



Oficina Catalana
del **Canvi Climàtic**



Generalitat de Catalunya
**Departament de Territori
i Sostenibilitat**

Olot. June 2012

Politics to tackling the Climate Change.

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0. Pills of science

1. Global context

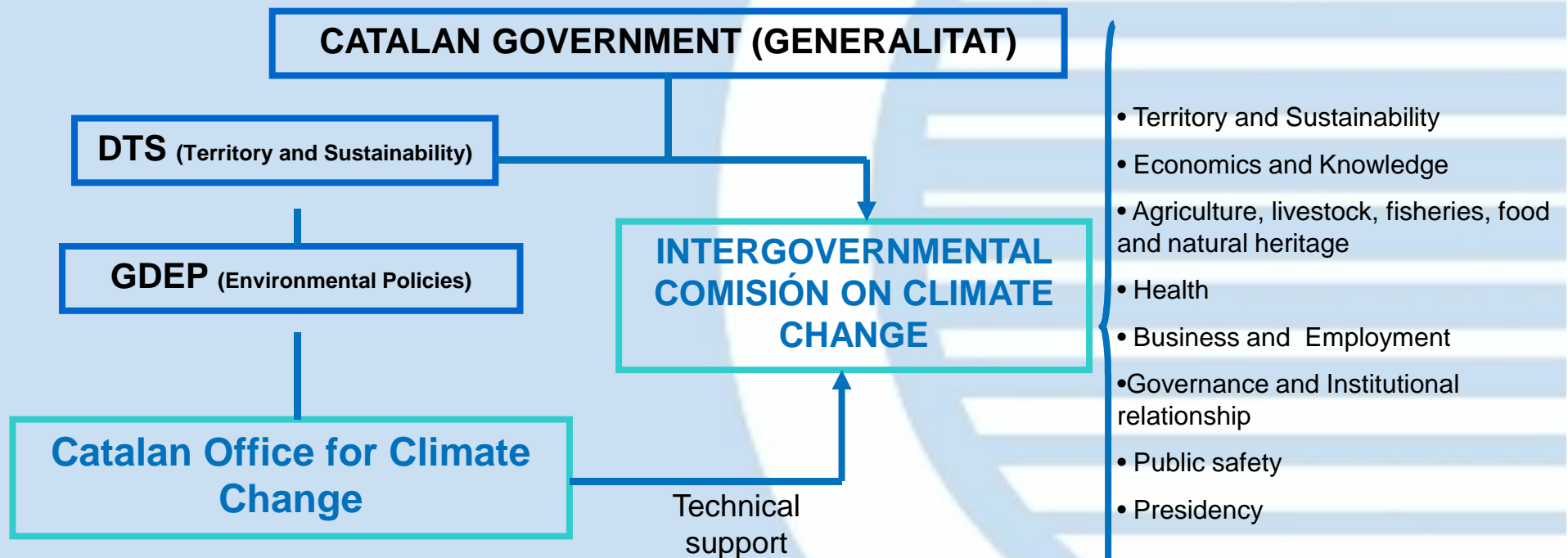
2. European context

3. Catalan context

Institutional Organization

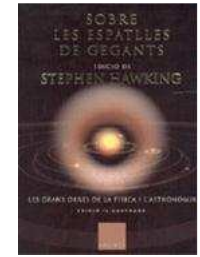
Intergovernmental Commission and The Catalan Office for Climate Change

In late 2006 the Government of Catalonia provides two formal instruments to address climate change in Catalonia: the Catalan Office for Climate Change and the Intergovernmental Commission on Climate Change





0. Pills of Science



Edme Mariotte (1681): The light of the sun can easily pass through glass and other transparent materials, the heat can not

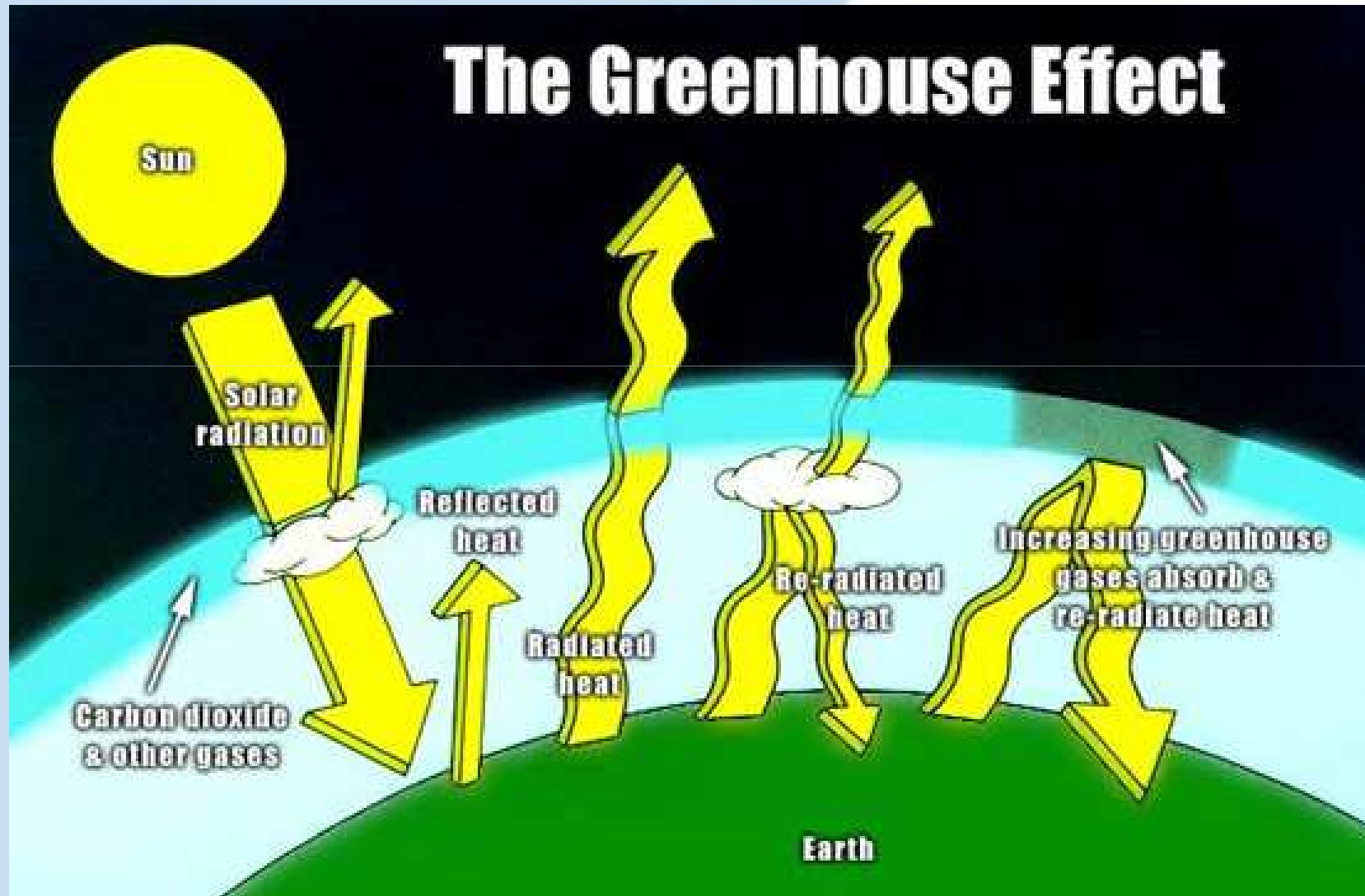
Joseph Fourier (1824): The T of the Earth increases by the interposition of the atmosphere. The heat in the form of light has less resistance to pass thorough the air, but more once it has become non-luminous heat

John Tyndall (1859): Identifies in the laboratory the absorption of thermal radiation by complex molecules. Changes in any of these active constituents of the atmosphere as CO₂ or H₂O can produce all the climate changes that geologists have found.

Svante Arrhenius (1895): Makes a climate prediction: an increase or a decrease of 40% in the amount of CO₂ in the atmosphere could be the cause of the glacial and interglacial periods.

G. S. Callendar (1938): Solve a set of equations linking the GHG to climate change: if you double the atmospheric concentration of CO₂, the global average temperature increases by 2 °C, with the greatest increase in the pole. He links the increased combustion of fossil fuels with the increasing of CO₂ and its greenhouse effect

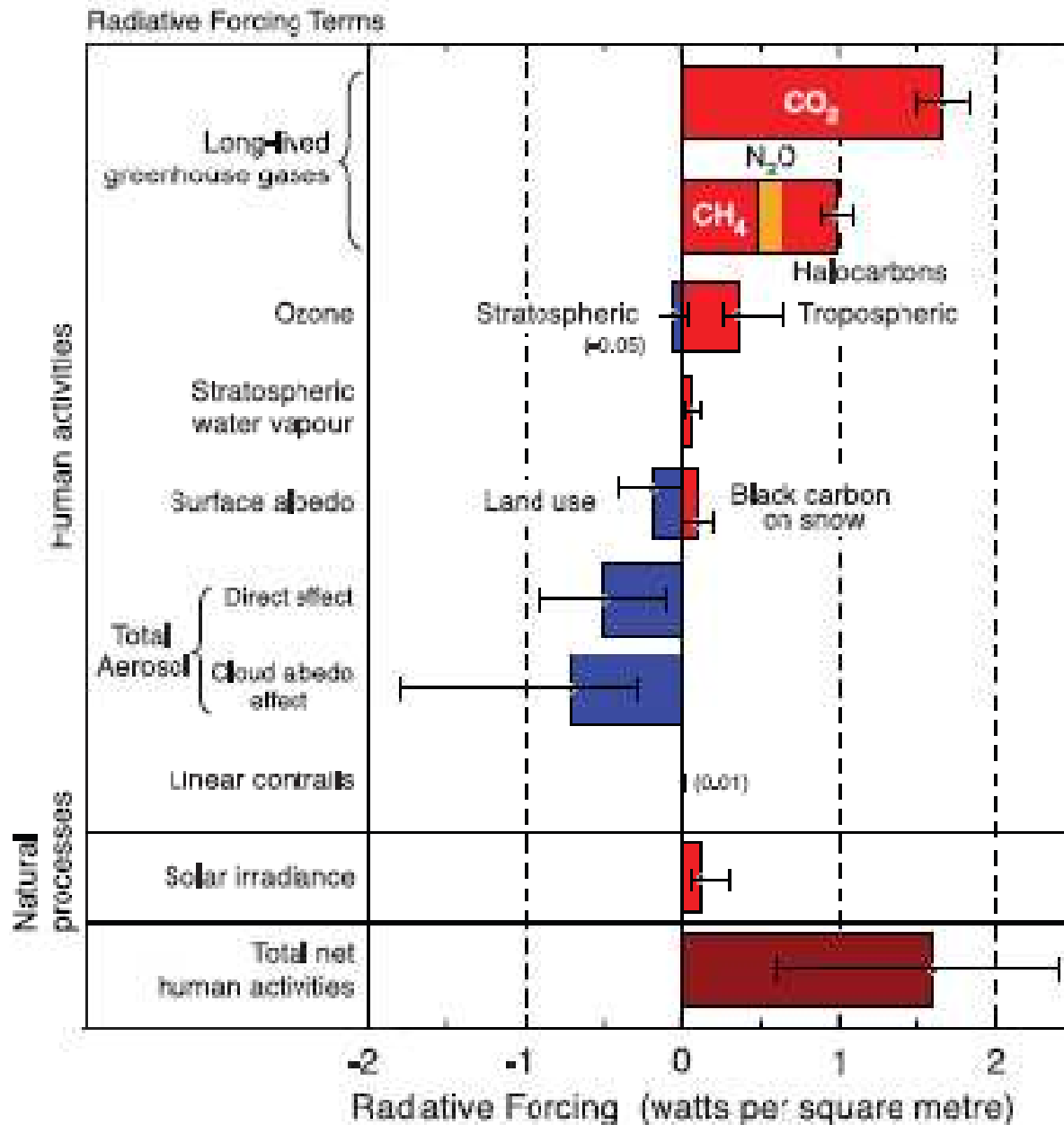
In 1950, GHG are still associated only to CO₂ and H₂O. It was not until 1970 that the CH₄, N₂O and GF are recognized as important anthropogenic GHG. In 1970 the importance of clouds to reflect sunlight were known as well as other atmospheric aerosols (suspended particles).



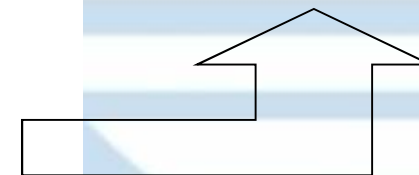


Radiative forcing of climate between 1750 and 2005

Pills of Science ➤ Greenhouse effect



The balance between factors that increase global warming and those that increase the cooling progresses **CLEARLY TO WARMING**

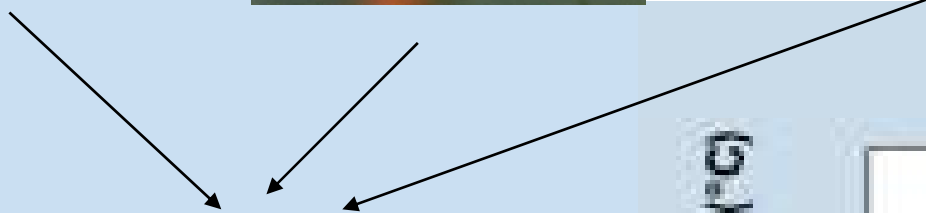
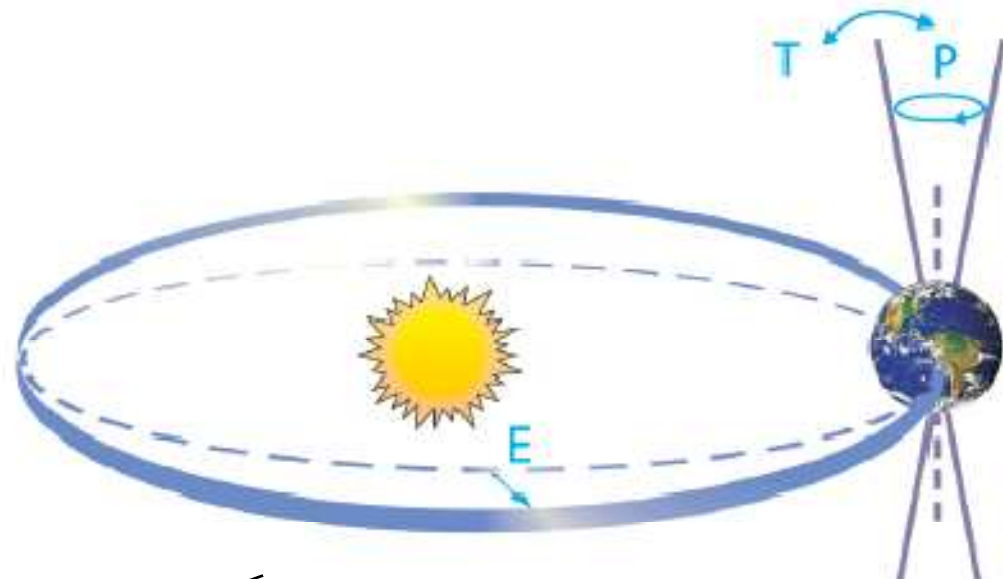
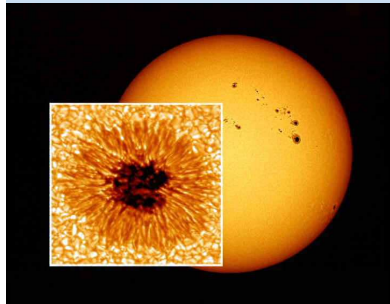




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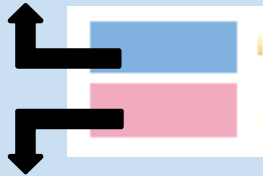


