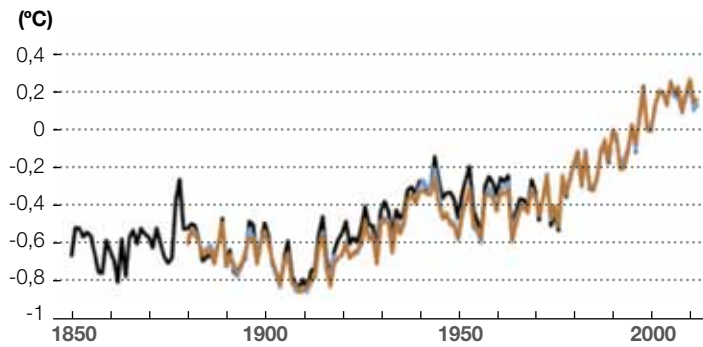
The measures to combat climate change are structured in two ways: cutting GHG emissions or mitigation and adapting to its impacts. Both are closely linked given the existing complementarity and synergies, as can be seen in Figure 2. The mitigation policies help to reduce GHG concentration in the atmosphere, which would mean fewer impacts arising from climate change and, consequently, less need to adapt to them.

Figure 1.

Historical evolution of global GHG emission, the average temperature and sea level

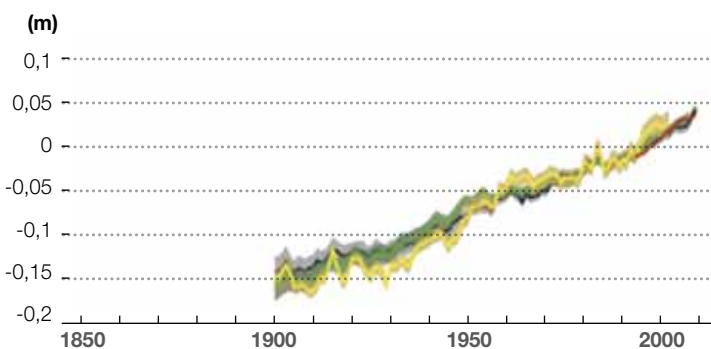
Source: IPCC, 2014

a) Variations in the average temperature of the ocean and land surface



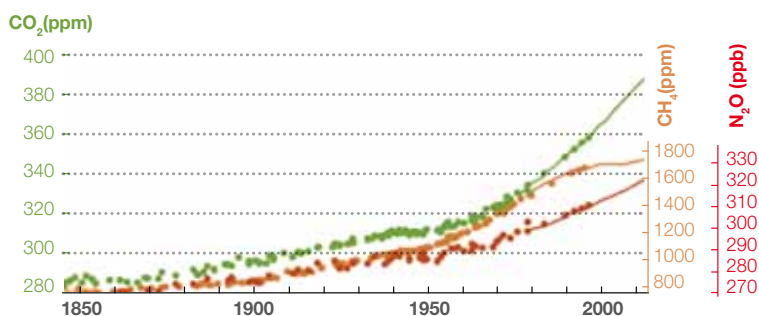
The different colours indicate different data groups.

b) Changes in the average sea level



The different colours indicate different data groups. They are all aligned with the same value in 1993 (the first year for which satellite data is available and marked by the red line). The uncertainties are shaded in.

c) GHG global average concentrations



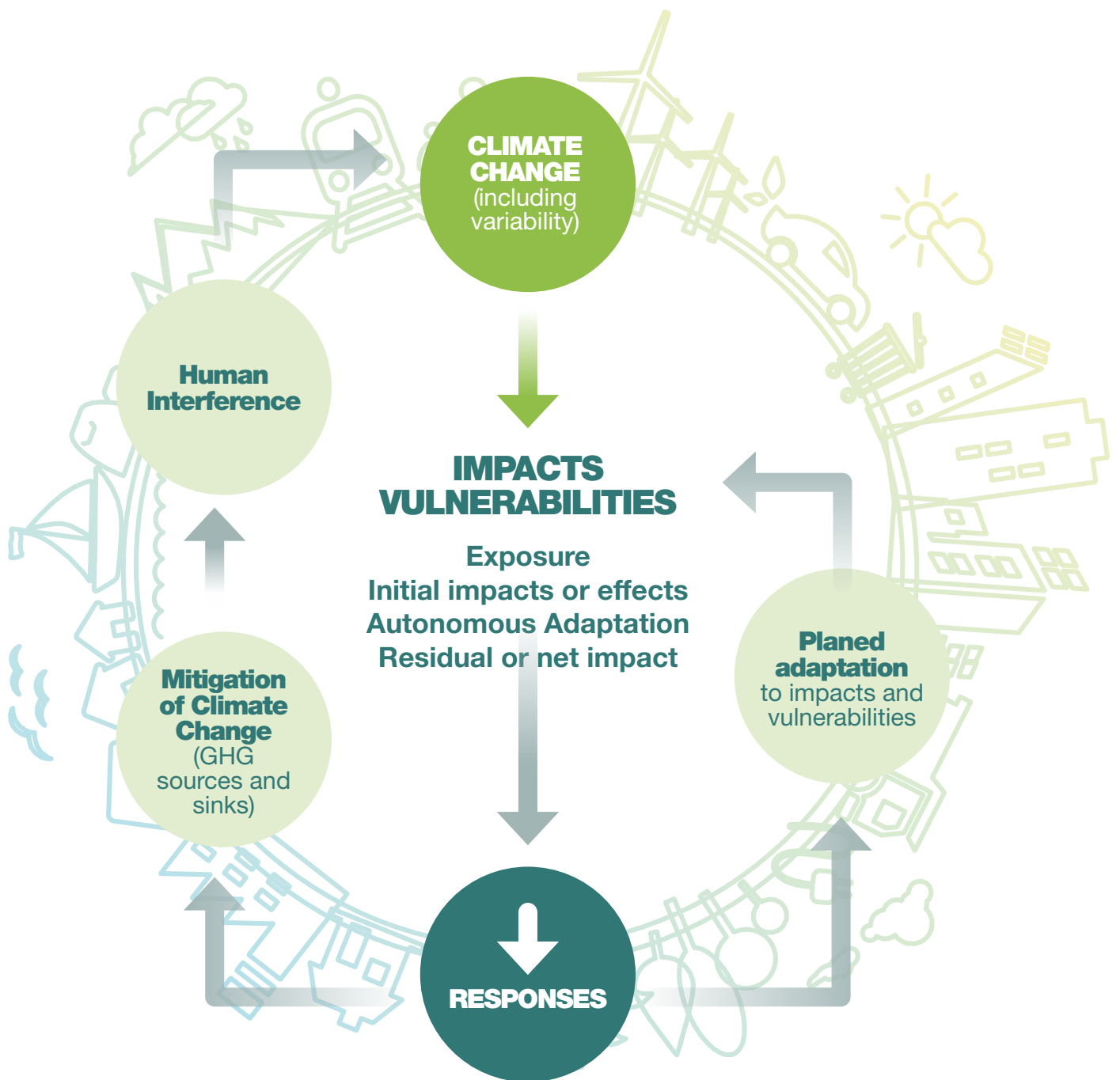
- Carbon dioxide concentration (CO₂)
- Methane concentration (CH₄)
- Nitrogen oxide concentration (N₂O)

All of these are calculated using ice core data (in points) and calculated using direct atmospheric measurements (in lines).

Figure 2.

Integration of climate change adaptation and mitigation policies

Source: Adapted from IPCC, 2014



1.1. INTERNATIONAL COMMITMENT: TO LIMIT THE TEMPERATURE INCREASE

Taking stock of 20 years of international negotiations on climate change, under the umbrella of the United Nations Framework Convention on Climate Change (UNFCCC) successes such as adopting the Kyoto Protocol have been achieved, as well as a new-born budgetary commitment to drive mitigation and adaptation measures.

After the preparations at the climate summits in recent years, the decisive event is the Paris COP 21⁴. The aim is to reach an international agreement there that limits the average temperature increase of the planet to under 2°C with respect to the pre-industrial era⁵. This is the limit, based on scientific information, which has been established to keep the interferences with the climate system to within acceptable thresholds. The European Union has already proposed that the international agreements should at least achieve a 60% reduction of global emissions by 2050, compared to 2010. This undertaking would involve both the major emitters - China, the United States and the European Union itself that together account for over half the global emissions – and emerging countries.

The aim would be to reach the maximum geographical cover by taking into account the very capacities and responsibilities of each party.

If we now turn our sights to the climate change international agenda for the coming decades, it should be noted that the United Nations has replaced the Millennium Development Goals by the Sustainable Development Goals for 2030. They propose 17 new goals regarding the main challenges of the planet. Goal 13 is defined as “Take urgent action to combat climate change and its impacts” and its three priority measures are:

- Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries;
- Integrate climate change measures into national policies, strategies and planning; and
- Improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

1.2. LEADERSHIP OF THE EUROPEAN UNION

The European Union (EU) has been leading international climate change policy for over 10 years. In 2005, the European Union Emission Trading Scheme (EU ETS) came into force. The 2020 climate and energy package was passed in 2010 and set three key objectives that are listed below.

Climate-Energy Goals of the European Union up to 2020

- A 20% reduction in EU greenhouse gas emissions in 2020 from 1990 levels;
- Achieving 20% renewable energies by 2020;
- Achieving 20% energy efficiency by 2020.

The most recent data suggest that the three goals can be achieved. In the case of the objective to cut emissions, the scenarios predict a reduction of between 21% and 26% by 2020, exceeding the target set of 20%. In fact, the figures for the last year available, 2012, showed a reduction in emissions of 18% and a 14% share of renewables out of the total final energy consumption⁶.

In this context, in October 2014, the European Council approved new targets for 2030 and was yet again heading the commitment to combat climate change worldwide.

⁴ COP 21, Conference of the Parties, December 2015.

⁵ The current scenario raises these predictions to 3.7 and 4.8°C by the end of 21st century.

⁶ EEA Report No 6/2014. Trends and projections in Europe 2014. Tracking progress towards Europe's climate and energy targets for 2020.

2030 targets of the European Union

- Reducing greenhouse gas emissions by at least 40% below the 1990 level;
- Increasing the share of renewable energy to at least 27% of total energy consumption;
- Increasing the minimum contribution of energy efficiency by at least 27%, a figure to be reviewed in 2020 and it may be possibly increased to 30%;
- Reforming the EU emission trading system for 2021.

European Union roadmap to 2050

In 2011, the European Commission published the Roadmap for moving to a low-carbon economy by 2050⁷ in which it recommends adopting a commitment to cut emissions by 80%⁸ with respect 1990, with milestones of 40% for 2030 and 60% for 2040.

It identifies innovation and technological development in the following areas as drivers for the change to a low-carbon economy:

- **Renewable energies.** Its technologies are expected to be cheaper in the future, but will require high investment to guarantee the supply and a smart distribution network, linked to a progressive electrification of the energy-demanding sectors.
- **Urban and spatial planning,** which enables optimum management of mobility supply and demand.
- The transition to a **more efficient and sustainable** European system by action on three main factors: vehicle efficiency through new engines, materials and design; cleaner energy use through new fuels and propulsion systems; better use of networks and more secure operation through information and communication systems.
- **Buildings** with practically zero GHG emissions thanks to savings and energy efficiency and renewable.
- Consolidation of **new technologies** such as carbon capture and storage.

This strategic documents concludes with the statement that: “As well as reducing the threat of dangerous climate change as part of ambitious global action, far-reaching reductions in the EU’s emissions have the potential to deliver benefits in the form of savings on fossil fuel imports and improvements in air quality and public health”.

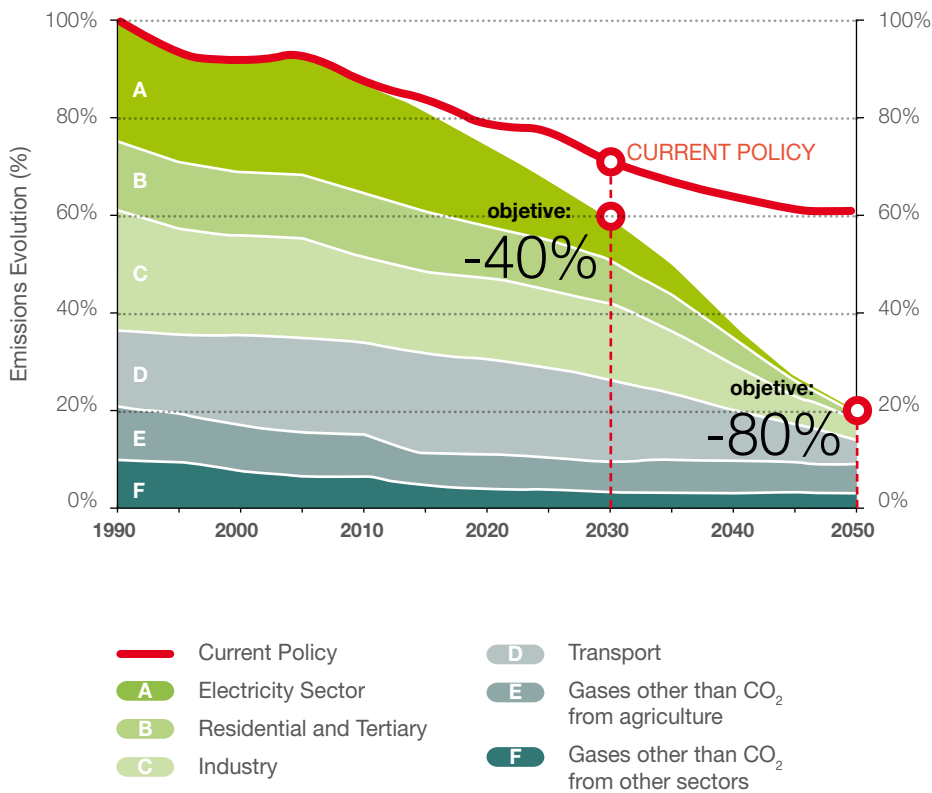
⁷ COM(2011) 112 final Roadmap for moving to a low-carbon economy in 2050.

⁸ This objective was set on EU internal emissions, without taking into account the acquisition of credits on carbon markets.

Figure 3.

Roadmap of the European Union to reduce emissions by 2050

Source: European Commission



The leadership of the European Union is not only focused on mitigation. At the end of 2013, the Commission published the European Strategy on Adaptation to Climate Change to help guide the regions to strengthen the adaptation capacity of the most vulnerable sectors (health, coastal and marine resources, infrastructures, biodiversity and

ecosystems, agriculture and tourism) and make them more resilient.

The main courses of action set to adapt to climate change focus on integrating it in the legislation and in financial policies, and in tandem, to continue improving knowledge as the base for decision making.





2.

A CHANGING SOCIETY. THE STARTING POINT AND FUTURE PROSPECTS IN THE BASQUE COUNTRY

The Basque Country has taken significant steps in its climate change policy and has managed to begin to get mitigation and adaptation to be present in the main sectoral plans of the Basque Government,

of the County Councils and of the municipalities. In turn, companies and the general public have significantly contributed to the advances that have been achieved (See Table 1).

Table 1.
Main milestones in policies related to climate change

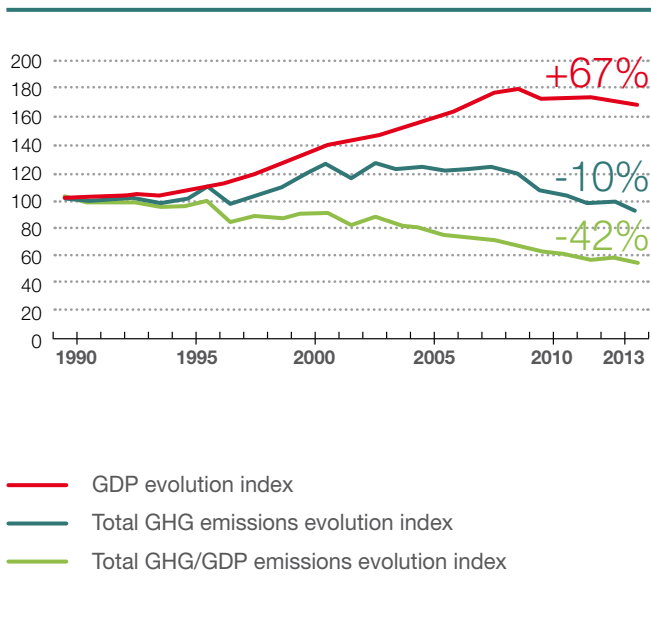
Year	International	European Union	The Basque Country
2002	World Summit on Sustainable Development (Rio +10), where several countries announced their intention to ratify the Kyoto Protocol	<ul style="list-style-type: none"> Council Decision 2002/358/EC concerning the approval, on behalf of the European Community, of the Kyoto Protocol. 	<ul style="list-style-type: none"> Environmental Strategy for Sustainable Development 2002-2020 Start of calculating the GHG annual inventories Sustainable Transport Management Plan 2002-2012.
2003		<ul style="list-style-type: none"> Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading in the EU (EU ETS). 	
2004			<ul style="list-style-type: none"> Practical guide to prepare Municipal Sustainable Mobility Plans.

Year	International	European Union	The Basque Country
2005	The Kyoto Protocol came into force	<ul style="list-style-type: none"> Phase I of the EU ETS. 	
2006		<ul style="list-style-type: none"> Green Paper: European Strategy for sustainable, competitive and secure energy. 	<ul style="list-style-type: none"> 30% Corporation Tax rebate for investments in equipment from the Basque Clean Technologies List.
2007	<ul style="list-style-type: none"> Fourth IPCC assessment report Bali Action Plan 	<ul style="list-style-type: none"> European Energy Technology Strategic Plan. 	<ul style="list-style-type: none"> Studies on flood costs in climate change scenarios: Bilbao and Urola Costa.
2008	Start of the first commitment period of the Kyoto Protocol	<ul style="list-style-type: none"> Energy and climate package 2020. Phase II of the EU ETS. 	<ul style="list-style-type: none"> First Basque Plan to fight against Climate Change 2008-2012. Energy Strategy 3E 2010. Setting up the BC3, Basque Centre for Climate Change.
2009	Copenhagen Agreement (COP 15): financial mechanism for mitigation and adaptation support for developing countries	<ul style="list-style-type: none"> Decision 406/2009/EC on the effort of the Member States to reduce their GHG. Directive 2009/31/EC on the geological storage of carbon dioxide. 	<ul style="list-style-type: none"> Creation of the Stop CO₂ Euskadi platform, voluntary reductions and emissions register. First Climate Change municipal bylaw (Durango). Focus CO₂, less cost, less CO₂. Action Guide for SMEs.
2010	Green Climate Fund	<ul style="list-style-type: none"> Directive 2010/31/EU on the Energy Performance of Buildings 	<ul style="list-style-type: none"> Knowledge Map of Climate Change in the Basque Country. The Vitoria-Gasteiz Plan against Climate Change 2020.
2011		<ul style="list-style-type: none"> Roadmap towards a competitive low-carbon economy in 2050. 	<ul style="list-style-type: none"> Energy Strategy of the Basque Country 2020 (3E 2020). Analysis of Impacts and Adaptation in the Basque Country (K-egokitzen). Maps shown likelihood of flooding from rising sea levels and peaks along the whole Basque coastline in climate change scenarios.
2012	Kyoto Protocol extended until 2020	<ul style="list-style-type: none"> Directive 2012/27/EU on energy efficiency. Inclusion of civil aviation emissions in the EU ETS. 	<ul style="list-style-type: none"> Urban planning manual for the mitigation and adaptation to climate change and Guide to prepare municipal climate change adaptation programmes.
2013		<ul style="list-style-type: none"> EU Strategy to adapt to climate change. Phase III of the EU ETS. 	<ul style="list-style-type: none"> Bilbao: Test case for the RAMSES European project (mitigation and adaptation of cities). Impact analysis on the marine ecosystem and resources of the Bay of Biscay (European MEECE project). Strategic focus to prepare the Basque Climate Change Strategy.
2014	Fifth IPCC Assessment Report	<ul style="list-style-type: none"> Climate and Energy Policy framework 2030. 	<ul style="list-style-type: none"> Environmental Framework Programme 2020 of the Basque Country. Roadmap to a low-carbon economy. 19 Basque municipalities signed up to the European Covenants of Mayors initiative. Donostia/San Sebastián signed up to Mayors Adapt. Carbon budgets of the Basque Administration. The Basque Country signed up to the "Compact of Regions".

From 1990 to 2013 (after the end of the target period of the Basque Plan to Combat Climate Change), the emissions in the Basque Country fell by 10%, despite the economy having grown by 67%. This implies a 42% improvement in efficiency in terms of CO₂ per GDP unit. The evolution of the emissions can be summarised in three stages: a first, when the economic growth was accompanied by an increase in emissions; a second stage of emissions containment; a third, when emissions have fallen since 2008 (See Figure 4 and Table 2).

Figure 4.
Evolution of GHG and GDP emissions in the Basque Country

Source: Basque Government



These achievements have been possible thanks to measures such as the gradual introduction of natural gas to replace other fuels; improving energy efficiency, implementing renewable energies and high efficiency cogeneration. Thanks to this, the Basque Country has improved its final energy intensity that was 12% lower in 2013 than in 2005 in terms of energy consumed per GDP unit.

Furthermore, the Basque Country has 545 MW of cogeneration, 23 MWp of photovoltaic solar energy installed, exceeding the targets set in the Basque Climate Change Plan 2008-2012.

It has also managed to drive less emission intensive means of transport with the implementation of urban rail networks, such as the underground and tramway that, together with the public bus lines, have helped to improve mobility in urban centres. Between 2000 and 2013, collective transport public services by road and rail grew by nearly 10%. In the same vein, freight transport by sea and by rail grew by nearly 7% for the same period. Furthermore, 16 km of tramway have been laid, which provide an alternative to urban mobility in two out of three Basque capitals.

In the sphere of waste management, dumping in landfill has been reduced by 60% and the ratios of fractions and recycling have increased.

The Basque Country has also consolidated research into climate change, by giving momentum to studies such as those arising from the K-egokitzen Project that brought together and coordinated the work of the University of the Basque Country (UPV-EHU) and technology centres, and whose results have been

Table 2.
GHG emissions (Mt CO₂e) per emitter sector

Source: Basque Government

GHG emissions (Mt CO ₂ e)	1990	1995	2000	2005	2010	2013
Energy Sector*	7.9	8.9	11.2	10.6	7.7	6.7
Industry	7.2	7.4	7.1	5.9	5.9	4.3
Transport	2,7	3,2	4,6	5,5	5,1	5,4
Residential	0,6	0,7	0,9	0,9	0,9	0,8
Services	0,2	0,3	0,4	0,5	0,5	0,5
Agriculture	1,1	1,1	1,1	1,1	0,8	0,7
Waste	1,0	1,2	1,2	1,2	1,0	0,9
Total	20,9	22,9	26,7	25,7	21,9	19,3

*Includes imported electricity.

the basis to update the diagnostics of the climatic vulnerability of the Basque Country. Based on this experience, *the Strategic Focus to Prepare the Basque Strategy to Combat Climate Change* document has been produced with other partners.

Different centres aimed at consolidating knowledge and technology to reduce GHG emissions and to adapt to climate change have been created and strengthened in tandem. The following table summarises the main innovative centres existing in this regard.

Centre	Description
Biscay Marine Energy Platform – bimep (2007)	<p>Dedicated to the research, demonstration and exploiting of marine energy harnessing systems.</p> <p>Closed area offshore, with a transfer power capacity of 20 MW, this infrastructure enables the installation, exploitation, demonstration, along with the running of tests and testing, in order to facilitate the transition of these new technologies to their commercial phase.</p>
BC3 Basque Centre for Climate Change (2008)	<p>Dedicated to research to cut emissions, analyse the climate and the natural environment, health and climate policy.</p> <p>Recognised as the leading most influential think tank in Europe and the second in the world, regarding climate change economics and policy, according to the International Center for Climate Change Governance.</p>
Basque Ecodesign Center (2011)	<p>Focused on driving the development of business policies and ideas by means of ecodesign, in such a way as to improve competitiveness and cutting GHG emissions.</p> <p>It has managed to become a benchmark in the European Union, by consolidating a network made up of companies and the Basque Government.</p>
CIC Energigune (2011)	<p>New energy research centre that seeks to position the Basque Country as a benchmark in research excellence in energy and sustainable development. It is dedicated to research excellence, knowledge transfer, high level training and coordinating R&D&i projects.</p> <p>Its work is considered to be crucial to drive the setting up of business groups with international leadership in new market niches.</p>

As regards sectoral planning, the Basque Country is introducing aspects related to mitigation and adaptation to climate change⁹. Local authorities have also developed plans to reduce GHG emissions, linked to schemes such as Local Agenda 21 and the Covenant of Mayors. The latter is driven at European level and under the commitment to reduce their emissions by at least 20% by 2020. Furthermore, a total of 30 municipalities have climate change programmes and 6 of them have introduced specific legislation in that regard.

In 2014, the Basque Country was confirmed as co-chair for a further term of the States and Regions Alliance in The Climate Group, a non-profit organisation that fosters the combating of climate change among public and private institutions. Among its initiatives, it includes the Compact of Regions, supported by the United Nations to give impetus to climate change mitigation actions of sub-national governments. The Basque Country, as a member of that platform, undertakes to adopt a commitment to cut emissions and report its data each year.

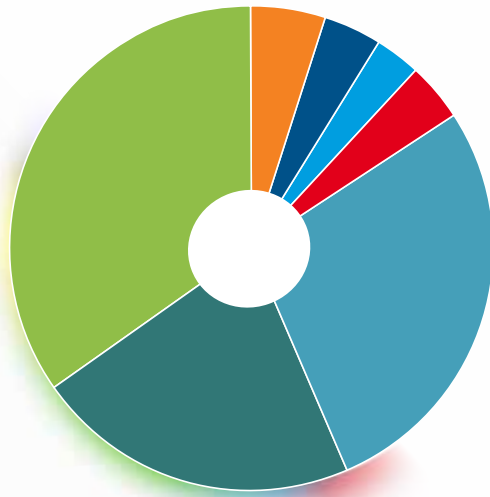
⁹ See Annex III “Related Sectoral Planning” for greater detail.

2.1. THE BASQUE COUNTRY'S CONTRIBUTION TO CLIMATE CHANGE

The GHG emissions of the Basque Country in 2013 stood at 19,304 ktCO₂e, with the energy sector, transport and industry being the main emitters accounting for 85% of the total emissions. These emissions represent a 0.5% contribution of the total emissions of the European Union (See Figure 5).

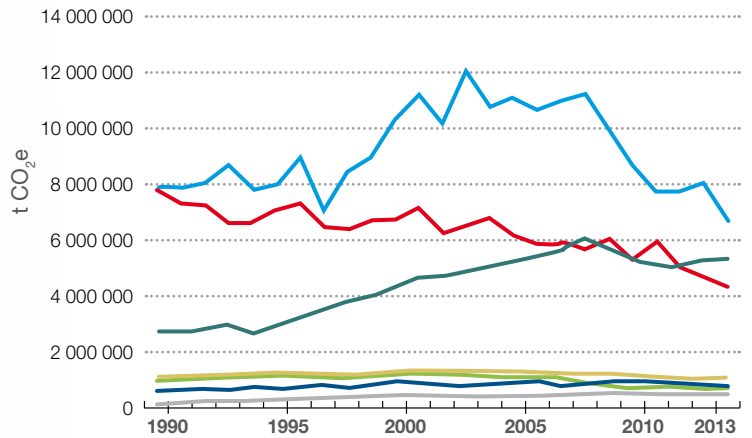
The evolution of GHG emissions from 1990 to the present has been mainly influenced by the reality of those three sectors. Emissions from industry were cut by 45% and those from energy by 15% between 1990 and 2013. However, transport emissions rose by 97% during that same period (See Figure 5).

Figure 5. **Emissions of the Basque Country, 2013.**
Source: Basque Government



- Waste 5 % (0,9 Mt)
- Agriculture 4 % (0,7 Mt)
- Services 3 % (0,5 Mt)
- Residential 4 % (0,8 Mt)
- Transport 28 % (5,4 Mt)
- Industry 22 % (4,3 Mt)
- Energy sector 35 % (6,7 Mt)

Figure 6. **Evolution of sectoral GHG emissions in the Basque Country, 1990-2013**
Source: Basque Government



- Energy sector
- Industry
- Transport
- Residential
- Services
- Agriculture
- Waste

GHG emissions projections

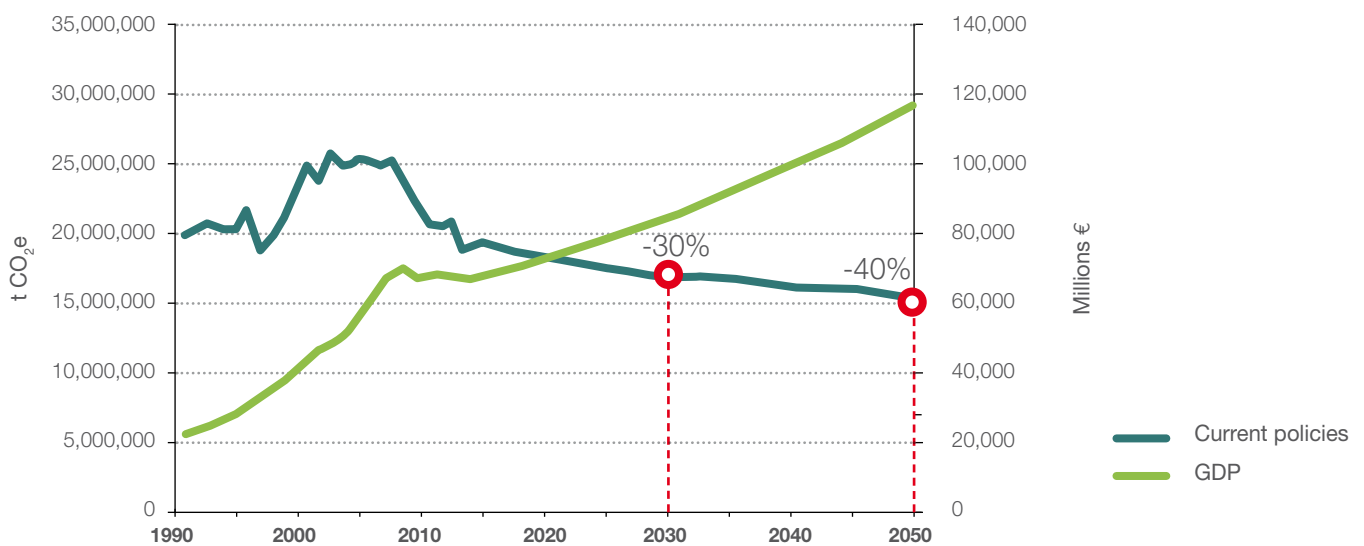
The long-term emissions forward studies carried out when preparing this Strategy were based on the BIOS[®] model¹⁰. It is a macro-economic simulation model that provides data on production, energy consumption and emissions using different social, economic and technical hypotheses. Its main driver uses the input-output tables to estimate the induced influence of the changes between the different economic sectors. In addition, it includes an exogenous treatment of those emission sources whose behaviour cannot be explained directly by mere demand hypotheses.

The emissions forward results for the Basque Country reveal that if we continue with the current policies, GHG emissions would be cut by 40% by 2050 in relation to 2005. This is in a future context of a slight fall in the population and increase of the GDP.

This continuity scenario of the efforts being already carried out (current policy scenario) would be achieved by 2050 with an increase of the energy efficiency and a renewables share of 16%¹¹ on the final energy consumption, apart from producing a shift in mobility towards more sustainable means of transport such as the railway or public transport and a reduction in the dumping of urban waste (See Figure 7).

Figure 7.