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Models

Natural factors



Models

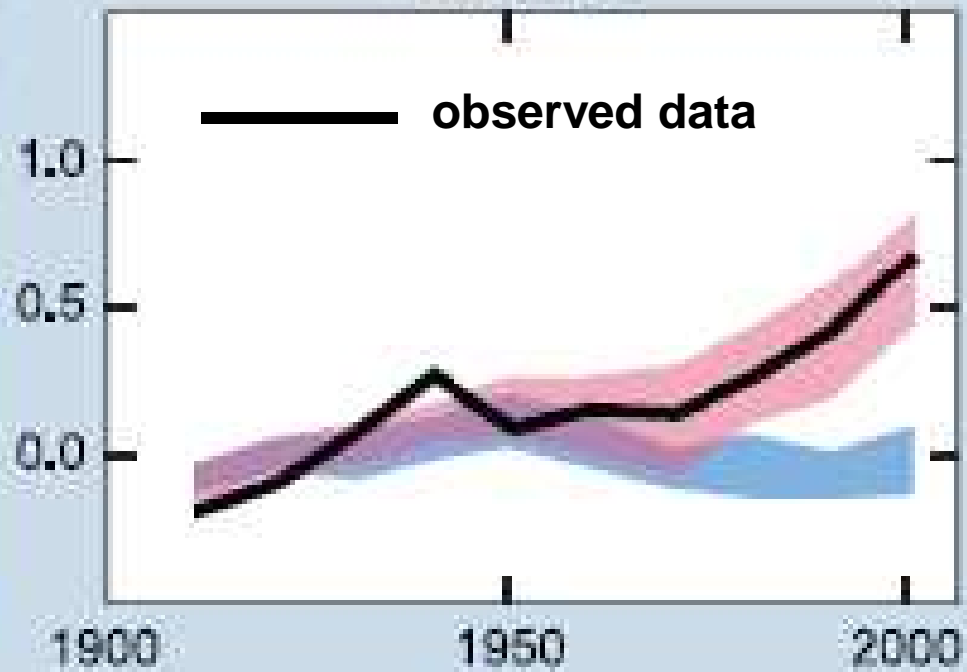
Natural factors

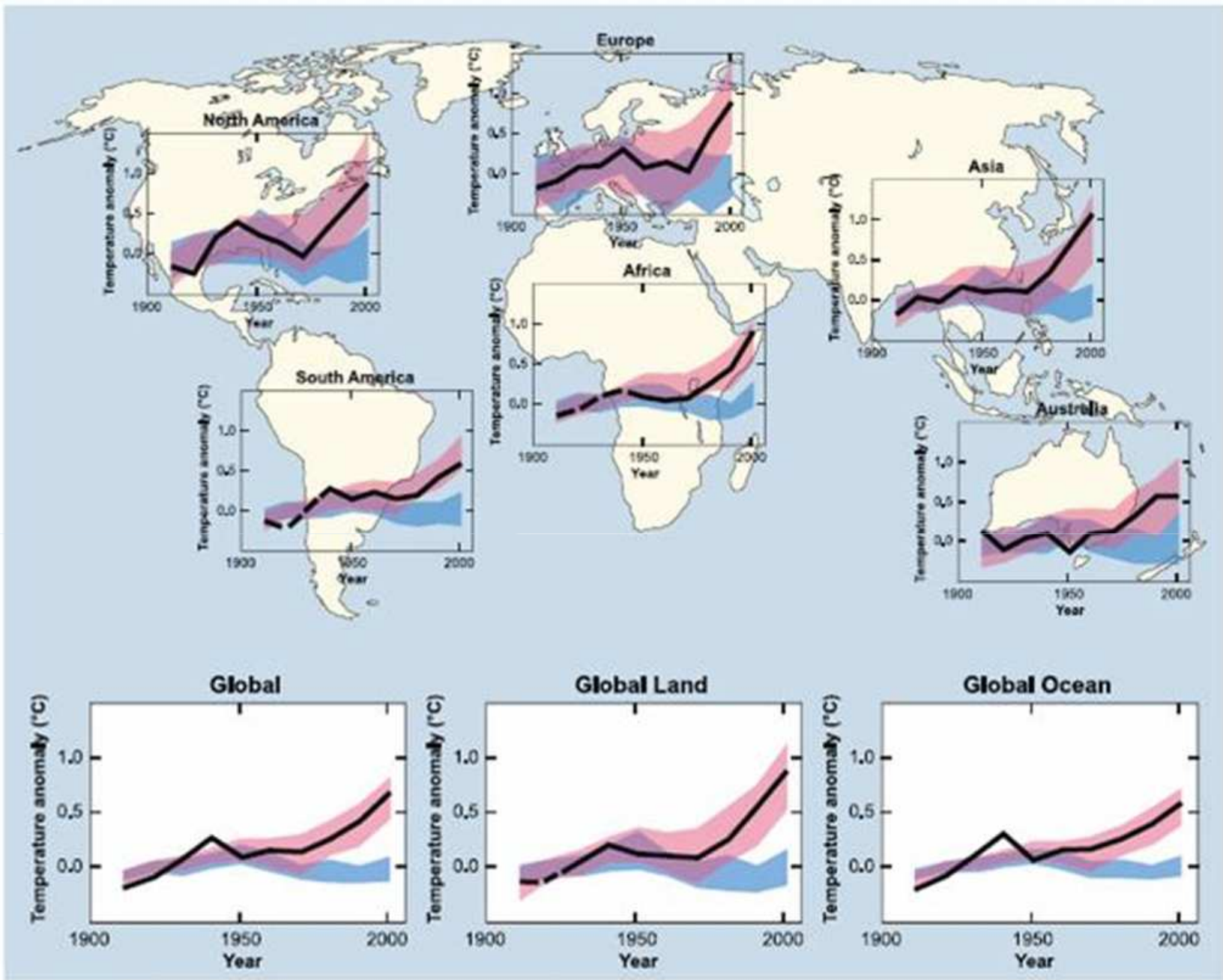
+

anthropogenic

Mundial

Anomalia de la temperatura (°C)





models using only natural forcings
models using both natural and anthropogenic forcings

observations

➤ What gases are responsible?

Carbon dioxide: **CO₂**



Gas taken as reference and therefore its index of global warming potential (GWP) is 1.

Metane: **CH₄**

----- GWP = 21

Nitrous oxide: **N₂O**

----- GWP = 30

Sulphur hexafluoride: **SF₆**

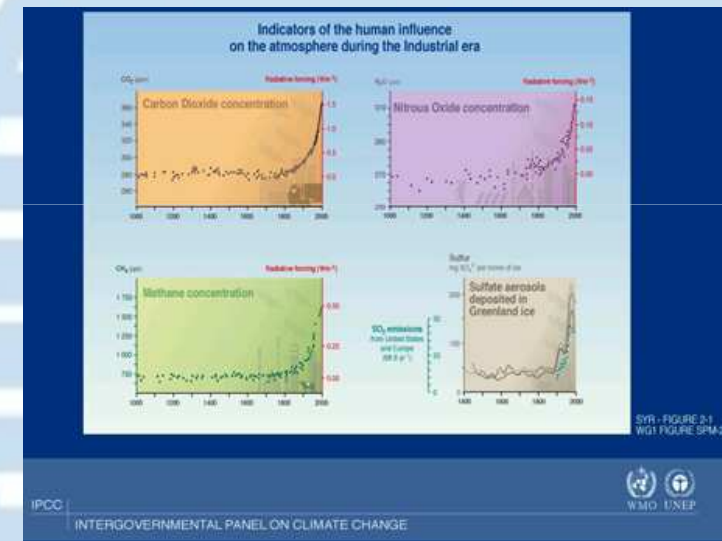
----- GWP = 23900

Hydrofluorocarbons: **HFC**

----- GWP = 1800

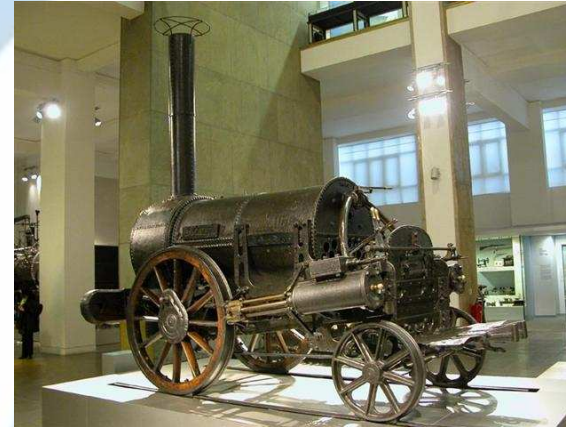
Perfluorocarbons: **PFC**

----- GWP = 7000



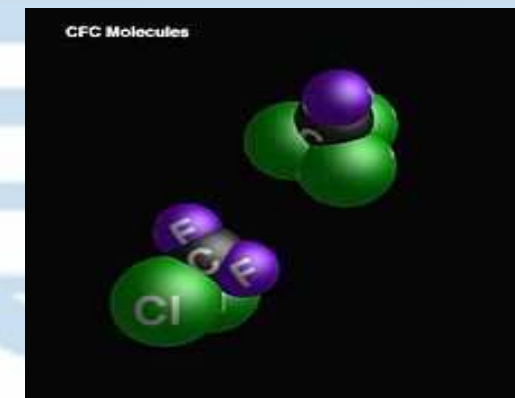
CO2 equivalent - CO2 eq

- Industrial Revolution XIX
- Very intensive use of fossil fuels
- Coal, oil and natural gas combustion...

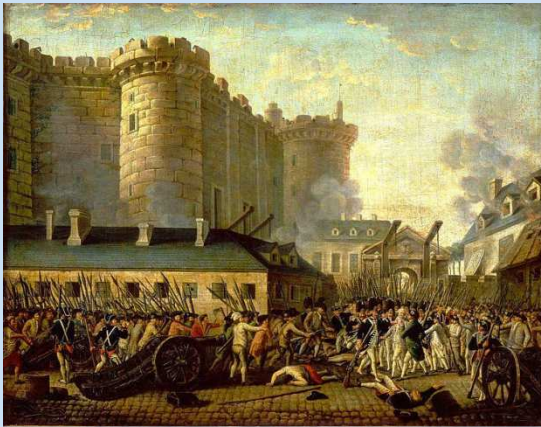


- Methane from agriculture, livestock and landfills
- N₂O from fertilization

- Fluorinated gases from the chemical industry



➤ CO2 atmospheric concentration

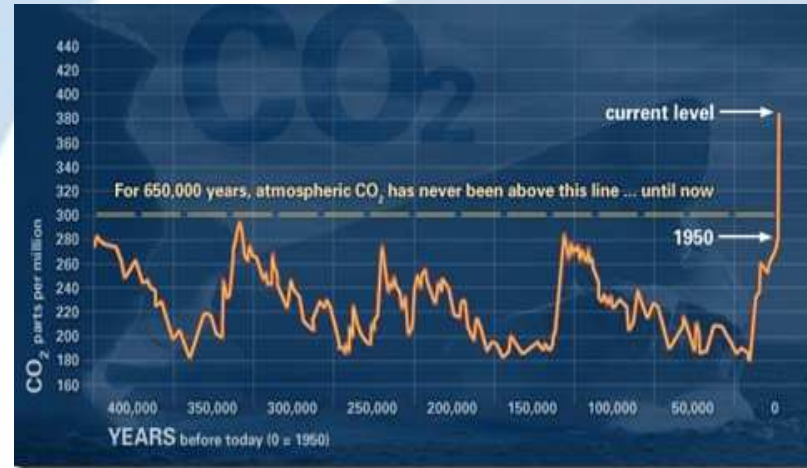


280 ppm

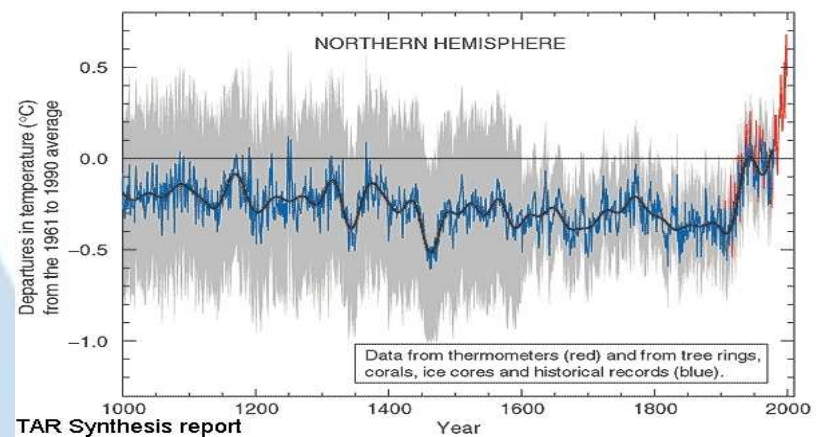
+38%
+1°C



387 ppm



Variations of the Earth's surface temperature for:
(b) the past 1,000 years





1. Global context



~ 30.000 MT CO₂.
38.000 MT CO_{2eq}



4.614 MT CO₂ eq.



1,1%

367,5 MT CO₂ eq.



13,6%

50,0 MT CO₂ eq.

Why is it important to reduce?

Scientific evidences

Ethical motivation

0,13%

Legal requirements

Economic Opportunities

Fuels

CO₂ has a price

Adaptation

UNFCCC OBJECTIVES (article 2) 1992

Stabilization of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the global climate system.

This level should be achieved within a period sufficient to allow ecosystems to adapt naturally to climate change, ensure that food production is not threatened and to enable economic development to proceed in a sustainable way.

UNFCCC OBJECTIVES (article 6) 1992

Article 6 of the United Nations Framework Convention on Climate Change (UNFCCC) calls on countries to promote and facilitate education and public awareness of climate change.



Specification: determining what constitutes "dangerous anthropogenic interference with the climate system"

2007

IPCC (Valencia): Four Assessment Report (AR4)

450 ppm

50%

2° C

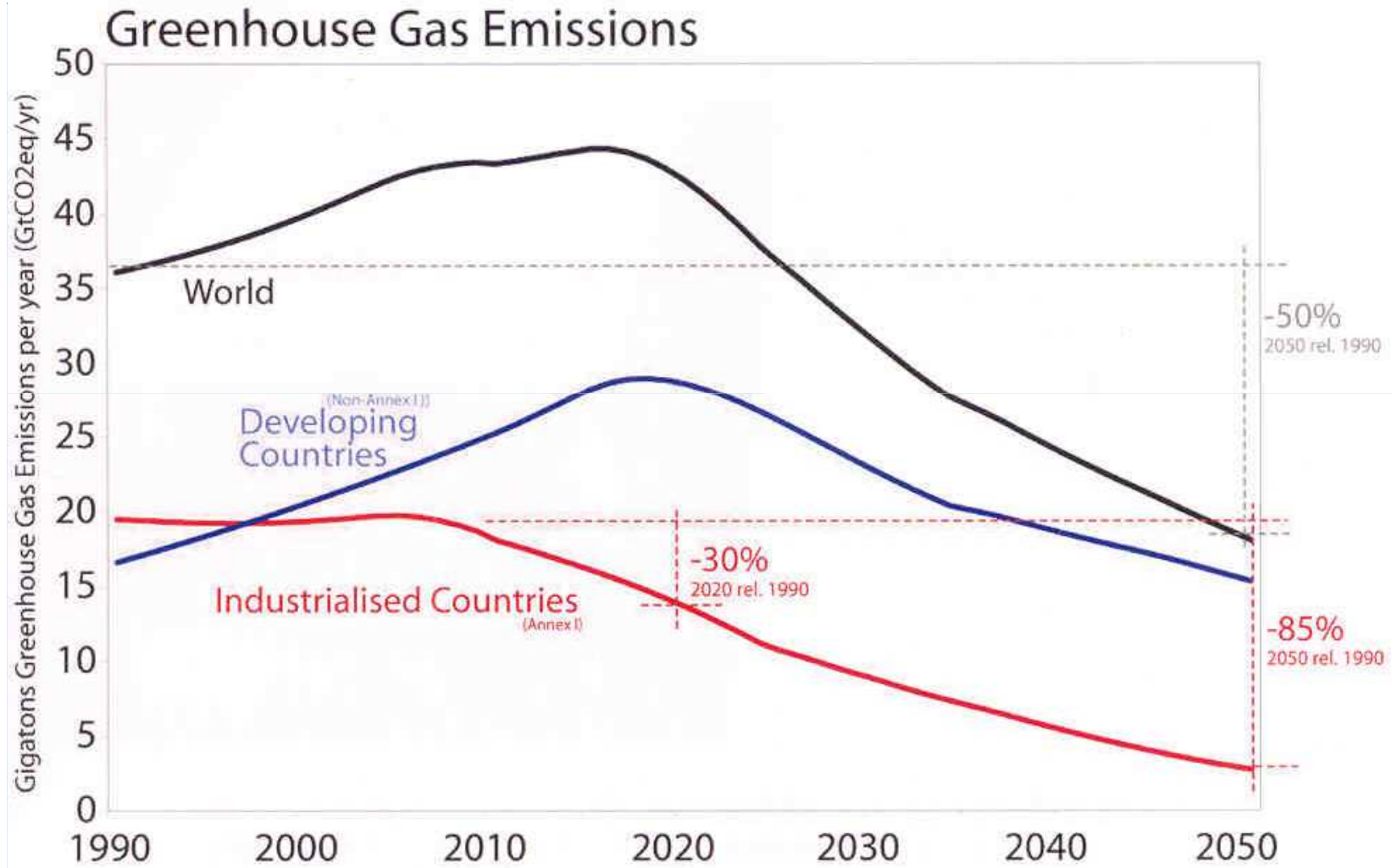
Acceptable Impacts

UNFCCC objective:
Limit warming to 2°C Not exceeding 450 ppm CO₂

- **Annex 1:** emissions decrease between **25 – 40% by 2020**
- Global emission **peak no later 2020**
- **No Annex 1: Stabilize emissions to 1990**
- **Reduce global emissions 50% in 2050 vs 1990**
- **Annex 1:** emissions decrease between **80 – 95% by 2050**

Copenhagen Accord open the door in 2015 to review the objective to 1,5 °C

The proposals made by countries in the framework of the Copenhagen Accord means an emission reduction between 12-18% by 2020 vs 1990.