Projection of the GHG emissions and GDP of the Basque Country by 2050. Current policy scenario



¹⁰ Model used in different countries and territorial spheres in the context of National Climate Change Communications and strategic processes.

¹¹ Taking imported electricity into account.

2.2. EVOLUTION OF THE CLIMATE AND VULNERABILITY IN THE BASQUE COUNTRY

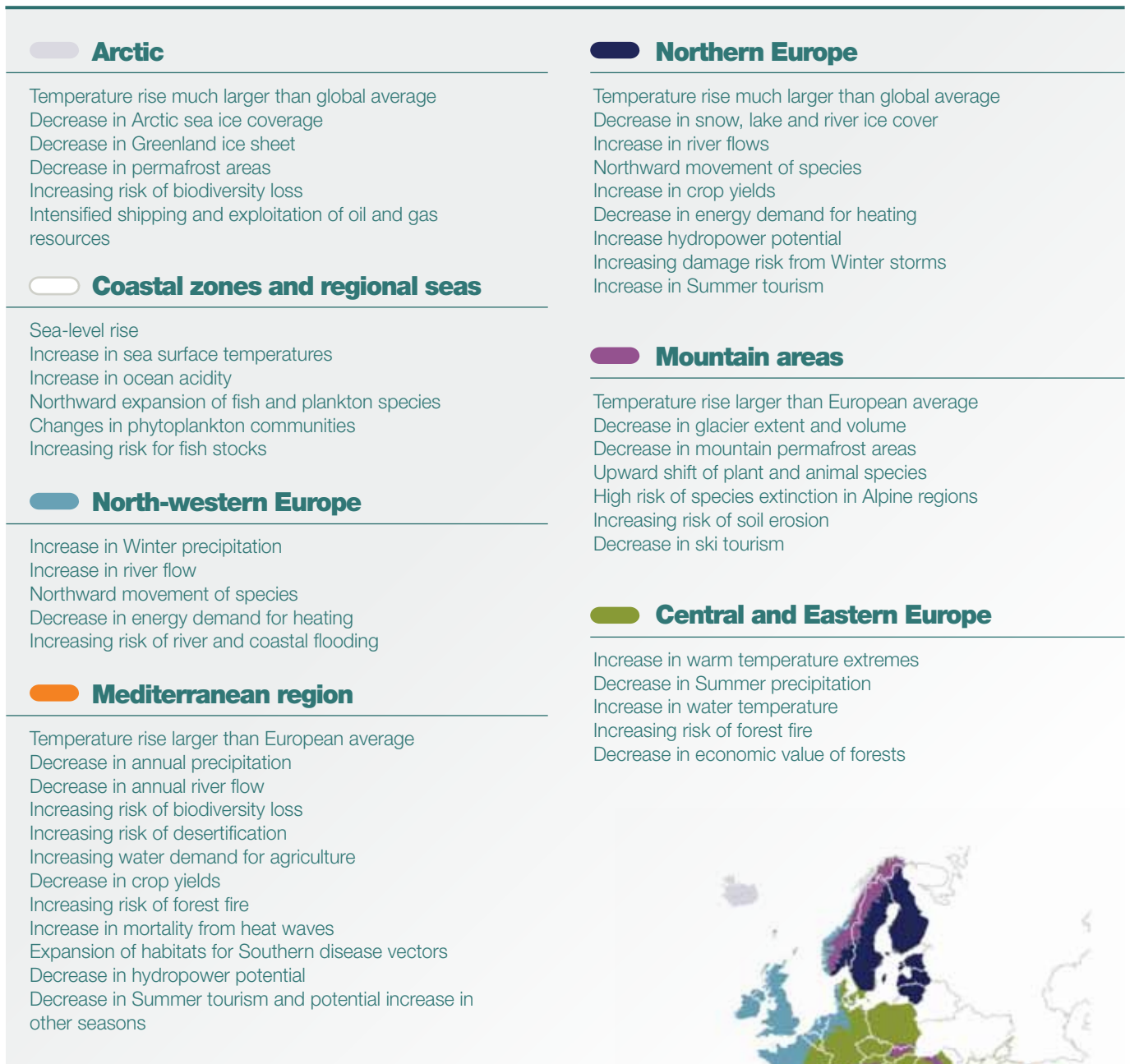
Changes in climate worldwide have set new records in recent years. The average temperature has increased and the precipitation patterns have been altered. The key effects of climate change for Europe

are set out in Figure 8, with the Basque Country being located in two of the identified regions: North-western Europe and the Mediterranean Region¹².

Figure 8.

Observed and future key effects of climate change in the main regions of Europe

Source: European Environment Agency – EEA, 2015



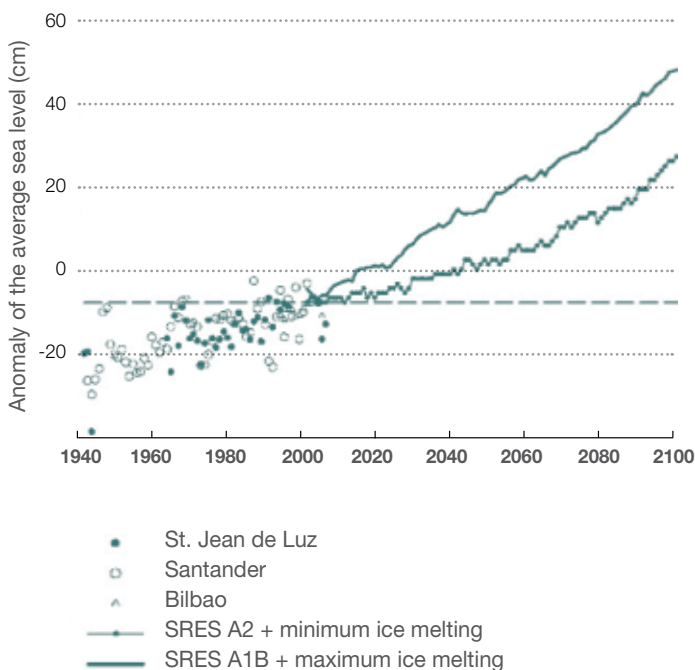
¹² AEMA, 2015 and IPCC Fifth Assessment Report, 2014.

Rising sea levels

The average sea level is expected to rise between 29 and 49 cm by the end of 21st century, which could cause beaches to shrink and increase the risk of flooding in estuaries¹³ (under the A1B and A2 scenario of the IPCC). Figure 9 shows that the trends of the rising sea level readings in the Bay of Biscay during the 20th century (circles) are consistent with the projected increase for the end of the 21st century according to climate scenarios (lines). Specifically, the speed in the rising sea level observed using Bilbao tide gauge data is 2.98 mm/year from 1993 to 2005; this rise rate is similar to that of Santander (2.67 mm/year) for the same period and to the rates obtained using the readings taken by sensors on board of satellites¹⁴.

Figure 9.
Average sea level rise rate (ASL) observed (circles) for the Santander, St. Jean de Luz and Bilbao tidal gauges, and projected levels (lines) for the 21st century

Source: Modified of Chust et al. (2011)¹⁵



Precipitation

In the case of the Basque Country, a slight drop in the average precipitation is expected, particularly in Spring. In particular, a drop of between 10% and 30% is expected on the Mediterranean side for the Spring period (by the end of the 21st century). On the other hand, the average precipitation may decrease up to 10% on the Bay of Biscay side in Autumn. As regards extreme precipitation, it is expected to increase by 30% by the end of the century (with greater increases expected for the western area of the Basque Country) (See Table 3).

Table 3.

Changes envisaged in precipitation by the end of the 21st century

Under the A1B scenario of the IPCC.

Source: MONJO, R.; CASELLES, V.; CHUST, G. (2014):

Probabilistic correction of RCM precipitation in the Basque Country (Northern Spain). Theoretical and Applied Climatology, 117: 317-329.

Season	Change in precipitation
Autumn	↓ 10%
Spring	↓ 10% to 30%
Extreme	↑ 30%

¹³ Chust *et al.*, 2011. Climate change impacts on coastal and pelagic environments in the southeastern Bay of Biscay. *Climate Research*, Vol. 48: 307–332.

¹⁴ Sea level is represented as the anomaly with respect to the average sea level of Santander in 2004. The projected rise is for two IPCC scenarios: SRES A2 for thermal expansion along with a minimum melting and SRES A1B for thermal expansion with a maximum melting.

¹⁵ Chust G, Borja A, Caballero A, Liria P, Marcos M, Moncho R, Irigoien X, Saenz J, Hidalgo J, Valle M, Valencia V. (2011) Climate Change impacts on the coastal and pelagic environments in the southeastern Bay of Biscay. *Climate Research* 48:307–332.

Temperatures

Temperature historical data, gathered in the three Basque capitals¹⁶, show an upward trend. The period 1995-2014 appears between the nineteen warmest years in the instrumental records of the surface temperature (except 2010) (Figures 10, 11 and 12).

As can be seen in Table 4 (page 25), the average temperature of the Basque Country for the period 2000-2014 was 0.8°C higher than the one on the period 1971-2000. That data are consistent with the data published in the IPCC Fifth Report (contribution of the working group to the Fifth Assessment Report of the Intergovernmental Expert Panel on Climate Change, 2013).

As can be seen in Table 5 (page 25), an increase of the annual average temperature is expected in Winter and in Summer, and it will be greater for the Mediterranean side. The extreme minimum temperatures at the end of the century may rise between 1 and 3°C during Winter months. Furthermore, the climate models show a 50% drop in the number of days below freezing ($T_{min} < 0^{\circ}\text{C}$) and given the drop in the length and frequency, cold spells are expected to have disappeared by halfway through the century.

With regard to the extreme maximum temperatures, the projections show a positive trend with an increase of 3°C by the end of the 21st century during the Summer months. The average of these maximum temperatures for the period 1978-2000 is 35°C, while it is expected to be 39°C for the period 2070-2100, meaning a much greater anomaly (4°C) than for extreme minimum temperatures. Given the envisaged changes, longer heat waves are expected and a slight increase in their frequency. During the benchmark period, just 10% of Summer days were classified as being in heat waves. However, this number will increase 30% between 2020 and 2050 and may reach 50% by the end of the century. This result is consistent with the increase in number and duration of the envisaged heat wave episodes.

¹⁶ The temperature anomaly is an indicator that expresses the deviation of the annual average mean temperature of a year determined, with respect to the historical average temperature of a reference period. The temperature anomaly data for the three Basque capitals, which are shown in Figures 10, 11 and 12 were calculated according to IPCC recommendations, which establishes 1961-1990 reference period. The temperature records are from the weather stations of Igeldo, Foronda and Bilbao airport, in EUROPEAN CLIMATE ASSESSMENT & DATASET (ECA&D). Klein Tank, A.M.G. and Coauthors, 2002. Daily dataset of 20th-century surface air temperature and precipitation series for the European Climate Assessment. Int. J. of Climatol., 22, 1441-1453.

Figure 10.

Annual average temperature anomaly with respect to the 1961-1990 benchmark period for Donostia/San Sebastián. Temperature records of the Igeldo weather station
DONOSTIA/SAN SEBASTIÁN, IGELDO

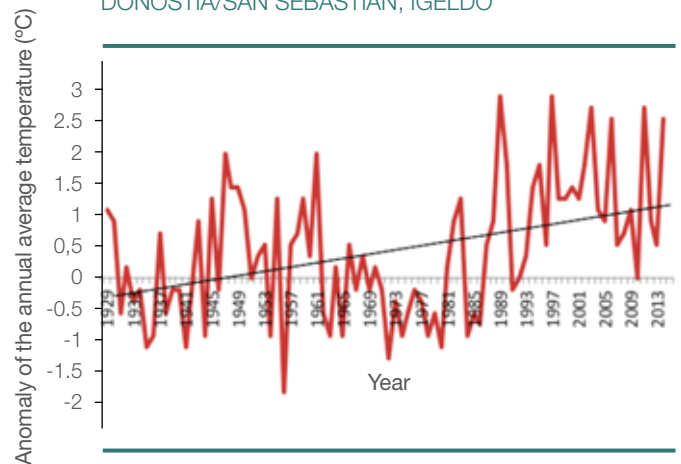


Figure 11.

Annual average temperature anomaly with respect to the 1961-1990 benchmark period for Vitoria-Gasteiz. Temperature records of the Foronda weather station
VITORIA-GASTEIZ, FORONDA

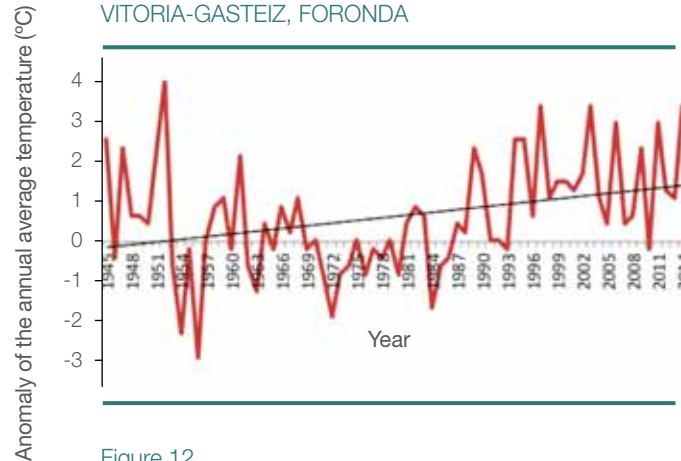


Figure 12.

Annual average temperature anomaly with respect to the 1961-1990 benchmark period for Bilbao. Temperature records of the Bilbao airport weather station
BILBAO, AIRPORT



Table 4.

The deviation in degrees centigrade of the monthly temperature of the 21st century with respect to the average temperature of the period 1971-2000

Source: Euskalmet

	E	F	M	A	M	J	J	A	S	O	N	D	med
2000	-1,6	1,5	-0,1	0,8	1,7	1,5	-0,2	0,2	0,8	-0,5	-0,8	1,5	0,6
2001	1,2	0,2	3,6	0,1	0,6	1,0	-0,4	1,5	-1,3	2,7	-1,9	-3,2	0,5
2002	1,9	1,5	1,7	0,6	-0,3	0,4	-1,3	-1,3	-0,3	1,0	1,7	2,5	0,9
2003	0,1	-1,1	2,8	2,3	0,8	4,3	1,3	4,0	1,2	-0,7	1,3	0,4	1,6
2004	1,6	-1,2	-1,4	-0,1	-0,1	2,7	0,0	1,1	1,2	1,8	-0,9	0,1	0,6
2005	-0,6	-3,3	0,5	1,4	1,9	3,3	1,1	-0,1	0,0	2,0	-0,8	-2,5	0,4
2006	-0,9	-1,9	2,1	1,5	1,8	2,5	3,3	-0,9	2,0	3,4	3,1	-1,1	1,4
2007	0,8	2,3	-0,4	2,5	0,8	1,2	0,0	-0,6	-0,8	-0,3	-1,4	-1,0	0,5
2008	1,8	2,2	0,1	1,3	1,2	0,5	-0,3	0,1	-0,6	-0,9	-0,8	-1,0	0,5
2009	-0,2	-0,6	0,1	0,4	1,4	2,2	1,3	1,3	0,4	1,3	2,1	-0,4	1,0
2010	-0,8	-1,0	0,1	2,3	-0,6	0,2	1,0	0,3	-0,1	-0,4	-0,5	-1,7	0,1
2011	0,4	0,8	1,0	4,3	2,4	0,9	-1,0	1,2	2,2	1,3	3,0	1,0	1,7
2012	0,7	-3,0	1,3	-0,2	1,9	2,1	-0,4	1,8	0,1	0,0	0,1	0,5	0,6
2013	0,7	-1,3	0,2	0,5	-2,6	-1,0	2,5	0,2	0,6	2,1	-0,3	-0,4	0,3
2014	2,2	0,5	0,8	2,9	-0,1	1,9	0,1	-0,3	2,0	3,0	2,3	-0,1	1,5
med	0,5	-0,3	0,8	1,3	0,8	1,6	0,5	0,6	0,4	1,1	0,4	-0,4	0,8

°C -5 -4 -3 -2 -1 0 1 2 3 4 5

Table 5.

Changes envisaged in temperature by the end of the 21st century

Under the A2, B2 (PROMES) and A1B (ENSEMBLES) scenarios of the IPCC

Source: Basque Government

Season	Watershed	Temperature Change
Winter	Bay of Biscay	↑ 1,5 – 2°C
	Mediterranean	↑ 2 – 2,5°C
Summer	Bay of Biscay	↑ 4,5 – 5,5°C
	Mediterranean	↑ 5,5 – 7°C
Extreme	Both	↑ Tmax 3°C Tmin 1-3°C

¹⁷ Hydrographics Studies Centre of the CEDEX, Centre for Studies and Experimentation on Public Works (2012): Study of the impacts of climate change on the water resources and water masses – effect of climate change on the ecological state of water masses. Ministry of Agriculture, Food and the Environment.

Expected main impacts of climate change on the Basque Country

The local studies on the effects of climate change on the risk of flooding suggest that significant increases could occur in the maximum flood flows, along with the flooded surface area and with the speed and flow values of the current. Those changes could produce a relative increase of the hazard and of the damage from flooding.

The work carried out at state level forecasts a drop in the average precipitation as a result in the net drop in precipitation and the increase in the evapo-transpiration, with 11%¹⁷ being established as the state reduction coefficient of the water resource inputs by 2033.

In the farming sector, the future environmental conditions due to climate change (by the end of the 21st century) will increase the yield of certain crops (Winter wheat, vine); along with an increase in the efficiency in the use of water, a factor that will be determining when plants grow simultaneously at high CO₂ and in droughts.

With regard to the forestry sector, the forecasts using ecological niche models show a significant impact on the studied species (*Q. robur*, *F. sylvatica* and *P. radiata*), whose niches are expected to have nearly totally disappeared by 2080 and their progressive migration towards the North of Europe during the 21st century.

The studies conducted to assess the impacts on marshland and coastal wetlands indicate that 7% of its current surface area could be affected by the rising sea level by the end of the 21st century. The response of the marshlands, wetlands and other intertidal communities such as the sea-grass meadows to this rise may result in the natural migration inland, even though they will be prevented in many cases by the natural and artificial fixed barriers, with the ensuing impact on biodiversity.

The impact on marine biodiversity can already be seen, for example, in the decrease of *Gelidium* seaweed due to the rise in the water temperature and increase in number of sunny days.

Source: K-egokitzen project. Basque Government

2.3. PERCEPTION OF BASQUE SOCIETY REGARDING CLIMATE CHANGE

This climate change Strategy responds to a demand by Basque society. Seventy-two per cent of the population considers that protecting the environment and combating pollution are urgent and immediate issues. Climate change is the second most important environmental problem, behind air pollution, according to the Environment and Energy study (2013) of the Basque Government's Sociological Surveying Office. Sixty per cent of the people surveyed believe that impetus should be given to the policies to protect the environment, despite the current economic context. This reflects a growing public demand for action by the Basque Public Administration.

As regards the use of energy sources, the study reflects that 67% of the population considers that the Basque Country must prioritise hydraulic, wind and solar power, compared to 7% who believe that sources such as oil, natural gas or coal must be prioritised. In this regard, 51% believe the current dependence on oil to be serious and 23% very serious. The majority opinion (60%) is that current energy consumption must change, looking for new sources of energy, but which must in turn allow the current standard of living to be maintained or improved. The Climate Change Strategy seeks to respond to those demands for action, by aligning the endeavours of the public authorities and acting as a benchmark framework for the economic stakeholders and society in general.

2.4. CLIMATE CHANGE STRATEGY OF THE BASQUE COUNTRY TO 2050 PREPARATION AND PARTICIPATION PROCESS

In 2013, after the expiry and assessment of the Basque Plan to Combat Climate Change 2008-2012, work began on preparing this Strategy in order to set a roadmap both to mitigate emissions and to adapt to climate change, and to bring its timeline in line with Europe.

In 2013 and 2014, an in-depth analysis of the baseline, entitled "Strategic Focus to Prepare the Climate Change of the Basque Country", was produced in conjunction with the University of the Basque Country, the technology centres, the three Basque county capitals and Basque companies specialising in climate change.

The main conclusions of that study revealed that the main sectors which needed to be prioritised to cut GHG emissions are the energy and transport sectors, without overlooking the consumer sectors with room for action, such as the residential and service sector and industrial sector. As regards adaptation to climate change, special mention should be made of the priority sectors of water resources, the urban environment and coastal zone, due

to their vulnerability, strategic importance and scope for action.

The preparation process has involved different Ministries of the Basque Government and input from the County Councils, local councils and Basque citizens, thanks to the participation process run together with the technical work.

The combination of sessions and individual contacts with all the agents of Basque society has enabled a joint definition of goals and lines of action up until 2050 and the prioritisation of the actions to be carried out up until 2020. The involvement of the different Ministries of the Basque Government has been essential in this process and they have strived to mainstream climate change planning in the different sectoral policies. The municipalities, associations and different research groups have also contributed their points of view and opinions, which has significantly enriched Basque planning regarding climate change.



3.

THE STRATEGIC APPROACH REGARDING CLIMATE CHANGE TO 2050

During the last decade, climate change has become a major environmental, social and economic challenge. Cutting GHG emissions and establishing strategies that enable it to adapt to the impacts of climate change has stopped being merely perceived as a threat and has now also become an opportunity to achieve a more competitive economy.

Climate change has a series of variables that mean broad and flexible planning is required, from the very cross-cutting nature of the impacts and measures, the needs to imply the different stakeholders of society, the breadth of the timelines and the uncertainty associated to its impacts.

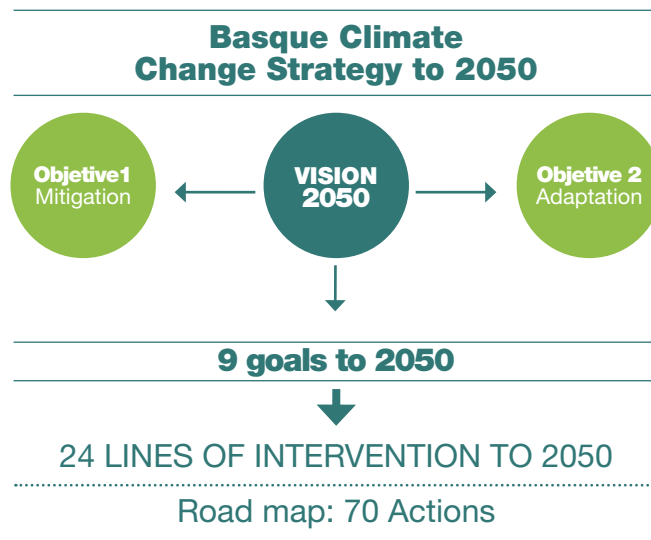
The Climate Change Strategy of the Basque Country to 2050 is in line with the endeavours and horizons of the European Union in this regard, but taking the situation of our society into account. It has also been designed as a cross-cutting tool of the Basque Government, which is coordinated by all its Ministries and linked with the policies that are driven in the three provinces and their municipalities. The exemplary nature of the Public Administration overall must be the driving force to give momentum to and foster a global co-responsibility of Basque society to tackle climate change.

The Strategy is the instrument that will allow a citizenry committed to a competitive and sustainable economy to be consolidated. This Strategy, therefore, defines the **Vision** of the Basque Country to 2050, underpinned

by five premises, whose application will also enable the objectives set to be reached.

As the action to combat climate change is addressed from the perspectives of mitigation and adaptation, the objectives that the Strategy sets are focused on both aspects, and due to its cross-cutting nature, they are divided into sectoral goals to 2050. To progress towards those goals, the Strategy sets lines of intervention that will guide the actions to be implemented in the coming decades (See Figure 13).

Figure 13.
Structure of the Climate Change Strategy of the Basque Country 2050



3.1. VISION

Vision to 2050...

The Basque Country has a low-carbon competitive economy, which is adapted to climate effects as a result of the consolidation of a knowledge-based climate change policy, which has allowed the opportunities offered by innovation and technological development to be seized.

This has been possible thanks to the co-responsibility of all stakeholders of Basque society, driven by the exemplary action of the Public Administration.



To achieve this vision to 2050, the Strategy identifies the following five premises as essential conditions to be taken into account in the climate change policy.

Premises to be taken into account

1. Mainstreaming action

To integrate mitigation and adaptation to climate change in public planning.

Climate change is still unknown in many spheres of action, which makes it necessary to raise awareness and knowledge about the channels to reduce the contribution to emissions, the expected impacts and the ways to adapt.

The integration of measures in planning instruments, in order to achieve that our cities and our territory are low-carbon and less vulnerable to the effects of the future climate, involves proactive and preventive measures, that will enable us to limit the environmental, social and economic losses and optimising the investments.

2. Exemplary Administration

To give impetus to the exemplary and coordinated action of the Administration to achieve the transformation towards an adapted and low-carbon society.

Any climate change policy must manage to bring all the stakeholders of society onboard. The Public Administration therefore needs to act as a driving motor for change, setting an example with visible measures that guide the action at all levels.

The inter-institutional coordination to achieve an effective climate change policy in all the sectors and spheres of action must also be ensured, as a response to the own cross-cutting nature of climate change.

3. Innovation and opportunities

To support innovation and technology development, which allow GHG emissions to be cut in all sectors and reduce the vulnerability of the territory to climate change.

To achieve a strong roadmap that envisages GHG emission reductions in line with European targets, the proposed lines of action must be supported in the impetus to mainstream innovation and technological development to all sectors, with special emphasis on the diffuse sectors (that is, not affected by the EU ETS), in order to encourage low-carbon economic growth.

On the other hand, innovative solutions are necessary to allow the costs of the impacts of climate change to be reduced and even obtain profits, in order to use the opportunities that exist to foster innovation, generating business and jobs, and social and economic entrepreneurship in this new sphere of action.

4. Zero emissions culture

To foster the co-responsibility of all the stakeholders of Basque society in the adaptation and mitigation actions.

The Basque Government's new plan regarding climate change must induce action at all levels, by fostering the involvement of all the stakeholders of society.

Therefore, education needs to be integrated in the action against climate change, by means of training from the Basque educational system, along with the co-responsibility, by means of robust awareness-raising, information and communication actions that will drive and guide private initiatives in this regard.

5. Transformative knowledge

To adapt the local knowledge about climate change to decision making.

The climate scenarios have broad horizons, particularly as regards adapting to climate change, also presenting levels of uncertainty that will gradually decrease with new research in this area. It requires long-term planning to be established, which needs to be flexible so that it can be adjusted according to future knowledge.

Climate change is not static, depending on anthropogenic factors and the social and economic evolution, the envisaged impacts can vary in character and intensity. It is, therefore, necessary to generate knowledge in the Basque Country, by guiding and coordinating the lines of research in this regard, so that the results obtained facilitate decision making.

3.2. THE CLIMATE CHANGE OBJECTIVES TO 2050

In order to avoid the most serious risks arising from climate change, global warming must be limited to a temperature under 2°C over the level prior to the industrial era. This means that the reduction of the effects of climate change must continue, therefore, to be a priority for the world population overall.

During the first commitment period of the Kyoto Protocol signed in 1997, the UNFCCC¹⁸ set different reduction targets for each country, taking the socio-economic situation of each of them and the result of the negotiation into account. Thus, for example, the target for the EU-15 was to cut emissions by 8%, while for the Spanish State, it was not to increase its emissions by over 15%. The Basque Country, in turn, established a target of not increasing its emissions by over 14%. All those targets were set for the period 2008-2012, using 1990 as the base line.¹⁹ Those different targets are coherent with the different economic development of each country (convergence with the European Union). Thus, those countries that started from a high economic development in 1990 could establish higher reduction targets than the others. This sets a different starting point for the different states and regions in the target setting system.

The conditions of the post-2020 international scheme will be set at the aforementioned COP 21 Summit in Paris, based on the contributions sent by the different countries. In these contributions, some countries are taking 1990 as the baseline and others 2005. The European Union overall (EU-28) has set a global reduction target of 40% for 2030 with respect to 1990.

This target will be subsequently divided between the countries until a 30% reduction is reached with diffuse sectors with respect to 2005. As regards 2050, the European Union has been a benchmark to reach a reduction of at least 80%²⁰. However, it must be remembered that it is not a formal target but rather a *suggestion* that will guide the development of future European policies²¹.

In order to establish the mitigation targets in the Basque Country, a “Greenhouse Gas Scenarios to 2050”²² exercise has been performed jointly between different Ministries of the Basque Government, taking into account the environmental, demographic, energy and economic scenarios. Based on this work, and using Europe as a permanent benchmark, the Basque Country has defined in this Strategy, the reduction target for 2030 of at least 40% of their GHG emissions, and for 2050 the target is to reduce them by at least 80%, all in respect to 2005²³.

There is a strong commitment nationwide that allows a structural change in all the emitter sectors to reach this horizon. This change will also partly depend on the technology options that are available on the market for many of the spheres of action.

The GHG emissions reduction targets will be accompanied, therefore, by converting the sectors towards more efficient energy consumption and a share of renewable energies in the final energy consumption of at least 40%, linked to a progressive transformation towards the electrification of the

¹⁸ United Nations Framework Convention on Climate Change.

¹⁹ With 1995 optional for fluoride gases.

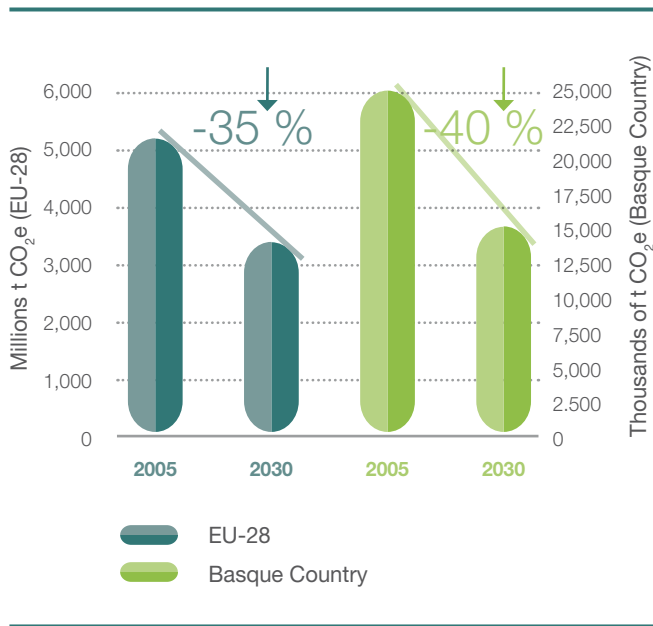
²⁰ “Roadmap 2050”.

²¹ The 80% benchmark also considers that to some extent the reduction will be produced by means of CCS (carbon capture and storage). The role of the sinks in this reduction has still not been determined.

²² See Annex VI, Emissions Scenarios 2050 report.

²³ Pursuant to the European distribution guidelines, and taking into account that different benchmark horizons are set internationally (varying between 1990, 2005 and 2010), meaning that this Basque Country Strategy takes 2005 as the baseline for their GHG emission mitigation targets.

Figure 14.
Reduction efforts comparison 2005-2030
EU-Basque Country



consumer sectors. Therefore, the Basque Country has set 40% renewable energy consumption out of the final consumption as the target for 2050²⁴.

In tandem, the structural change needed also contemplates modifications in the urban and territorial planning towards models with fewer mobility needs and with a sufficient supply of means of transport with low or zero

emissions. In addition, new technologies and ways of doing things are expected to be consolidated during this period that will allow the targets set for 2030 and 2050 to be overcome. Very ambitious values will be able to be achieved if new technologies currently in the pipeline are consolidated and an international policy with equivalent commitments for the developed countries is confirmed.

On the other hand, we need to get ready for the impacts of climate change, along with cutting emissions. Irrespective of the warming scenarios being used and the efficiency of the efforts being made to mitigate this phenomenon, the impacts of climate change will increase in the coming decades due to the lagged effects of the past and to the current emissions of greenhouse gases. Therefore, there is no other choice than to adopt adaptation measures to address the inevitable climate effects and the ensuing social, environmental and economic costs. It is more economic to programme adaptation measures with sufficient notice than pay the price of not doing anything.

In keeping with the European Adaptation Strategy and the foreseeable impacts of climate change in the Basque Country, this Strategy seeks to ensure the resilience of the Basque territory to climate change. The specific goals and lines of action to achieve this objective are set and will be taken both locally and regionally. Better knowledge of the impacts will be necessary, along with important efforts to integrate the adaptation of climate change in sectoral policies.

Table 6.
Objectives of the Climate Change Strategy of the Basque Country 2050

Objective 1.	Objective 2.
To reduce GHG emissions in the Basque Country by at least 40% by 2030 and by at least 80% by 2050, with respect to 2005.	To ensure the resilience of the Basque territory to climate change.
To achieve 40% renewable energy consumption out of the final consumption by 2050.	

²⁴ This target takes into account the consumption of imported electricity.

3.3. THE CLIMATE CHANGE GOALS AND LINES OF ACTION OF THE BASQUE COUNTRY

In order to achieve the objectives defined in the previous section regarding mitigation, adaptation and renewable, 9 Goals and a total of 24 Lines of Intervention have been defined.

Based on the sectoral analysis performed, needs for action have been identified in the field of mitigation mainly in the transport and energy sectors, in the territorial model and in the waste sector, as they are the greater emitters of GHG. As regards the adaptation to the effects of climate change, measures have mainly

been defined for the natural environment, the urban sector, the primary sector, coastal protections and water supply, as well as to foster a resilient territory.

Apart from the goals aimed at the sectors discussed, a mainstream application goal has been defined that is aimed at improving the expertise, training and awareness raising of the professional staff and the general public; and a final goal directly involves the Administration as a driving force for the application and compliance of this Strategy.

GOALS IN CLIMATE CHANGE

G1. Commitment to a low-carbon energy model

G2. Moving towards zero-emissions transport

G3. Increasing the efficiency and resilience of the territory

G4. Making the natural environment more resilient

G5. Making the primary sector more resilient and cutting its emissions

G6. Reducing the amount of municipal solid waste generated and zero untreated waste dumping

G7. Anticipating the risks

G8. Driving innovation, improvement and knowledge transfer

G9. Exemplary and responsible Basque Public Administration: a benchmark in climate change

GOAL 1. Commitment to a low-carbon energy model

The Basque Country has a high energy dependency on external sources from abroad (over 90%, much higher than the majority of the countries of the European Union), with natural gas and petroleum derivatives accounting for around 80% of the total energy demand, while the renewable energy share has remained steady over recent years at 7%²⁵.

The main energy demanding sector is industry, accounting for nearly 42% of the total, mainly natural gas and electricity. In this regard, its main climate change policy is the aforementioned EU ETS, which creates an economic incentive to implement mitigation measures. As regards renewable energies, over 80% of the renewable energy use is associated to biomass and biofuels and the greatest direct demand for renewable energy is linked to industry, mainly to the paper sector. As far as renewable electricity generation is concerned, even though the wind power and hydroelectricity generation has remained more or less stable in the last decade, 173 and 153 MW respectively, the photovoltaic solar capacity and the thermal solar surface have increased up to 24 MWp and 59,000 m²²⁶.

The urban environment, which includes the residential sector and services, was responsible for 20% of the energy demand of the Basque Country in 2013, mainly

based on electricity and natural gas. The Basque Country has nearly one million family housing units and the majority of them are the main places of residence. The analysis by provinces of the housing stock highlights a greater seniority of the Gipuzkoa stock, where nearly half (49%) of the houses built up to 2001 are prior to 1960, while this proportion falls to 33% in Bizkaia and 24% in Araba. Linked to this, the data reveal that the energy consumption per household and inhabitant is falling annually²⁷.

The cornerstones of the Basque energy policy are the security of the supply, competitiveness and environmental sustainability, aimed at achieving a low-carbon economy. The current economy is based on driving savings and energy efficiency, maximising the use of renewable energies and consolidating natural gas as transition energy to renewable. The lines of action set out below uphold this policy, with the aim of making a greater commitment to the horizon 2050, to achieve a reconversion of the industrial and energy sector towards maximum competitiveness and efficiency. They are likewise committed to modernising the stock of buildings of the Basque Country, from a sustainable and integral neighbourhood approach, and linked to driving savings, energy efficiency and renewable energies.

The **lines of intervention** set to achieve Goal 1 by 2050 are as follows:

- 1. Improving energy efficiency and managing energy demand.**
 - 2. Giving impetus to renewable energies.**
 - 3. Fostering energy efficiency criteria and renewable energies in the urban environment towards “zero-emissions building”.**
-

²⁵ This percentage would stand 14% taking imported electricity into account.

²⁶ Industry Office and EVE, 2013. Basque Government.

²⁷ Housing Office, 2013. Basque Government.

GOAL 2. Moving towards zero-emissions transport

In 2013, nearly 40% of Basque energy demand was associated to mobility. Transport mainly consumes petroleum derivatives (93% of its final energy consumption) and is the most demanding sector of this type of energy source (over 85% of petroleum derivatives consumed in the Basque Country are due to transport). Within mobility as a whole, 95% of energy consumption is due to road transport.

Analysis of the Transport Master Plan 2002-2012 reveals that during this period, there was an increase of the average mobility per inhabitant in the first years (+11% between 2003 and 2007) and lower in the last years (1.9% between 2007 and 2011), mainly due to the economic recession. The mobility studies conducted since then show that there is a high concentration of journeys in the county capitals (over 40% of the journeys each year start and/or end in one of the three Basque county capitals), which makes it easier to structure the future lines of action. In addition, the geographical situation of the Basque Country means that there is a great deal of freight transport in its territory, and nearly 80% is associated to road transport²⁸.

The future planning of mobility in the Basque Country will be focused on sustainability, with lines of action been set for the mitigation that reduces the mobility needs and fosters the use of public transport and intermodality, along with more efficient and environmentally sustainable vehicles and fuels.

According to the European Commission, the increase in the average temperatures and the sea level, the growing frequency and intensity of the extreme events (storms,

heat waves, floods, etc.) are having a significant impact on the operating of the transport infrastructures. In the specific case of the road network, climate stress is estimated to be already responsible between 30% and 50% of the total expenditure at European level. Around 10% of those costs are directly related to extreme events, particularly those with intense precipitation and flooding.

Particularly noteworthy among the direct impacts on the linear transport infrastructures due to the rise of the average temperatures are the greater wear and tear of the materials (including asphalt, expansion joints, reinforced concrete, railways, etc.) and the overheating of the auxiliary equipment. The most significant impacts caused by the change in the precipitation patterns include the damage and loss of functionality of the infrastructures caused by flooding and landslides. All this results in a shorter serviceable life of the infrastructures, on the one hand, and the impact in economic (possible sporadic blocking of the network) and social (foreseeable increase in accident rates for environmental reasons), on the other hand.

In response to the expected impacts, this Strategy sets lines of action to identify and monitor the vulnerable transport infrastructures (road stretches with platforms closest to watercourses, as well as stretches located in areas of greater hydro-geological instability, including the networks close to the coast and estuaries) to detect maintenance and resizing needs. In turn, the proposal is to give impetus to innovation in the designing of solutions to increase the resilience that allows the infrastructures to adapt to climate change.

The **lines of intervention** set to achieve Goal 2 by 2050 are as follows:

- 4. Fostering intermodality and means of transport with lower GHG emissions.**
 - 5. Replacing the use of oil derivatives.**
 - 6. Integrating vulnerability and adaptation criteria into transport infrastructures.**
-

²⁸ Transport Office, 2014. Basque Government.

GOAL 3.

Increasing the efficiency and resilience of the territory

The adaptation and mitigation of climate change need to be integrated into more mature public policies, such as urban and territorial planning and the management of risks and civic emergency due to extreme events, in order to progress towards a resilient and adapted territorial model.

In the municipal sphere, the most significant impacts are expected to occur in the form of tidal or river flooding, along with intensifying the urban heat island effect in Summer periods. Those effects can cause serious harm to the social, economic and environmental spheres of the municipality, including human losses and harm to health, damage to houses and infrastructures, loss of businesses and drops in productivity.

The lines of action set until 2050 in the sphere of adaptation are committed to an urban structure that is resilient to climate change, by means of detecting vulnerable areas and designing resilient urban and architectural solutions. Therefore, the proposal is to incorporate solutions based on nature and green infrastructures, as measures to adapt to climate change.

A key aspect at municipal level would be to have local climate change plans that include the adaptation perspective and emphasise interinstitutional coordination and citizen participation around the major challenges raised by climate change, while likewise fostering the cohesion of the urban, social and economic frameworks.

Territorial planning as a cross-cutting public policy is deemed to be the most appropriate framework for climate resilience, given its clear aim to set up in each territory the coordinated deployment of other sectoral policies and the involvement of private stakeholders. From this perspective, the Basque planning system is a mature and efficient system and is the outcome of a deployment of over 20 years.

The review of the Territory Organisation Directives (DOT) is the ideal framework to include the adaptation to climate change perspective when renewing and updating the territorial strategy of the Basque Autonomous Community.

Given that the vulnerability and impacts of climate change are locally specific and depend on the social, economic, ecological, biological and physical characteristics of each territory, the role of local governments in the adaptation is fundamental. One notable variable in this regard is the consideration of the limits of the urban area, as a mitigation and adaptation to climate change mechanism. Coordination at a supramunicipal scale is also essential for greater effectiveness of the efforts and actions. In this regard, the Partial Territorial Plans (PTPs) coordinate the municipal urban development plans at supramunicipal levels and other sectoral or strategic interventions at local level.

The options of integrating the adaptation to climate change at local level range from integration in the Local Agenda 21 to the very General Urban Development Plans that define and implement ad hoc measures and actions, aimed at minimising the adverse impacts of climate change at local level, strengthen the response capacities and exploit the opportunities of this phenomenon.

Another course of action in terms of integration will consist of incorporating the consideration of the possible effects of climate change in the short, medium and long term in the environmental assessment processes (Environmental Impact Assessment –EIA- and Strategic Environmental Assessment – SEA-) of certain plans, programmes and, as applicable, projects, so that the relevant measurement, assessment and adaptation measures are integrated in their design and development. All these options would be demonstrated using test cases that will act as an example to be put into practice in other contexts.

The **lines of intervention** set to achieve Goal 3 by 2050 are as follows:

- 7. Driving an urban structure that is resilient to climate change, compact and with a mix of uses.**
 - 8. Integrating vulnerability analysis and adaptation to climate change in territorial planning.**
-

GOAL 4. Making the natural environment more resilient

As stated in the report of the Intergovernmental Panel on Climate Change and the European Adaptation to Climate Change Strategy, the loss of biodiversity and of services in the associated ecosystems as the result of climate change, along with other dynamics such as the artificialization of the land or the fragmentation of the territory, are a problem to be addressed both due to their very importance and their influence on the correct operating of other sectors (health, safety, economy, etc.).

Land ecosystems act as process regulators and shock absorbers of the impact of extreme natural phenomena. Thus, managing the ecosystems appropriately helps, among other important aspects, to the widespread adaptation to climate change, reduces the risks of disasters, increases food safety and enables sustainable management of water sources.

The European Adaptation Strategy indicates different and resilient landscapes as the ones that best adapt to climate change, as they have a greater capacity to mitigate its possible impacts and, therefore, recovering from the extreme weather effects is easier.

In the Basque Country, 58% of the natural habitats are of community interest, 14% of which are priority interest, and form part of the Natura 2000 Network²⁹. The existence of different endemic plant species in the territory shows the importance of the Basque Country in preserving biodiversity. However, climate change can be expected to impact those habitats as follows: loss of biodiversity, changes in structure (dominance/composition of communities), disappearance of populations in particularly vulnerable habitats, changes in phenology and life

cycle, migration of some species, establishment of other species, etc. Given those potential impacts, this Strategy is committed to regenerating the ecosystems and their naturalisation, in order to maintain the resilience of the territory, and to promoting the connectivity between ecosystems that enable the migration of species and, therefore, combat the drop in populations and loss of species.

On the other hand, the coastal strip is one of the priority areas for adaptation. The specific geo-morphological features of the Basque coast (dominated by cliffs and facing the prevailing winds and swell), along with the urban development, has led to the confinement of certain coastal ecosystems (sea-grass meadow, wetland, marshland and dune vegetation). This prevents the natural shift of these communities inland in a global context of the rising sea level.

The most important impacts expected on the coastal strip are: the shrinking of the current width of the beaches, increase in the areas affected by the rise of sea level by the end of the century; increase in the total area affected by extreme swell; the advance of the salt wedge in the estuaries affecting cliffs and emissaries; wetlands and sea grass meadows shifting inland will be often prevented by natural and artificial fixed barriers; modification of salt habitats and changes in the circulation of nutrients, plankton production and lower concentration of dissolved oxygen.

Therefore, it is essential to manage the coastal zones taking the aforementioned effects of climate change into account. In such a way that it minimises the impact on the natural environment, the urbanised coastal zones and the possible impacts on the tourist sector.

The **lines of intervention** set to achieve Goal 4 by 2050 are as follows:

- 9. Fostering the multifunctionality of ecosystems as regulators of geological and biological processes, restoring species and vulnerable habitats.**
 - 10. Integrating the climate change variable in the management of coastal zones.**
-

²⁹ Council Directive 92/43/EEC of 21 May 1992 on the Conservation of natural habitats and of wild fauna and flora.

GOAL 5.

Making the primary sector more resilient and cutting its emissions

The rural territory accounts for 87% of the surface area of the Basque Country, with worked agricultural land accounting for 26% (in the last census in 2009). Even though the agricultural environment accounts for 4% of annual GHG emissions, it is a socially important sector, given that it generates wealth and jobs in rural zones, and it is environmentally important for its close interaction with the natural environment and for its role in preserving certain landscape values³⁰. Furthermore, the agricultural sector is the base of the agri-food sector, which makes it one of the cornerstones of the Basque rural environment. The rural and natural environment can also act as a carbon sink, by absorbing and retaining atmospheric CO₂ in the vegetation and land.

Woodland accounts for 55% of the total surface area of the Basque Country. It is noted for its importance regarding the multi-functionality and the goods and services that the woodland contributes to society, and not only in terms of those that have traditionally provided economic yields. The expected impacts are summarised in an increase in the CO₂ concentration, rise in temperatures or changes to the precipitation patterns that will have significant effects on the woodland. An increase in weather extremes is also expected and it will lead to more fires, earth movements, soil erosion and a loss of the carbon reserve of the land.

The crops, which account for 15% of the territory (just over 30% is Useful Farming Land), will also be affected by the climate change. The thermal stress on the crops is likely to rise, as will the pests and diseases, and the appearance of invasive species is more likely. These climate conditions will force the crops and plantations to shift in terms of latitude or those that remain in the same place will be less healthy. The foreseeable increase in weather extremes will lead to crop losses.

These changes in the climate may have an impact on the livestock sector. The changes in the rainy seasons

may affect the availability of the foraging and thus have an impact on the grazing periods. The changes in the temperature and in the precipitation may increase the appearance of parasite diseases, which together with the thermal stress may affect the health of the animals.

However, climate change may also create new opportunities in the primary sector. The rise in Winter temperatures along with the greater CO₂ concentration may increase the growth of some crop species (longer period). This effect would increase the yield of the agri-forest holdings, which in turn will mean more food at a better price for the livestock, thus increasing the profitability of the holding.

As regards the fishing sector, given its tradition and roots, special mention should be made of the following of the maritime activities overall: there are 2,782 people employed in direct jobs³¹ and over 15 municipalities consider themselves to be highly dependent on fishing. The climate change is expected to affect this sector as the warming, acidification and stratification of the water may have a significant impact on the ecosystems and marine resources. The temperature of the coastal water is expected to rise between 1.5 and 3.5°C by the end of the 21st century, with consequences on the shift of the populations of species (fish and zooplankton) and potential arrival of species from warmer water. The very characteristics of the mean imposes a limited capacity to act on the ecosystems, even if the adaptation of the affected economic sectors (the fishing fleet) and the control of some anthropogenic impacts (pollution) that affect the resilience of the marine ecosystems can be encouraged.

This context indicates that it is necessary to act in the sphere of adaptation. The Strategy is committed to adapt the practices and manage the primary sector to the new climate conditions. The proposal is to convert the studies and research on the effects of climate change

³⁰ Agriculture, Fisheries and Food Policy Office, 2014.

³¹ 2011 Data, Eustat.

on the primary sector into solutions and tools that allow the sector's managers and professionals to make decisions aimed at combating the negative effects of climate change and use the ensuing opportunities; and to define new practices in the primary sector (new eras

for sowing and harvesting, using resistant genotypes, fishing techniques, etc.).

In this context, three main lines of action for the fishing sector are established and are set out below.

The **lines of intervention** set to achieve Goal 5 by 2050 are as follows:

- 11. Fostering local, organic and integrated agricultural production and with lower GHG emissions.**
 - 12. Growing the potential of the carbon sink in the Basque Country.**
 - 13. Adapting the practices and management of the primary sector (farming and fishing) to the new climate conditions.**
-

GOAL 6.

Reducing the amount of municipal solid waste generated and zero untreated waste dumping

Around 80% of the municipal solid waste generated in the Basque Country is produced in households, while the remaining 20% is linked to stores, institutions and industries. Half the waste generated in 2010 was recovered by means of recycling (25%), composting (1.5%) or energy recovery (25%), and only 0.3% of the waste was reused, after being duly prepared. The remaining 53% ended up in the landfill³².

Even though the economic recession of recent years has meant a cut in waste generation, it must be taken into account that consumption of food has increased by 10% in the decade 1999-2009, with the increased consumption of fruit and vegetables over meat products. The consumption of vegetables is expected to

increase in the future, due to the steady rise in the price of meat and the policies to promote the consumption of that food. However, the generation per inhabitant is not expected to increase overall. These trends may end in an increase in the generation of biowaste, which create methane gas (CH₄) when it decomposes.

In any event, there is still room for improvement and this Strategy envisages measures in that regard, due to the potential of municipal solid waste to generate GHG. Further prevention policies need to be driven, in tandem with encouraging sorting waste and its subsequent treatment, so that the amount of municipal solid waste dumped in landfill without prior treatment is reduced, achieving zero landfill.

The **lines of intervention** set to achieve Goal 6 by 2050 are as follows:

- 14. Reducing the generation of municipal solid waste.**
 - 15. Increasing the selective collection and sorting ratios and their subsequent reuse, recycling and recovery.**
-

³² Environment Office, 2014.

GOAL 7. Anticipating the risks

As regards adaptation, it is a priority to tackle water supply, as according to the climate change forecasts, changes in precipitation and temperature would affect the availability of the water resources with a drop of the average flow and probably with greater seasonal variability and greater frequency of droughts.

Sustainable management of water is a critical element of the green economy, as a resilient ecosystem provides the necessary services to underpin wellbeing and the economy. Under this scenario, the Strategy opts for designing new drought thresholds and indicators taking into account the future flow projects, the new ecological flows and future demand for water.

The diagnosis carried out in the framework of hydrological planning conclude that our main supply systems are well prepared to meet current demands, along with guaranteeing, in turn, appropriate compatibility with maintaining the ecological flows. However, those diagnostics identify local problems related to infrastructures or to management models of the water services that are not always ideal.

Therefore, the lines of action set in the Strategy, opt for creating and consolidating the sanitation

and supply service manager entities with economic and technical capacities. The manager entities must contribute to the progressive improvement and adaptation of the supply systems aimed at meeting and ensuring the water demands, in a compatible way with the ecological caudal patterns and environmental targets of the water and to the efficient management of the water demand (renewing and mending leaks). The general approach of these measures is set out in the hydrological plan programmes.

On the other part, the vulnerability of the territory to climate risks (flooding, landslides, swell and rise of the sea level) is linked both to the very design and operation of the built environment and to its location, along with the possible chain effects related to climate impacts that affect the built environment and the energy, water, food health and Information and Communication Technologies (ICTs) critical infrastructures. The future measures regarding adaptation are therefore aimed at identifying, analysing and monitoring the most vulnerable infrastructures and zones to subsequently design innovative solutions that increase the resilience of the new ones.

The **lines of intervention** set to achieve Goal 7 by 2050 are as follows:

- 16. Guaranteeing the long-term water supply for different uses.**
 - 17. Ensuring the resilience of the built environment and of the critical infrastructures (energy, water, food, health and ICTs) to extreme events.**
-

GOAL 8.

Driving innovation, improvement and knowledge transfer

Climate change raises new adaptation needs and will entail in turn opportunities in the economic sectors with the possibility to access new market niches. However, one of the barriers to tackling this challenge is the lack of knowledge and uncertainty regarding the time space and the degree of severity of the expected impacts.

In this regard, a short-term priority action has been identified as improving expertise in many of the sectors that could be affected, so that it will subsequently enable more accurate decision making on the basis of sound knowledge. Therefore, the baseline for improving the knowledge is to adjust the scale of the studies using the regional climatic models with greater resolution and using bias correction methods that aim to reduce the calibration error. It will provide climate projections with a higher level of details that will act as the basis to expand knowledge in the aforementioned sectors.

Therefore, this Strategy, through its lines of actions, envisages continuing to progress in the knowledge of future climate scenarios and in the assessment of their impacts on ecosystems and on the economic sectors.

It therefore opts to incorporate the climate change variable in innovation projects in the strategic priorities of the PCTI Euskadi 2020: energy and health³³.

In relation to the capacity for action, there are private and public institutions with potential, skills and resources. The following step of the Strategy is focused on the transfer of the results by the University and Technology Centres to the Administration and companies, by prioritising the creation of an advanced knowledge forum to showcase demonstration projects.

Another key aspect in the sphere of adaptation that should go hand in hand with improving knowledge is the monitoring of the effects of climate change. In this regard, the Strategy opts to progress in monitoring through selection of the main variables to be monitored and their standardisations (key species and geotechnical and structural changes related to the infrastructures) which will allow, on the one hand, the continuous monitoring to be performed and, on the other hand, to generate and validate the prediction and simulation models.

The **lines of intervention** set to achieve Goal 8 by 2050 are as follows:

18. Promoting innovation, improving and transferring scientific knowledge.

19. Implementing a system to monitor and follow-up the effects of climate change.

³³ Basque Science, Technology and Innovation Plan 2020.

GOAL 9.

Exemplary and responsible Basque Public Administration: a benchmark in climate change

Exemplary action by all the bodies of the Basque Public Administration should be driven to achieve the involvement of all the stakeholders of Basque society. Vertical and horizontal coordination therefore needs to be carried out, that is, between the different departments of the Basque Government, along with the County Councils and local councils. The Basque Government will therefore apply instruments that facilitate the mainstreaming of climate change in public planning. Training in the sectors of the administration involved in climate change is essential, as they are the driving force to adopt measures.

In turn, mechanisms need to be implemented that enable the transfer of knowledge to the decision-making and technical staff of the administration, in aspects such as identifying research need, decision-making for management, adopting adaptation measures, etc.

As regards adaptation, the Local Administration is closer to the population and this means it has a transcendent

role when channelling the participations of different stakeholders and citizenry. In their exemplary role, their local councils can foster the need to change the habits of the citizenry that allows climate change to be tackled more effectively.

This latter, public awareness, is a key aspect regarding climate change, not only for the ensuing actions to be carried out, but also for the general public to understand the importance of adapting to changes and to moving towards a more adapted and resilient society.

Furthermore, given that climate change is a global challenge and following the lines set by the Euskadi-Basque Country Internationalisation Framework Strategy, this roadmap will help to position the Basque Country in the international sphere, showcasing the Basque productive and technological fabric that are working to offer knowledge and solutions regarding climate change.

The **lines of intervention** set to achieve Goal 9 by 2050 are as follows:

- 20. Organising training measures to acquire skills and expertise regarding climate change.**
 - 21. Awareness-raising, training and informing the general public about climate change.**
 - 22. Zero emissions Public Administration.**
 - 23. Consolidating inter-institutional coordination mechanisms for climate action.**
 - 24. Positioning the Basque Country on the international stage regarding climate change.**
-

3.4. BASQUE COUNTRY'S ROAD MAP FOR MITIGATION TO 2050

Developing the aforementioned lines of action will mean a structural change in the society as we know it today and will consolidate the position of the Basque Country regarding climate change, both as regards increasing its resilience to the impacts of climate change and to reduce its contribution in terms of GHG emissions.

In this regard, following the European commitment to the sphere of the mitigation of emissions, the goals and lines of action set by the Climate Change Strategy of the Basque Country to 2050 is aimed at a progressive electrification of energy consumer sectors, linked to a clear commitment for alternative energies and energy savings and efficiency. This transformation in processes, products and habits, will allow a sustainable and competitive economy to be consolidated, which will have managed to cut its GHG issues by at least 80% for 2050, compared to 2005 levels.

The following graph (Figure 15) shows the envisaged roadmap (Additional Policies Scenario) for Basque emissions to reach 2050, 20% of 2005 emissions, in other words, achieving an 80% reduction. This is all in comparison with a continuity scenario of current policies, where 60% of the 2005 levels would be reached by 2050, in other words, a 40% reduction.

The implementation of the lines of action set and the achievement of the goals indicated will allow the industrial and energy sectors to attain reductions in their emissions of between 50% and 60% by 2050 with respect to the 2005 levels, thanks to the development of

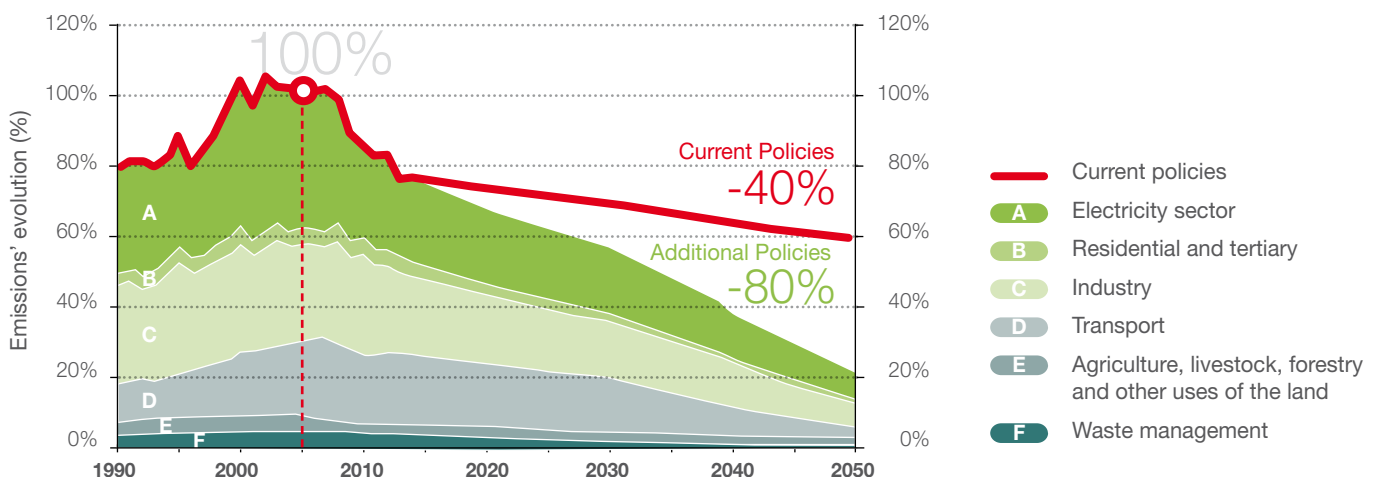
renewable energies and the spread of energy efficiency technologies.

On the other hand, the mobility of the Basque Country will in turn undergo an important transformation. First, there will be a gradual change from petroleum derivatives to alternative fuels, combined with giving impetus to intermodality, by promoting means of transport with lower GHG emissions and encouraging pedestrians in urban centres. Subsequently, in the recent decades of the period, where the mobility needs will have been reduced thanks to the new urban and territorial planning, means such as rail and the electric vehicle will be consolidated, linked to forms of electricity generation with lower GHG emissions. This transformation will allow reductions to be achieved in the transport over 80% in 2050.

Even though the contribution of the services and residential sectors to the annual GHG inventory is lower, they show a reduction potential linked to savings and energy efficiency. Following the guidelines set at European level, the commitment in this case will be aimed at buildings with lower energy needs, which will be replaced by means of renewable energies. This will enable them to achieve reductions of over 90% of the GHG emissions by 2050. Finally, the reduction in the generation of municipal solid waste, linked to the optimisation of its management will allow zero dumping without prior treatment, which will mean reductions close to 80% by 2050 in the emissions of the sector.

Figure15.

Depiction of the roadmap of the Climate Change Strategy of the Basque Country to 2050





4.

ACTION TO 2020. THE PATH TO TRANSFORMATION

“Many adaptation and mitigation options can help address climate change, but no single option is sufficient by itself. Effective implementation depends on policies and cooperation at all scales and can be enhanced through integrated responses that link adaptations and mitigation with other societal objectives.”

IPCC, 2014

Due to the very nature of climate change, both regarding mitigation and particularly adaptation, the emphasis needs to be on working and combining timelines in the distant future with short/medium-term actions.

In this sense, the objectives and goals defined for the Basque Country seek to set the end point that needs to be achieved in the long term (2050). To reach this horizon, measures need to be applied on shorter timelines that can be updated with the scientific and technology advances in the pipeline. Thus, the roadmap set for 2050 will be hashed out in shorter time periods (by decades), which will allow the actions that must be carried out in the different lines of action to be specified.

In this regard, the first of those development periods of the Strategy, up to 2020, is in line with the first commitment horizon established at European level. Seventy actions deriving from the following processes have been defined for the first period to 2020:

- contrasting with different strategies and plans of other countries and cutting-edge regions regarding climate change;
- the coordinated work between the different departments of the Basque Government;
- the participative process carried out with municipalities, County Councils and socio-economic stakeholders .

Therefore, a set of actions will be specified for 2020 that will be the first steps towards the objectives set for 2050. As has been specified in the monitoring chapter, this first set of actions must be reviewed and updated every ten years, in the successive development periods of the Strategy to 2050.

The 70 Actions defined for the different lines of intervention within each goal are set out below.

³⁴ Síntesis del proceso participativo en el Anexo IV.

GOAL 1

Commitment to a low-carbon energy model

Line of Intervention 1: Improving energy efficiency and managing energy demand

1. Promoting projects to invest in energy efficiency and improving equipment and facilities.

 2. Promoting energy rational use habits in all the consumer sectors and the figure of the energy manager in companies and major consumers, along with conducting audits and energy certification.

 3. Developing a smart-grid scheme and a general installation of Smart meters in the Basque municipalities.

 4. Supporting the development of economic activity in new emerging spheres linked to energy management.

 5. Boosting cogeneration, both from new facilities and by renewing the existing park.
-

Line of Intervention 2: Giving impetus to renewable energies

6. Driving the implementation of new low-power renewable facilities (photovoltaic, mini-hydraulic, mini-wind power).

 7. Giving momentum to marine and land wind farms, along with repowering existing ones.

 8. Using biomass as an energy source.
-

Line of Intervention 3: Fostering energy efficiency criteria and renewable energies in the urban environment towards “zero-emissions building”

9. Optimising the economic subsidies for urban regeneration and the refurbishing of buildings with a neighbourhood focus, facilitating the processing and advising on their structure in time and space, with a special emphasis on the nature-based solution (for example, green infrastructures).