CO₂ emissions above the normal carbon cycle are leading to an accumulation of this GHG in the atmosphere. Stock problem.

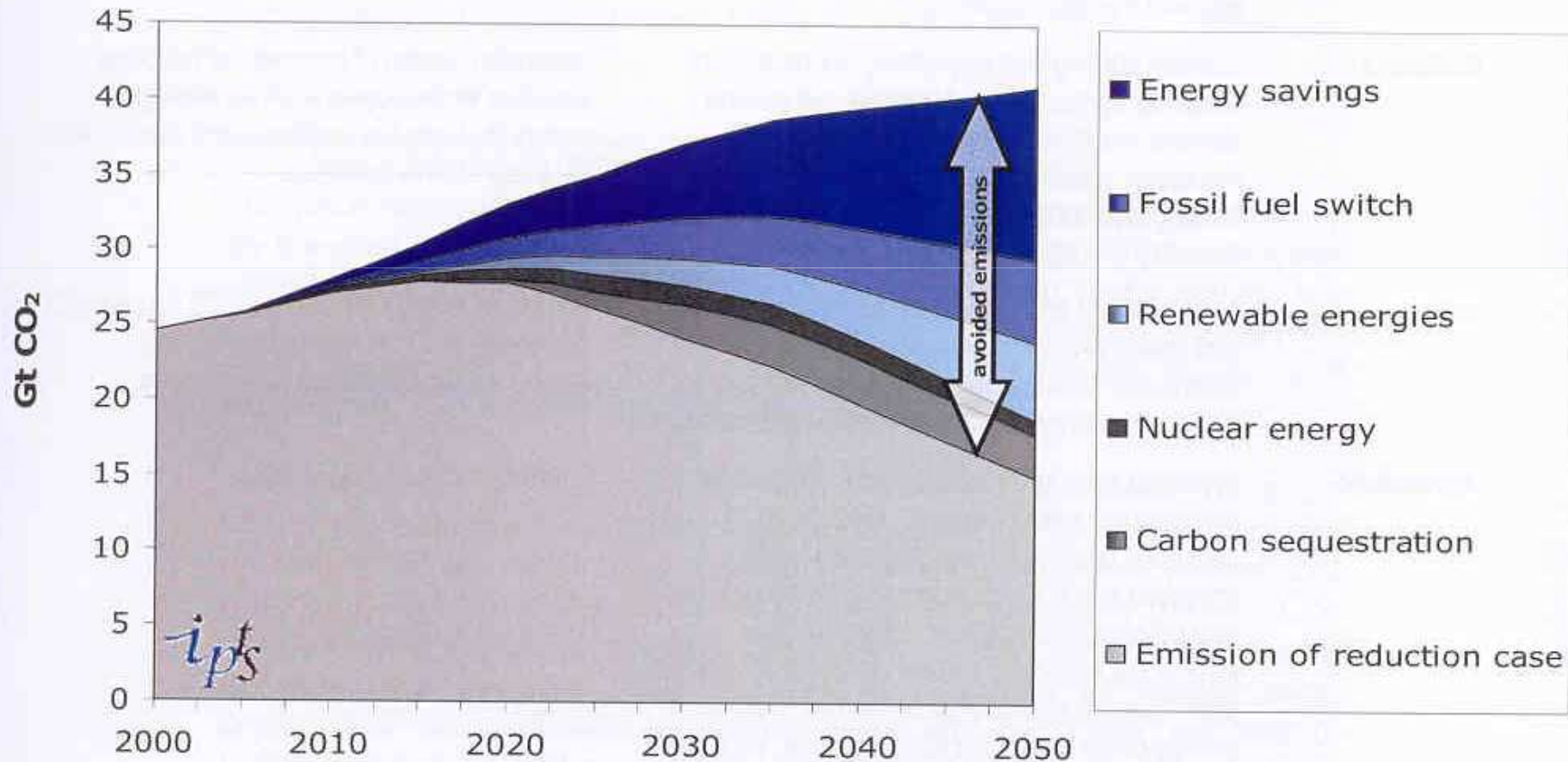
A cumulative emission (or stock) of 2.7 trillion tons CO₂ is equivalent to a 2°C rise in temperature (Nature, April 2009).

Between 1750 and 2010 we have emitted half this quantity. By 2045 the cumulative limit will be exceeded at expected rates of energy use.

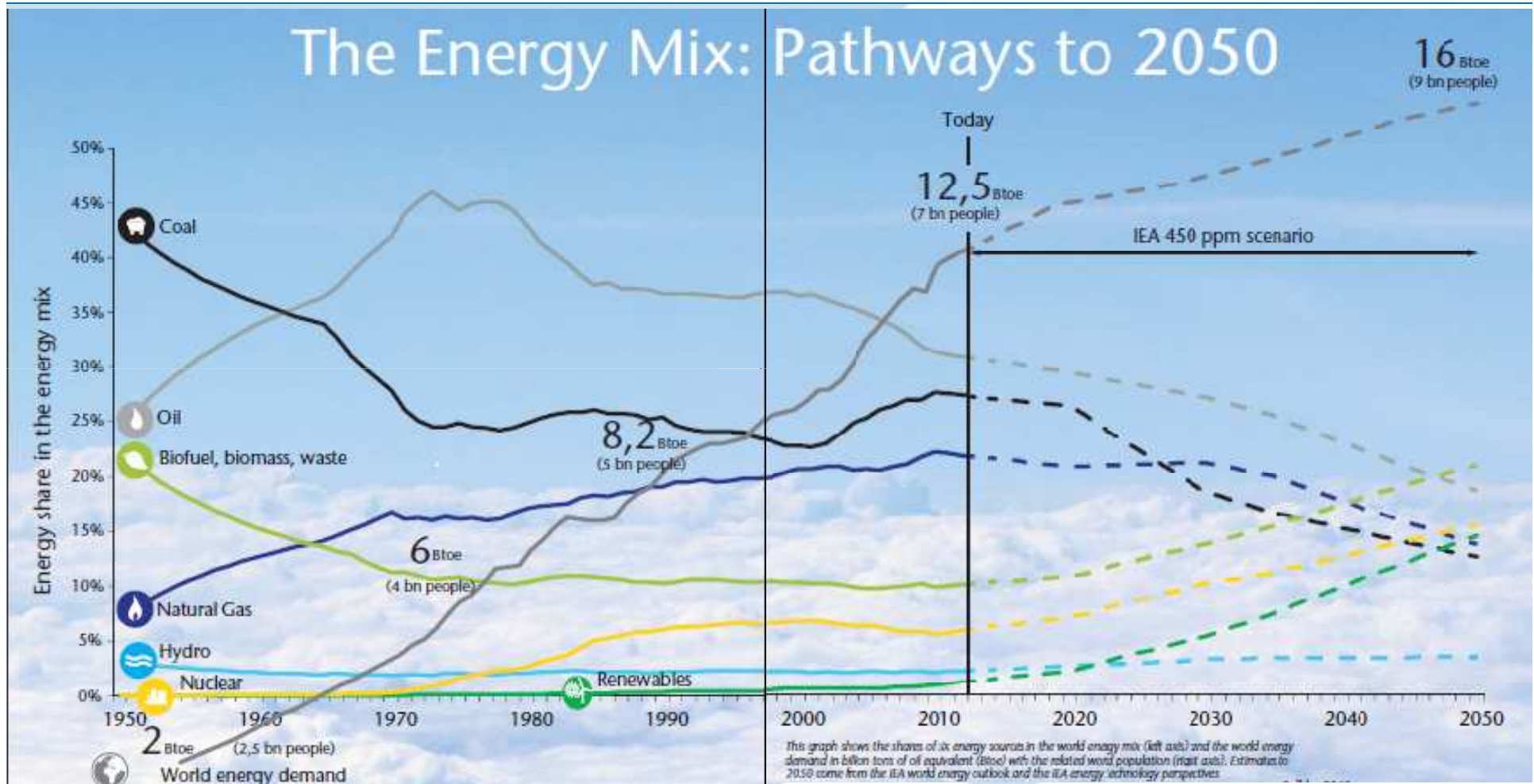
The remaining fossil reserves will far exceed the remaining atmospheric stock” so the energy mix must move way from fossil fuels, leaving them unused in the ground, or carbon capture and storage must be rapidly applied on a very substantial scale.



Decomposition of global CO2 reductions technologies for fossil fuel combustion



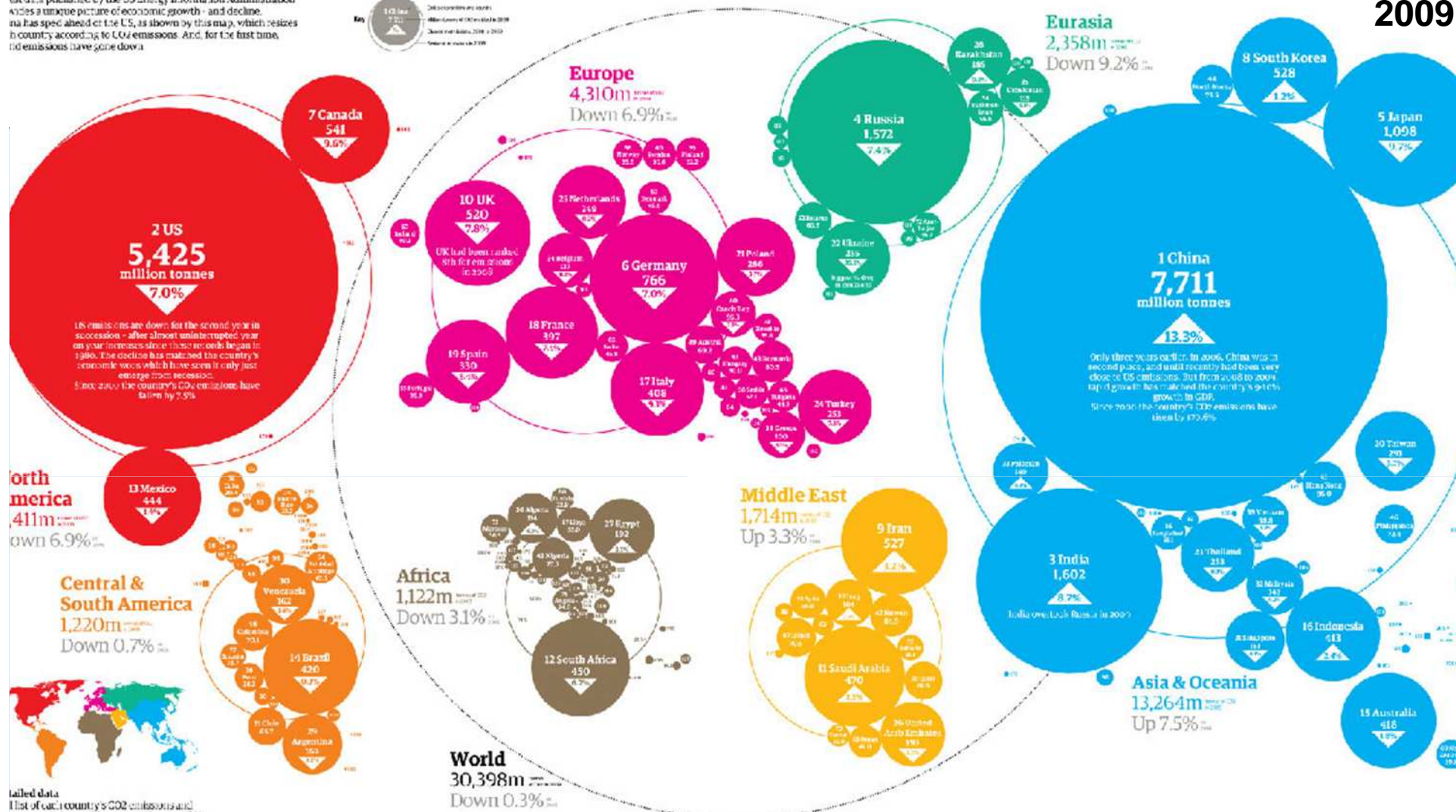
Global Climate Policy Scenarios for 2030 and beyond. JRC-IPTS, 2007



An atlas of pollution: the world in carbon dioxide emissions

Best data published by the US Energy Information Administration across a unique picture of economic growth - and decline. China has sped ahead of the US, as shown by this map, which reizes its country according to CO₂ emissions. And, for the first time, CO₂ emissions have gone down.

1.5 billion people
248 countries and territories
Other countries not shown
Data from October 2009 to 2009
Source: Energy Information Administration
Updated: 10 October 2009



Full data
List of each country's CO₂ emissions and cement in the world emissions league table

Country	2009 CO ₂ Emissions (m tonnes)	2008 CO ₂ Emissions (m tonnes)	% Change
1 US	5,425	5,800	-6.5%
2 China	7,711	6,700	+15.1%
3 India	1,602	1,480	+8.2%
4 Russia	1,572	1,680	-6.4%
5 Japan	1,098	1,100	-0.2%
6 Germany	766	820	-6.5%
7 Canada	541	590	-8.3%
8 South Korea	528	550	-4.0%
9 Iran	527	500	+5.4%
10 UK	520	550	-5.5%
11 Saudi Arabia	470	450	+4.4%
12 South Africa	430	450	-4.4%
13 Mexico	444	470	-5.5%
14 Brazil	420	430	-2.3%
15 Australia	416	430	-3.0%
16 Indonesia	413	430	-3.9%
17 Italy	408	430	-5.1%
18 France	397	410	-3.2%
19 Spain	330	340	-3.0%
20 Taiwan	290	300	-3.3%
21 Netherlands	249	260	-4.2%
22 Poland	286	300	-4.7%
23 Turkey	253	260	-2.7%
24 Turkey	253	260	-2.7%
25 Egypt	192	200	-4.0%
26 Algeria	174	180	-3.3%
27 Egypt	192	200	-4.0%
28 Argentina	160	170	-6.5%
29 Chile	65	70	-7.1%
30 Albania	74	80	-7.5%
31 Serbia	120	130	-8.5%
32 Azerbaijan	100	110	-9.1%
33 Kazakhstan	100	110	-9.1%
34 Uzbekistan	100	110	-9.1%
35 Turkmenistan	100	110	-9.1%
36 Kyrgyzstan	100	110	-9.1%
37 Tajikistan	100	110	-9.1%
38 Oman	100	110	-9.1%
39 Qatar	100	110	-9.1%
40 Brunei Darussalam	100	110	-9.1%
41 Timor-Leste	100	110	-9.1%
42 Bhutan	100	110	-9.1%
43 Nepal	100	110	-9.1%
44 Sri Lanka	100	110	-9.1%
45 Bangladesh	100	110	-9.1%
46 Pakistan	100	110	-9.1%
47 Myanmar	100	110	-9.1%
48 Cambodia	100	110	-9.1%
49 Laos	100	110	-9.1%
50 Vietnam	100	110	-9.1%
51 Thailand	100	110	-9.1%
52 Philippines	100	110	-9.1%
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97 Philippines	100	110	-9.1%
98 Malaysia	100	110	-9.1%
99 Singapore	100	110	-9.1%
100 Brunei Darussalam	100	110	-9.1%