 10. Giving momentum to the Technical Building Inspections with inclusion of energy certification.

 11. Placing the emphasis on buildings (new and existing) that are self-sufficient energy wise.
-

GOAL 2

Moving towards zero-emissions transport

Line of Intervention 4: **Fostering intermodality and means of transport with lower GHG emissions**

12. Developing the new railway network of the Basque Country for passenger and freight transport.

 13. Fostering the Atlantic freight corridor (Red Trans-European Transport Networks – TENT-T).

 14. Setting up of logistic platforms that foster the use of the railway and maritime freight transport (beginning with Jundiz, Pasaia-Irun and Arasur).

 15. Creating and/or expanding the bus, tramway, train and underground networks by achieving the implementation of the single ticket for inter-urban and municipal public transport throughout the Basque Country.

 16. Fostering the development of sustainable mobility plans at urban, supramunicipal level and in the different business centres.
-

Line of Intervention 5: **Replacing the use of oil derivatives**

17. Spreading the use of means of transport with lower GHG emissions (electric vehicle, natural gas vehicle, bicycle, etc.) by means of economic support and of positive discrimination measures such as exempting non-internal combustion vehicles from paying parking charges, cutting the mechanical traction vehicle tax, etc.
-

Line of Intervention 6: **Integrating vulnerability and adaptation criteria into transport infrastructures**

18. Identifying and monitoring vulnerable transport infrastructures to detect resizing and maintenance needs.

 19. Driving innovation when designing solutions to increase the resilience of transport infrastructures.
-

GOAL 3

Increasing the efficiency and resilience of the territory

Line of Intervention 7:

Driving an urban structure that is resilient to climate change, compact and with a mix of uses

20. Preparing support tools and methodologies for the municipalities (comparative vulnerability maps, standards for resilient urban design and limiting the urban area, guides, best practices, etc.).

 21. Promoting green infrastructures and solutions based on nature as a means to adapt to climate change and urban sustainable development.

 22. Working on municipal policies and measures to adapt to climate change in the framework of the Udalsarea 21 network (for example, developing demonstrative test cases, adaptation plans, etc.).
-

Line of Intervention 8:

Integrating vulnerability analysis and adaptation to climate change in territorial planning

23. Integrating the adaptation to climate change perspective in the process to review the territorial strategy of the Basque Autonomous Community set out in the Territorial Development Guidelines and defining the mechanisms to integrate climate change in the urban and territorial planning instruments.

 24. Implementing a demonstration project at the supramunicipal planning scale that includes a climate change vulnerability study and mechanisms to include adaptation measures.

 25. Including climate change adaptation in the DOT through a thematic cartography of impacts and vulnerability to climate change.
-

GOAL 4

Making the natural environment more resilient

Line of Intervention 9:

Fostering the multifunctionality of ecosystems as regulators of geological and biological processes, restoring species and vulnerable habitats

- 26. Regenerating the ecosystems and their naturalization to ensure the resilience of the territory.
 - 27. Fostering and facilitating connectivity between ecosystems that allow species migration.
-

Line of Intervention 10:

Integrating the climate change variable in the management of coastal zones

- 28. Avoiding the artificial barriers that confine the dune-beach-underwater and/or river-estuary deposits to maintain the natural sedimentary transport that prevents the loss and shrinkage of beaches and sand deposits.
 - 29. Identifying the coastal zones affected by the rise of the sea level and extreme swell.
-

GOAL 5

Making the primary sector more resilient and cutting its emissions

Line of Intervention 11: **Fostering local, organic and integrated agricultural production and with lower GHG emissions**

30. Fostering farming practices to minimise erosion and preserve the organic matter of the soil (e.g.: minimum tillage, vegetable cover, etc.).
-
31. Focusing on programmes that drive integrated local production, along with organic production.
-

Line of Intervention 12: **Growing the potential of the carbon sink in the Basque Country**

32. Reforesting degraded zones and increasing the surface area of natural woodland
-
33. Improving forestry management by increasing the certified surface area and improving the fire prevention programmes.
-

Line of Intervention 13: **Adapting the practices and management of the primary sector (farming and fishing) to the new climate conditions**

34. Developing tools that allow the managers and professionals of the farming and fishing sector to make decisions.
-
35. Defining new practices in the primary sector in keeping with changes in the climate (e.g.: sowing and harvesting times, drought-resistant genotypes, controlling the fish stock changes, grazing periods, etc.).
-

GOAL 6

Reducing the amount of municipal solid waste and achieving zero untreated waste dumping

Line of Intervention 14: Reducing the generation of municipal solid waste

36. Fostering the prevention, reuse and recycling of urban waste.
-
37. Promoting the ecodesign of containers, packages and eco-labels that can be accredited in order to minimise the generation of container waste.
-
38. Defining and implementing environmental tax measures (e.g. dumping tax, paying for generating, tax on extracting raw materials), along with tax incentives to minimise waste generation, extracting resources and landfill dumping.
-

Line of Intervention 15: Increasing the selective collection and sorting ratios and their subsequent reuse, recycling and recovery

39. Fostering the recovery of biowaste, driving composting and encouraging the use of the compost produced.
-
40. Supporting the establishment of reuse networks and centres and preparing to reuse waste (e.g.: second-hand markets).
-
41. Developing pre-treatment lines in all the waste currents to ensure zero dumping.
-
42. Implementing instruments to optimise selective waste collection.
-

GOAL 7

Anticipating the risks

Line of Intervention 16: **Guaranteeing the long-term water supply for different uses**

- 43. Creating and strengthening sanitation and supply service managers with economic and technical capacity.

 - 44. Efficient management of water demand (renewal and eliminating leaks).

 - 45. Designing new drought thresholds and indicators taking into account the future flow projects, the new ecological flows and future demand for water.
-

Line of Intervention 17: **Ensuring the resilience of the built environment and of the critical infrastructures (energy, water, food, health and ICTs) to extreme events**

- 46. Identifying and monitoring vulnerable areas (floods, landslides, swell and rising of the sea level and storms), defining plans of action and reducing impacts.

 - 47. Driving innovation when designing solutions for new critical infrastructures.
-

GOAL 8

Driving innovation, improvement and knowledge transfer

Line of Intervention 18:

Promoting innovation, improvement and transfer of scientific knowledge

48. Incorporating the climate change variable in the innovation projects with the strategy priorities of the Basque 2020 PCTI: energy, health and territory.
-
49. Performing regionalised projections of climate and oceanographic variables for the Basque Country.
-
50. Working on studies and projections of the effects of climate change on: water resources, coastal, marine and land ecosystems, primary sector (farming and fishing), urban environment and health (or complementing existing studies).
-
51. Setting up the "KlimaTEC" Forum for the transfer of advanced knowledge and to showcase demonstration projects (university-technology centres-administration-company).
-

Line of Intervention 19:

Implementing a system to monitor and follow-up the effects of climate change

52. Incorporating the climate change variable in the training plans of the public sector.
-
53. Fostering training in climate change in the economic sectors.
-

GOAL 9

Exemplary and responsible Basque Public Administration: a benchmark in climate change

Line of Intervention 20: **Organising training measures to acquire skills and expertise regarding climate change**

54. Incorporating the climate change variable in the training plans of the public sector.
-
55. Fostering training in climate change in the economic sectors.
-

Line of Intervention 21: **Awareness-raising, training and informing the general public about climate change**

56. Setting up the “KLIMA 2050” portal that compiles the benchmark expertise, projects and schemes in the Basque Country.
-
57. “KLIMA 2050” communication campaign associated to energy, transport, water and health.
-
58. Preparing a climate change social parameter (every five years).
-

Line of Intervention 22: **Zero emissions public sector**

59. Formulating an institutional pact so that the Basque public sector achieves the CO₂ “zero emissions” threshold by 2050.
-
60. Integration of the carbon budget in the general budget of the public sector (reviewed every five years).
-
61. Introduction of a voluntary GHG emissions reduction section in the BAC Register of Activities with Environmental Impact.
-
62. Ensuring that 100% of the electricity bought by the Basque Country comes from a renewable source.
-
63. Driving energy efficiency and renewable energies so that the buildings of the Basque Government improve their energy rating.
-
64. Impetus so that 40% of the vehicles of the Basque Government use alternative energy sources.
-
65. Applying climate change mitigation measures at local level.
-

Line of Intervention 23:**Consolidating inter-institutional coordination mechanisms for climate action**

66. Interdepartmental coordination to measure the impact of the public action regarding climate change.
-
67. Driving an interinstitutional coordination mechanism regarding climate change among the different Basque authorities.
-
68. Defining a climate change line of work in the General Administration of the Basque Autonomous Community.
-

Line of Intervention 24:**Positioning the Basque Country on the international stage regarding climate change**

69. Participation in the inter-regional and international networks that are benchmarks as regards climate change (IPCC, Compact of Mayors, ICLEI, nrg4sd, The Climate Group, etc.).
-
70. Driving the international visibility of Basque institutions and companies that contribute solutions to climate change (Internationalisation Framework Strategy 2020).
-



5.

GOVERNANCE, ECONOMIC ANALYSIS AND MONITORING

5.1. GOVERNANCE. THE MANAGEMENT MODEL OF THE BASQUE CLIMATE POLICY

Europe makes a clear difference between its climate policy and its environmental policy. In the same way as the European Commission, the Basque Country also differentiates between both policies in its IV Environmental Framework Programme 2020. It is committed to mainstreaming climate change as was already set out in the “Assessment of the III Environmental Framework Programme 2011-2014”, where it makes the following recommendation to address climate change:

- a. “Climate change mainstreamed in the IV EFP. The proposed approach is similar to the one adopted in Europe where climate change is embedded in and is present throughout the 7th European Environmental Action Programme, but it does not include any specific climate change priority objective”.

Therefore, the Climate Change Strategy of the Basque Country to 2050 has been defined and created as an umbrella and benchmark for the other sectoral plans and policies of the Government that have an impact on climate change.

In 2002, the Basque Environmental Strategy for Sustainable Development 2002-2020 included as one of its five goals “To limit the influence of climate change”. It established different targets aimed at mitigating greenhouse gas emissions and to foster the CO₂ removal by the so-called “carbon sinks”. The Environmental Framework Programme 2002-2006 formulated a series of commitments regarding climate change which led to measures mainly focused on four spheres: energy, transport, industry and construction. The IV Environmental Framework Programme gave the Energy-Climate Change binomial a new challenge to 2020: “To progress towards a resource efficient, low-carbon, innovative and competitive economy”. Its measure number 17 includes the preparation of this Strategy.

On the other hand, since the approval of the **Basque Energy Strategy – 3E 2010**, energy planning has already included aspects strictly linked to climate change: progressing towards a sustainable energy model based on efficiency, competitiveness, quality and safety, and improving the environment criteria. However, the Basque Energy Strategy – 3E 2020 includes objectives

such as improving energy efficiency and reducing energy consumption, and fostering the generation and use of renewable energies. Furthermore, it includes for the first time in its Strategic Objective 6, “To contribute to the mitigation of climate change by means of cutting 2.5 Mt of CO₂ due to the energy policy measures”.

The contribution to the environmental sustainability of the energy strategy is reflected in its most direct exponent by the contribution to the reduction of the greenhouse gas emissions. “The energy policy is related to strategic lines linked to areas such as combating climate change, environmental protection, or the optimisation of industry, housing and transport consumption, and whose expertise requires the intervention of the responsible authorities of those areas”.

As regards transport planning, the **Sustainable Transport Master Plan 2002-2012** set for the first time the explicit challenge to progress towards progress towards environmentally sustainable transport, assuming the challenge shared with the European Union to decouple the demand for transport and economic growth, along with improving and promoting greater use of public transport and fostering a more rational use of the private vehicle.

From the perspective of **local government**, County Councils are in turn addressing climate change in their jurisdiction in areas such as agriculture, transport, supporting municipal entities in the Agenda 21 processes, etc. On the other hand, the municipalities are implementing very important measures as regards climate change both in terms of mitigation and adaptation, which are set out in the plans of action of the Local Agenda 21 or in specific climate change plans such as the ones to be found in Bilbao, Vitoria-Gasteiz and Donostia/San Sebastián. The Basque Network of Municipalities towards Sustainable Development – Udalsarea 21 is the cooperation and coordination

forum for the different institutions who are working for sustainable development at local level and which drives, coordinates and assesses climate change measures.

In this framework, one of the key aspects for both creating and implementing climate change policies, is the coordination of those policies. Given the horizontal nature of climate change, the coordination of strategies and actions is particularly complicated, as it requires the participation of a high number of stakeholders working effectively. In fact, in the absence of effective coordination tools, it is very complicated to achieve the targets set in a climate change strategy. The following structure is therefore established:

- The Basque Government’s Ministry of Environment and Territorial Policy leads the coordination and driving of this “Climate Change Strategy of the Basque Country to 2050” with the support and impetus mainly from the Ministries of Economic Development and Competitiveness (Industry Office) and of the Treasury and Finances (Economy and Budget Office).
- The Environmental Planning and Natural Environment Directorate (Environment Office) is tasked with supporting this Strategy. Therefore, it will have the necessary cooperation from all the interested parties. It will have the support of Ihobe and the Basque Water Agency -URA for the assessing and monitoring the climate policy. This Directorate is tasked with supporting the coordinator Ministries in all the technical work to analyse, diagnose, plan and assess the environmental policy designed in this Strategy.

In addition, it will foster an interinstitutional coordination mechanism within the Administration of the Basque Autonomous Community to implement and monitor the actions of this Strategy.

5.2. ECONOMIC ANALYSIS OF THE CLIMATE CHANGE STRATEGY OF THE BASQUE COUNTRY TO 2050

The “Climate Change Strategy of the Basque Country to 2050” is clearly cross-cutting, as has been explained throughout this document and impacts practically on all the sectoral policies and levels of the Administration. This characteristic sometimes comes with the difficulty to establish a clear line between what may be a public measure with an important impact on the climate change policy and other measure that, even though they help to meet the climate change objectives, have not been covered in this document. Therefore, the “Climate Change Strategy of the Basque Country to 2050” brings together the most important actions that have been identified throughout the shared process with other Ministries of the Government and Authorities to prepare it.

Given the slow economic recovery and the need for a conservative approach, it has been estimated that the 2016 budgetary allocation will be the same as the one approved for the current year. In order to calculate the budgetary allocation, the aforementioned 2015 budgets have been reviewed, along with the current plans and programmes for measures related, in full or partially, to the mitigation and adaptation to climate change. It should be noted that only one of the aforementioned references have been taken into account, either the 2015 budgets or the plan or strategy, as applicable, in order to avoid duplication in the budgetary allocations.

For the annual budgetary estimate to 2050, a continuing annual projection similar to the one for 2016 has been envisaged. For the budgetary items allocated to each action of this Strategy, the criterion that applied that is established by the **Commission Implementing Regulation (EU) No. 215/2014** of 7 March 2014 which lays down the rules for the implementing Regulation (EU) No. 1303/2014 of the European Parliament and the Council, which states the common and general provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund, regarding methodologies for climate change support, the determination of milestones and targets in the performance framework, and nomenclature of categories for the European Structural and Investment Funds. This Regulation establishes the coefficient to be applied to calculate the grants for the objectives related to climate change, and is the one that has been used

to calculate the budgets allocated to the actions. For example, this coefficient is 100% for renewable energy infrastructures, 40% for railway infrastructures and 0% for waste management.

The figures included in this chapter are for the actions envisaged by the Basque Government; the ones of the County Councils, local councils and those of the private sector are expressly excluded from the economic calculation. The County Councils and local councils establish their respective climate change policies or programmes with their budget items mainly through the Provincial Sustainable Development Strategies and the Local Plans of Action of the Agendas 21.

The Climate Change Strategy of the Basque Country sets a 35-year time line, with an initial implementation period for 2015-2020. At the end of that period, the degree of advancement of the actions and objectives envisaged will be comprehensively assessed, along with the implementation of the inter-institutional and inter-departmental measures. The actions will be redefined in 2020 for the second implementation period, 2020-2030. Given the timeline envisaged and the economic context, the degree of associated uncertainty, both regarding the budgetary needs and the availability of economic resources, is relatively high and increases in the last years of the Roadmap to 2020 being in force.

In this context, the Strategy will be aligned with the budgetary-economic forecast of the Government and it will include the measures to be undertaken in its powers of action. On the other hand, the complexity faced when preparing long-term macro-economic scenarios (2050) compounds the difficulty of planning budgetary-economic estimates. The benchmark framework for the analysis must be, therefore, the budgetary situation set out in the 2015 budgets.

The “Climate Change Strategy of the Basque Country to 2050” is facing two challenges. On the one hand, the need to effectively implement climate change policy in the Basque Country; and, on the other hand, in line with the demand to maximise the efficiency of the use of resources and drawing on synergies, driving the economic profitability of the investment in the energy-climate change binomial, so that the climate variable starts to be considered as a competitiveness factor.

By considering the Strategy as the benchmark planning instrument of the climate policy of the Basque Public Administration that covers the operational measures, the budgets of the measures of the Industry (Energy), Transport and Environment Offices that are included in the measures of the Roadmap 2020 are set out as budgetary requirements for their implementation. Taking as the starting point the actions indicated in the Roadmap 2020, and based on what is set out in the Basque Government Budget 2015, along with the aforementioned “Methodology to determine the support to the objectives related with climate change for each of the investment and structural funds”, the following table sets out the budgetary resources related to climate change in 2016 to achieve the set objectives and goals (See Table 7).

The total budget related to climate change, estimated for 2016, stands at €84,538,078. It should be noted that this budget is the sum of the budgetary requirements of the series of sectoral actions of the climate policy. Therefore, it is not about specific budgetary resources to implement the Climate Change Strategy to 2050. No direct expenditure arises from its approval, even though the spending that the Strategy indirectly executes is that

necessary, as applicable, to produce the support reports and monitoring assessments envisaged in Point 5.3.

Based on that budget for 2016, an average annual spending increase is envisaged until 2020 of around 2% that will lead to the spending levels reflected in the following Table 8.

With all these conditioning factors, the estimated operating budget for the correct implementation of the Strategy stands at €439,939,552, divided over the years of the Roadmap 2020. Regardless of the budgetary provisions, the level of implementation in each of the financial years will be subject to the amounts, limits and mandates that the Basque Parliament establishes at the time of approving the budgets of the Basque Autonomous Community, along with the formal processing of those instruments that are to be used to ensure the implementation of those actions.

Despite the uncertainty of the economic context and based on the climate objectives, it is not foreseen that significant budgetary increases will be necessary with respect to those implemented in previous years.

Table 7.

Basque Government budgets related to climate change per Goal (2016)

Goals of the Basque Climate Change Strategy to 2050	Budget (€)	Percentage (%)
Goal 1. Commitment to a low-carbon energy model	23,620,948	28
Goal 2. Moving towards zero-emissions transport	13,124,582*	16
Goal 3. Increasing the efficiency and resilience of the territory	1,404,767	2
Goal 4. Making the natural environment more resilient	2,733,773	3
Goal 5. Making the primary sector more resilient and cutting its emissions	5,284,772	6
Goal 6. Reducing the amount of municipal solid waste generated and zero untreated waste dumping	n.a.	n.a.
Goal 7. Anticipating the risks	26,415,000	31
Goal 8. Driving innovation, improvement and knowledge transfer	9,013,125	11
Goal 9. Exemplary and responsible Basque Public Administration: a benchmark in climate change	2,941,111	3

* Only the own budgetary items of the Basque Government for railways are considered.

n.a. Not applicable according to the aforementioned Feder methodology.

It should be noted that the expected economic impact of these actions for the period 2015-2020³⁵ shows that these measures would generate EUR 57 million of economic activity in the Basque Country, which would be associated to 1,030 “gross” total jobs being created each year over the coming 5 years. The co-benefits of

mitigation are important. The annual energy invoice could be cut up to EUR 55 million per year, which would help to make companies more competitive. The harm avoided to health due to reduction associated to air pollution is also estimated to be between EUR 12 and 32 million per year.

Table 8.

Basque Government Budgets to 2020 related to climate change per Goal

	2016	2017	2018	2019	2020
Goal 1. Commitment to a low-carbon energy model	23,620,948	24,093,367	24,575,234	25,066,739	25,568,074
Goal 2. Moving towards zero-emissions transport	13,124,582	13,387,073	13,654,815	13,927,911	14,206,469
Goal 3. Increasing the efficiency and resilience of the territory	1,404,767	1,432,862	1,461,519	1,490,750	1,520,565
Goal 4. Making the natural environment more resilient	2,733,773	2,788,449	2,844,218	2,901,102	2,959,124
Goal 5. Making the primary sector more resilient and cutting its emissions	5,284,772	5,390,467	5,498,277	5,608,242	5,720,407
Goal 6. Reducing the amount of municipal solid waste generated and zero untreated waste dumping	0	0	0	0	0
Goal 7. Anticipating the risks.	26,415,000	26,943,300	27,482,166	28,031,809	28,592,446
Goal 8. Driving innovation, improvement and knowledge transfer	9,013,125	9,193,388	9,377,256	9,564,801	9,756,097
Goal 9. Exemplary and responsible Basque Public Administration: a benchmark in climate change	2,941,111	2,999,933	3,059,932	3,121,131	3,183,553
Total €	84,538,078	86,228,839	87,953,416	89,712,485	91,506,734

³⁵ Economic impact of the Basque Climate Change Strategy in its First Implementation Period (2015-2020) Mikel González-Eguino and Iñaki Arto (BC3).

5.3. MONITORING AND ASSESSING THE STRATEGY

A periodic monitoring mechanism of the actions included in the Strategy, along with their effects needs to be established to know how the climate framework is evolving and the degree of progress of the Strategy. The Basque Country has some tools to measure the progress, such as calculating the Greenhouse Gas Inventories, environmental statistics, monitoring the work carried out at local level, etc. These continue to be valid tools and are in line with the purpose of discovering and improving our baseline.

Comparing the objectives established in the Strategy with the results really obtained overtime will allow for the Strategy to be checked and assessed, so that any deviations can be detected and corrective measures put forward.

The elements of the Monitoring Plan, based on criteria of simplicity and effectiveness, will be as follows:

- **Datasheets of the degree of compliance of the actions:** Each one of the actions will have its detailed datasheet indicating the person in charge, measures, and associated budget in the management plans of the departments involved to foster its implementation and ongoing monitoring.
- **Monitoring indicators:** they will be set out in the actions datasheets and on the scorecard and will be based on first-rate and consistent information that reflects the reality of the climate situation in the Basque Country and provides a gauging of the actions carried out and their impact.
- **Monitoring reports:** Beginning in 2017, they will be produced every two years and will set out the degree of progress and implementation of the actions envisaged in each period of the Strategy (Action to 2020 and successive periods: 2020-30, 2030-40 and 2040-50), of the changes taken place in the climate framework and the evolution of the monitoring indicators in relation to the established targets.. Each one of the actions will have its detailed datasheet indicating associated budget

in the management plans of the departments involved to foster its implementation and ongoing monitoring.

- **Interim assessment reports:** Beginning in 2020, they will be produced every ten years and apart from compiling the information set out in the monitoring reports, there will be an assessment of the deviations in the implementation of the actions and of the indicators of the Scorecard, with corrective measures being proposed for the 2020-2030 and successive Roadmaps. They will be prepared by an external and independent entity following the criteria of transparency, participation and cooperation. A leading expert external entity in the field will be required to support the whole assessment process.

In addition and according to the needs, specific sectoral analysis and reports will be produced to complement the earlier ones. All those reports will be coordinated by the Environmental Planning Directorate of the Basque Government.

The monitoring and assessment processes of the Climate Change Strategy of the Basque Country to 2050 will always have mechanisms in place for the participation of the general public and of socio-economic stakeholders. Sessions will be organised to showcase and compare the advances regarding climate change (Social Forum) in order to energise those processes and participation will be encouraged by means of channels such as the Klima-Tec forum, the Udalsarea 21 network, the climate change social barometer and the Basque Government portal: www.klima2050.eus.

The aforementioned mechanisms have been defined to analyse the progress being made in the implementation of the Strategy:

- Production of Mid-term assessment reports (2020, 2030 and 2040).
- Two-yearly Monitoring Reports produced beginning in 2017.

Table 9.

Integral scorecard of the Climate Change Strategy of the Basque Country to 2050

Integral Scorecard	Objective 2030	Objective 2050
Reduction of total GHG emissions (2005 baseline)	-40%	-80%
Ensuring the resilience of the Basque territory to climate change	Measurement mechanism to be defined in line with Europe	
Consumption of renewable energies out of final consumption	20%	40%
Level of implementation of the actions envisaged in the Roadmap 2020	> 80%	





ANNEXES

- I. Glossary**
- II. Summary of the strategic diagnosis**
- III. Related sectoral planning**
- IV. Synthesis of the participation process to prepare the Strategy**
- V. Detailed analysis of adaptation needs**
- VI. Emissions scenarios 2050 report**
- VII. Scorecard of the 2020 actions per Ministries**
- VIII. Summary of the economic impact of the Climate Change Strategy of the Basque Country to 2050 in its first implementation period (2015-2020)**

ANNEX I

GLOSSARY¹

Adaptation

The process of adjustment to the actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Biodiversity

The variability among living organisms from terrestrial, marine and other ecosystems. Biodiversity includes variability at the genetic, species and ecosystem levels.

Climate change

Change in the state of the climate that can be identified (for example, by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings, such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes.

Sustainable development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987)².

Ecosystem

An ecosystem is a functional unit consisting of living organisms, their non-living environment and the interactions between them. The components included in a given ecosystem and its spatial boundaries depend on the purpose for which the ecosystem is defined: in some cases they are relatively sharp, while in others they are diffuse. Ecosystem boundaries can change over time. Ecosystems are nested within other ecosystems, and their scale can range from very small to the entire biosphere. In the current era (Anthropocene), most ecosystems either contain people as key organisms or are influenced by the effects of human activities on the environment.

Greenhouse effect

The infrared radiative effect of all infrared-absorbing constituents in the atmosphere. Greenhouse gases, clouds and (to a small extent) aerosols absorb terrestrial radiation emitted by the Earth's surface and elsewhere in the atmosphere. These substances emit infrared radiation in all directions, but, everything, else being equal, the net amount emitted to space is normally less than would have been emitted in the absence of these absorbers because of the decline of temperature with altitude in the troposphere and the consequent weakening of emission. An increase in the concentration of greenhouse gases increases the magnitude of this effect; the consequence is an increase in the temperature of the Earth's surface and the troposphere.

Anthropogenic emissions

Emissions of greenhouse gases, greenhouse gas precursors and aerosols caused by human activities. These activities including the burning of fossil fuels, deforestation, land use changes, livestock production, fertilization, waste management and industrial processes.

¹ Selected from the glossary of the IPCC WGII AR5 March 2014.

² World Commission on Environment and Development (WCED), 1987: Our Common Future. Oxford University Press, Oxford, United Kingdom..

Scenario

A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces “known as drivers” (for example: rate of technological change, prices) and relationships. Not that scenarios are either predictions or forecasts, but are useful to provide a view of the implications of developments and actions.

Climate scenario

A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models. Climate projections often serve as the raw material for constructing climate scenarios, but climate scenarios usually require additional information, such as the observed current climate.

Emission scenario

A plausible representation of the future development of emissions of substances that are potentially radiatively active (e.g. greenhouse gases, aerosols) based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socioeconomic development, technological change) and their key relationships. Concentration scenarios, derived from emission scenarios, are used as input to a climate model to compute climate projections. In IPCC (1992) a set of emission scenarios was presented, which were used as a basis for the climate projection in IPCC (1996). These emissions scenarios are referred to as the IS92 scenarios. In the IPCC Special Report on Emission Scenarios (Nakićenović and Swart, 2000)³, emission scenarios, the so-called SRES scenarios, were published, some of which were used, among others, as a basis for the climate projections presented in Chapters 9 to 11 of the IPCC (2001) and Chapters 10 and 11 of IPCC (2007). The “Four Representative Concentration Pathways” gather the new emission scenarios for climate change developed for the IPCC assessment report.

EU ETS (EU Emissions Trading System)⁴

The EU emissions trading system (EU ETS) is a cornerstone of the European Union’s policy to combat climate change and its key tool for reducing industrial greenhouse gas emissions cost-effectively. The first and the largest international system for trading greenhouse gas emission allowances, the EU ETS covers more than 11,000 power stations and industrial plants in 31 countries, as well as airlines.

Extreme weather event

An event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g. drought or heavy rainfall over a season).

Greenhouse gas (GHG)

Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth’s surface, the atmosphere itself and clouds. This property causes the greenhouse effect. Water vapour (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and ozone (O₃) are greenhouse gases in the Earth’s atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine – and bromine containing substances, dealt with under the Montreal Protocol. Along with CO₂, N₂O and CH₄, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF₆), hydrofluorocarbons (HFC) and perfluorocarbons (PFC).

³ Nakićenović, N., and R. Swart (eds.), 2000: Special Report on Emissions Scenarios. A Special Report of Working Group III of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 599 pp.

⁴ Climate Action http://ec.europa.eu/clima/policies/ets/index_en.htm

Risk management

The plans, actions or policies implemented to reduce the likelihood and/or consequences of risks or to respond to consequences.

Impacts

Effects on natural and human systems. In this report, the long-term impacts refer to the effects on the human and natural systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health status, ecosystems, economic, social and cultural assets, services (including environmental) and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. Impacts are also referred to as consequences and outcomes. The impacts of climate change on geophysical systems, including floods, droughts and sea level rise, are a subset of impacts called physical impacts.

Uncertainty

A state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from imprecision in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour. Uncertainty can therefore be represented by quantitative measures (e.g. a probability density function) or by qualitative statements (e.g. reflecting the judgement of a team of experts).

Flood

The overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas not normally submerged. Floods include river (fluvial) floods, flash floods, urban floods, pluvial floods, sewer floods, coastal floods and glacial lake outburst floods.

Urban heat island

The relative warmth of a city compared with surrounding rural areas, associated with changes in runoff, effects on heat retention and changes in surface albedo.

Mitigation (of climate change)

A human intervention to reduce the sources or enhance the sinks of greenhouse gases.

Mitigation (of catastrophe and disaster risks)

The lessening of the potential adverse impacts of physical hazards (including those that are human-induced) through actions that reduce hazard, exposure and vulnerability.

Heat wave

A period of abnormally and uncomfortably hot weather.

Hazard

The potential occurrence of a natural or human-induced physical event or trend, or physical impact, that may cause loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, and environmental resources. In this report, the term hazard usually refers to climate-related physical events or trends or their physical impacts.

Likelihood

The change of a specific outcome occurring, where this might be estimated probabilistically.

Resilience

The capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation (Arctic Council, 2013)⁵.

Risk

The potential for consequences where something of human value (including humans themselves) is at stake and where the outcome is uncertain. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the consequences if these events occur. The report assesses climate-related risks.

⁵ Arctic Council, 2013: Glossary of terms. In: *Arctic Resilience Interim Report 2013*. Stockholm Environment Institute and Stockholm Resilience Centre, Stockholm, Sweden.

Disaster risk

The likelihood of disaster within a specific time period.

Drought

A period of abnormally dry weather long enough to cause a serious hydrological imbalance. Drought is a relative term. Therefore, any discussion in terms of precipitation deficit must refer to the particular precipitation-related activity that is under discussion. For example, shortage of precipitation during the growing season impinges on crop production or ecosystem function in general (due to soil moisture drought, also termed *agricultural drought*), and during the runoff and percolation season primarily affects water supplies (*hydrological drought*). Storage changes in soil moisture and groundwater are also affected by increases in actual evapotranspiration in addition to reductions in precipitation. A period with an abnormal precipitation deficit is defined as a meteorological drought. A megadrought is a very lengthy and pervasive drought, lasting much longer than normal, usually a decade or more.

Ecosystem services

Ecological processes or functions having monetary or non-monetary value to individuals or society at large. These are frequently classified as (i) supporting services such as productivity or biodiversity maintenance; (ii) provisioning services such as food, fibre or fish, (iii) regulating services such as climate regulation or carbon sequestration; and (iv) cultural services such as tourism or spiritual and aesthetic appreciation.

Early Warning System

The set of capacities needed to generate and disseminate timely and meaningful information to enable individuals, communities, and organisations threatened by a hazard to prepare to act promptly and appropriately to reduce the possibility of harm or loss.

SMART GRID⁶

Grids that control and manage the transport of electricity from all the generation sources to meet the different electricity demands of the end users.

Sustainability

A dynamic process that guarantees the persistence of natural and human systems in an equitable manner.

Vulnerability

The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Climate vulnerability⁷ is the degree to which a system is exposed to climate risks, its sensibility to them and its adaptation capacity. It is defined as the level to which a system is susceptible, or is not capable of withstanding the adverse effects of climate change, including climate variability and extreme phenomena. The vulnerability is given by the nature, magnitude and speed of the climate variation to which a system is exposed, its sensitivity and its adaptation capacity⁸.

⁶ Definition according to the International Energy Agency, IEA. <https://www.iea.org/>

⁷ FEMP, RECC, & MMA. (n.d.). Local Strategy on Climate Change. Practical guide for municipalities facing climate change.

⁸ Glossary of terms used in the IPCC Third Assessment Report.

ANNEX II

SUMMARY OF THE STRATEGIC DIAGNOSIS

Between 2013 and 2014, the situation of the Basque Country⁹ was analysed in terms of climate change, which coincided with the end of the Basque Plan to Combat Climate Change 2008-2012 and the intention to establish the Basque Country strategy in that regard in the long run.

A working group and a technical commission to oversee the study were set up during the process to prepare the analysis. The results obtained were presented in workshops, specifically designed to inform, receive feedback from the Basque Government and local councils, along with validating the approach for the following steps. In total, 30 people were involved in the Working Group, representing public administrations, universities, technology centres and companies specialising in climate change. There were 3 review rounds, a review of the draft report and 3 versions of the report. This was possible thanks to a total of 19 joint meetings between the Working Group and the Basque Government and local councils involved.

The work started with selecting a series of assessment criteria and their weighting both for the mitigation and adaptation sectors. The group of experts assessed those criteria, following a work approach based on the Delphi method along with a methodology based on multi-criteria analysis.

The results obtained reflect the expert opinion of the people involved in preparing this report and must therefore be interpreted as such. The methodology allowed a series of consensus conclusions to be reached that have guided the process to prepare the Climate Change Strategy of the Basque Country to 2050. In any event, it should also be noted that both the limitations imposed by the methodology, (for example, the fact that the systems have been assessed independently) and the cross-cutting nature of certain sectors (such as the urban) and impact, requires emphasis to be placed on the integrating approach when designing specific courses of actions.

Having made this point, the preliminary conclusions are set out below.

1. In terms of associated emissions, the priority sectors are energy and transport. However, as regards the structural characteristics, the services and residential sector and the industry sector are the most important. As regards the capacity to take action, the transport sector stands out as the most important. Finally, when weighting the combined criteria, it can be seen that the transport sector can be seen as the the priority area, followed by the energy and industry sectors.
2. Adaptation questions require an approach based on at least 7 assessment criteria that enable a more integrated view of the topic. The results show the greater importance of the vulnerability criteria and the strategic importance, and a lesser importance of the equity and the difficulty of action criteria. Issues such as the capacity to act, the potential and the economic benefits are in the middle.
3. The strategic importance and vulnerability criteria seem to show overall the greater importance of water resources, coasts, forestry sector and, the urban environment and terrestrial ecosystems. The second criteria also points towards the relevance of the other sectors, even though farming, forestry, livestock, tourism and terrestrial ecosystems seem to be less important.
4. The capacity to act is quite high and uniform across the sector (undoubtedly due to the high number of competencies that the Basque Country holds) with the exception of marine resources and ecosystems. In the case of the potential and economic benefits, the importance seems to also be moderately high. The industrial and energy sector stands out for its high potential and marine resources and ecosystems for their low potential. Water resources, linear infrastructures and urban environment are noted for their high economic importance.

⁹ The study conducted was structured into seven sections and supported by 5 annexes: (1) Strategic focus, (2) From the international context to the local context, (3) Our institutional framework, (4) The commitment of the Basque Country to cut GHG emissions, (5) Impacts and adaptation, (6) Analysis and prioritisation: keys for change and (7) Towards the definition of commitments, visions, challenges and strategic goals (Annex I: Sectoral policies of the BAC related to climate change; Annex II: Institutions of the BAC related to climate change; Annex III: Climate change in the BAC; Annex IV: Climate impacts in the BAC; and Annex V: Detailed methodology).

5. As regards equity, the majority of the sectors foresee uneven impacts. However, the terrestrial ecosystems and coasts stand out for their lesser importance and health and linear infrastructures for their medium importance. And when it comes to difficulty of action, special mention should be made of the ease of action in all the sectors. In other words, the experts consider that there are easily implementable and potentially viable measures.

Particularly noteworthy in the integrated assessment is the importance given to the following sectors: Water resources, Urban Environment, and Coasts, mainly due to the relatively greater importance given to criteria of Vulnerability and Strategic Importance (nearly 45% of the total).



ANNEX III

RELATED SECTORAL PLANNING

The following table summarises the main sectoral planning in the Basque Country and which are more closely related to climate change policy.

Table 1.

Sectoral Planning of the Basque Country related to climate change

Source: Own preparation

Sectoral Planning	Aspects regarding the integration of climate change
IV Environmental Framework Programme 2020 of the Basque Country	Apart from including different lines and courses of action with implications on both cutting GHG emissions and the adaptation to climate change, it envisages preparing the Basque Climate Change Strategy to 2050 in its strategic objective 2 (To progress towards a resource-efficient, low carbon, innovative and competitive economy).
Basque Energy Strategy 2020 (3E2020)	It responds to the need to incorporate an energy policy that, along with the one in place for Europe, helps to ensure a more sustainable energy system and thus enhance the competitiveness of the companies and the wellbeing of Basque society in general.
Industrialisation Plan 2014-2016	It is committed to enhance the productive industry as the main driving force to generate wealth and employment, with the emphasis on its restructuring and survival in order to maintain and reinforce its weight in the Basque economy.
Territorial Planning Guidelines (DOT)	The amendments, approved in February 2012, address aspects that are directly or indirectly related to climate change. They envisaged improvements in the following aspects: (1) urban settlements; (2) agricultural land; (3) architectural and urban design; (4) uses of rustic land; (5) forestry areas.
Sectoral Territorial Plans (PTS)	Those approved at the end of 2013, and the ones being processed or drafted (at least 15), that will develop the DOT and which have impact on climate change, for example: Stream and River Bank Planning PTS (Mediterranean and Cantabrian areas), Wetland PTS, Coastal Planning and Protection PTS, Agri-forestry PTS, Railway Network PTS, etc.
Housing Master Plan 2013-2016	Its strategic Core Area 4 envisages the refurbishment of housing in a sustainable manner, including the energy efficiency and saving requirements set at European level.

(.../...)

(.../...)

Sectoral Planning	Aspects regarding the integration of climate change
<p>Basque Country Sustainable Transport Management Plan 2000-2012</p>	<p>Developed in line with the European Common Policy guidelines, it sought to control mobility and achieve a modal balance between the different means of transport, without forgetting safety, preventive transport and its quality and effectiveness. Its main courses of action are aimed at promoting public transport and intermodality.</p> <p>The next Sustainable Transport Master Plan is currently being prepared on a 2020 timeline. It will include key aspects to cut GHG emissions, such as encouraging intermodality, efficiency, and the new technologies and fuels with lower emissions, along with improving information and infrastructures.</p>
<p>Rural Development Programme 2015-2020</p>	<p>Its main objective is to structure the financial support of the Common Agricultural Policy (CAP) for the courses of action and measures to be implemented in the rural environment during that period. It is an essential instrument to drive and support the policies to be enacted in the Basque rural environment. One of its priorities is to achieve a low-carbon economy and capable of adapting to climate change in the forestry, food and agricultural sector.</p>
<p>Forestry Plan 1994-2030</p>	<p>It contributes to conserving and increasing the carbon sinks in the Basque Country, by means of woodland.</p>
<p>Waste Prevention and Management Plan of the BAC 2020</p>	<p>Its cornerstones are to prevent generating and to increase the separate collection and recycling, in order to reduce the amount of waste with no pre-treatment reaching landfills.</p>
<p>Geodiversity of the Basque Country Strategy 2020</p>	<p>It analyses and assesses the geodiversity of the Basque Country and the ecosystemic systems of its geological heritage and, at the same time, it establishes the management intervention proposals and criteria.</p>
<p>Natura 2000 Network</p>	<p>This European network consisting of the Special Areas of Conservation (SAC) and of Special Protection Areas for Birds (SPAs), designated according to the Habitat Directive (92/43/EEC) and the Birds Directive (2009/147/EEC) respectively, seeks to guarantee the maintenance or re-establishing habitats and species of community importance. It should therefore be noted that this network accounts for over 20% of the surface areas of the BAC and comprises 25 Sites of Community Importance (SCI), 27 SACs and 6 SPAs.</p>
<p>Water Management Plans</p>	<p>The water policy is underpinned by the Water Framework Directive (Directive 2000/60/EC) and it is implemented in the BAC through the Water Management Plan of the Western and Eastern Cantabrian River Basin District 2009-2015 and the Water Management Plan of the Ebro River Basin District. Even though they are still pending approval, they take into account the possible effects of climate change on the water resources by means of future projections and including courses of actions that help their adaptation, particularly to meet demand and minimise the impacts of extreme weather phenomena.</p>
<p>Flood Risk Management Plans</p>	<p>As the result of the application of the Flood Directive (Directive 2007/60/EC), the Significant Potential Risk Areas (SPRAs) have been identified in the BAC, considering the possible influence of climate change on flood risks, and their risk and hazard maps have been published.</p>
<p>Environmental Performance Index, EPI</p>	<p>Published in 2013, it positions the BAC among the top regions in terms of environmental performance. In the report, where up to 22 performance variables are analysed, the effort carried out in the BAC in the last decade to cut the SO₂ and CO₂ emissions or to increase the surface area of protected land within the Natura 2000 Network is recognised.</p>

ANNEX IV

SUMMARY OF THE PARTICIPATION PROCESS TO PREPARE THE STRATEGY

In tandem with the technical work linked to preparing the Climate Change Strategy of the Basque Country to 2050, a citizen participation process was designed and implemented. It sought to communicate and contrast with the key stakeholders in terms of climate change the main lines of action to be included in the Strategy and bring them into line with their specific perceptions, addressing different spheres and sectors. Thus, the preparation process has involved practically all the ministries of the Basque Government and contributions from the Country Councils, municipalities and society in general, by means of the different forums held in the participation process along with the work of experts.

Between January and April 2015, different participatory sessions were held in conjunction with the main stakeholders involved in climate management in the Basque Country, in order to present the preparation process of the Basque Climate Change Strategy 2050 and to study the main lines of action in each case. The following stakeholders were thus involved:

1. Offices of the Deputy Ministers of the Basque Government, who were involved in defining and adjusting the sectoral analysis carried out beforehand and the lines of action and specific interventions actions that the Strategy will contain in each sphere of action. And given its cross-cutting nature, the emphasis has been put on involving the largest number of divisions and departments of the Basque Country, and specifically:

- a) The Office of the Deputy Minister for Industry.
- b) The Office of the Deputy Minister for Transport.
- c) The Office of the Deputy Minister for Housing.
- d) The Office of the Deputy Minister for Security.
- e) The Office of the Deputy Minister for Territorial Planning and Administration.
- f) The Office of the Deputy Minister for Health.
- g) The office of the Deputy Minister for the Environment.

Those offices stressed the importance of including innovation and technological development as fundamental pillars of the Strategy, along with the interinstitutional coordination between the different levels of government in the Basque Country. More specifically, the sessions showed that the main areas for improvement were increasing knowledge about the different technical aspects linked to climate change policy, mainly regarding adaptation and also mitigation. This greater awareness is detected at all levels of Basque society, from technical and political to grassroots levels. This need is also mainly identified as being linked to the municipal or local sphere, where there is less awareness of the need to adapt to climate change.

Other conclusions included the need to improve the coordination required between transport /mobility and urban and territorial planning, and the importance of the densification of urban centres. On the other hand, improvements were detected in data collection linked to the field of adaptation (for example, weather data linked to the impact forecasting models and in alert levels). In addition, it was stressed the need to include aspects related to urban regeneration and solutions based on nature, such as green facilities, and with an emphasis on the organisational aspects of water management.

As regards energy, the sessions concluded that a greater commitment to renewable energies was needed by the end of the Strategy period, along with working to achieve zero consumption of oil derivatives by fostering alternative energy among the consumer sectors.

On this point, the importance of the cross-cutting aspect of the Strategy should be stressed, since, in addition to the Ministry of the Environment and Territorial Policy, it is highly useful that other Deputy Ministers' offices of the Basque Government have indicated their specific lines of action and specified which measures they will adopt to reduce emissions (mitigation of climate change) and to reduce their vulnerability to it (adaptation).

2. County Councils, which have contributed their input to prepare the Strategy from an institutional perspective and focused more on the territorial sphere. The work with the Deputy Ministers' offices was studied with them so that the final lines of action of the Strategy would be in line with and shored up by their policies and perceptions.

The main lines of action considered by these entities include those relating to adaptation to climate change. Emphasis was here placed on aspects such as the transferability of knowledge about climate change, raising awareness of its impact on the natural environment and forestry and agricultural sectors, or the workers' skills-building process of the workers in this regard.

3. Basque county capitals (Bilbao, Donostia/San Sebastián, Vitoria-Gasteiz), which contributed their approach to preparing the Strategy from an institutional perspective and focused more on the local arena. In the same way as in the previous case, the work with the Deputy Ministers' offices was studied with them so that the final lines of action of the Strategy would be in line with and shored up by their policies and perceptions.

The main meetings held with the county capitals have been aimed at improving the institutional coordination between different government levels, both regarding mitigation and adaptation aspects. Different experiences regarding urban development, combining climate change mitigation and adaptations criteria were discussed. The pilot schemes were considered to be of great interest as they can be disseminated and then reproduced in other urban centres.

4. Udalsarea 21 Network Forum, held in order to include different local councils and related local organisations in the process to prepare the Strategy. The lines of intervention and action regarding territorial planning and mobility, building and social services, including water and waste management, were discussed during the group work that addressed different courses of action.

The main contributions received include the need for greater knowledge and dissemination of climate change, mainly in the area of adaptation, which is more overlooked in the local arena. In this regard, the involvement of the political and technical levels of the local councils, even in the mitigation area, where there is still a lack of knowledge about the new technologies, such as the electric vehicle or novel energy efficiency techniques, is essential. Furthermore, it is also considered important to drive the Information and Communication Technologies (ICTs), adjust the mobility model to the size of each municipality (without forgetting those with more rural characteristics, which is the case of a large number in the Basque geography), foster the use of bicycles and pedestrian networks in cities and urban centres or greater awareness of green public procurement, among others.

5. Social Forum. This forum was open to society in general, along with the participation of associations, clusters, universities and technology centres, among others, along with people who, in their individual capacity, wished to take part in the initiative. With similar dynamics to the forum held with the municipalities, groups were formed to study all the courses of action of the Climate Change Strategy of the Basque Country to 2050. The long-term approach was first defined for each course of action and the specific lines and actions were adjusted, based on the work previously carried out in the sessions with the Deputy Ministers' Offices of the Basque Government.

6. Irekia. A space was set up to discuss the development of the Strategy from January to March 2015. The baseline information came from: the summary of the analysis performed and of the assessment of the Basque Climate Change Plan 2008-2012, document with the basic strategic lines and other different information documents on climate change. In total, 15 participations and 30 comments were recorded, which have contributed several points of view on different aspects, mainly focused on the mitigation of climate change.

ANNEX V

DETAILED ANALYSIS OF ADAPTATION NEEDS

Climate change adaptation is a less well known area than mitigation and the relation existing between the impacts linked to climate change and the sectors that it affects depend, in turn, on many interrelations.

Therefore, in order to identify the more specific actions to be implemented by those lines of action, the need to prepare a systems map for each sector has been detected. The components of a sector or system are detected, the relationship between them is determined and the link between the issues and components is established. Thus, creating system maps where the components and issues are located makes it possible to identify the adaptation needs in order to obtain a global photo of the sector to plan the adaptation (define priorities, organise the measures, set the timeline and complementarity, along with identifying the monitoring indicators). Therefore, the systems map represents the relations between drivers and impacts and is also the basis for identifying aspects to measure and monitor using indicators.

The system map identifies the drivers (climate and non-climate that may be controllable and contextual) that generate impacts on each sector and actions (adaptation) are proposed to potentially minimise the vulnerability of the sector or affect the driver that generates the impact. The controllable drivers have more adaptation options, while the contextual drivers offer few opportunities to be modified by measures. The purpose of those systems maps is, on the one hand, to present the problems of each sector in a schematic way in order to propose adaptation measures (measures that are oriented both at minimising the effects of the non-climate drivers along with minimising the vulnerability of the sector, have a traceability); on the other hand, the second purpose of those maps is to define the impact and adaptation measures indicators in order to be able to track and monitor the Strategy.

Apart from the aforementioned factors, the relationship with other systems has been depicted within the map, which reflects the interaction between sectors as a system alone cannot be explained or adapted. Figures 1 summarises the legend used to define the sectors.

In any event, there are aspects that must be considered for all the sectors such as the existence of accumulated and chain risks (due to the interdependencies and to the cascading effect), the cost-benefit of the measures and the co-benefits, along with the need to define action priorities and adaptation routes. The steps taken in this section is that of identifying the actions to be undertaken to adapt, but they must be organised within a plan. The latter requires a measure screening analysis (assessing the measures), identifying their timeline, analysing the complementarity (relationship and synergies between actions) and defining routes (detecting drivers and factors that condition and permit the change may range from governance to financial conditions and social acceptance).

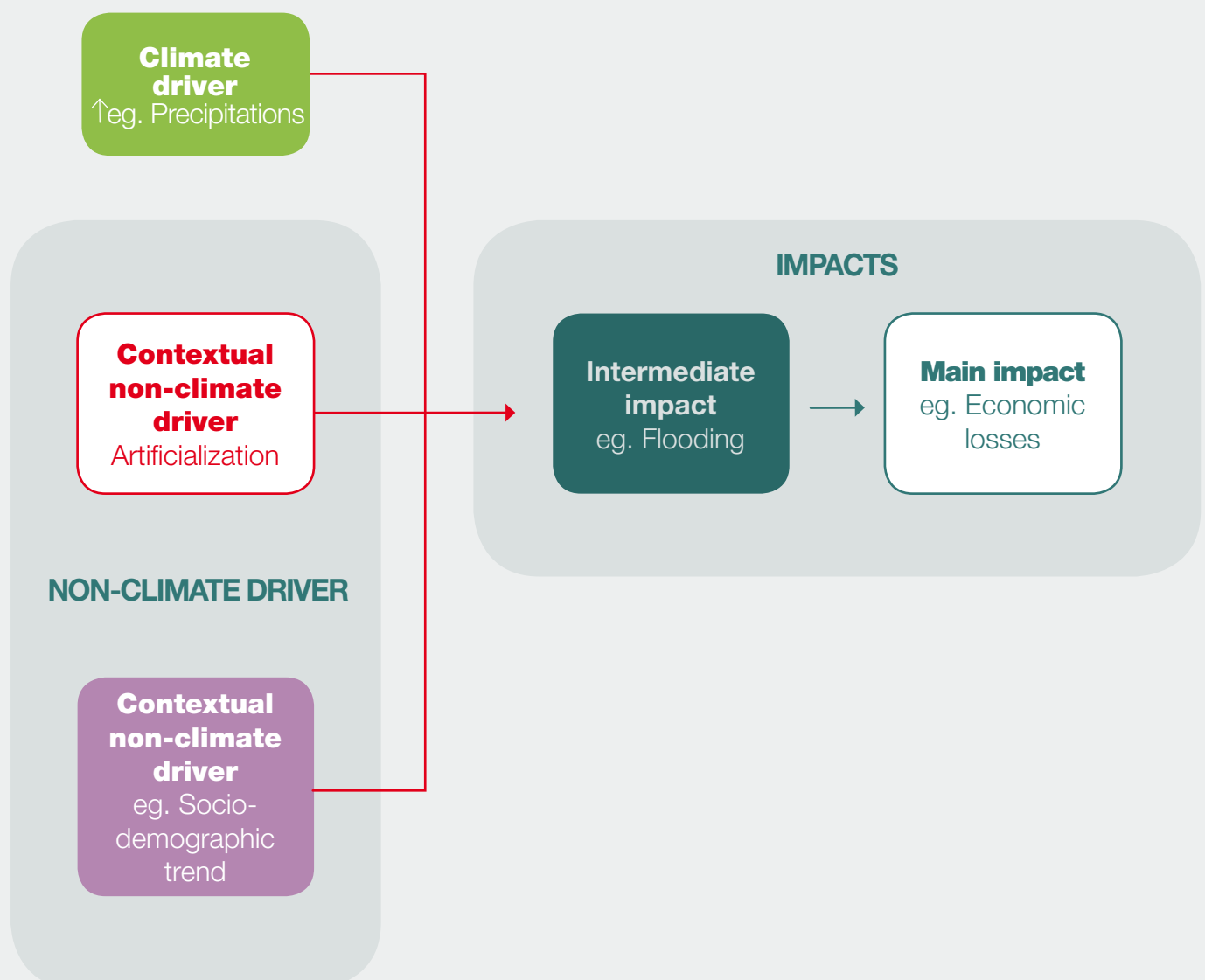
Taking this into account, even though the approach to define the lines of intervention and action is the same as regards mitigation, the analysis performed is presented by sector, including the more specific lines of action and measures for each. The datasheet produce is set out below along with the systems map for the following sectors:

- Water resources: demand-supply and water sanitation.
- Floods.
- Coastal and Terrestrial Ecosystems.
- Primary sector: Fishing.
- Primary sector: Agri-forestry.
- Primary sector: Livestock.
- Energy and Industry.
- Urban Environment.
- Linear infrastructures.
- Public Health.

Figure 1.

Diagram of the systems map defined to define each sector

Source: adapted from the Report of the EEA Adaptation Sub-Committee, 2011



SECTOR:
**WATER RESOURCES, DEMAND-SUPPLY
 AND WATER SANITATION**

Authority: URA

**Office of the Deputy Minister:
 Environment**

Main characteristics of the sector:

Water resources are an essential strategic commodity for the survival of any society or productive system. Their availability must be achieved taking into consideration an overall view of the role of water, its functions and its associated ecosystems, and based on sustainable, efficient and rational use.

The diagnoses carried out in the framework of water management planning conclude that our main supply systems are well prepared to meet current demands, along with ensuring, in turn, there is appropriate compatibility with maintaining the ecological flows. However, those diagnoses identify local problems due to the lack of guarantee in some smaller systems, particularly in prolonged periods of low water levels or drought, associated with lack of infrastructures or with management models of the water services that are not always ideal.

Diagnostics:

The latest report of the Intergovernmental Panel on Climate Change (IPCC) states that climate records show an unequivocal rise of the global average temperature in recent decades, along with changes to the water cycle and variations in the precipitation patterns. There are European models, with greater resolution, that coincide in pointing towards a moderate drop in annual average precipitation in the Cantabrian region, along with an increase in the evapotranspiration due to the temperatures rising. However, even though the new RCP scenarios are not considered, the most important research is that conducted by the CEDEX (Centre for Hydrographical Studies) that assesses the natural water resources and which establishes an overall reduction coefficient for the contributions in the Eastern Cantabrian River Basin Districts (RBD) for the timeline up to 2033 of 11% (according to the planning of the A2 scenario that is a global development horizon that can be classified as pessimistic)¹⁰ and 4% by 2027.

Therefore changes in the precipitation and in the temperature can be expected, which would affect the availability of the water resources (drop in the average flow and probably with greater seasonal variability and more frequent hydrological droughts).

The projections in the water plans regarding the relationship between the available water resources and the water demands for the different uses on different future horizons indicate that the majority of the supply systems of the Basque Country would be ready to satisfactorily cope with the foreseeable reduction in water resources. However, the current situations of local guarantee could worsen in the future if measures are not adopted.

Therefore, it is essential to continue implementing courses of actions that contribute to the progressive improvement and adaptation of the supply systems, aimed at meeting water demands (guided by the efficient use principle) with sufficient guarantees and in a compatible way with the established water ecological flows and environmental targets. The general approach of these courses of action is included in the set of measures within the water management plans.

Water resources affect the majority of sectors and therefore need to be managed and adapted according to the expected changes.

Envisaged planning for adaptation

The Environmental Framework Programme (PMA) 2020 currently has the following lines of intervention:

- Effectively integrating the conservation of the natural environment in sectoral policies.
- Fostering responsible use of energy, water, waste and land in the territory (driving the regeneration of urban fabrics by fostering the necessary transition towards a more sustainable business model, a more efficient building stock and a first-rate public area as a centre for citizen relationship).

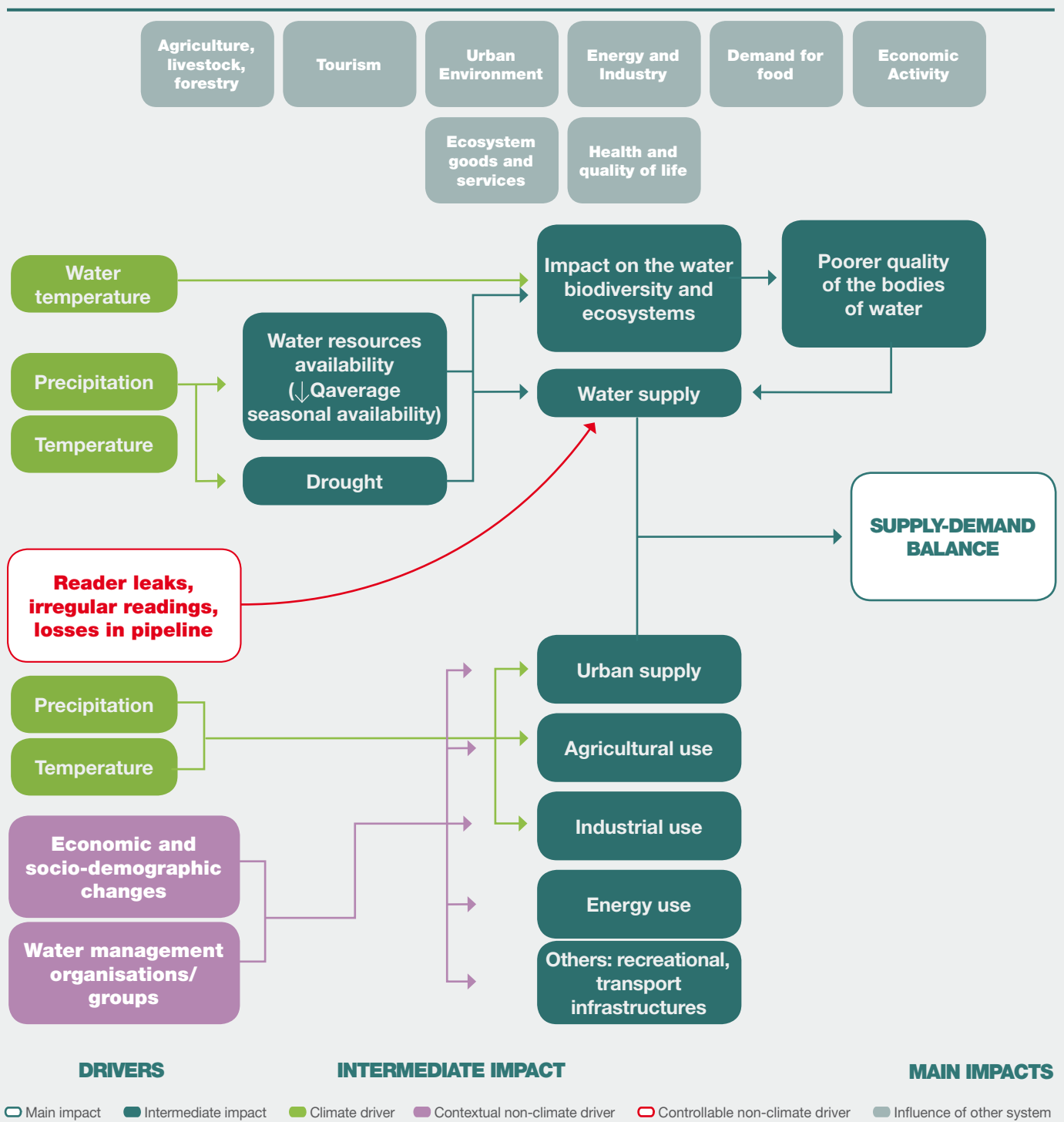
¹⁰ Pg 59 of the Hydrology Plan 2015-2021 REPORT.

— Addressing the environmental challenges and aspects that are of growing concern (climate change, noise, light and electromagnetic pollution, new substances, etc.).

In addition, the current Water Management Plans are at a consultation stage for its 2015-2021 review. The proposed set of measures consider different courses of action related to improving the supply systems and being ready for the possible effects of climate change of the different uses of water.

Figure 2.

Status map for water resources



SECTOR: FLOODING

Authority: URA

Office of the Deputy Minister: Environment

Main characteristics of the sector:

Flooding is currently one of the natural risks that cause the greatest injuries and property damage in the Basque Autonomous Community (BAC). Therefore, the general public are increasingly more aware of the problems of flooding and it is therefore considered to be a more pressing issue among society.

In the Basque Country, the property damage associated to floods has been estimated (exclusively considering direct damage): structural damage to buildings, damage to the goods contained in the buildings, damage to vehicles, affecting communications links, clean-up costs and the costs of emergency services, as these are the major ones. In keeping with the procedure defined in the Flood Risk and Hazard Maps Report prepared by URA in 2003, the estimation of the annual damage expected at the ARPSIs of the Internal River Basins of the BAC stands at 62,984,937 €/year: 31,253,070 €/year on buildings, 13,821,150 €/year on vehicles, 9,695,290 €/year on communication links, 8,215,427 €/year on the costs of cleaning-up and emergency services.

Apart from the effect of climate change, other factors should be considered that impact on the increased risk. For example, the risk of flooding could be magnified by the greater impermeable surface due to urban development and the changes in the vegetation cover. Those changes can alter the runoff and hinder the prevention of flooding.

Diagnostics:

The Iberian Peninsula is at a transition point between temperate oceanic and dry sub-tropical climates. This makes it difficult to predict future rainfall in the area. It is therefore important to improve the scale of the studies using the regional climate models with greater resolution and using bias correction methods that aim to reduce the calibration error. Better knowledge of the impact will act as the baseline for the proposed adaptation strategies, and where emphasis must be on the adaptation measures aimed at cutting vulnerability.

The first studies on climate change conducted in the BAC point to a 10% increase in intense precipitations under the A1B scenario for the end of the 21st century. This may lead to a possible Mediterraneanization of the climate (increase in the number of dry days and precipitation concentrated in short periods).

The local studies on the effects of climate change on the risk of flooding in the BAC suggest that significant increases could occur in the maximum flood flows, along with the flooded surface area and with the speed and flow values of the current. Those changes could produce a relative increase of the risk and of the damage from flooding. However, these estimates are highly sensitive to the climate change model used and still do not take into account the impact of other important variables such as land use and the socio-economic context.

In short, the possible effects of climate change (increase in intense precipitations, rise in sea level and extreme waves) may lead to a greater likelihood of flooding, which would affect the injury, mortality and morbidity rates of the population leading to economic losses. Those potential events would in turn affect the constructed environment generating damage and economic losses.