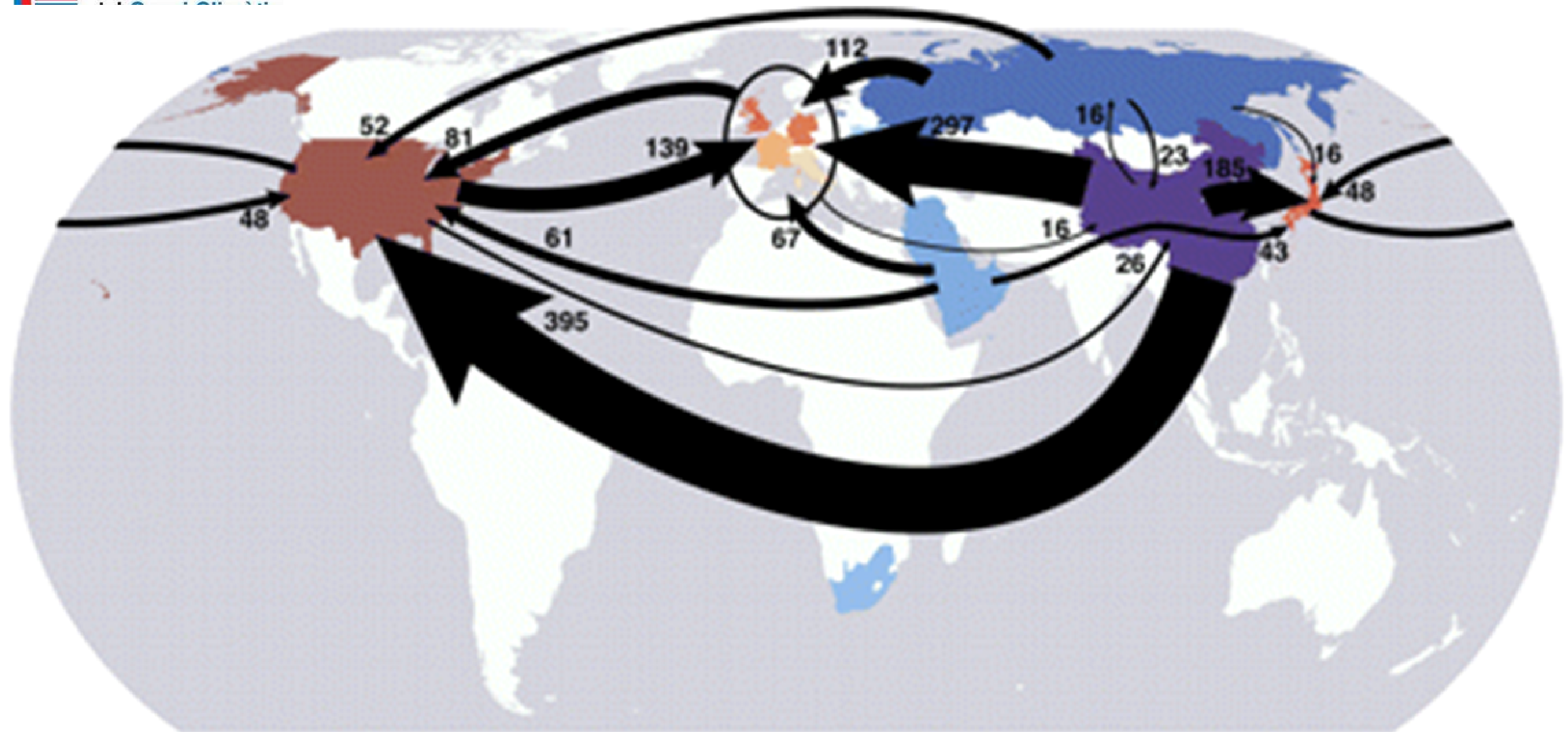
2009

WORLD CO2 EMISSION 2009	30.000	Mt
WORLD POPULATION 2009	6.810	M
t CO2/inhabitant	4,4	

COUNTRY	Emissions CO2 (Mt)	Population (M)	Total %	Aggregated %	Rate CO2/inh
China	7.711	1.331	25,7%	25,7%	5,8
USA	5.425	307	18,1%	43,8%	17,7
EU-27	4.614	501	15,4%	59,2%	9,2
India	1.602	1.171	5,3%	64,5%	1,4
Russia	1.572	142	5,2%	69,7%	11,1
Japan	1.098	128	3,7%	73,4%	8,6
Canada	541	34	1,8%	1,8%	15,9
South Korea	528	49	1,8%	3,6%	10,8
Iran	527	73	1,8%	5,3%	7,2
Saudi Arabia	470	29	1,6%	6,9%	16,2
South Africa	450	51	1,5%	8,4%	8,8
Mexico	444	110	1,5%	9,9%	4,0
Brasil	420	191	1,4%	11,3%	2,2
Australia	418	22	1,4%	12,7%	19,0
Indonesia	413	243	1,4%	14,0%	1,7
BRICS	11.755	2.886	39,2%		4,1
Spain	297,0	47	1,0%		6,3
Catalonia	40,5	7,4	0,1%		5,5

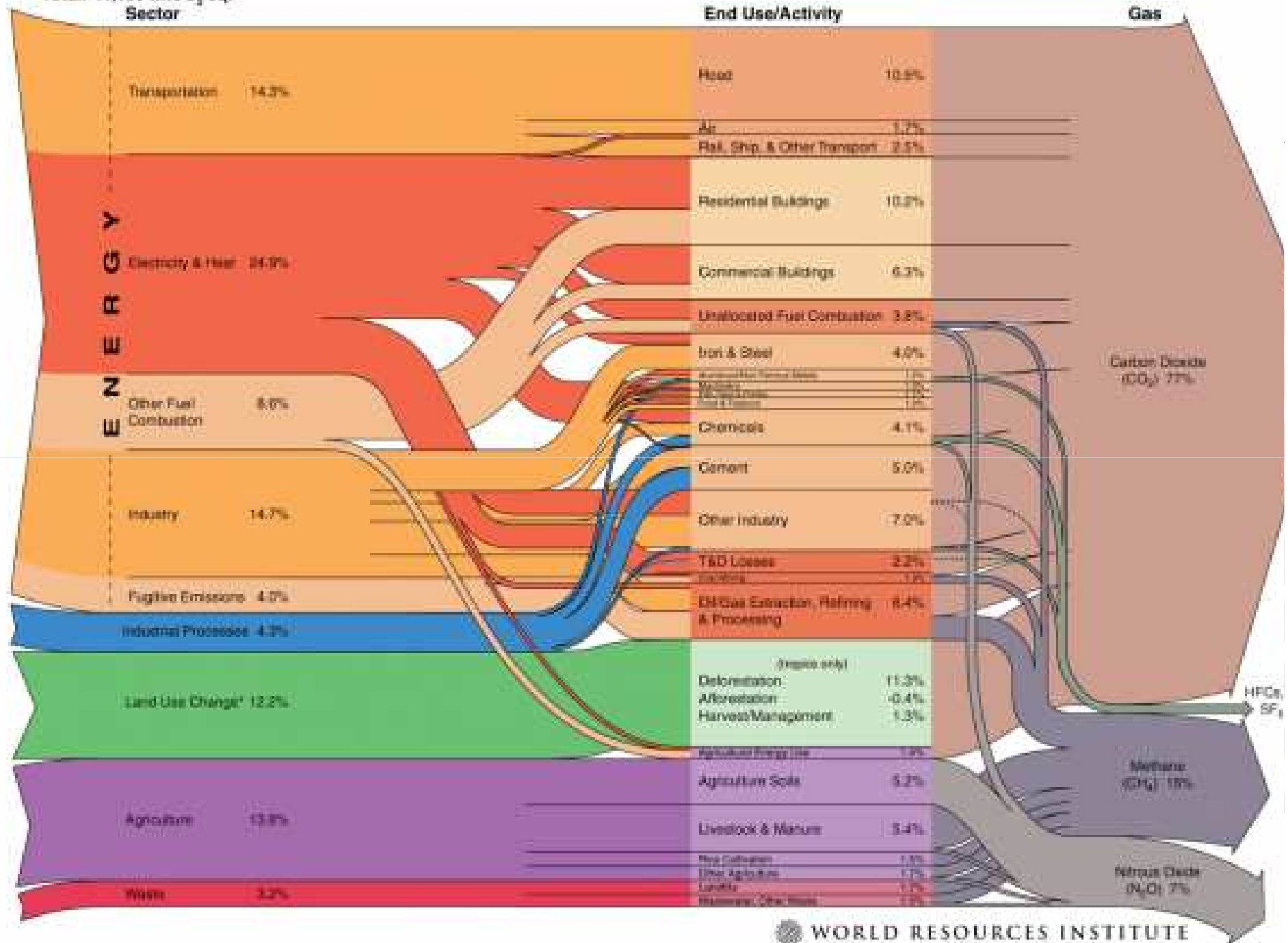
6 Countries/regions near 75% of all CO2 emissions

BRICS accounts for 39% of all CO2 emissions



Arrows indicate direction and magnitude of flow; numbers are megatons (millions of tons). (Credit: Steven Davis/Carnegie Institution for Science)

World Greenhouse Gas Emissions in 2005
 Total: 44,153 MtCO₂ eq.





2. European context

Limit: 2°C

Copenhagen (COP 15) &
 Cancun (COP 16)

How (IPCC)?

80% a -95% vs 1990 Annex I + efforts from developing countries

Possible a global reduction of 50% in 2050

EU approach
 (commission) 2050

-80% to -95% vs 1990 (80% domestic)

A Roadmap for moving to a competitive low carbon economy in 2050 (COM (2011) 112 final)

**Short term
 2008-2012**

- 5,2% global
 -8% UE
 +15% (+37%) Spain

↓
 +37% Non ETS
 Catalunya

KP

**Mid term
 2020**

Climate & Energy package
 (2020)
 -20% EU (approved)
 -25 o -30% (raised by EU)
 -25% -40% Annex I (raised
 by NNUU)

**Long term 2050
 Must intensify efforts to:**

- Efficient use of resources
- Energy system with low carbon emission
- Transport system with low carbon emission
- Sustainable buildings
- Ecodesign of products and services
- Responsible Consumption

Post-Kioto negotiations

World Commitment (Annex I countries):

- 5,2 % GHG in 2008-2012 vs base year

European Commitment : - 8% GEH

European bubble

Spain	_____	+15 %
France	_____	0 %
Italy	_____	-6,5 %
Germany	_____	-21 %
U.K.	_____	-12,5%
Portugal	_____	+27 %
Netherlands	_____	-6 %
Eire	_____	+13 %
Greece	_____	+25 %

AAUs

Domestic reductions

Flexibility mechanisms

- Emissions Trading – EUAs
- Clean Development Mechanism (CDM) – CERs
Annex I Countries – No Annex I Countries
- Joint Implementation (JI) – ERUs
Between Annex I countries

NATIONAL ALLOCATION PLAN

- Set objectives for ETS sectors (cap) and non-ETS sectors.
- Allocate permits to the sources included in the ETS.
- How many offsets mechanism can be used (flexibility mechanisms)
- Actions to be developed non-ETS sectors
- Removal by sinks

Spain: +37%

- +15% free
- + 2 % forest sinks
- +20% offset



European context

➤ Short term 2008-2012

At the end of 2010, the EU-15 was on track to achieve its Kyoto target but three EU-15 Member States (Austria, Italy and Luxembourg) were not on track to meet their burden-sharing targets. These countries must therefore seriously consider further action to ensure compliance, in particular revising their plans on using flexible mechanisms. Among the EEA member countries outside the EU, Liechtenstein and Switzerland were not on track to achieve their Kyoto target at the end of 2009 (*). All other European countries are on track to meet their targets, either based on domestic emissions only or with the assistance of Kyoto mechanisms.

The economic recession had a significant impact on the EU's total greenhouse gas (GHG) emission trends but a more limited effect on progress towards Kyoto targets. This is because emissions in the sectors covered by the EU Emissions Trading Scheme (ETS), which were most affected by the crisis, do not affect Kyoto compliance once ETS caps have been set.

With existing national measures, Member States do not project enough emission reductions for the EU to meet its unilateral 20 % reduction commitment in 2020. Additional measures currently planned by Member States will help further reduce emissions but will be insufficient to achieve the important emission cuts needed in the longer term. By 2020 Member States must enhance their efforts to reduce emissions in non-EU ETS sectors, such as the residential, transport or agriculture sectors, where legally binding national targets have been set under the EU's 2009 climate and energy package.

Greenhouse gas emission trends and projections in Europe 2011. Tracking progress towards Kyoto and 2020 targets. EEA

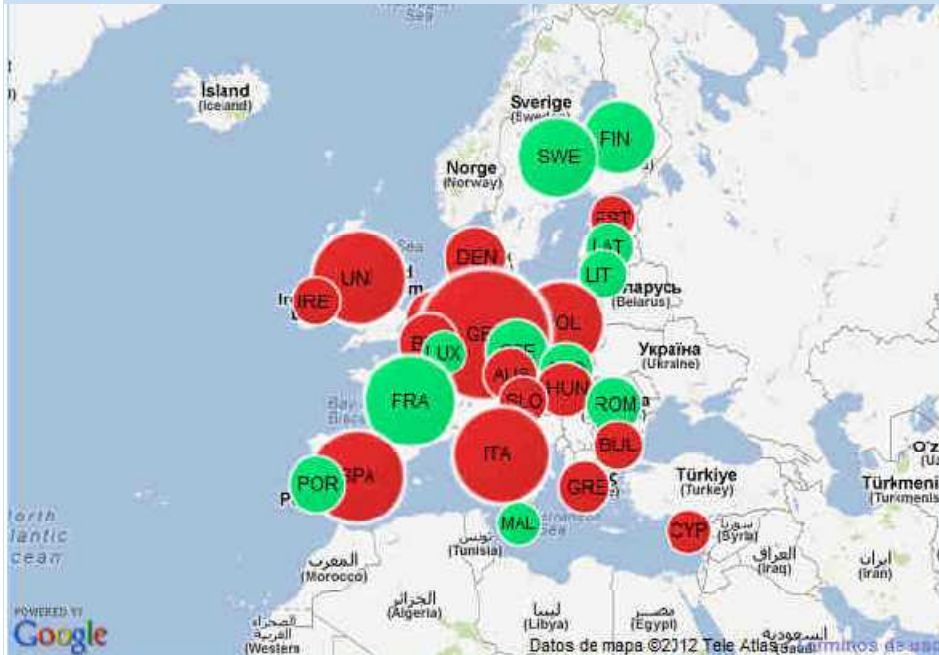
- All 27 EU member countries and Norway, Lichtenstein, Iceland.
 - Around 11,500 installations
 - Sectors:
 - Combustion installations
 - Oil refineries
 - Coke ovens
 - Metal ore
 - Pig iron and steel
 - Cement clinker and lime
 - Pulp, board and paper
 - Glass and ceramic
- if specific thresholds are exceeded
- 3 phases (different time periods)
 - Phase I: 2005-2007
 - Phase II: 2008-2012
 - Phase III: 2013-2020 (+ chemical + aviation)

The most important carbon market of the world:
84%



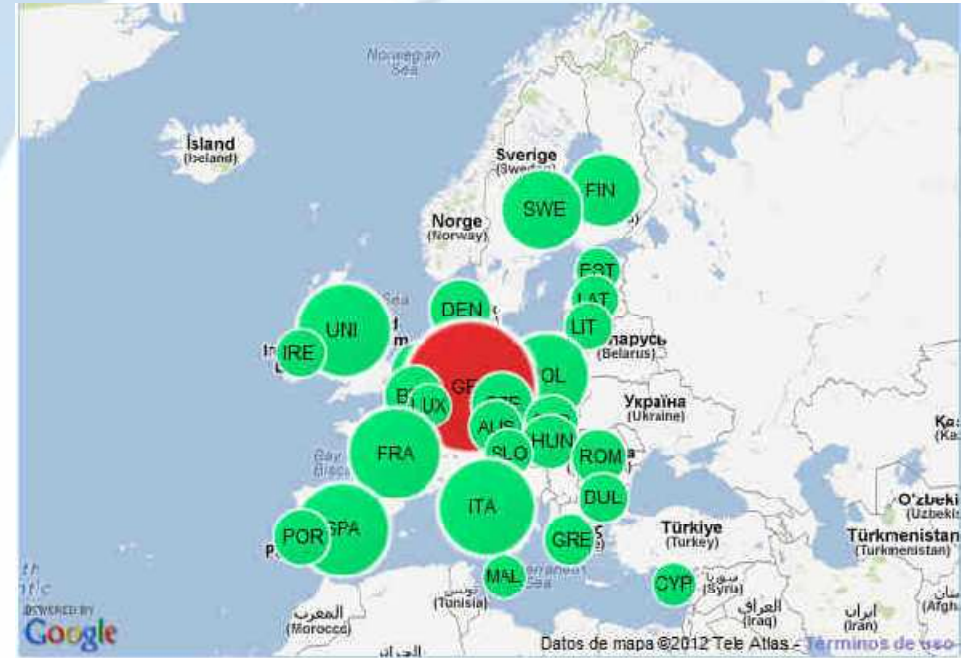
- Each period sets a total cap on EU ETS emissions, which determines an emission target, materialized as tradable permits (EUAs).
- The permits are allocated every year to stationary sources, on the basis of historical emission corrected by an effort factor.
 - Phase I and II, permits mainly free of charge.
- Phase III
 - Power sector: 100% of the allowances will be auctioned.
 - Non-power sectors: In 2013, 80% free allowances on the basis of benchmarks (20% auctioning). The free allocation will decrease each year by equal amounts resulting in 30% free allocation in 2020 (70% auctioning). Intention to phase out in 2027.
 - Sectors which are exposed to a significant risk of carbon leakage shall get 100% of the allowances for free on the basis of benchmarks (average performance of the 10% most GHG efficient installations).