Envisaged planning for adaptation:

We currently have the lines of intervention included in the following Plans and Programmes:

- PGRI projects that affect the BAC (2015 – 2021).
- Water Management Plans (2015-2021).
- Special Flood Risk Emergency Response Plan of the BAC (approved by the Basque Government Cabinet on 13/01/2015). This plan is part of the council and municipal plan of action regarding flooding.
- EFP 2020: The “Addressing the environmental vectors and challenges of growing concern (climate change, light and noise pollution, electromagnetic, new substances, etc.)” line of intervention considers the need to reinforce the monitoring, prevention and managing the environmental risks to health, by improving the environmental information systems.

SECTOR: COASTAL AND TERRESTRIAL ECOSYSTEMS

Ministry: Environment and Territorial Policy

Office of the Deputy Minister: Environment

Main characteristics of the sector:

Terrestrial ecosystems act as process regulators and shock absorbers of the impact of extreme natural phenomena.

Terrestrial ecosystems account for 92% of the surface area of the Basque Country, with 56% seminatural habitats (forests, meadows, scrubland and bushes), 31% forestry plantations and 12% crops. Fifty-eight per cent of the natural habitats are of community importance, 14% of which are of priority interest, and are part of the Natura 2000 Network (Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora).

The existence in the Basque Country of different plant species endemic to the Cantabrian cornice such as *Apium graveolens subsp. butronensis*, *Armeria pubinervis subsp. orissonensis*, *Armeria cantabrica subsp. vasconica*, *Cytisus commutatus* and *Soldanella villosa* (Loidi et al., 2009), shows the importance of biodiversity in the Basque Country. The Cantabrian Cornice is one of the regions of the peninsula with the greater diversity of species (Lobo et al., 2001) as there are 2300 plant species in the Basque Country (Campos & Herrera, 2009). It is therefore one of the most important areas of Spain in terms of conserving biodiversity.

Precisely, conserving biodiversity and the services of the ecosystem, along with controlling the progressive greening and fragmentation of the territory, have been some of the environmental problems addressed by the Basque Government.

On the other hand, forestry plantations of *Pinus radiata* in the Atlantic part and vineyards and other mono-crops in the Mediterranean zone occupying part of the territory of the Basque Country, hinder the response capacity to climate change threats. Natural ecosystems such as mixed forests are very fragmented, particularly in the Atlantic area. In this regard, the Adaptation to Climate Change Strategy adopted by the European Commission indicates that different

and resilient landscapes are the ones that best adapt to climate change, as they have a greater capacity to mitigate its possible impacts and, therefore, recovering from the extreme weather effects is easier.

The coastal zones are of great economic importance worldwide as most of the population, industry, ports, commercial operations, tourism and residential areas are concentrated there. The urban planning and demographic pressure on the coast may alter the ecosystems dramatically. The coast environment is particularly dynamic and fragile, as it is an interface between oceans and continents, and is, therefore, affected by the forcings of both. The constant degradation of natural habitats in general, and those belonging to the coastal zone in particular, along with the threats to certain species, are the fundamental concerns of the EU environmental policy.

From an environmental perspective, the estuaries of the Basque coast are home to species and habitats of community importance (European Habitats Directive) and to salt marshes, wetlands, dune vegetation, meadows of *Zostera noltii* seagrass (a species catalogued as being at risk of extinction in the BAC).

In the coastal and estuary areas, the complexity of the competences, mainly between the Basque Government (Environment, URA, Fisheries, etc.) and the Spanish Central Government (mainly Coasts) means that the potential for action should be shared or coordinated, so as not to duplicate efforts. For example, the European Marine Strategy Framework Directive (MSFD) introduced the need to conduct an initial assessment (Art. 8) of the socio-economic activities and their impact on the marine environment. The Basque Government does not have jurisdiction to carry out that assessment and therefore needs to work with the Spanish Ministry for the Environment, as the lack of economic assessment of some sectors hinders decision making and courses of action.

The ecosystems are currently not appropriately assessed as the goods and services that they generate are not taken into account in the GDP as they are not monetary. That does not mean that it must not be considered a strategic core area in the future. Studies on the economic assessment of the services of the ecosystems highlight their great value worldwide, which may even be triple the value of the GDP (Constanza et al. 1997).

Therefore, and as is set out in the report of the Intergovernmental Panel on Climate Change (IPCC) and in the European Adaptation to Climate Change Strategy, the loss of biodiversity and of services in the associated ecosystems as the result of climate change, along with other dynamics such as the artificialization of the land or the fragmentation of the territory, are a problem to be addressed both due to their very importance and for their influence on the smooth running of other sectors (health, safety, economy, etc.). Thus, managing the ecosystems appropriately contributes, among other important aspects, to the widespread adaptation to climate change, reduces the risks of disasters, increases food safety and enables sustainable management of water sources. In addition, the economic benefits of restoring the ecosystem exceed the initial investment costs in many cases.

Diagnosics:

The main direct impacts of climate change on the terrestrial ecosystems in our territory are mainly down to two effects: on the one hand, surface heating, which varies between 1 and 4°C depending on the sources and, on the other hand, higher precipitation in winter and lower in summer, which means an annual reduction of between 15 and 20%, and a 10% increase in extreme precipitation.

It also has to be taken into account that the climatology, topographic, ecological and also socio-economic conditions are different in the two areas of the territory. On the one hand, the Atlantic area, with an annual average rainfall of 1,323 mm, is characterised by steep slopes (62% of its surface area is made up of slopes over 30%). Its problems are therefore mainly associated to events related to intense precipitation: earth movements, erosion and floods. On the other hand, in the Mediterranean area, with annual precipitation of 874 mm and gentler slopes (26% of its surface area in slopes over 30%), the impact of climate change is mainly expressed in the form of droughts and water shortage, which will be the main impact to which the ecosystems of this area will be subject.

As regards the biodiversity, the Atlantic area will be affected in the mountain zones, particularly over 900 m due to the temperature increase (particularly beech trees and mountain zones), which means a foreseeable impact on 32,844 ha (7.25% of the Atlantic area), 26,286 ha of which are habitats of community importance (SCI), in other words, 80% of the areas over 900 m of the Atlantic area are sites of community importance, particularly the beech woods (4868 ha) and mountain meadows (3373 ha) (UNESCO Chair, 2013).

There will be a greater risk of out-of-control fires in the two areas (Peñuelas, 1996; Kloster *et al.*, 2012) and the increased frequency of fires will affect the species distribution, particularly in the Mediterranean case (Luis Calabuig *et al.*, 2000; Moreno *et al.*, 1998; Piñol *et al.*, 1998).

Furthermore, pollination will be affected throughout the territory and changes are expected in the interactions between species (between plants and their pollinators) (Santandreu and Lloret, 1999). In the Basque Country there are 345 bird species and 22 of bats, many of which play a very important role in pollination (Galán, 2006).

As regards the coast, the greatest expected impacts of climate change are those arising from the rise of the average level of the sea, the variations in the extreme marine climates (waves and tidal weather conditions) and warming of the sea and change in the precipitation pattern (Chust *et al.* 2011) with their ensuing impact on: 1) The current width of the beaches shrinking by between 34 and 100% due to the rise in sea level (Chust *et al.* 2010); 2) the total area affected along the Gipuzkoa coast due to extreme waves with a 50 year return period is estimated to be 164 hectares (Liria *et al.* 2011); 3) Advance of the salt wedge in the estuaries with impacts on the sewage and outfalls; 4) the coastal waters will experience warming of between 1.5 and 3.5 °C by 2100, with consequences on the movements of populations of species (fish and *zooplankton*) (Chust *et al.* 2014) and potential entry of species from warmer climates; 5) with the rise of the sea level the natural migration of the salt marshes, wetlands and seagrass meadows inland will be prevented in many cases by natural and artificial fixed barriers (Valle *et al.* 2014); and 6) the changes in precipitation would modify salt habitats and changes in the circulation of nutrients, plankton and a lower concentration of dissolved oxygen.

Given this situation, a significant challenge is the integration and coordination of disciplines and groups of experts that work in the different sectoral spheres, along with managers and politicians involved in managing the territory to work on the resilience of coastal and terrestrial ecosystems.

Another of the challenges is to work towards achieving a resilient territory, managing it so that the land uses are the most appropriate to address the effects of climate change. This challenge is in line with some of the actions already envisaged in the Basque Plan to Combat **Climate Change 2008-2012** in order to preserve the natural ecosystems and prevent their degradation.

Envisaged planning for adaptation:

The Environmental Framework Programme 2020 currently has these lines of intervention:

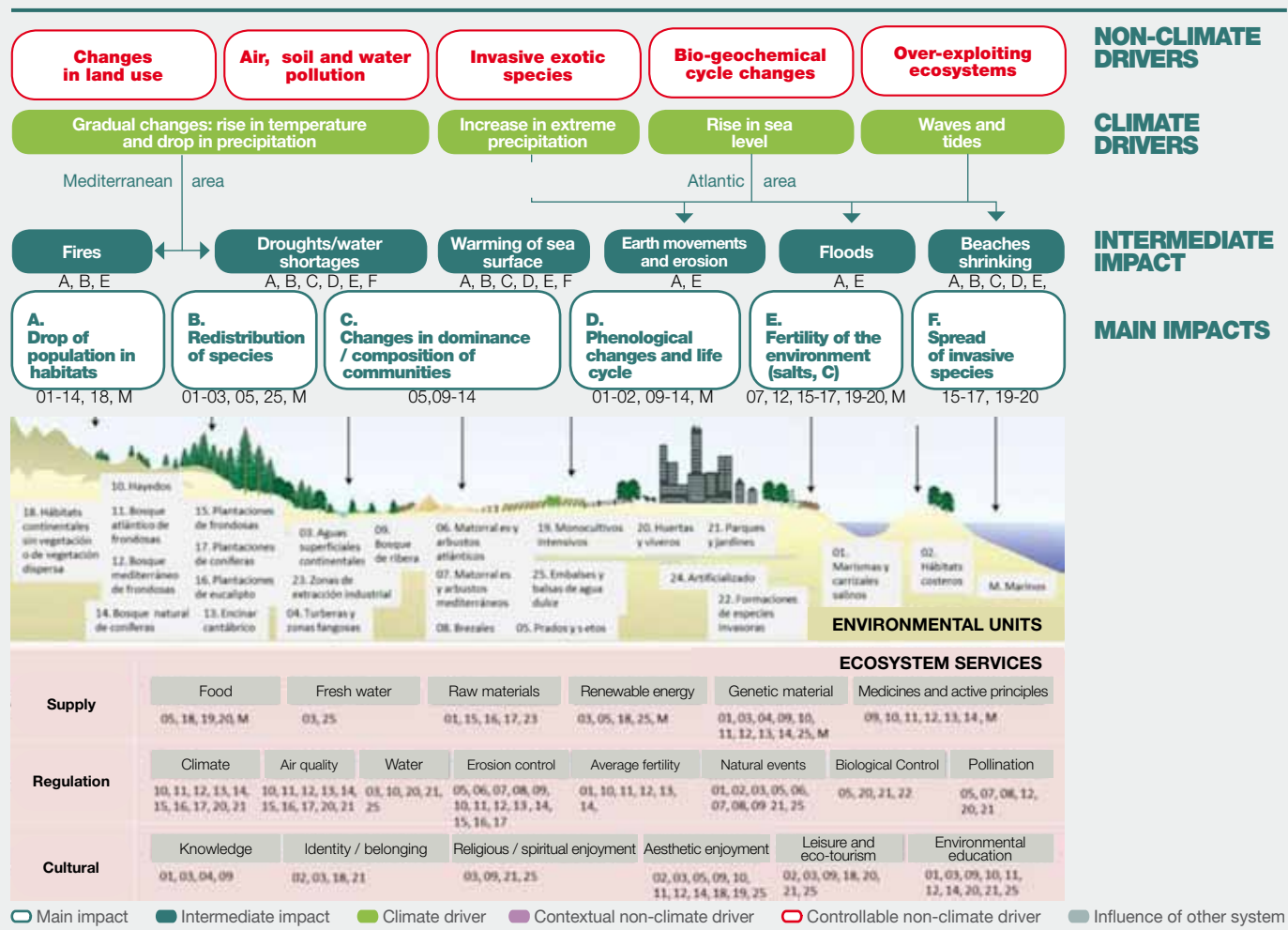
- Limiting the loss of the ecosystems and their services envisages the measures of “implementing an information system on the state of the natural capital in the Basque Country” and “improving and consolidating the analysis and monitoring mechanisms of the state of conservation of the threatened species”.
- Including instruments in the management of the natural capital of the Basque Country. Engaging and awareness raising of the stakeholders that operate in the territory of the importance of the services of the ecosystems.
- Effectively integrating the conservation of the natural environment in sectoral policies.
- Slowing down land occupancy, encouraging the mix of uses and the regeneration and reuse of degraded spaces.
- Developing and implementing green infrastructures to foster mitigation and adapting to climate change

and contribute social, economic and ecological benefits by means of solutions that integrate nature in the territory.

Moreover, the EFP 2020 is complemented by the Geodiversity Strategy of the BAC 2020, the amendment of the Territorial Planning Guidelines (DOT); Stream and River Bank Planning Sectoral Territorial Plan (PTS) (Mediterranean and Cantabrian areas); Wetland PTS, Coastal Planning and Protection PTS; Agri-forestry PTS; Railway Network PTS; Transport Logistics and Intermodal Network PTS; Wind Power PTS; Creation of Public Land for Economic Activities and Commercial Amenities PTS; Land for Public Housing Developments PTS; Gipuzkoa Municipal Waste Infrastructures PTS; Basque Contaminated Soil Plan 2013-2020; Rural Development Programme 2014-2020; Water Management Plans of the Western and Eastern Cantabrian River Basins 2009-2015 and the Water Management plants for the Ebro River Basing; and Flooding Risk Management Plants.

Figure 3.

Status map for the terrestrial ecosystems and coastal sector



SECTOR: FISHING

Ministry: Economic Development and Competitiveness

Office of the Deputy Minister: Agriculture, Fisheries and Food Policy

Main characteristics of the sector

The ecosystems and marine resources are highly important from the environmental and socio-economic perspective due to their multiple and intensive uses: fishing, gas storage and pipeline, transport, extracting sand, tourism, outfalls, underwater cables, alga extracting, harnessing wave energy, recreational activities, protected marine areas, etc. The sector stands out in the Basque Country for its great deep-rootedness and tradition, with 2.782 direct jobs and €173 million of gross added value in 2011.

As regards climate change, the warming, acidification and stratification of the water have significant consequences on the marine resources and ecosystem, but there are still huge gaps of knowledge regarding the specific possible impacts on the primary productivity of the sea and, therefore on the fishing sector. The very characteristics of the environment imposes a limited capacity to act on the ecosystems, even though the adaptation of the economic sectors affects (the fishing fleet) and the control of some anthropogenic impacts (pollution) that affect the resilience of the marine ecosystems can be encouraged.

Diagnostics:

The main physical-chemical changes expected in the marine environment and the coastal zones arising from climate change are: gradual changes to the ocean temperature, acidification, stratification of the water, changes to the currents and to the availability of nutrients in the photic zone of the sea column. This will lead to changes in the marine ecosystem: shifts in the distribution of marine species northwards and (in the case of some fish) to deeper waters, changes to the marine biodiversity, changes in the population dynamics, reduction in the size of the individuals, trophic decoupling, and spread of certain toxic algae

and invasive species. As the result of this warming, greater thermal stratification of the column is expected and that will lead to a drop in the biomass of the zooplankton on the French continental platform (Chust et al. 2014).

This will result in a loss of eco-systemic services with its ensuing impact on the economic activities.

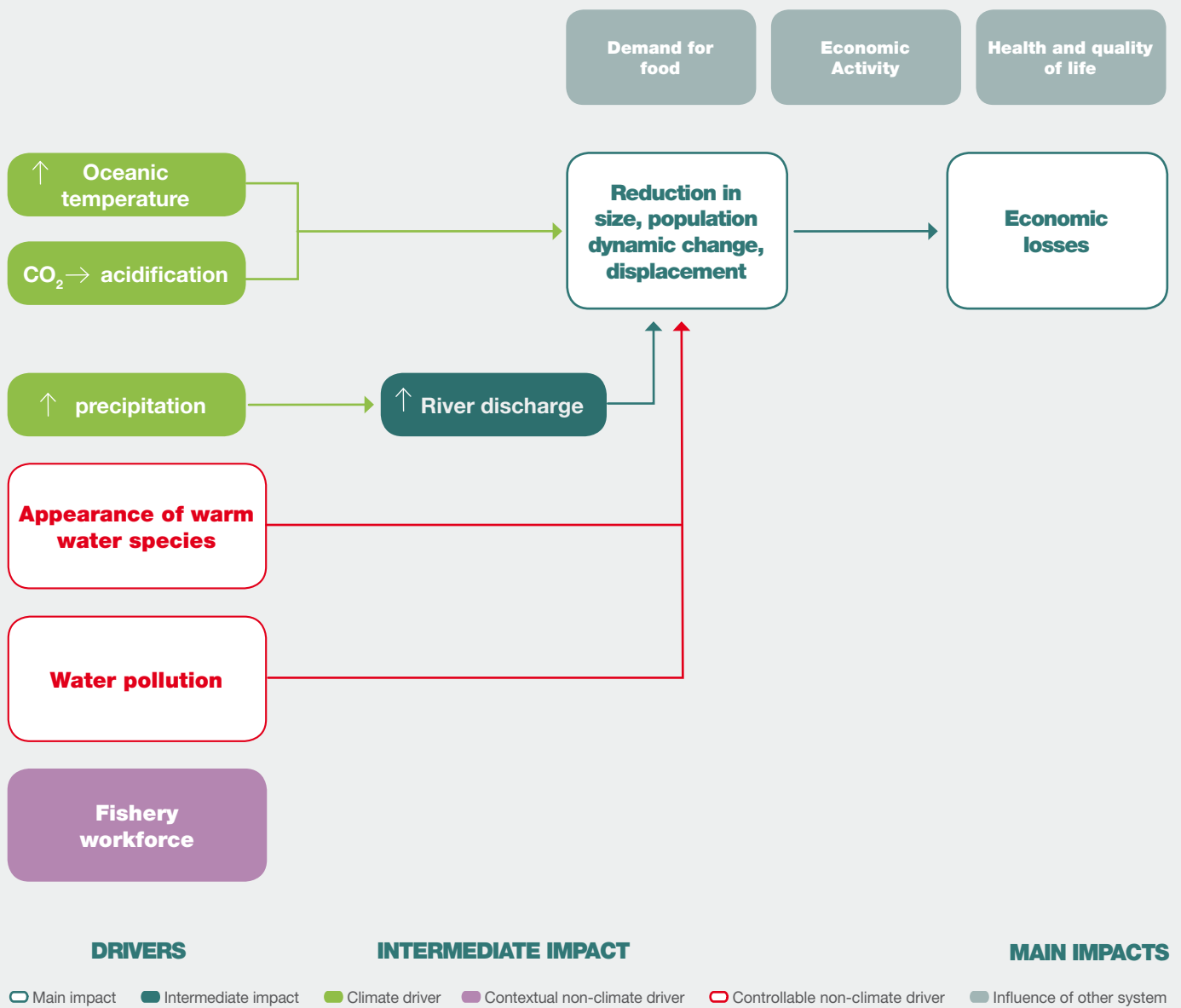
In the case of tuna, climate change could mean that some species (e.g. blue-fin and albacore tune) reach the Bay of Biscay earlier or that they move further North (e.g. Ireland). In the case of tropical fleets, climate change in the long term could change the distribution of the tuna with potential implication on negotiations with coastal countries to access their water. The warming and stratification of the sea can also lead to changes in the seasonality (phenology) of the key plankton species that could generate decoupling with the recruitment of fished species. The rise in temperature could extend the distribution of potentially toxic dinoflagellates (*Ostreopsis* and *Gambierdiscus*) in estuary and coastal zones.

With the increase in atmospheric CO₂, an acidification of water is also expected that will reduce the growth of calcareous organisms (bivalves, sea urchins, calcareous algae). Furthermore, other factors related to climate change, such as the deoxidation of the water and changes to the solar radiation, currents, outcroppings or wind systems may influence the marine communities.

Envisaged planning for adaptation:

Implementation of the Basque Aquiculture and Fishery Strategy Plan 2020.

Figure 4.
Status map for the fishing sector



SECTOR: AGRICULTURE & FORESTRY

Ministry: Economic Development and Competitiveness

Office of the Deputy Minister: Agriculture, Fisheries and Food Policy

Sphere of the EVCC: Adaptation to climate change effects

Main characteristics of the sector:

The agricultural sector contributes to the expansion of the agri-food sector, which makes it one of the cornerstones of the Basque rural environment. Beyond the mere economic interest, its benefit for society overall is assessed, due to its important role in preserving the environment and landscape, the cultural heritage, etc. In this regard, the Kyoto Protocol notes the fundamental role that the forestry sector plays in terms of climate change, as apart from its protective, recreational and productive role, the forestry sector, through photosynthesis, is capable of storing carbon in the wood and in the organic matter of the soil.

The projected changes in CO₂ concentration, in temperature and in precipitation patterns will have a significant impact on the sector, as it will cause changes to the productivity of the crops. The sector is addressing the challenge of climate change, hampered by the traditional uses and customs, the lack of specific training of the farmers, the difficult access to new land, along with important topographical and structural conditioning factors, and a lack of generational handover. Climate change will in turn provide opportunities due to the heterogeneous impacts that will result in the possibility of crops changes and access to new market niches.

If the forestry sector is analysed in socio-economic terms, the importance within the GDP is slight. However, its contribution is the reverse in terms of surface area (55% of the total surface area of the Basque Country is used for forestry purposes). Such a high percentage of surface area makes climate change a greater challenge for the sector. In this regard, the expected impacts can be summarised as an increase in the CO₂ concentration, rise in temperatures or changes in precipitation patterns that will have significant effects on the woodland. Given the great challenge of climate change, the sector is facing the difficulties

arising from a high percentage of private ownership, with an excessive economist slant, with a lack of generational handover, with a rugged terrain that makes using machinery difficult and with production specialisation (*Pinus radiata*).

Diagnostics:

The rise in temperature along with the drop in precipitation will increase the thermal stress on the crops and on the forestry plantations, in the same way that there will be a rise in pests and diseases, and there will also be ideal conditions for the appearance of invasive species. These climate conditions will force the crops and plantations to shift in terms of latitude or those that remain in the same place will be less healthy. There will also to a rise in fires that in turn will lead to a drop in the soil carbon reserves. This will all result in damage to and losses in the productivity of crops and plantations.

The rise in climate extremes will speed up soil erosion and will result in losses to crops and plantations.

On the other hand, climate change will create new opportunities as the higher winter temperatures together with the rise in the CO₂ concentration will increase the growing season of some crop species (longer periods) leading to better profitability of the holding.

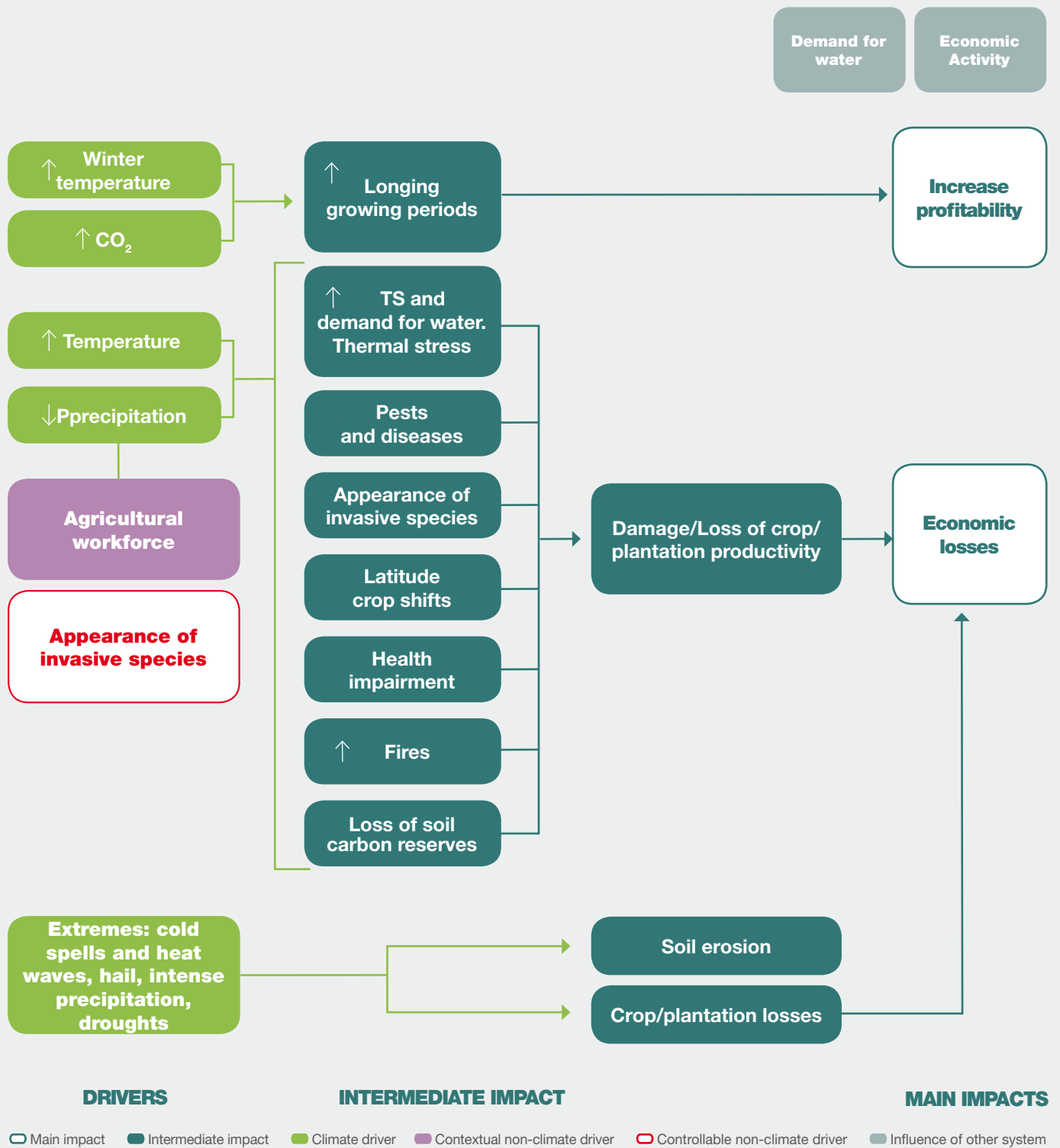
Envisaged planning for adaptation:

The Environmental Framework Programme (EFP) 2020 currently has these lines of intervention:

- Effectively integrating the conservation of the natural environment in sectoral policies.
- Slowing down land occupancy, encouraging the mix of uses and the regeneration and reuse of degraded spaces.
- “Including economic instruments in the management of the natural capital of the Basque Country” which refers to identifying the impacts on the ecosystemic services of the main funding system in the primary sector, by intensifying the work to apply positive incentive for the sustainable conservation and use of biological diversity and gradually eliminating the possible harmful incentives.

There is also an Integral Support Plan for the Agrarian Sector.

Figure 5.
Status map for the Agri-Forestry sector



SECTOR: LIVESTOCK

Ministry: Economic Development and Competitiveness

Office of the Deputy Minister: Agriculture, Fisheries and Food Policy

Sphere of the EVCC: Adaptation to climate change effects

Main characteristics of the sector:

Even though the livestock sector of the Basque Country is not significant in terms of GDP, this is not the case in terms of maintaining the population in rural environments, in terms of landscape and in terms of safeguarding the cultural heritage of the Basque Country. In the case of livestock, changes in the temperature and precipitation patterns will affect the reproduction, metabolism and health of the productive processes, as well as the availability of forage resources, and the stress of the animals, in other words, the future economic viability of the holdings. The Basque livestock sector is facing the impacts of climate change with the difficulties arising from the lack of specific training, the established habits and customs, a high average age in the sector and with a weak generational handover, and the economic and structural problems of embarking on new investments given the current lack of profitability of the livestock systems. In this regard, special mention should be made to the active role of the Basque Administration that is committed to driving a more sustainable sector and to guaranteeing the cultural heritage.

Diagnostics:

Gradual and extreme climate impacts are expected in this sector of activity. On the one hand, the increase

of the Winter temperature will lead to an increase in parasite diseases that will affect the livestock sector. These diseases, along with the thermal stress, are expected to lead to losses in livestock production.

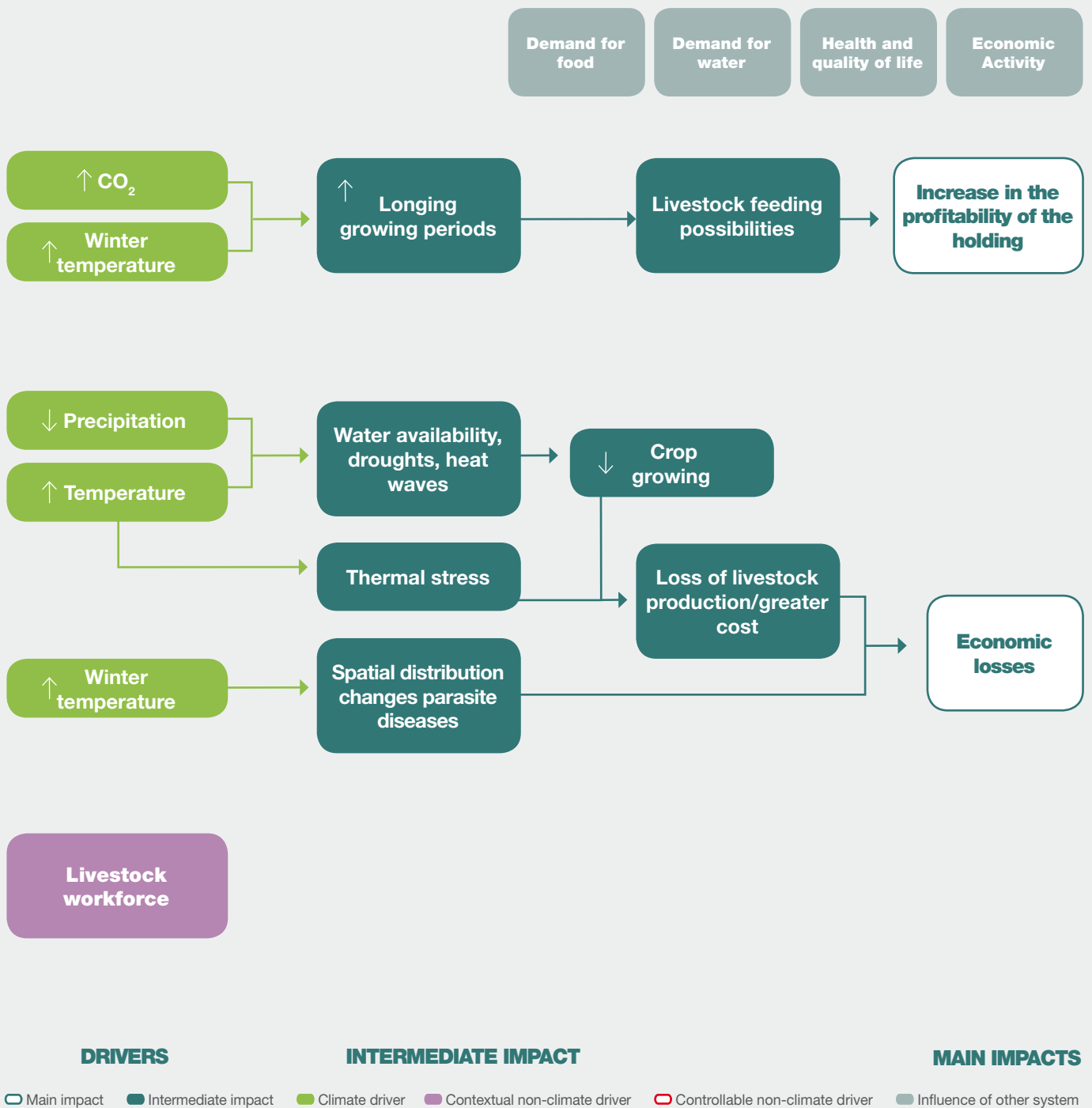
On the other hand, climate change may lead to new opportunities being created due to the increase of the Winter temperatures along with the rise in CO₂ concentration, which may improve the growing season of some species (longer periods), thus meaning more food at a better price for the livestock and thus making the holding more profitable. However, this would be the case if sufficient water was available and avoiding the negative effects of the droughts and heat waves (which are ultimately the greatest cause for the lack of food for the livestock in recent years).

Envisaged planning for adaptation:

The Environmental Framework Programme (EFP) 2020 currently has these lines of intervention:

- Effectively integrating the conservation of the natural environment in sectoral policies.
- Slowing down land occupancy, encouraging the mix of uses and the regeneration and reuse of degraded spaces.
- “Including economic instruments in the management of the natural capital of the Basque Country” which refers to identifying the impacts on the ecosystemic services of the main funding system in the primary sector, by intensifying the work to apply positive incentive for the sustainable conservation and use of biological diversity and gradually eliminating the possible harmful incentives.

Figure 6.

Status map for the livestock sector

SECTOR:
ENERGY AND INDUSTRY

Ministry: Economic Development and Competitiveness

Office of the Deputy Minister: Industry

Main characteristics of the sector:

The vulnerability to climate change in the industry and energy sector is particularly focused on the possible physical damage due to extreme events, as well as on the flooding of industrial areas in altered river basins and on the surges in electricity consumption in heat waves. There is not enough sufficient information to assess indirect impacts that occur in other stages of the value chain. As regards the adaptation capacity, it should be stressed that there are adaptation options, but many are costly and there is little operational flexibility, and smaller companies can be seen to find it harder to access major investors. Both the physical location and the type of activity of the companies means that the equity and distribution of the damage are not balanced. However, different benefits linked to generating jobs are expected in this sector, along with the huge potential of R&D&I and the boost to business (inside and outside the Basque Country) in adapting those sectors.

Diagnostics:

Minimum and maximum temperatures are expected to increase which, together with a drop in the precipitation will cause problems to the cooling of the machinery of the industrial and electricity-generating plants while reducing their efficiency. This will have an impact on the industrial and energy production. On the other hand, the drop in precipitation may have

an impact on the availability of water which in turn will affect the hydroelectricity production. An increase in extreme events is also expected that will impact the exposed infrastructures, the transport networks and distribution, leading to damages. Those changes to the meteorological variables, along with the socio-economic (contextual) trends will alter the energy demand patterns and consumption habits.

Due to those changes, the price of energy and greenhouse gas emissions will be affected.

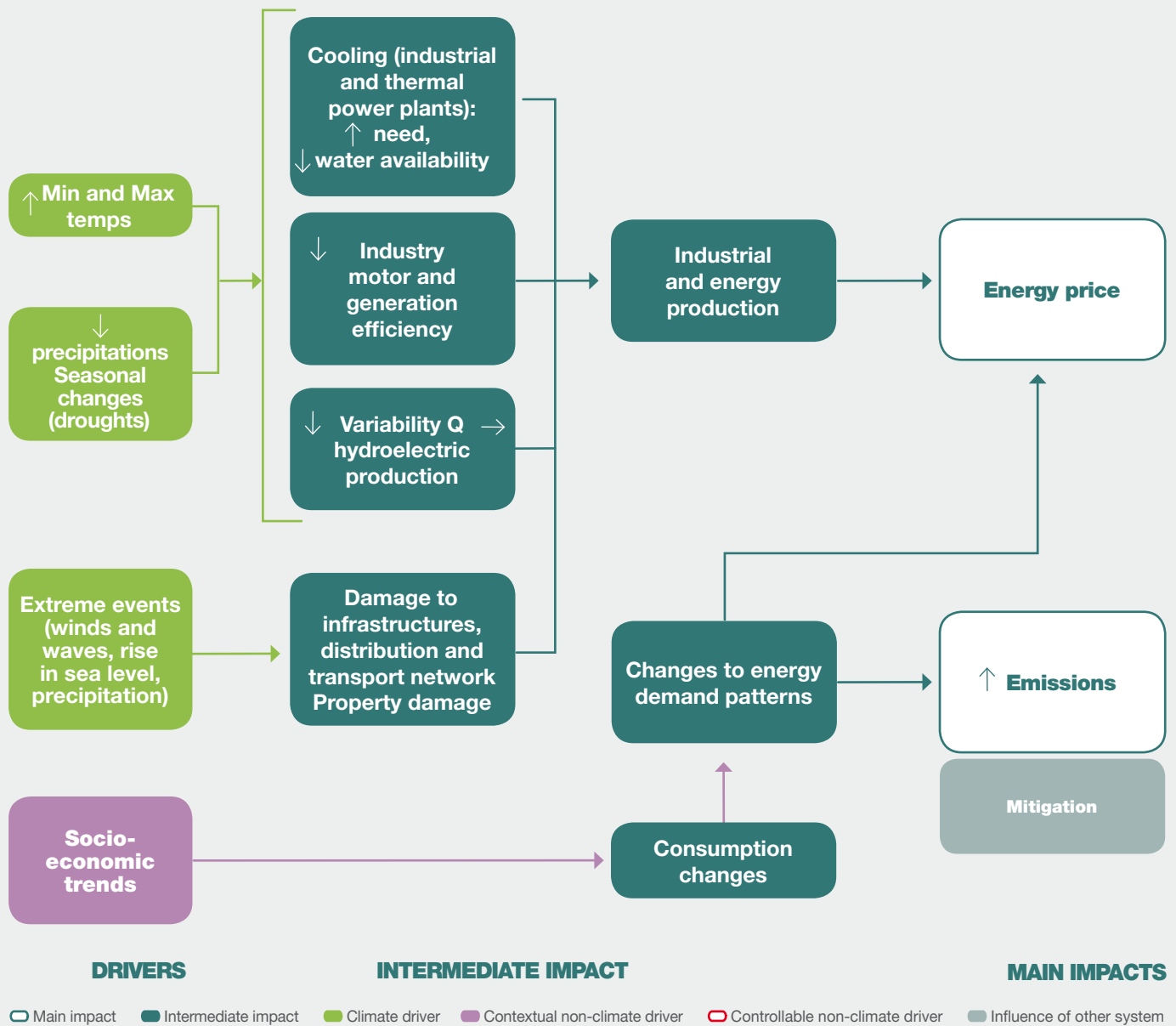
Envisaged planning for adaptation:

The Environmental Framework Programme (EFP) 2020 currently has these lines of intervention:

- Slowing down land occupancy, encouraging the mix of uses and the regeneration and reuse of degraded spaces.
- Fostering responsible use of energy, water, waste and land in the territory (driving the regeneration of urban fabrics by fostering the necessary transition towards a more sustainable business model, a more efficient building stock and a first-rate public space as a citizen relations centre).

The Industrialization Plan (approved in the 4th Quarter of 2013), has the goal of driving the green economy and low carbon economy, together with an efficient use of natural resources (LEEB, 2014). There are also the Basque Strategy to Promote the Tourism Sector, the Basque Energy Strategy 2020, 3E 2020, and the Plan to Back Entrepreneurial Activity that must be taken into account.

Figure 7.

Status Map for the Energy and Industry sector

SECTOR: URBAN ENVIRONMENT

Ministry: Environment and Territorial Policy

Office of the Deputy Minister: Territorial Planning and Administration

Main characteristics of the sector:

Urban areas, whether on the coast or inland, are complex systems, where there are many processes that play a fundamental role in the economy and in the social welfare state at all levels, not just locally. Cities are co-responsible for climate change, while they have to bear their impacts in the form of tide or river flooding or of the intensification of the impact of the urban heat island, which can cause serious problems to its social, economic and environmental aspects, including human losses and health impairment, damage to housing and infrastructure, loss of earnings, disruption to productivity, etc.

In the case of the cities, the opportunities to adapt to climate change are closely related to the incorporation of measures envisaged in the territorial planning to the urban and sectoral planning. Therefore, instruments such as the Territorial Planning Guidelines (DOT), the Partial Planning Plans (PTP), the Sectoral Territorial Plans (PTS), the General Urban Land Use Plan (PGOU) or subsidiary regulations and development planning such as the special plans, partial plans or the detailed studies should be taken into account.

Diagnostics:

The urban environment, understood as the constructed environment, will be affected by the extreme changes in temperature and precipitation, along with the rise of the sea level and extreme waves. Along with those climate factors, there are the non-climate factors such as the form, structure and functions of the city, changes in use, the sewerage system and socio-demographic changes. This all affect the exposure of the constructed environment and/or economic assets to impacts such as flooding, landslides or subsidence, urban heat island effect and periods of drought. Based

on those impacts, losses are expected to goods and services, along with damage to and ageing of physical assets, which will mean economic losses. Then there are the cascade effects due to the interdependences that exist. The urban areas are complex systems where there is room for a quantity of processes that are not always easy to pinpoint and control and which interact with other sectors (energy, water, transport).

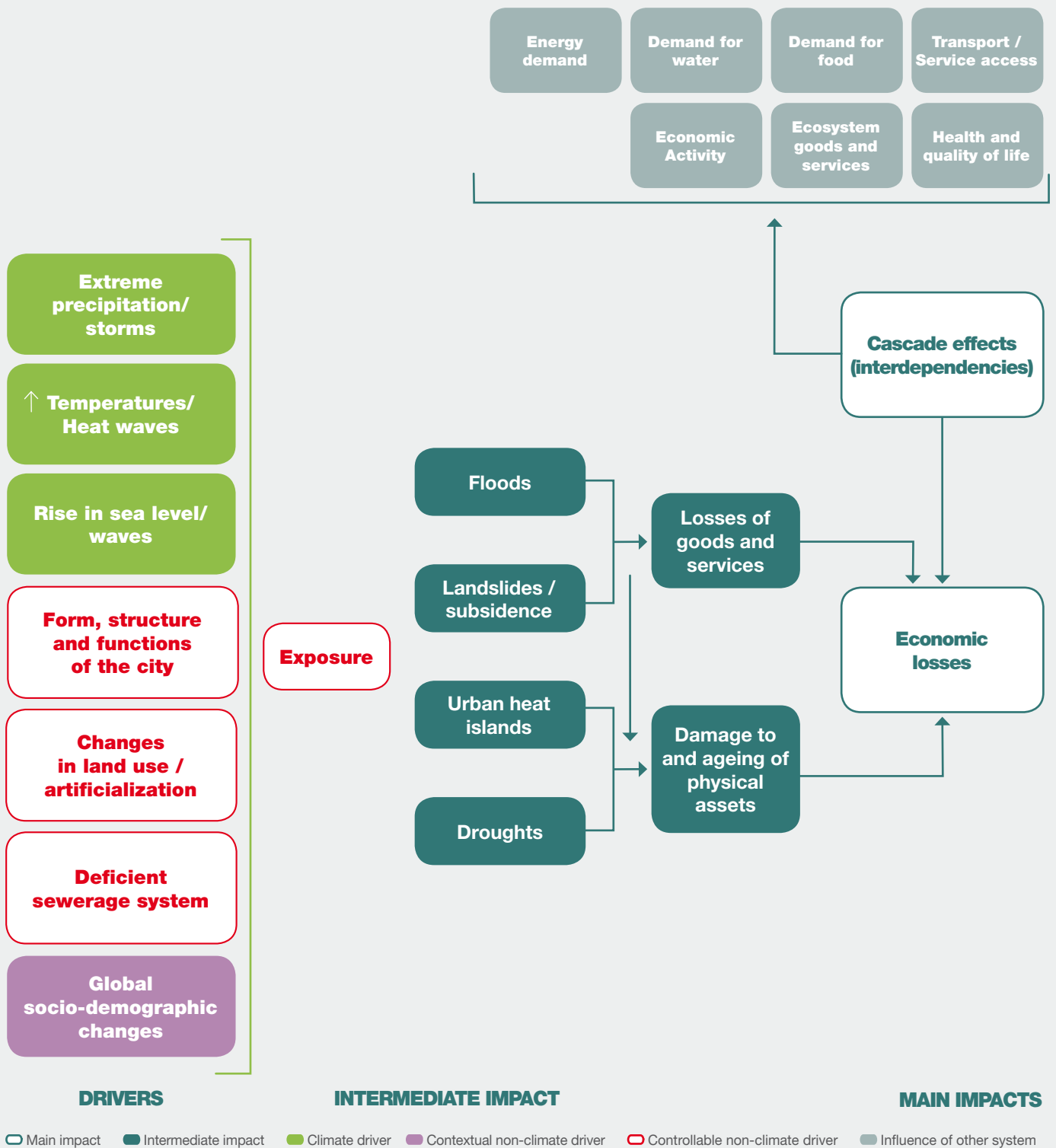
Envisaged planning for adaptation:

The Territorial Planning Guidelines are currently being reviewed. Therefore, the Initial Approval of the Amendment of the DOT has therefore been obtained regarding the Residential Quantification (2014), the Partial Territorial Plans (PTP), the Sectoral Territorial Plans (PTS), Waste Management Plan, the Contaminated Soil of the Basque Country Plan 2013-2020, the General Urban Land Use Plans (PGOU) and subsidiary regulations and the Assessment and Management of Flood Risks. There is also a programme to support the urban refurbishment and regeneration that must be taken into account.

Finally, the Environmental Framework Programme (EFP) 2020 has the following lines of intervention related to climate change:

- Slowing down land occupancy, encouraging the mix of uses and the regeneration and reuse of degraded spaces.
- Developing and implementing green infrastructures to foster mitigation and adapting to climate change and contribute to social, economic and ecological benefits by means of solutions that integrate nature in the territory.
- Fostering responsible use of energy, water, waste and land in the territory (driving the regeneration of urban fabrics by fostering the necessary transition towards a more sustainable business model, a more efficient building stock and a first-rate public space as a citizen relations centre).

Figure 8.

Status map for the urban environment

SECTOR: HOUSING. URBAN ENVIRONMENT

Ministry: Employment and Social Policies

Office of the Deputy Minister: Housing

Sphere of the EVCC: Adaptation to climate change effects

Main characteristics of the sector:

Urban areas, whether on the coast or inland, are complex systems, where there are many processes that play a fundamental role in the economy and in the social welfare state at all levels, not just locally. While being co-responsible for climate change, cities and buildings have to bear their impacts in the form of tide or river flooding or of the intensification of the impact of the urban heat island, which can cause serious problems to its social, economic and environmental aspects, including human losses and health impairment, damage to housing and infrastructure, loss of earnings, disruption to productivity, etc. In the case of urban areas, it seems obvious that the opportunities to significantly contribute to their adaptation to climate change are closely related to the incorporation of measures contemplated from the very territorial planning to the urban and sectoral planning. Therefore, instruments such DOTs, the PTPs, the PTSs, the PGOUs or subsidiary regulations and development planning such as the special plans or partial plans, building bye-laws and the technical standards should be taken into account.

Housing, buildings and the urban complex will be one of the aspects of the urban environment affected by climate change. The housing density in the Basque Country is 45.43 (housing units per hectare on residential land, EUSTAT 2014), with Gipuzkoa being the county with the highest density (59.85 housing units/Ha), Araba the lowest (25.7 housing units/Ha) and Bizkaia in the middle (48.99 housing units/Ha). In the case of Bizkaia and Gipuzkoa, the figures reveal that approximately half the building land has been used for housing.

As regards the age of the housing stock, the average is around 40.3 years old. Sixty-three percent of the housing of the Basque Country was constructed prior

to 1980 (with the values being 54%, 68% and 62% for Araba, Bizkaia and Gipuzkoa, respectively). Those buildings therefore lack thermal insulation in their frontages and roofs.

Diagnostics:

The urban environment, understood as the constructed environment, will be affected by the extreme changes in temperature and precipitation, along with the rise of the sea level and extreme waves. Along with those climate factors, there are the non-climate factors such as the form, structure and functions of the city, changes in use, the sewerage system and socio-demographic changes. This all affects the exposure of the constructed environment and/or economic assets to impacts such as flooding, landslides or subsidence, urban heat island effect and periods of drought. Based on those impacts, losses are expected to goods and services, along with damage to and ageing of physical assets, which will mean economic losses. Then there are the cascade effects due to the interdependences that exist. In the same way as the water resources, the urban areas are complex systems where there is room for a quantity of processes that are not always easy to pinpoint and control and which interact with other sectors (energy, water, transport).

Envisaged planning :

We currently have the following lines of intervention (EFP 2020):

- Slowing down land occupancy, encouraging the mix of uses, conservation, rehabilitation, regeneration and renewal of urban areas, with the reuse of degraded spaces.
- Developing and implementing green infrastructures to foster mitigation and adapting to climate change and contribute to social, economic and ecological benefits by means of solutions that integrate nature in the territory.
- Fostering responsible use of energy, water, waste and land in the territory (driving the regeneration of urban fabrics by fostering the necessary transition towards a more sustainable business model, a more efficient building stock and a first-rate public space as a citizen relations centre).

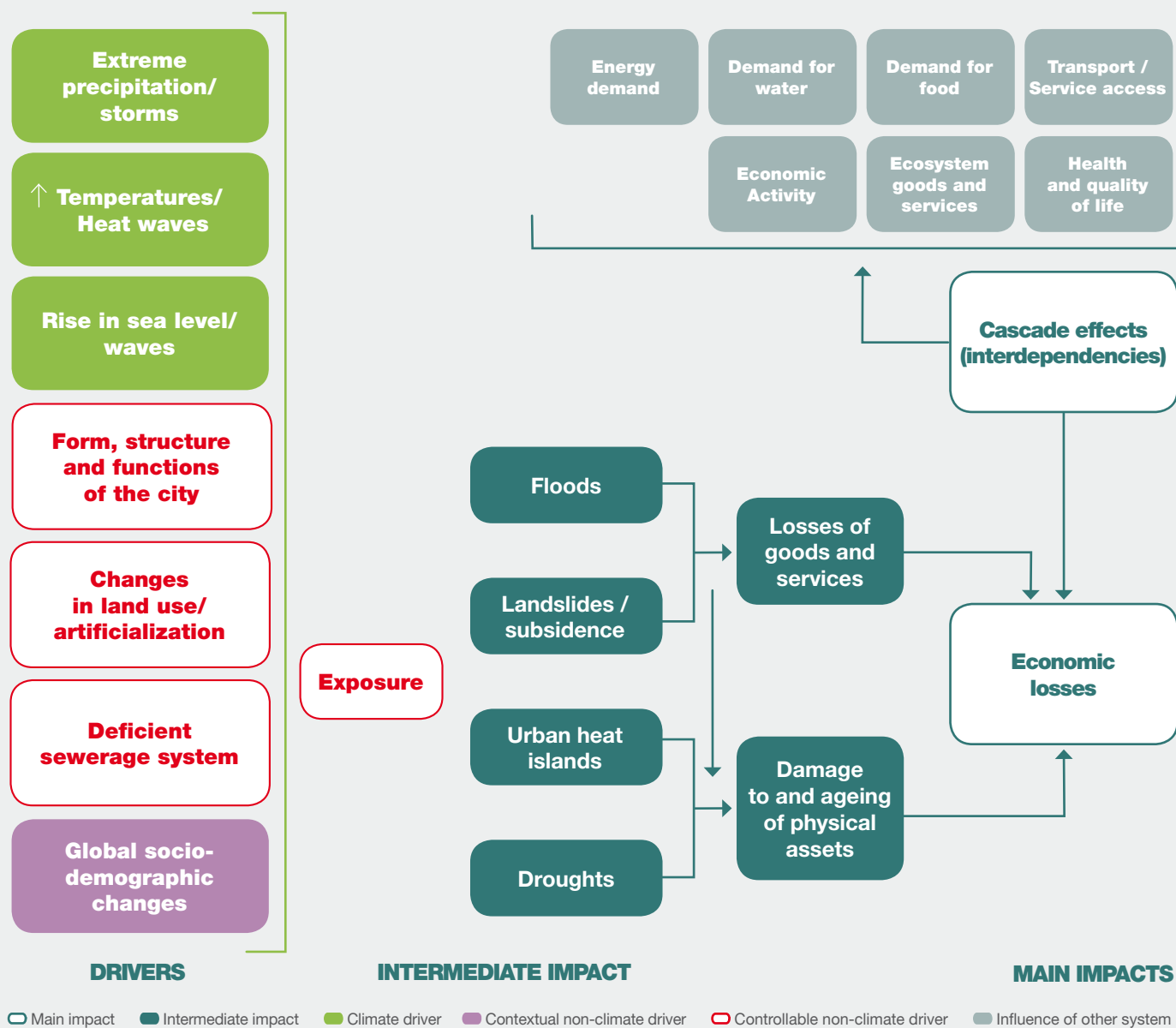
Other existing documents to be taken into account:

- Housing Refurbishing Renove Plan (programme to support urban rehabilitation, regeneration and renewal).
- Building Technical Code.
- Sustainable Building Guide for Housing in the Basque Autonomous Community.
- Sustainable Economy Act 2/2011, of 4 March

- Urban Renewal, Regeneration and Refurbishment Act 8/2013, 26 June.
- Specific municipal bye-laws on building.
- Decree 241/2012, of 21 November, regulating the technical inspection of buildings in the BAC, and its subsequent amendments.
- Royal Decree 235/2013, of 5 April, approving the basic procedure to certify the energy efficiency of the buildings.

Figure 9.

Status map for housing



SECTOR:
LINEAR INFRASTRUCTURES

Ministry: Environment and Territorial Policy

Office of the Deputy Minister: Transport

Main characteristics of the sector:

The greater vulnerability of the linear transport infrastructures of the Basque Country is associated to the likely increase of extreme precipitation events, which may cause disruptions to the transport network due to flooding and landslides, with the ensuing impact in economic (the network becoming possibly blocked) and social terms (foreseeable increase in the accident rate for environmental reasons). Logically, the areas that will be most hit are along stretches of roads with platforms closest to waterways (both horizontally and, above all, vertically), as well as in the stretches in areas of greater water instability, including the networks close to the coast and estuaries. The structural intervention needs in certain stretches of the network, as the consequence of the change in climate conditions, will not present insurmountable jurisdictional, budgetary and technical difficulties. On the contrary, it is a greater challenge to analyse, interpret and plan appropriately the impacts and implications that the interventions to offset climate change may have on the network. Along with the analysis of the possible change in the mobility model with greater penetration of public transport, and of other forms of sustainable mobility (cycling and on foot) that are currently more used by women than by men.

Diagnostics:

Linear infrastructures show greater fatigue of the materials and overheating of auxiliary equipment due to the increased temperature and CO₂ concentration, generating damage to and loss of functionality of them. On the other hand, the increase in the extreme precipitations along with the rise of the sea level and the extreme waves may reduce road safety (with the ensuing traffic congestion) due to the rise in flood and landslides that are expected. This all leads to greater costs and loss of productivity.

In any event, the consumption, travel and mobility patterns of the population raise more questions when consider the problems of this environment.

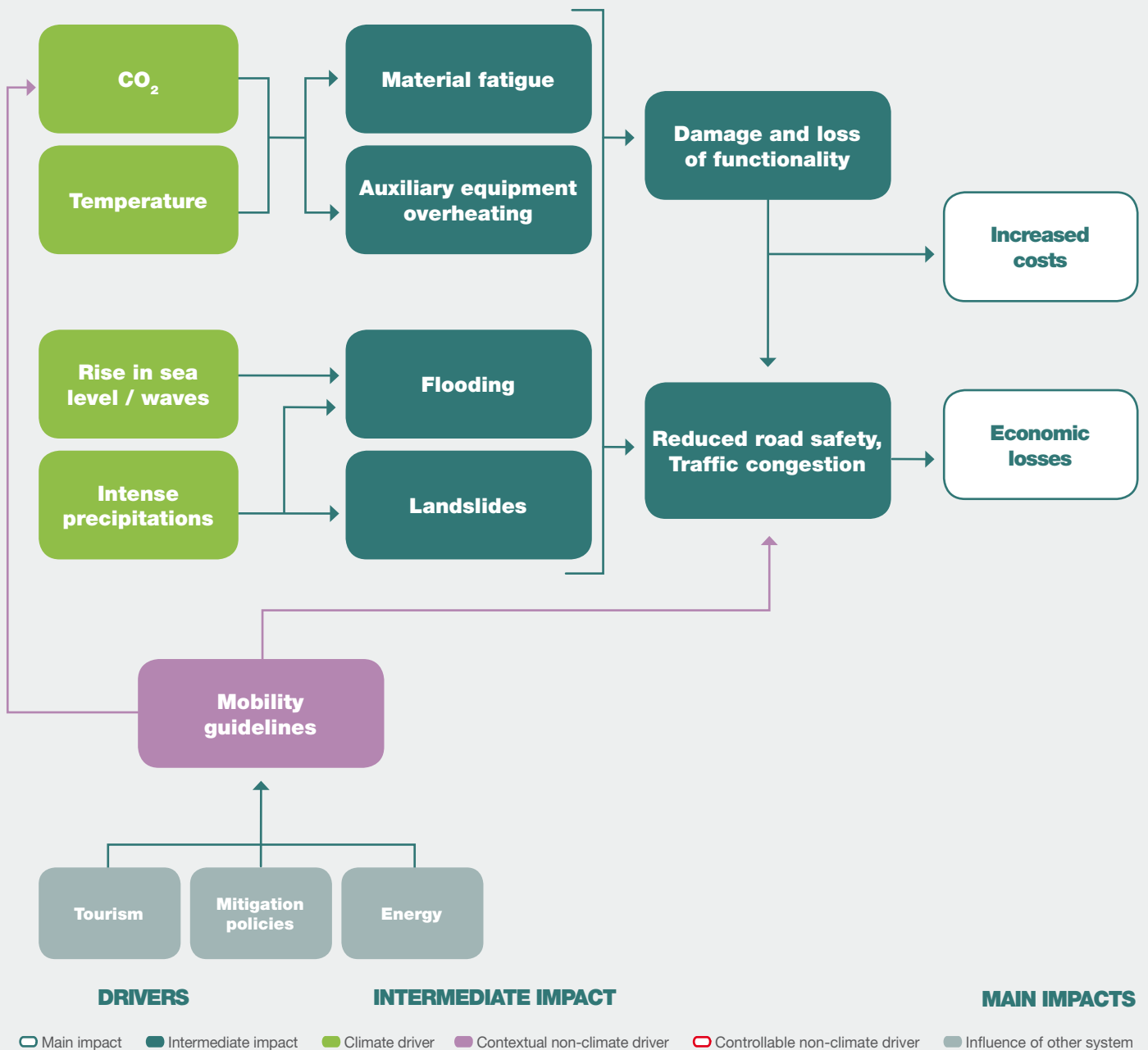
Envisaged planning for adaptation:

The Environmental Framework Programme (EFP) 2020 currently has these lines of intervention:

- Fostering urban models of sustainable mobility of people and goods.
- Driving a low-carbon competitive economy, by means of the general public and company sharing responsibility regarding climate change (fostering public transport).

The Sustainable Transport Master Plan 2013-2020 must be also taken into account, along with the Review of the Territorial Planning Guidelines (DOT).

Figure 10.
Status map for the linear infrastructure and transport sector



SECTOR: PUBLI HEALTH

Ministry: Health / Safety

Office of the Deputy Minister: Health / Safety

Main characteristics of the sector:

Around a third of the Basque public budget is allocated to the health sector (infrastructures, human resources, research, etc).

The Basque Country has a progressively ageing population to 2030 and an increase in life expectancy. This has implications on the vulnerability to climate variables (rise in the particularly sensitive population and with a poor response capacity to extreme events) and consequently on the economy (increase of the economic dependency rate and of the hospital and medical needs). Progressing in studies on the specific differences in the vulnerability of the different social groups and between men and women, both due to gender and biological differences, is identified as being particularly necessary.

In order to reduce the vulnerability, having 100% jurisdiction in the field of health, emergencies and early response and its own Meteorological Agency (Euskalmet) means that the Basque Country has a high capacity of action. The loss of productivity at work and of wellbeing, and the increase spending on hospitals and medicines, are very likely impacts of climate change that may be easily addressed by means of health infrastructures and an emergency and alert system that is flexible and proactive.

Diagnostics:

The expected impacts on the health field are related, on the one hand, to the changes in temperature, humidity, radiation and wind that affects the air quality (along

with the traffic intensity) and the urban climate as it decreases human comfort and increases disease.

The increase in intense precipitations, rise in sea level and extreme waves may lead to a greater likelihood of flooding, which would affect the injury, mortality and morbidity rates of the population.

It is also foreseen that there will be changes in the hydrological cycle that may affect the quality of drinking water (in quantity and quality due to the increase in temperature), which could mean an increase in diseases transmitted by food or water. This effect could also occur after flooding with crops being polluted, water treatment infrastructures, etc.

Air pollution drives the appearance of cancer, cardiovascular and respiratory diseases, as well as increasing allergies, asthma, etc.

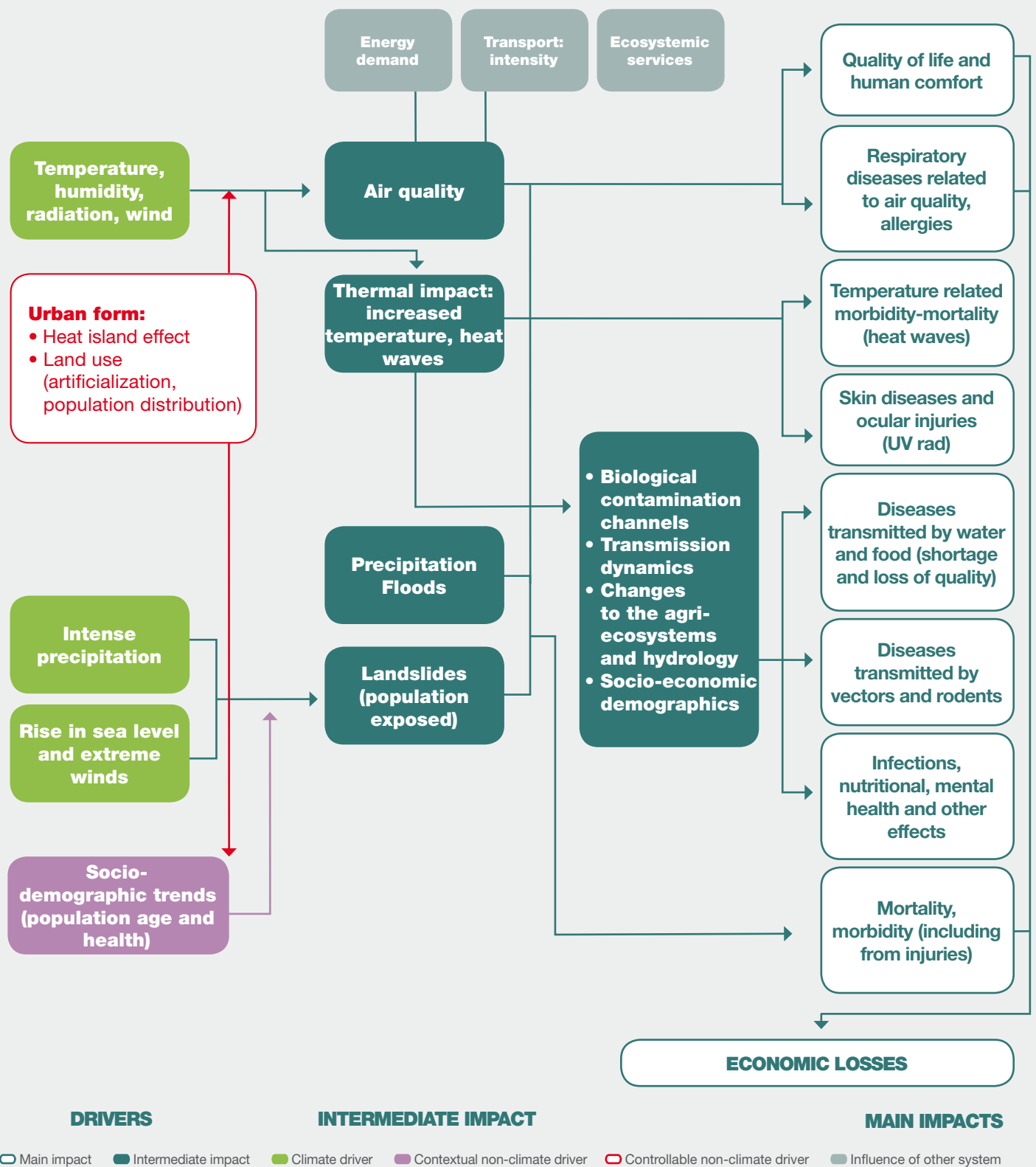
Changes in the climate may influence the distribution and frequency of diseases transmitted by vectors, leading to the appearance of diseases that had been deemed to be eradicated, such as malaria, dengue fever and others.