- The covered installations must surrender as many permits each year as they have verified emissions.
- If an installation does not have enough allowances it must reduce emissions or buy additional allowances from other installations.
 - Phase III: Aviation is included as a new sector. They can buy EUAs from industrial sectors, but industrial sectors can not buy EUAs from aviation.
- Installations can keep unused permits to use at a later date (banking) but unused phase I cannot be used in phase II (in discussion phase II to phase III).
- They are also implicitly allowed to borrow allowances from next year, up to the amount of next year's free allowance (with the exception that allowances from phase III can not be borrowed in phase II)
- In phase II and III emission credits from project mechanisms (CERs & ERUs) can be used (linking directive) to a certain limit (EU average 13,5%, with the range 0%-20%)



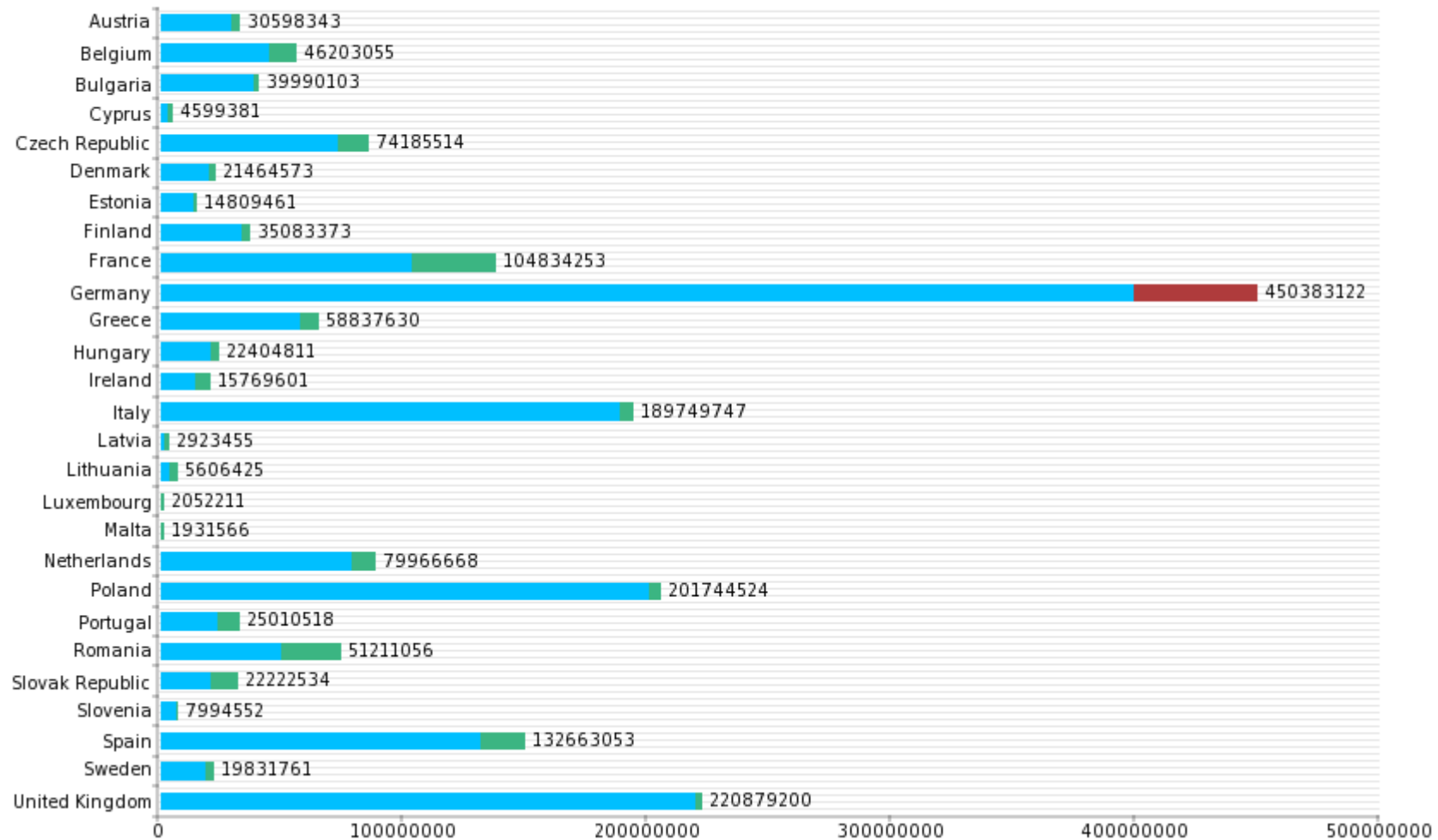
2008

 Buy
 Sell



2011

Verified emissions / allowances 2011



The three companies having in 2011 the highest shortage of EU carbon allowances are all involved in the electricity generation business. All have an energy mix with a high proportion of coal- or lignite-fired electricity generation

Table 1: EU ETS Company Emissions Ranking (Mt CO₂)

company	distributed allowances 2011 *	verified emissions 2011
RWE	92	141
Vattenfall	64	92
E.ON	76	86

* Allowances distributed to "new entrants" are not included

Table 3: EU ETS Companies with highest carbon surplus in 2011

company	sector	allocated allowances 2011 (M)	verified emissions 2011 (MtCO ₂)	emissions-to-cap (=E-C) 2011 (M)
ArcelorMittal	Iron & Steel	87	53	-34
Corus	Iron & Steel	35	19	-16
Lafarge	Cement	29	18	-11

Carbon Market Data
<http://www.carbonmarketdata.com>

CONCERNS

- Specific problems relate to effectiveness: prices and target, stimulus for innovation and windfall profits.
- Overallocation (crisis). CO2 prices will stay low unless EU steps up to -30% and/or limit role of CDM.
- EU ETS in Phase 1 (2005-2007) did not result in emission reductions.
- In Phase II discretionality of States on their allocation plans.
- Windfall profits remain a problem and consumers are overcompensating companies for their costs.
- Carbon leakage is another negative side-effect.

TARGET EU 2020: APPROVED

(Climate and Energy Package: European Parliament, December 2008)

↓ **20% GHG vs1990**
(Decision n° 406/2009/CE)

↓ **20% primary energy consumption**
through increased energy efficiency

20% Renewable
gross final consumption of
energy
(Directive 2009/28/CE)



Period 2013-2020

↓ 14% vs 2005 (new base year)

EU ETS Directive
↓ 21% vs 2005
(Policies defined by EU)

Power Sector

Industrial Sector (Cement,
ceramics, lime, glass,
paper, metal, refining and
combustions)

Aviation (2012)

Non EU ETS Sectors
↓
10% vs 2005
(Policies by each MS)

Energy no Directive

Transport

Waste

Agriculture

Fluorinated gases

Forest

Regulatory developments plans in
Spain

Target for Spain :
20%

The national targets
range from a
renewables share of
10% in Malta to 49% in
Sweden.

Target for Spain

↓ 10% Non EU ETS vs 2005

The targets range from an
emissions reduction of
20% by the richest
Member States to an
increase in emissions of
20% by the poorest.



THE CLIMATE AND ENERGY PACKAGE (2008)

- 1 DIRECTIVE: REVISION AND STRENGTHENING OF THE ETS
- 2 EFFORT SHARING DECISION
- 4 RENEWABLE ENERGIE DIRECTIVE
(At least 10% of transport fuel in each country must be renewable)
- 5 ENERGY EFFICIENCY: PRESIDENCY CONCLUSIONS OF THE EUROPEAN COUNCIL OF 8/9 MARCH 2007
- 6 DIRECTIVE ON THE GEOLOGICAL STORAGE OF CARBON DIOXIDE (CCS)
- 7 REGULATION: CO2 EMISSIONS NEW LIGHT DUTY VEHICLES
- 8 DIRECTIVE: QUALITY FUELS (life cycle view. 10% reduction in 2020)

DECISION (in progress): COMMON ACCOUNTING RULES FOR GHG EMISSIONS AND REMOVALS IN THE FOREST AND AGRICULTURE (LULUCF)

TARGET EU 2020: APPROVED (Climate and Energy Package: European Parliament, December 2008)

↓ **20% GHG** vs 1990
(Decision n° 406/2009/CE)

+

↓ **20% primary energy consumption**
through increased energy efficiency

+

20% Renewable del gross
final energy consumption
(Directive 2009/28/CE)



With current measures EU will reach a 10%.
Boost instruments to achieve 20%
(COM(2011) 109 final) → [Energy Efficiency
Plan 2011](#)

Targets 2020 under discussion

Achieving the goal of greater energy efficiency
↓ 25% EU GHG vs 1990 (Probable mid term)

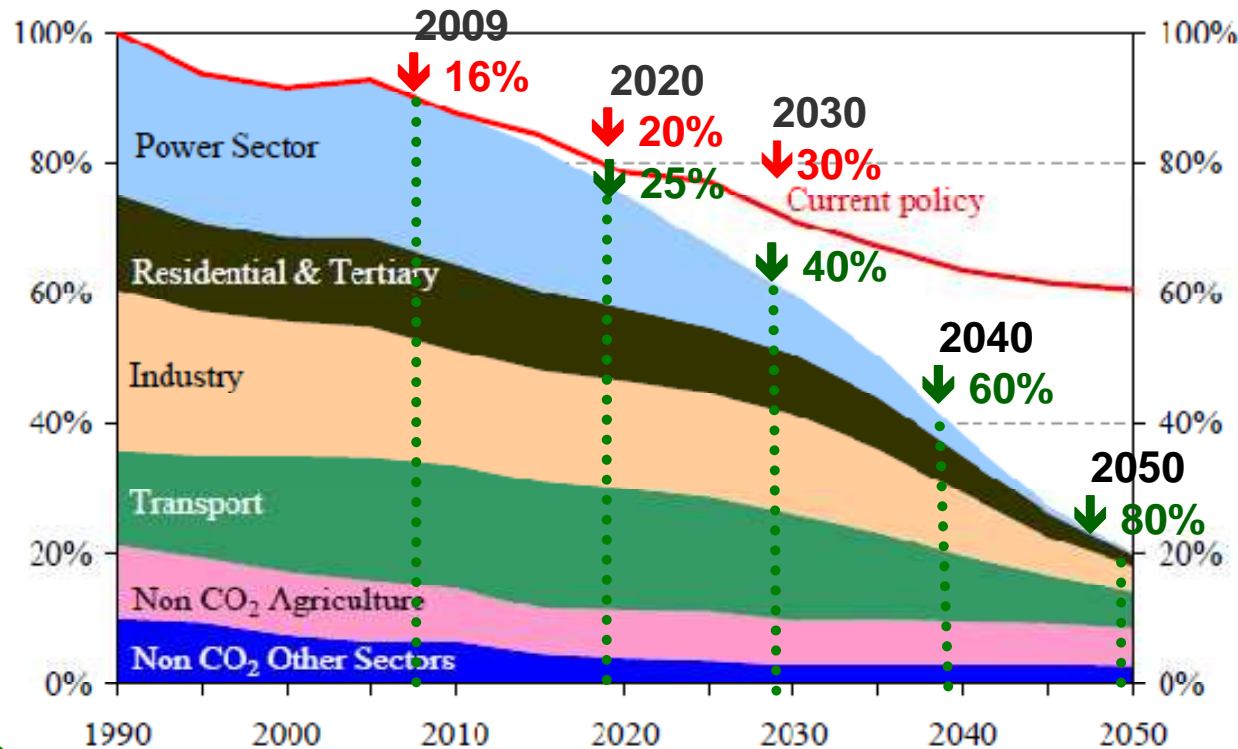
International agreement

↓ 30% EU GHG vs 1990 (Not foreseeable at mid term)

↓ 25% -40% annex I (raised by IPCC-UN)

➤ Proposed EU long-term objectives in 2050

Figure 1: EU GHG emissions towards an 80% domestic reduction (100% =1990)



Half 20% energy efficiency target

Reductions considering additional policies and technological options available in time

Annual GHG Reduction effort vs 1990

↓1%

↓1,5%

↓2%

Several hypotheses: technological innovation and fossil fuel prices.
 Global Context: constant population growth, an increase of GDP and a change in trends in terms of climate action, energy and technological development



European context

➤ Proposed EU long-term objectives in 2050

POWER SECTOR

↓ GHG vs 1990

2005 EU	2030 EU	2050 EU
-7%	-54% to -68%	~100% Almost fully decarbonised

COMPETITIVE, ENERGY SECURITY

INDUSTRIAL SECTORS

2005 UE	2030 UE	2050 UE
-20%	-34 to -40%	-83 a 87%%

COMPETITIVITY: avoid carbon leakage

BUILT ENV. AND SERVICES

2005	2030	2050
-12%	-37 to -53%	-88 to -91% Decarbonisation almost complete

ZERO EMISSIONS RESIDENCIAL AND SERVICE BUILDINGS

MOBILITY

2005 EU	2030 EU	2050 EU
+30%	+20 to -9%	-54 to 67% No complete decarbonisation

LOW CARBON TRANSPORT SYSTEM 2050

Other GHG No-CO2

2005 EU	2030 EU	2050 EU
-30%	-71,5% to -72,5%	-70% to -78%



LAND USE

**EMISSION REDUCTIONS
 AGRICULTURE (other GHG no-CO₂)**

2005 EU	2030 EU	2050 EU
-20%	-36%	-42% - 49% No complete decarbonisation

GLOBAL FOOD DESCURITY

INCREASE SINK CAPACITY

- Increase efficiency
- Efficient fertiliser use
- Bio-gasification of organic manure
- Improved manure management
- Better fodder
- Local diversification and commercialization of production
- Livestock productivity improvement
- Maximising benefits of extensive farming

- Better agricultural and forestry practices
- Maintenance of grasslands
- Restore wetlands and peat lands
- Low or zero tillage
- Reduce erosion
- Allow development of forests

Resources for bio-energy (LCA perspective) and industrial feedstock



➤ Proposed EU long-term objectives in 2050

1 Energy saving and managing demand

2 Renewable rise substantially

- Achieving at least 55% in gross final energy consumption in 2050.
- The share of RES in electricity consumption reaches 64% in a High Energy Efficiency scenario and 97% in a High Renewables Scenario that includes significant electricity storage to accommodate varying RES supply even at times of low demand.