Envisaged planning for adaptation:

The following plans set out the specific targets, lines of intervention and actions in the field of health, which could be applied as tools to adapt to climate change. Those documents are listed below and have been specified in the lines of intervention set.

- Basque Health Plan 2013-2020.
- Osakidetza [Basque Health Service] Strategic Lines and Plans of Action 2013-2016.
- Socio-Health Care Strategic Lines for the Basque Country 2013-2016.

Figure 11.

Status map for the health sector

ANNEX VI

SUMMARY OF THE EMISSION SCENARIOS REPORT 2050

An emissions projection up to 2050 has been carried out in order to establish the GHG reduction targets of the Strategy.

The exercise was carried out by applying the macroeconomic BIOS® simulation model, developed Factor CO2. The model is based on the interrelation of the different emission sectors in the framework of the Basque economy and its exterior context. It is a holistic model that treats the different sectors of the economy relationally and which reacts dynamically to different economic scenarios overtime. The model has already been used in different countries, as part of their National Communications as required by the United Nations or in planning processes, as well as in different regions that seek to embark on long-term commitments.

This general relationship is complemented with the exogenous treatment of certain emission sources, whose behaviour cannot be predicted in such a direct way using pure demand hypotheses.

It is important to stress that the projections are not, therefore, forecasts. The main outputs of the models generated as GHG emissions due to hypothesis in certain statistically relevant variables. In the framework of a

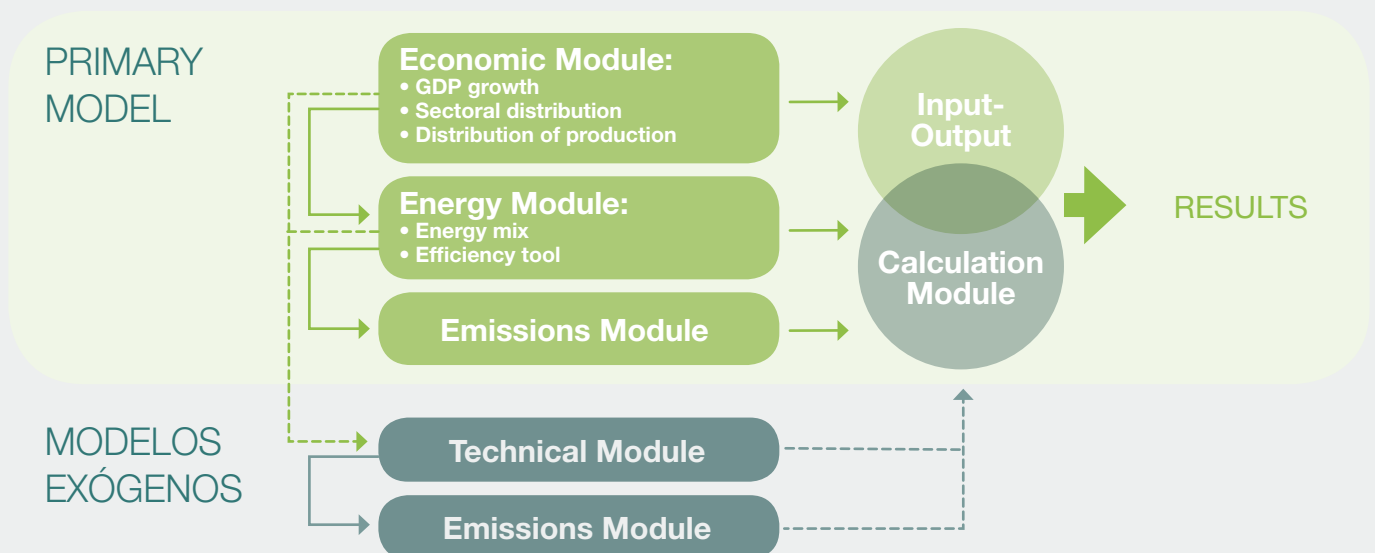
simulation (what-if) model as proposed here, the aim is to cover a range of probable events and assess their impact in terms of climate change mitigation policies. As the Strategy develops, some of those hypotheses should be updated towards greater or lesser ambition, help the model to better define the results envisaged in each case (see Figure 12).

The economic growth horizon estimated by the Organization for Economic Development and Cooperation (OECD) was used for this specific study. Within this economic framework, two possible scenarios are defined, according to the intensity of the measures envisaged:

- **Current policies**, which incorporate the impact on the emissions as a consequence of applying measures of the already envisaged planning. At the end of their application period, they continue in time in a similar line of effort.
- **Additional polices**, where the possible result is the reflect of a more intense and ambitious course of action, which apart from incorporating the envisaged planning, includes measures in keeping with those established by Europe in the Roadmap to 2050.

Figure 12.

Outline of the GHG projection BIOS model



RESULTS

The results obtained for both scenarios are set out in the following table (see Tables 2 y 3).

The GHG emissions projection study conducted up to 2050 indicates that reductions of over 70% can be achieved compared to 2005 levels. However, it must

be noted that the period studied is very broad and that numerous technologies that are currently under development will be consolidated during that time. Therefore, taking into account the consolidation of new technologies, the Basque roadmap could achieve 80% reductions on the 2050 timeline.

Table 2.

Total GHG emissions (t CO₂e)

Scenario	1990	2005	2013	2030	2050
Current policies	20.904.975	25.668.978	19.303.799	17.028.710	14.549.328
Additional policies				13.885.834	7.348.963

Table 3.

Emissions trends

Scenario	Variation with respect to 1990		Variation with respect to 2005	
	2030	2050	2030	2050
Current policies	-19 %	-30 %	-34 %	-43 %
Additional policies	-34 %	-65 %	-46 %	-71 %

Figure 13.

Evolution of the sectoral emissions in the Current Policies scenario

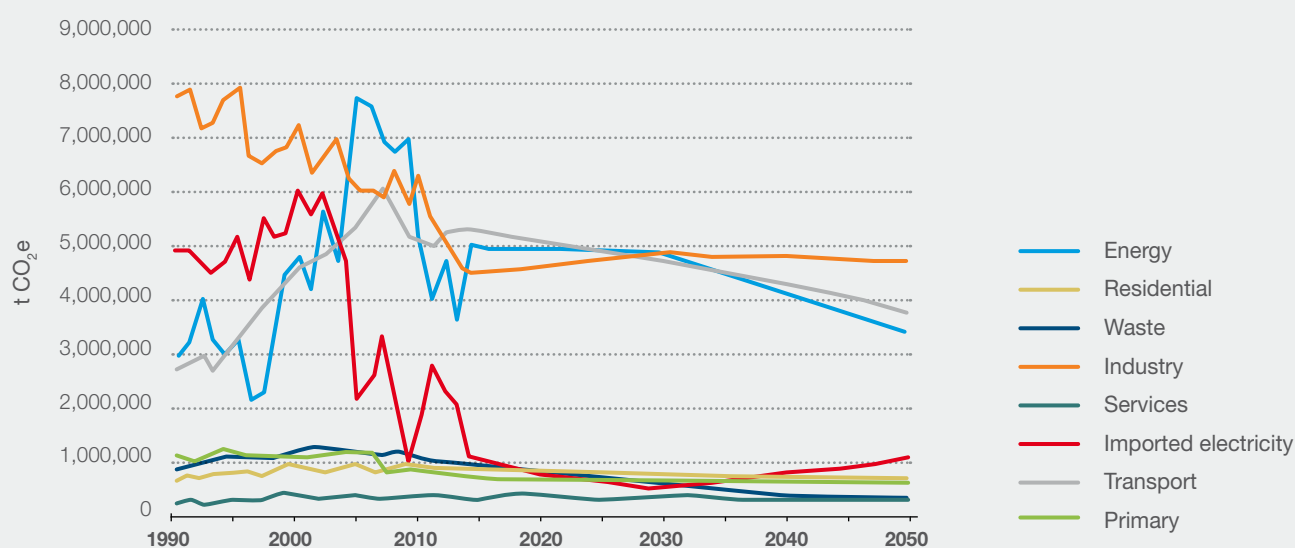
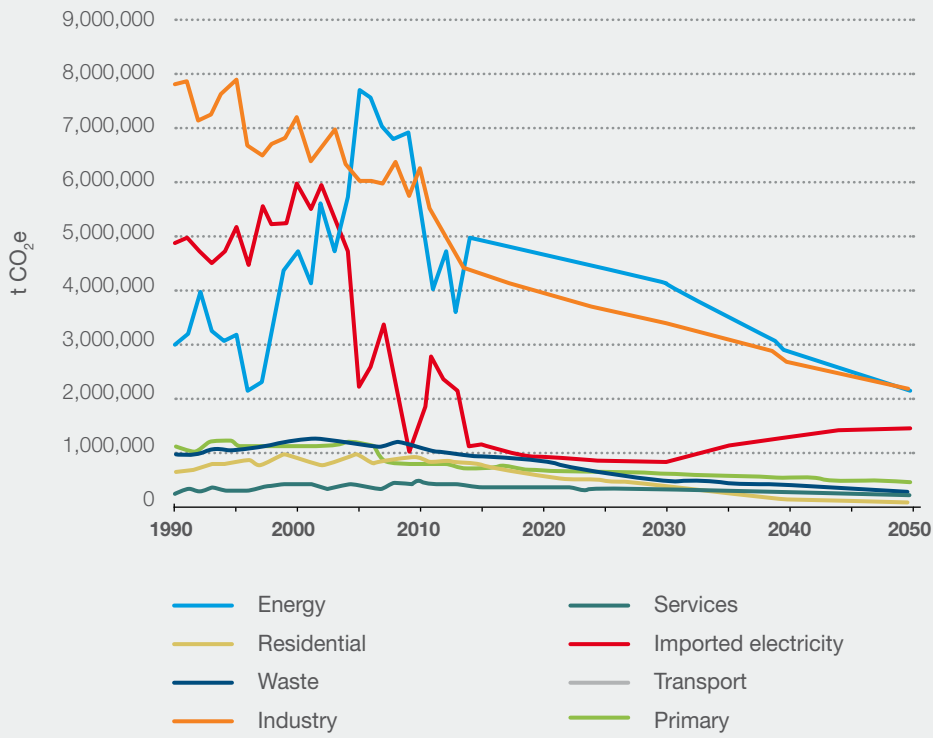


Figure 14.

Evolution of the sectoral emissions in the Additional Policies scenario

Source: Own preparation



ANNEX VII

SUMMARY OF THE SCORECARD OF THE ACTIONS UP TO 2020 PER MINISTRIES OF THE BASQUE GOVERNMENT

The following annex sets out the main Basque Government Ministries in charge of implementing and monitoring the actions of the Basque Climate Change Strategy. The different people tasked with implementing them will also have the cooperation of other ministries involved.

Overall, the ministries involved in the implementation of the Strategy are: Lehendakaritza – General Secretariat for External Action-, the Ministry of Justice and Public Administration, the Ministry of Economic Development and Competitiveness, the Ministry of Employment and Social Affairs, the Ministry of the Treasury and Finances, the Ministry of Education, Linguistic Policy and Culture, the Ministry of Security, the Ministry of Health, and the Ministry of the Environment and Territorial Policy.

LEHENDAKARITZA – GENERAL SECRETARIAT FOR EXTERNAL ACTION

The Lehendakaritza's General Secretariat for External Action is in charge of the action of the Strategy detailed below:

GOAL 9 Exemplary and responsible Basque Public Administration: a benchmark in climate change

Line of Intervention 24 Positioning the Basque Country on the international stage

69. Participation in the inter-regional and international networks that are benchmarks as regards climate change (IPCC, Compact of Mayors, ICLEI, nrg4sd, The Climate Group, etc.).

MINISTRY OF JUSTICE AND PUBLIC ADMINISTRATION

The actions of the Strategy tasked to the Department of Justice and Public Administration are indicated below, specified by goal and line of action:

GOAL 9

Exemplary and responsible Basque Public Administration: a benchmark in climate change

Line of intervention 20

Organising training measures to acquire skills and expertise regarding climate change

54. Incorporating the climate change variable in the training plans of the public sector.

Line of intervention 22

Zero emissions public administration

62. Ensure that 100% of the electricity bought by the Basque Country comes from a renewable source.
64. Impetus so that 40% of the vehicles of the Basque Government use alternative energy sources.
-

MINISTRY OF ECONOMIC DEVELOPMENT AND COMPETITIVENESS

The actions of the Strategy tasked to the Department of Economic Development and Competitiveness are indicated below, specified by goal and line of action:

GOAL 1

Commitment to a low-carbon energy model

Line of intervention 1

Improving energy efficiency and managing energy demand

1. Promoting projects to invest in energy efficiency and improving equipment and facilities.
 2. Promoting rational energy use habits in all the consumer sectors and of the figure of the energy manager in companies and major consumers, along with conducting audits and energy certification.
 3. Developing a smart-grid scheme and installing smart meters in general in Basque municipalities.
 4. Supporting the development of economic activity in new emerging spheres linked to energy management.
 5. Boosting cogeneration, both from new facilities and by renewing the existing park.
-

Line of intervention 2

Giving impetus to renewable energies

6. Driving the implementation of new low-power renewable facilities (photovoltaic, mini-hydraulic, mini-wind power)
 7. Giving momentum to marine and land wind farms, along with repowering existing ones.
 8. Use of biomass as an energy source.
-

GOAL 5

Making the primary sector more resilient and cutting its emissions

Line of intervention 11

Fostering local, organic and integrated agricultural production and with lower GHG emissions

30. Fostering farming practices to minimise erosion and preserve the organic matter of the soil (e.g.: minimum tillage, vegetable cover, etc.).
31. Focusing on programmes to drive integrated local production, along with organic production.

Line of intervention 12

Increasing Basque Country's potential as carbon sink

32. Reforesting degraded zones and increasing the surface area of natural woodland.
33. Improving forestry management by increasing the certified surface area and improving the fire prevention programmes.

Line of intervention 13

Adapting the practices and managing the primary sector (farming and fishing) to the new climate conditions

34. Developing tools that allow managers and professionals of the farming and fishing sector to make decisions.
35. Defining new practices in the primary sector in keeping with changes in the climate (e.g.: sowing and harvesting times, drought-resistant genotypes, controlling the fish stock changes, grazing periods, etc.).

GOAL 7

Anticipating the risks

Line of intervention 17

Ensuring the resilience of the built environment and of the critical infrastructures (energy, water, food, health and ICTs) to extreme events

47. Driving innovation when designing solutions for new critical infrastructures.

GOAL 8

Driving innovation, improvement and knowledge transfer

Line of intervention 18

Promoting innovation, improving and transferring of scientific knowledge

48. Incorporating the climate change variable in the innovation projects with the strategy priorities of the Basque 2020 PCTI: energy, health and territory.
50. Studies and projections of the effects of climate change on: water resources, coastal, marine and land ecosystems, primary sector (farming and fishing), urban environment and health (or complementing existing studies).
51. Setting up the "KlimaTEC" Forum for the transfer of advanced knowledge and to showcase demonstration projects (university-technology centres-administration-company).

GOAL 9

Exemplary and responsible Basque Public Administration: a benchmark in climate change

Line of intervention 22

Zero emissions public administration

63. Driving energy efficiency and renewable energies so that the buildings of the Basque Government improve their energy rating.

Line of intervention 24

Positioning the Basque Country on the international stage

70. Driving the international visibility of Basque institutions and companies that contribute solutions to climate change (Internationalisation Framework Strategy 2020).

MINISTRY OF EMPLOYMENT AND SOCIAL POLICIES

The of Employment and Social Policies is responsible for the actions of the Strategy that are detailed below:

GOAL 1

Commitment to a low-carbon energy model

Line of intervention 3

Fostering energy efficiency criteria and renewable energies in the urban environment towards “zero-emissions building”

9. Optimising the economic subsidies for urban regeneration and the refurbishing buildings with a neighbourhood focus, facilitating the processing and advising on their structure in time and space, with a special emphasis on the nature-based solution (for example, green infrastructures).
10. Giving momentum to the Technical Building Inspections with inclusion of energy certification.
11. Placing the emphasis on buildings (new and existing) that are self-sufficient energy speaking.

MINISTRY OF THE TREASURY AND FINANCES

The Department of the Treasury and Finances is responsible for the actions of the Strategy that are detailed below:

GOAL 9

Exemplary and responsible Basque Public Administration: a benchmark in climate change

Line of intervention 23

Consolidating inter-institutional coordination mechanisms for climate action

67. Driving an interinstitutional coordination mechanism regarding climate change among the different Basque authorities.

MINISTRY OF EDUCATION, LINGUISTIC POLICY AND CULTURE

The Department of Education, Linguistic Policy and Culture is responsible for the actions of the Strategy that are detailed below:

GOAL 9

Exemplary and responsible Basque Public Administration: a benchmark in climate change

Line of intervention 20

Organising training measures to acquire skills and expertise regarding climate change

55. Fostering training in climate change in the economic sectors.

MINISTRY OF SECURITY

The actions of the Strategy tasked to the Department of Security are indicated below, specified by goal and line of action:

GOAL 7 Anticipating the risks

Line of intervention 17

Ensuring the resilience of the built environment and of the critical infrastructures (energy, water, food, health and ICTs) to extreme events

46. Identifying and monitoring vulnerable areas (floods, landslides, waves and rising of the sea level and storms), defining plans of action and reducing impacts.

GOAL 8 Driving innovation, improvement and knowledge transfer

Line of intervention 18

Promoting innovation, improving and transferring of scientific knowledge

49. Performing regionalised projections of climate and oceanographic variables for the Basque Country.

Line of intervention 19

Implementing a system to monitor and follow the effects of climate change

52. Improving the emergency monitoring network and strengthening the existing early-warning integral system.

MINISTRY OF THE ENVIRONMENT AND TERRITORIAL POLICY

The actions of the Strategy tasked to the Department of Environment and Territorial Policy are indicated below, specified by goal and line of action:

GOAL 2 Moving towards zero-emissions transport

Line of intervention 4

Fostering intermodality and means of transport with lower GHG emissions

12. Developing the new railway network of the Basque Country for passenger and freight transport.
13. Fostering the Atlantic freight corridor (Red Trans-European Transport Networks – TENT-T).
14. Setting up logistic platforms that foster the use of the railway and maritime freight transport (beginning with Jundiz, Pasaia-Irun and Arasur).
15. Creating and/or expanding the bus, tram, train and underground networks by achieving the implementation of the single ticket for inter-urban and municipal public transport throughout the Basque Country.
16. Fostering the development of sustainable mobility plans at urban, supramunicipal level and in the different business centres.

Line of intervention 5

Replacing the use of oil derivatives

17. Spreading the use of means of transport with lower GHG emissions (electric vehicle, natural gas vehicle, bicycle, etc.) by means of economic support and of positive discrimination measures such as exempting non-internal combustion vehicles from paying parking charges, cutting the mechanical traction vehicle tax, etc.

Line of intervention 6

Integrating vulnerability criteria and adaptation criteria into transport infrastructures

- 18. Identifying and monitoring vulnerable transport infrastructures to detect resizing and maintenance needs.
 - 19. Driving innovation when designing solutions to increase the resilience of transport infrastructures.
-

GOAL 3

Increasing the efficiency and resilience of the territory

Line of intervention 7

Driving an urban structure that is resilient to climate change, compact and with a mix of uses

- 20. Preparing support tools and methodologies for the municipalities (comparative vulnerability maps, standards for resilient urban design and limiting the urban area, guides, best practices, etc.)
 - 21. Impetus to green infrastructures and solution based on nature as means to adapt to climate change and urban sustainable development.
 - 22. Impetus in the municipal sphere of policies and measures to adapt to climate change in the framework of the Udalsarea 21 network (for example, developing demonstrative test cases, adaptation plans, etc.)
-

Line of intervention 8

Integrating vulnerability analysis and adaptation to climate change in territorial planning

- 23. Integrating the adaptation to climate change perspective in the process to review the territorial strategy of the Basque Autonomous Community set out in the Territorial Development Guidelines and defining the mechanisms to integrate climate change in the urban and territorial planning instruments.
- 24. Implementing a demonstration project at the supramunicipal planning scale that includes a climate change vulnerability study and mechanisms to include adaptation measures.
- 25. Including climate change adaptation in the DOT through a thematic cartography of impacts and vulnerability to climate change.

GOAL 4

Making the natural environment more resilient

Line of intervention 9

Fostering the multifunctionality of ecosystems as regulators of geological and biological processes

- 26. Regenerating the ecosystems and their naturalization to ensure the resilience of the territory.
 - 27. Fostering and facilitating connectivity between ecosystems that allow species migration.
-

Line of intervention 10

Integrating the climate change variable in the management of coastal zones

- 28. Avoiding the artificial barriers that confine the dune-beach-underwater and/or river-estuary deposits to maintain the natural sedimentary transport that prevents the loss and shrinkage of beaches and sand deposits.
 - 29. Identifying the coastal zones affected by the rise of the sea level and extreme waves.
-

GOAL 6

Reducing amount of municipal solid waste generated and zero untreated waste dumping

Line of intervention 14

Reducing the generation of municipal solid waste

- 36. Fostering the prevention, reuse and recycling of urban waste.
- 37. Promoting the ecodesign of containers and packages and eco-labels that can be accredited in order to minimise the generation of container waste.
- 38. Defining and implementing environmental tax measures (e.g. dumping tax, paying for generating, tax on extracting raw materials), along with tax incentives to minimise waste generation, extracting resources and landfill dumping.

Line of intervention 15

Increasing the selective collection and sorting ratios and their subsequent reuse, recycling and recovery

- 39. Fostering the recovery of biowaste, driving composting and encouraging the use of the compost produced.
- 40. Supporting the establishment of reuse networks and centres and preparing to reuse waste (e.g.: second-hand markets).
- 41. Developing pre-treatment lines in all the waste current to ensure zero dumping
- 42. Implementing instruments to optimise selective waste collection.

GOAL 7
Anticipating the risks

Line of intervention 16

Guaranteeing the long-term water supply for different uses

- 43. Creating and strengthening sanitation and supply service managers with economic and technical capacity.
- 44. Efficient management of water demand (renewal and elimination of leaks).
- 45. Designing new drought thresholds and indicators taking into account the future flow projects, the new ecological flows and future demand for water.

GOAL 8
Driving innovation, improvement and knowledge transfer

Line of intervention 19

Implementing a system to monitor and follow-up the effects of climate change

- 53. Selecting the main variables to be monitored and their standardisation (for example, key species, embankments, etc.) and implementation of the network.
-

GOAL 9
Exemplary and responsible Basque Public Administration which is a benchmark in climate change

Line of intervention 21

Awareness-raising, training and informing the general public about climate change

- 56. Setting up the “KLIMA 2050” portal that compiles the benchmark expertise, projects and schemes in the Basque Country.
- 57. “KLIMA 2050” communication campaign associated to energy, transport, water and health.
- 58. Preparing a climate change social parameter (every five years).

Line of intervention 22

Zero emissions public administration

- 59. Formulating an institutional pact so that the Basque public sector achieves the CO₂ “zero emissions” threshold by 2050.
- 60. Integration of the carbon budget in the general budget of the public sector (reviewed every five years).
- 61. Introduction of a voluntary GHG emissions reduction section in the BAC Register of Activities with Environmental Impact.
- 65. Impetus at local level of climate change mitigation measures.

Line of intervention 23

Consolidating inter-institutional coordination mechanisms for climate action

- 66. Interdepartmental coordination to measure the impact of the public action regarding climate change.
 - 68. Defining a climate change working area in the General Administration of the BAC.
-

ANNEX VIII

SUMMARY OF THE ECONOMIC IMPACT OF THE CLIMATE CHANGE STRATEGY OF THE BASQUE COUNTRY TO 2050 IN ITS FIRST IMPLEMENTATION PERIOD (2015-2020)

This annex sets out the expected economic impact of the measures of the first implementation period (2015-2020) of the Climate Change Strategy of the Basque Country to 2050. The measures up until 2020 are organised through 9 goals and 70 measures, some of which are new and others are already contained in other plans or programmes but which are included as they have a direct impact on climate change.

The scenario of the Strategy for the first period (2015-2020) shows that the emissions cut expected to 2020 will be, approximately, of 24% with respect to 2005 levels, even though that reduction will notably depend on the degree of economic recovery. This reduction would, mainly, be achieved by means of energy efficiency and saving measures, impetus to renewable energies, fostering the use of public transport and cutting the generation of waste, among others.

Based on these scenarios and the cost of the measures established in the Strategy, the economic impacts and the main associated additional benefits (co-benefits) have been analysed; specifically, the saving in energy bills and the improvement to public health arising from cutting atmospheric pollutants. An integrated environmental-energy-economic model for the Basque Country (prepared by the Basque Centre for Climate Change BC3) and the methodologies on pollution damages used by the European Commission were used for that purpose.

The expected cost of the measures for the Basque Public Administration is €88 million (M€) per year which means an estimated annual cost of 0.13% with regard to GDP, that is €40 per inhabitant and

year. This cost seems low if compared to the expected damages from climate change if nothing is done globally that, according to the Stern Report¹¹ (Stern 2006), could be between 5 and 20% of the GDP in the long term.. On the other hand, driving these measures would generate €57 million of economic activity in the Basque Country, which would be associated to creating 1,030 total “gross” jobs¹² each year during the coming 5 years, as set out in Figure 15.

The co-benefits of mitigation are important, as can be seen in Figure 16. First, the annual energy bill could be cut by up to €55 million per year, mainly associated with importing fossil fuels, which would help to improve the competitiveness of the companies and would increase the spending of the families.

Second, the emissions of air pollutants, linked to cutting CO₂, would also be reduced. A 9.6% reduction of CO₂ emissions between 2015 and 2020 would result in a reduction of 10% and 17% of fine particles (PM_{2.5} and PM₁₀), along with a 27% cut of SO₂ emissions and 15% of NO_x emissions. Important benefits would be obtained if the estimated monetary range¹³ associated to health impairment avoided (drop of mortality and associated diseases, along with the health spending arising from medical treatments and the cost of time off work) was applied to those emissions avoided. According to the results obtained, it is estimated that the health impairment avoided by the reduction associated to the air pollution would be between €12 and 32 million per year, a similar order of magnitude to those obtained with similar studies and recently published by the World Health Organisation¹⁴.

¹¹ Stern, N. (2006), The Stern Review: the Economics of Climate Change, HM treasury, UK.

¹² It is “gross” employment as it does not take into account alternative employment that could have been generated if the cost of the plan had been used on another type of expenditure or public investment.

¹³ Markandya et al 2010 Markandya, A, Bigano, A, Prochina, R, 2010, The Social Cost of Electricity, Scenarios and Policy Implications, Fondazione Eni Enrico Mattei, Milan.

The uncertainty related to the estimates is high and the results must be taken with caution. However, the results allows us to conclude that the public cost of the measures in the first implementation period does not appear to be high if compared to the damage caused by climate change. Moreover, these measures will generate employment in strategic sectors, particularly

if the international and European climate policies are more ambitious in the future. Finally, the estimated co-benefits are of a sufficiently high magnitude to lead us to think that an important part of the costs for the public sector of the strategy will be offset by immediate and positive effects for the Basque society.

Figure 15.

Annual total employment per sectors, 2015-2020 (Number of people)

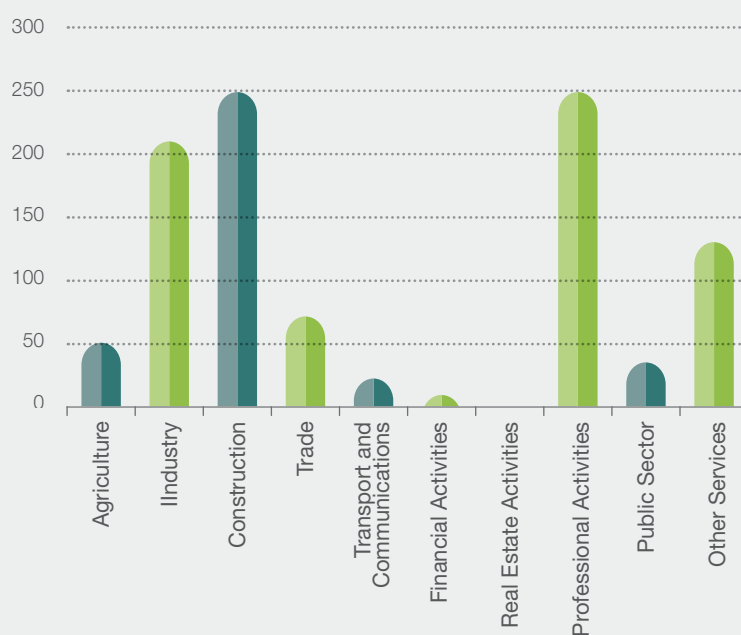
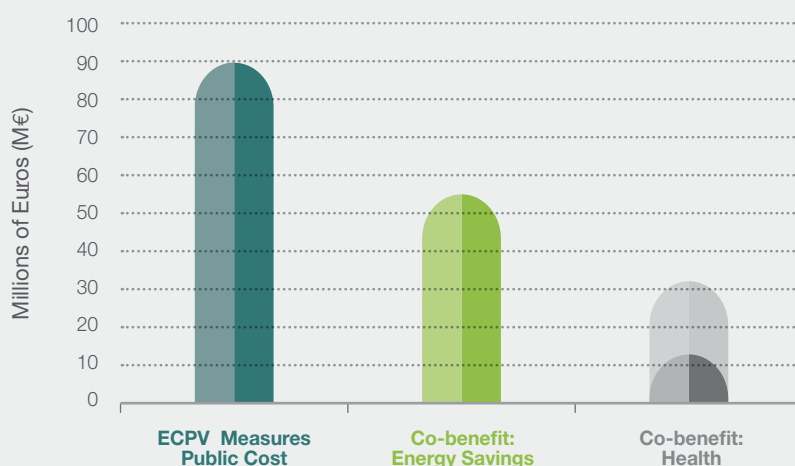


Figure 16.

Strategy Public Cost and co-benefits in energy and health (€M/year, 2015-2020)



¹⁴ WHO and OECD (2015) Economic cost of the health impact of air pollution in Europe: Clean air, health and wealth, WHO Regional Office for Europe.