3 Diversified supply technologies. No technology is preferred

- CCS / Nuclear

4 Electricity plays an increasing role

5 Decentralisation and centralised systems increasingly interact

6 Change in consumption patterns

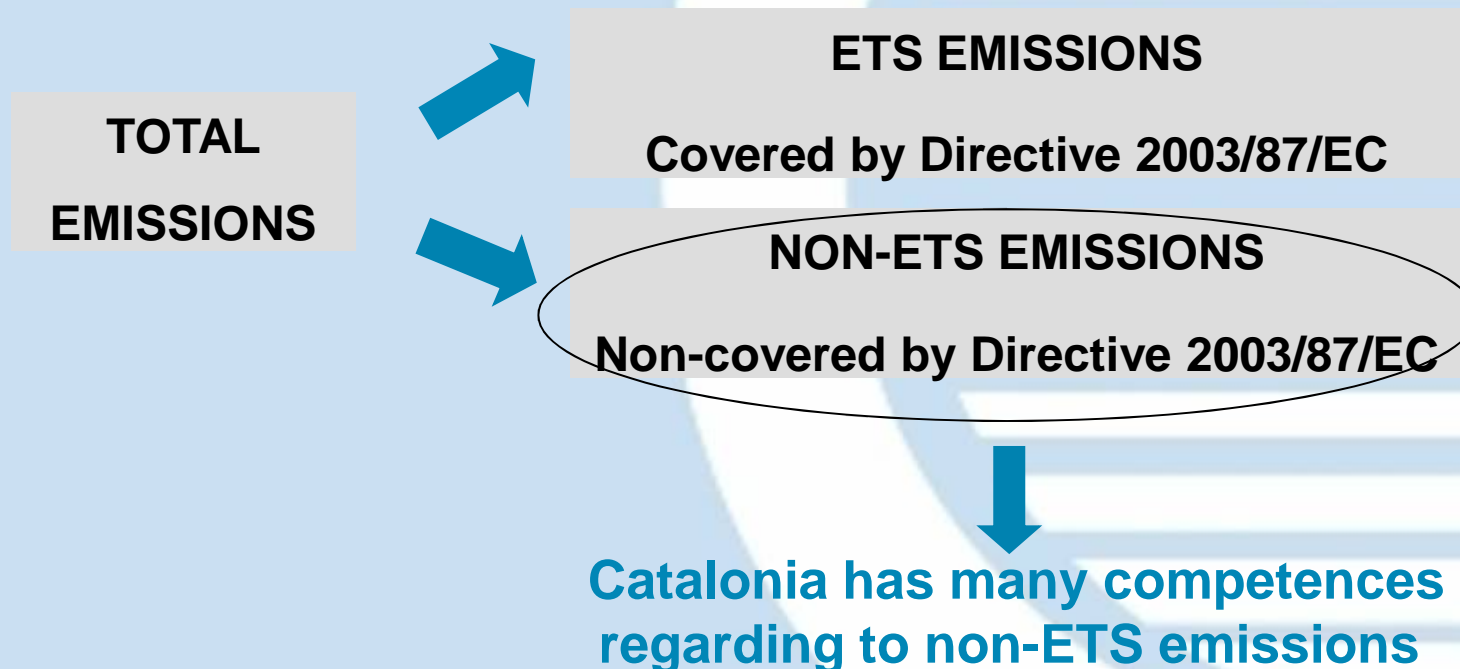
7 Oil and CO2 price ?¿



3. Catalan context

Catalonia's voluntary commitment to contribute to Spain's compliance with the Kyoto Protocol

Catalonia sets up by itself a voluntary commitment coherent with Spain's commitment



Spanish commitment in the EU bubble

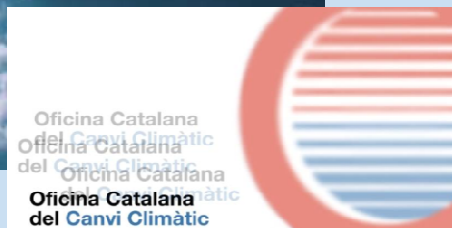
+15 % with respect to base
year levels, for 2008-2012

What is the answer?

- **15%** free, under the Kyoto Protocol commitment
- **2% compensated** by the growth of forests (sinks)
- **20% bought** by the Spanish government to compensate the **diffuse emissions** for the whole of Spain

**37% increase
in emissions
over the base
year**

CLIMATE CHANGE FRAMEWORK PLA 2008-2012



Programs

- **Program 1. Emissions reduction in diffuse (non-ETS) sectors (Program 5,33).** Avoid **5,33 Mt CO₂ eq** on annual average in 2008-2012 versus BAU

8 subprograms and 22 actions

- **Program 2. Support sites under EU ETS**

2 subprograms and 5 actions

- **Program 3. Cross sectorial**

5 subprograms and 14 actions

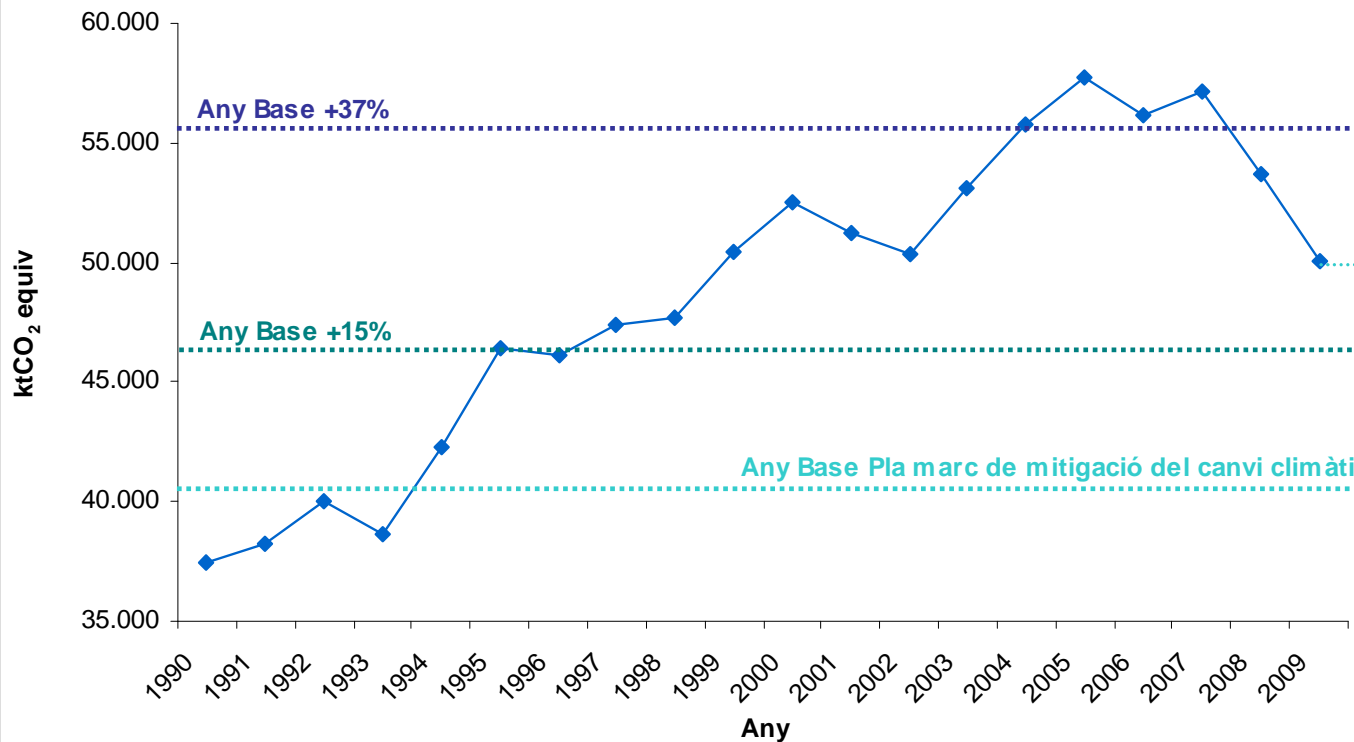
- **Sectoral support measures**

59 actions



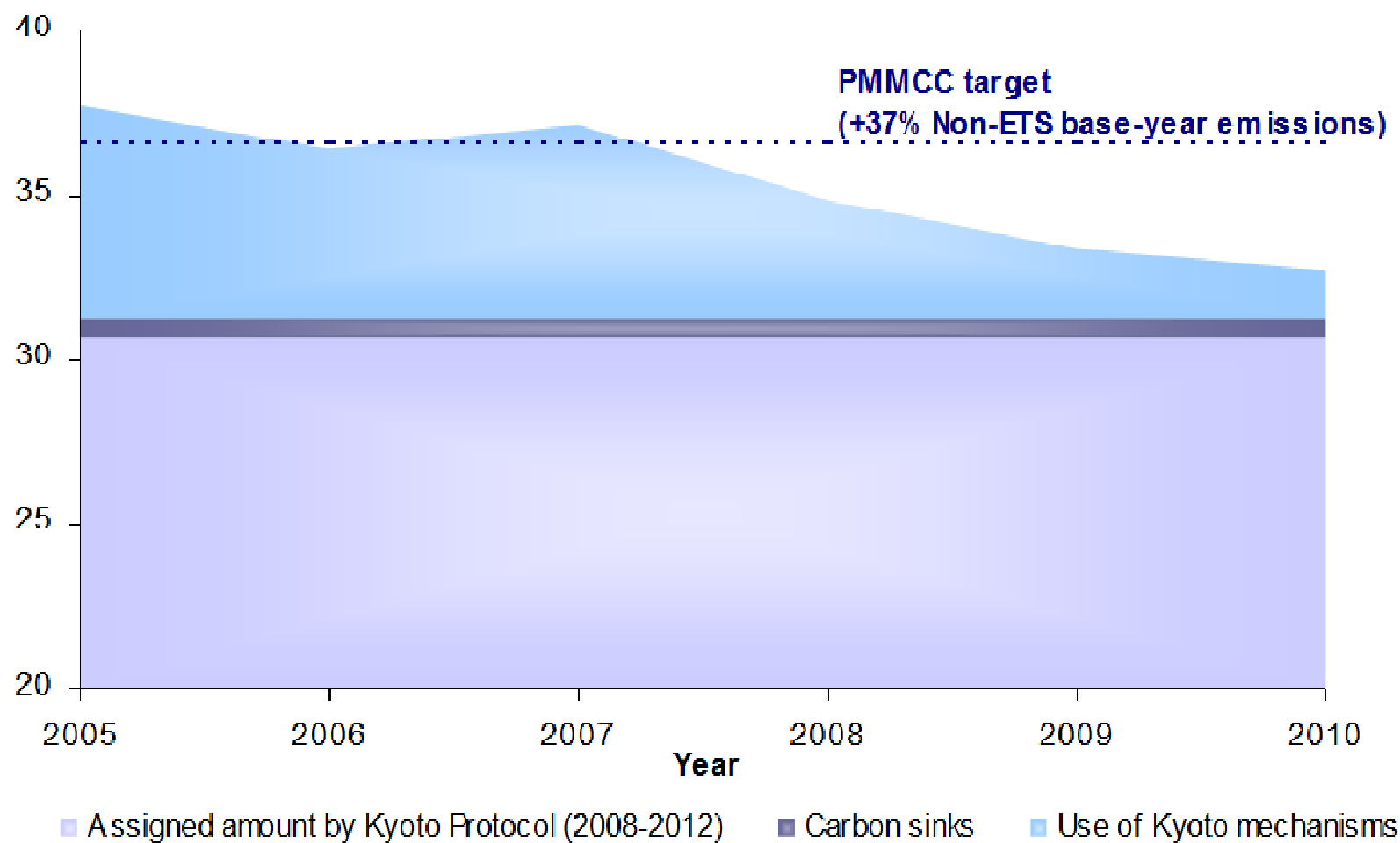
	Any base	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
kt CO ₂ equiv.	40.331	37.453	46.377	46.102	47.383	47.729	50.441	52.484	51.192	50.319	53.100	55.764	57.729	56.171	57.106	53.688	50.029

Tendència d'emissions totals a Catalunya



24% increase in emissions in 2008 compared to the base year

Million tonnes CO₂eq

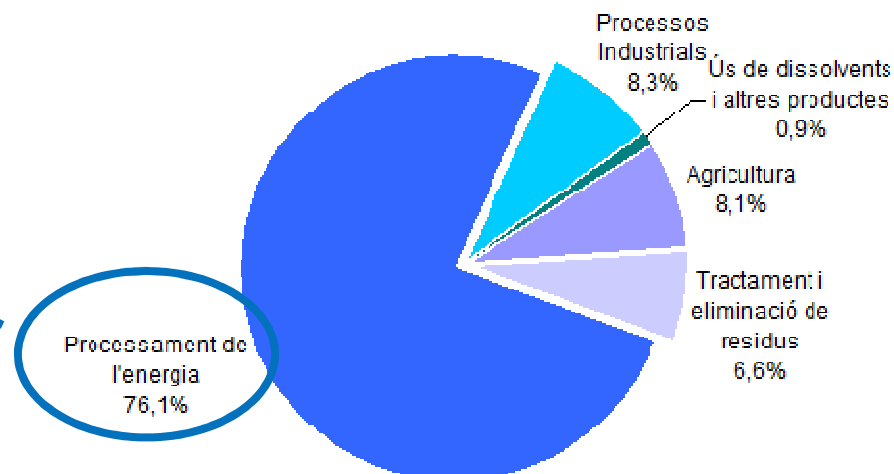


Emissions in Catalonia 2009 = 50,03 Mt CO₂ eq

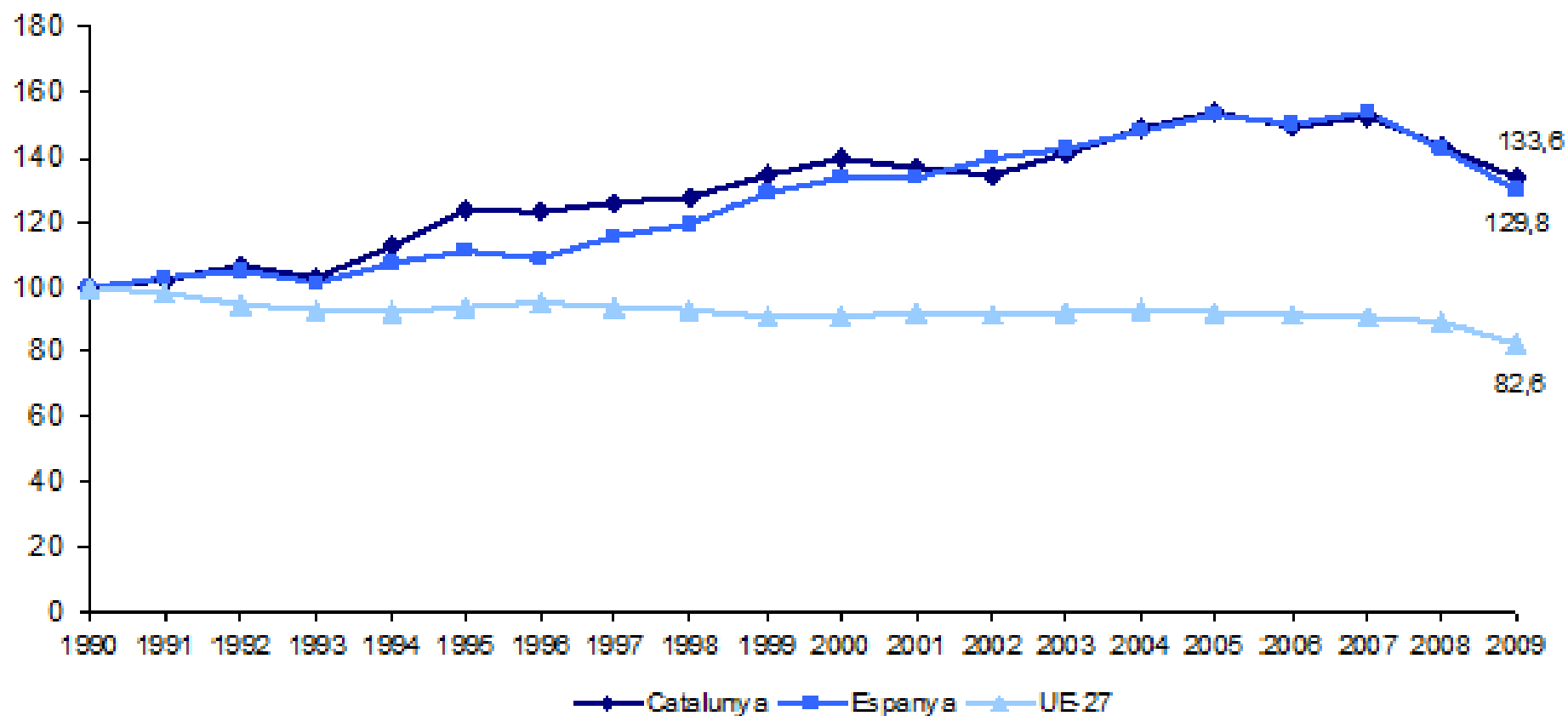
GHG. 2009	CO ₂	CH ₄	N ₂ O	HFC	PFC	SF ₆	Total
SECTOR	Milers de tones de CO ₂ eq						
1. Energy	37.291	458	336	0	0	0	38.085
2. Industrial processes	2.888	23	27	1.111	34	63	4.147
3. Solvent uses	173	0	254	0	0	0	427
4. Agriculture	0	2.256	1.804	0	0	0	4.060
5. Land use change and forestry	-	-	-	-	-	-	-
6. Waste	1	3.104	206	0	0	0	3.310
7. Other							0
TOTAL ANUAL	40.352	5.841	2.627	1.111	34	63	50.029
Variació respecte a l'Any Base PMMCC							24%
Variació respecte al 2008							-7%

Emissions GEH per sectors. Catalunya 2009

- ❖ Transport: 28%
- ❖ Industry and construction: 23%
- ❖ Energy Sector: 15%
- ❖ Residential, services: 8%

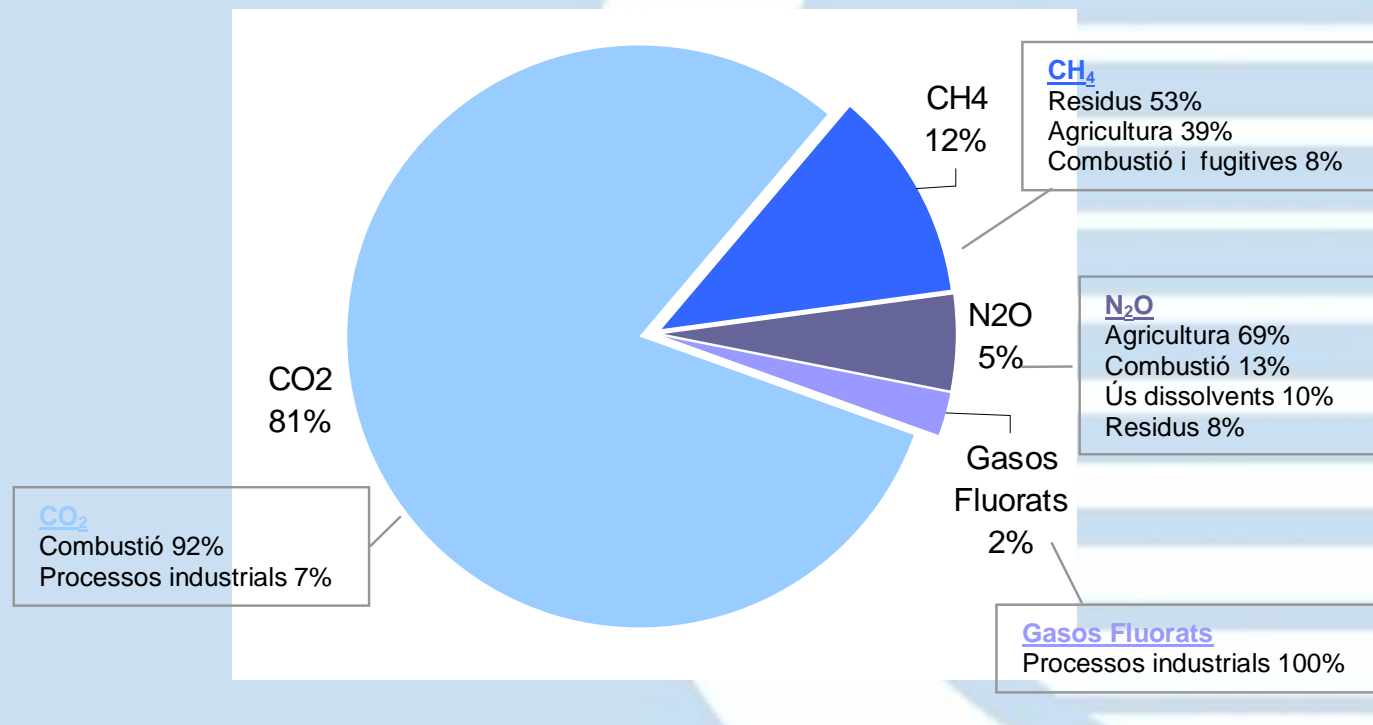


nivell 1990 = 100



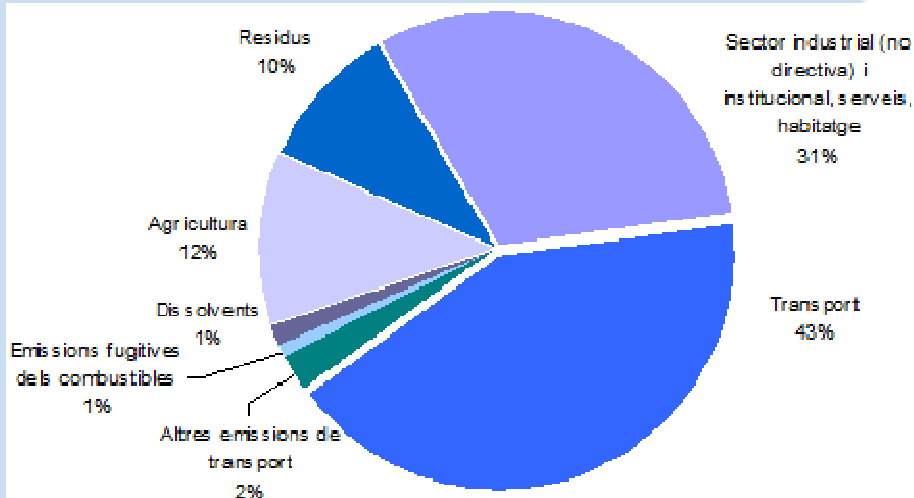
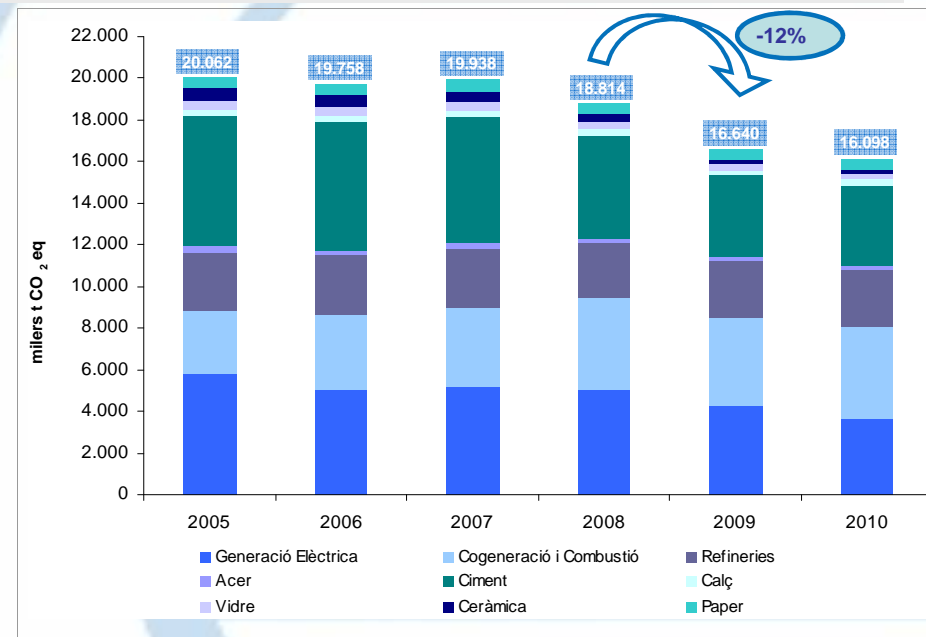
El CO₂ va ser el gas regulat amb efecte d'hivernacle més abundant a l'atmosfera i el que va contribuir més a l'escalfament global (un 81%, equivalent a un total de **40,3 milions de tones de CO₂**)

Il·lustració 1. Distribució per gas de les emissions de GEH, en CO₂ equivalent, a Catalunya. Any 2009.



De les 50,03 Mt CO₂ eq totals emeses a Catalunya l'any 2009, el **33%** (16,6 Mt CO₂ eq) corresponen a les emissions de les instal·lacions sotmeses a la Directiva, i el **67%** restant (33,4 Mt CO₂ eq) són emissions en els sectors difusos.

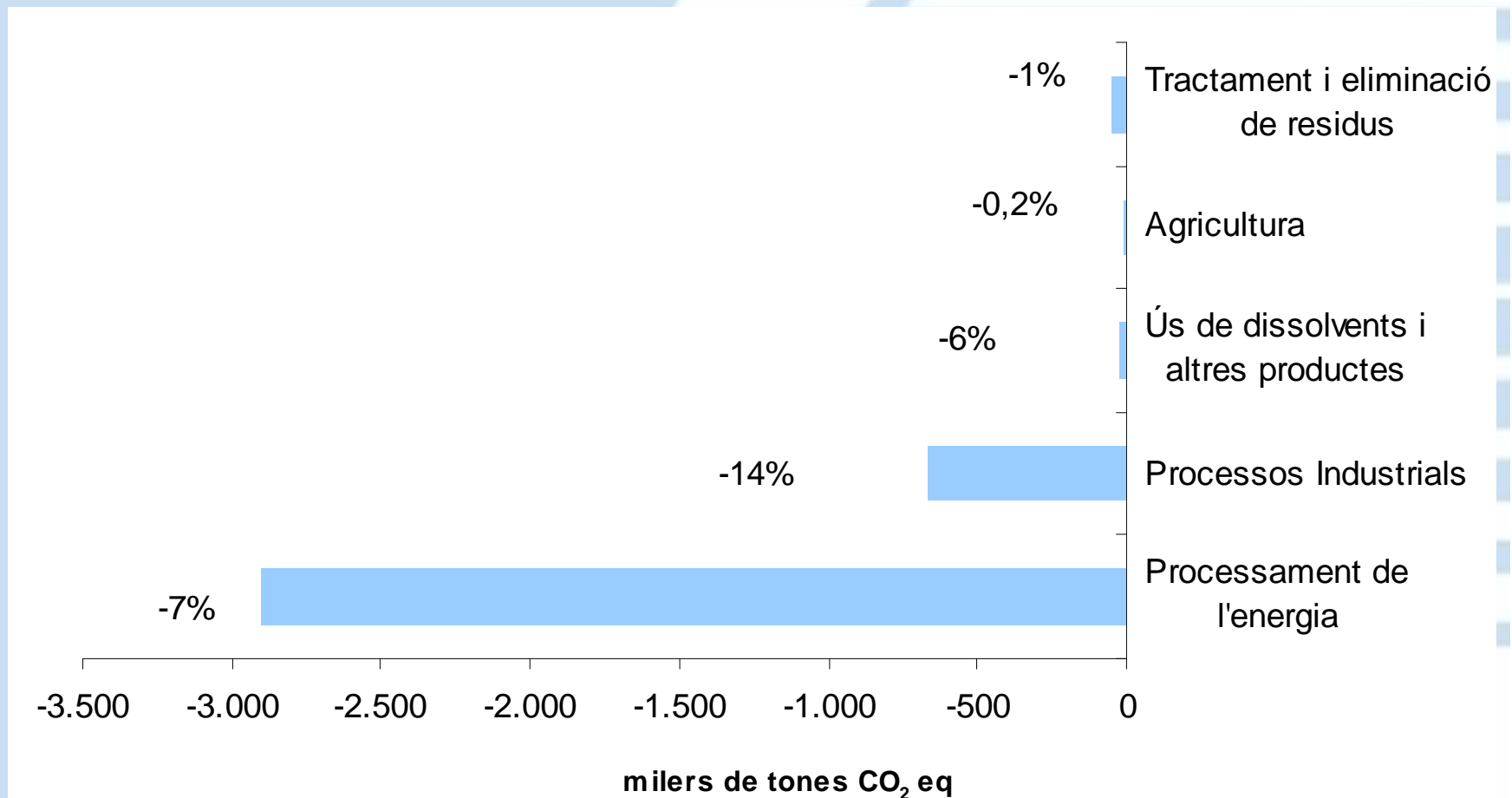
Emissions verificades al **2008** = 99% dels drets assignats
 Emissions verificades al **2009** = 88% dels drets assignats
 Emissions verificades al **2010** = 85% dels drets assignats



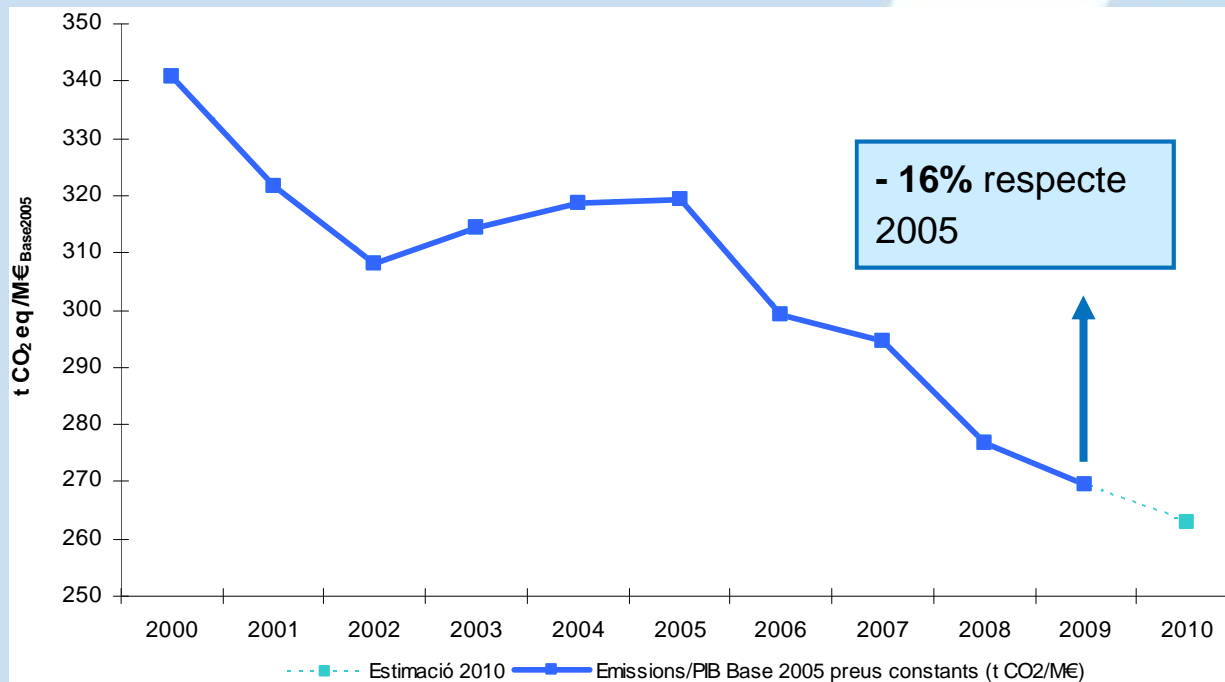
Sector del Transport → **màxim** contribuent dins dels sectors difusos → 45% del total (14,9 Mt CO₂ eq)



Les emissions totals de GEH del 2009 **van caure un 7%** respecte a les emissions de l'any 2008. Tots els sectors van disminuir en relació amb l'any anterior.



Millora contínua de la intensitat energètica i d'emissions de l'economia catalana ➔ es genera el mateix producte interior brut utilitzant menys recursos fòssils.



Emissions per PIB (gCO₂eq/€)

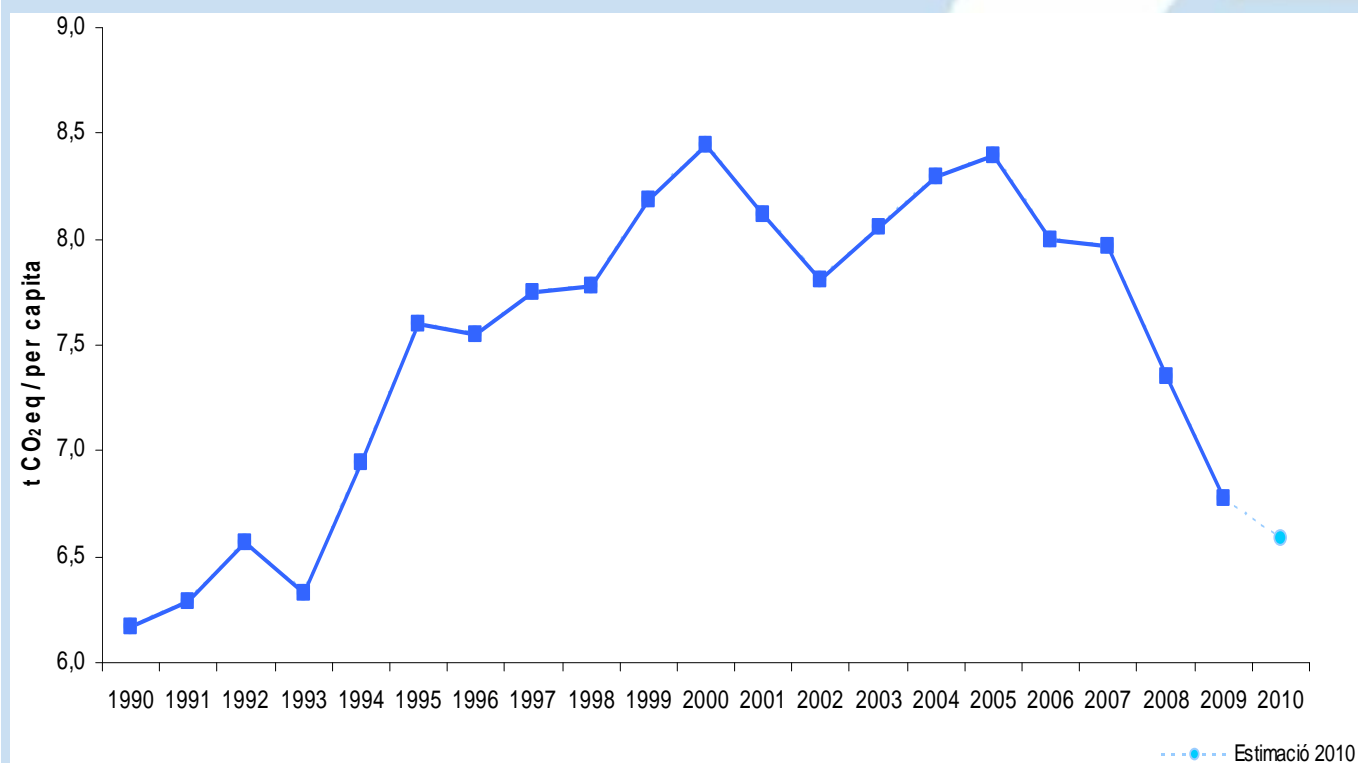
Any 2009:

- ❖ Catalunya: 269
- ❖ Espanya: 386
- ❖ UE-27: 407

Any 2000:

- ❖ Catalunya: 341
- ❖ Espanya: 490
- ❖ UE-27: 505

L'evolució de les emissions de GEH es van anar **desacoblant del creixement** de la població



Emissions per capita
[tCO₂ eq per cap]

Any 2009:

- ❖ Catalunya: 6,8
- ❖ Espanya: 8,0
- ❖ UE-27: 9,2

Any 2000:

- ❖ Catalunya: 8,4
- ❖ Espanya: 9,4
- ❖ UE-27: 10,5

Any 1990:

- ❖ Catalunya: 6,2
- ❖ Espanya: 7,3
- ❖ UE-27: 11,8

- Catalan Energy and Climate Change Plan
- Mitigation Plan
- Save and Efficiency Energy Plan in public buildings
- Catalan Strategy for Adapting to Climate Change
- Voluntary Agreement Programme on GHG emissions reduction
- Climate Change Law

Mission:

To achieve an economy/society with low levels of energy intensity and low carbon emissions that is innovative, competitive and sustainable in the medium to long term.



Pla de l'Energia i Canvi Climàtic
de Catalunya 2012-2020

 Generalitat
de Catalunya

- The Energy and Climate Change Plan sets out the **strategies of Catalan energy policy** up to 2020 in line with the established mission.
- It also considers **reducing the effects of greenhouse gas emissions** (GHG –basically CO₂) linked to the energy cycle.
 - From a climatic perspective it is a (very significant) **element of climate policy planning**.
- Framework of reference: European 20-20-20 targets for the year 2020.
 - Providing Catalonia with the capacity to react if the EU agrees to set a more ambitious target for emissions reduction and a new way of sharing efforts.

Strategic pillars. Core principles

1. Energy saving and energy efficiency policies will be key to ensuring that Catalonia achieves a sustainable energy system.
 - The management of demand is the top priority for Catalan energy policy.
 - Catalonia must be a leading figure in energy efficiency solutions.
2. Renewable energies as a strategic present and future option for Catalonia.
3. Catalan energy policy should contribute to the commitments made by the Spanish Government to reduce greenhouse gases within the European Union.
4. The consolidation of the energy sector as an opportunity for economic growth and the creation of skilled jobs.
5. The improved security and quality of the energy supply and the development of the energy infrastructure necessary for achieving a new energy system for Catalonia

6. Catalan energy and environmental policies must have coherent strategies to achieve a sustainable future for Catalonia, integrating its social, economic and environmental development
7. Greater stimulus for R&D&I in new technologies in the energy field.
8. Decisive action on the part of the Government of Catalonia and other public administration bodies in Catalonia to implement the new energy model as a way of setting an example and encouraging dynamism.
9. Take energy policy to the maximum strategic level.
10. The involvement of civil society in the construction of Catalonia's new energy model: training, information, participation and inclusion of the most economically disadvantaged social sectors.

Energy saving and efficiency. Quantitative objectives:

Compliance with EU objectives for energy saving and efficiency by 2020: a 20.2% reduction in primary energy consumption (without taking non-energy uses into account) in relation to the current trend (a business-as-usual scenario) without additional energy policy measures from the year 2007 onwards.

Renewable energies. Quantitative objectives:

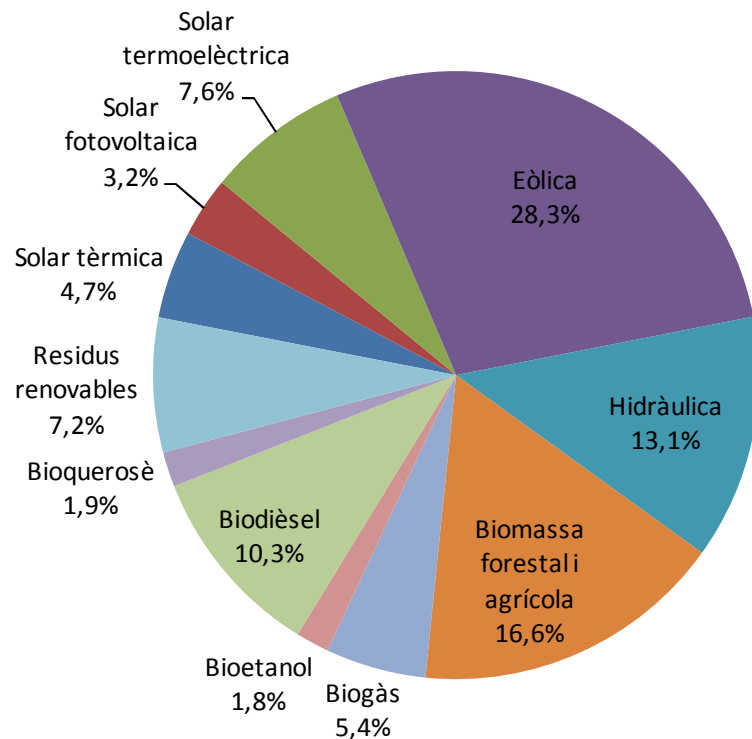
Compliance with EU objectives for renewable energies by the year 2020 (Directive 2009/28/EC): percentage of renewable energy sources of gross final energy consumption: 20.1%. Increase in wind, biomass and solar (photovoltaic & thermoelectric) energy.

Energy GHG emissions. Quantitative objectives:

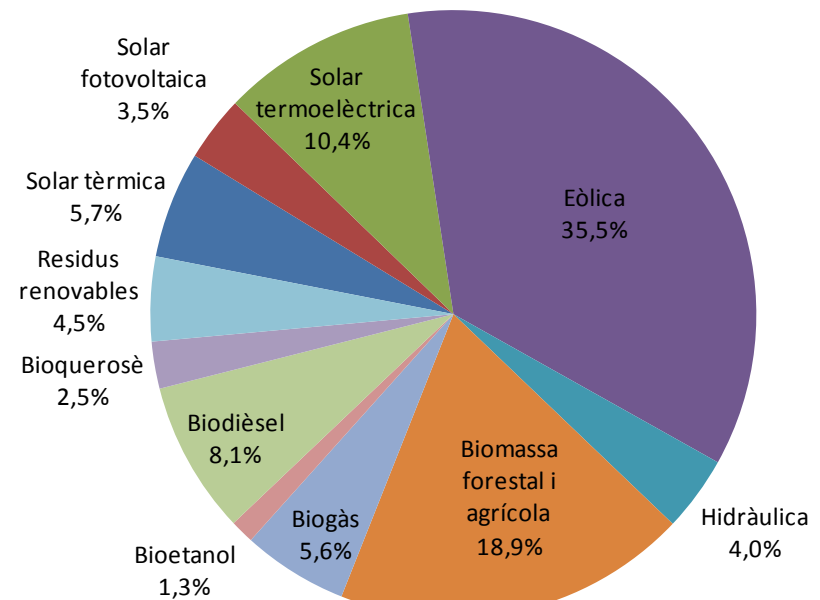
The contribution of Catalonia to the Spanish commitment within the framework of the EU objective on gases that contribute to the greenhouse effect by 2020: a 27.0% reduction of total greenhouse gases from energy based on emissions in the year 2005 and a 22.8% reduction of emissions in diffuse sectors.

Renewable energies. Objectives

Consum d'energia primària amb renovables any 2020



Increment previst any 2020



Renewable primary energy consumption
 in 2020

Expected increase primary energy
 consumption from renewable
 sources 2012- 2020

Thermal solar
Photovoltaic solar

Thermoelectric solar
Wind

Hydro
Agr. Biomass / Forest
Biogas
Bio ethanol

Bio diesel
Bio Kerosene

Renewable waste

Font d'energia renovable	Consum d'energia primària amb fonts d'energia renovable (ktep)		
	Any 2009	Any 2020	Increment
Solar tèrmica	18,4	178,2	159,8
Solar fotovoltaica	24,1	121,8	97,7
Solar termoelèctrica	0,0	290,3	290,3
Eòlica	78,5	1.074,7	996,2
Hidràulica	383,5	496,1	112,6
Biomassa forestal i agrícola	102,8	831,9	529,1
Biogàs	45,5	203,2	157,7
Bioetanol	31,7	67,2	35,5
Biodiesel	162,6	391,0	228,4
Bioquerosè	0,0	70,3	70,3
Residus renovables	148,4	272,8	124,2
TOTAL renovables	993,4	3.797,3	2.803,9

(*) Aquest total no inclou les bombes de calor

Individual strategies

The Energy and Climate Change Plan requires individual strategies that are necessary if the targets set are to be attained. These strategies are:

1. Wind energy.
2. Electric vehicles.
3. Energy sustainability in the buildings sector.
4. Electricity infrastructure.
5. Energy exploitation of forest biomass.
6. Energy recovery from waste.
7. Fostering a business sector in emerging sectors in the energy field.
8. A new focus for the actions of the Catalan energy authority.
9. Guidelines for the Energy Emergency Plan for Catalonia.

Socioeconomic impact of the Plan

Associated investments

- The implementation of the Plan will generate investments with a value of €24.6 billion
- The public contribution will be €1.79 billion, of which €1.13 billion will be provided by the Government of Catalonia

Creation of employment

- These energy policies will lead to the creation of 70,000 jobs by 2020 (38,000 in the field of energy savings and efficiency and 32,000 in the field of renewable energy)

Indirect savings

- The Plan will lead to savings of €33.85 billion for end consumers and €20.41 billion in fossil fuel imports for the period 2012-2020

Income resulting from carbon trading

- Of the total income forecast for Spain as a whole, it is estimated that Catalonia will be entitled to around €150 million/year for actions to slow down and adapt to climate change.

Mitigation Plan: non energetic GHG emissions

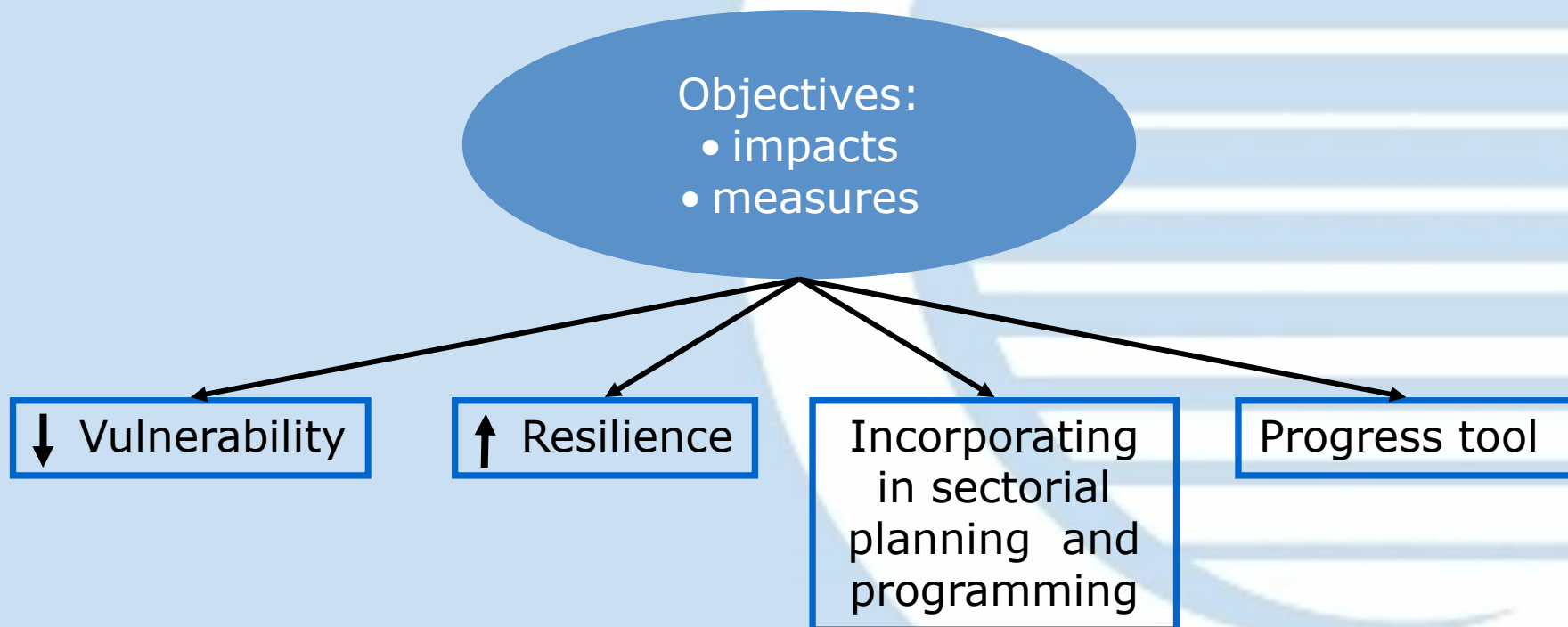
- Agriculture: Slurry biodigestion
- Forest:
 - Sink Capacity
 - Marrakesh accords 2-4%, but post Kyoto?
 - Not before 1990
 - Potential use of biomass
- Fluorinated gases
- Markets
- Mobility / Built environment
- Information, education and participation
- Research

➤ Save and efficiency energy plan in public buildings 2014

- The Government of Catalonia approved the plan on August 30, 2011, with the goal of reducing energy consumption, increase energy efficiency and reduce energy bills of the Catalan government.
- The program, which affects all government facilities and public sector, hopes to achieve in 2014 a 12% reduction in energy consumption and 4.4% in the energy bill. The savings is multiplied by four in the horizon 2020-2026.
- The Government's energy consumption is around 1,000 GWh per year, representing an expenditure of about 100 million euros. Its reduction is due in part to the current context of budget austerity on the other hand the new Energy Plan and Climate Change 2012-2020.

➤ Catalan strategy for Adapting to Climate Change 2020

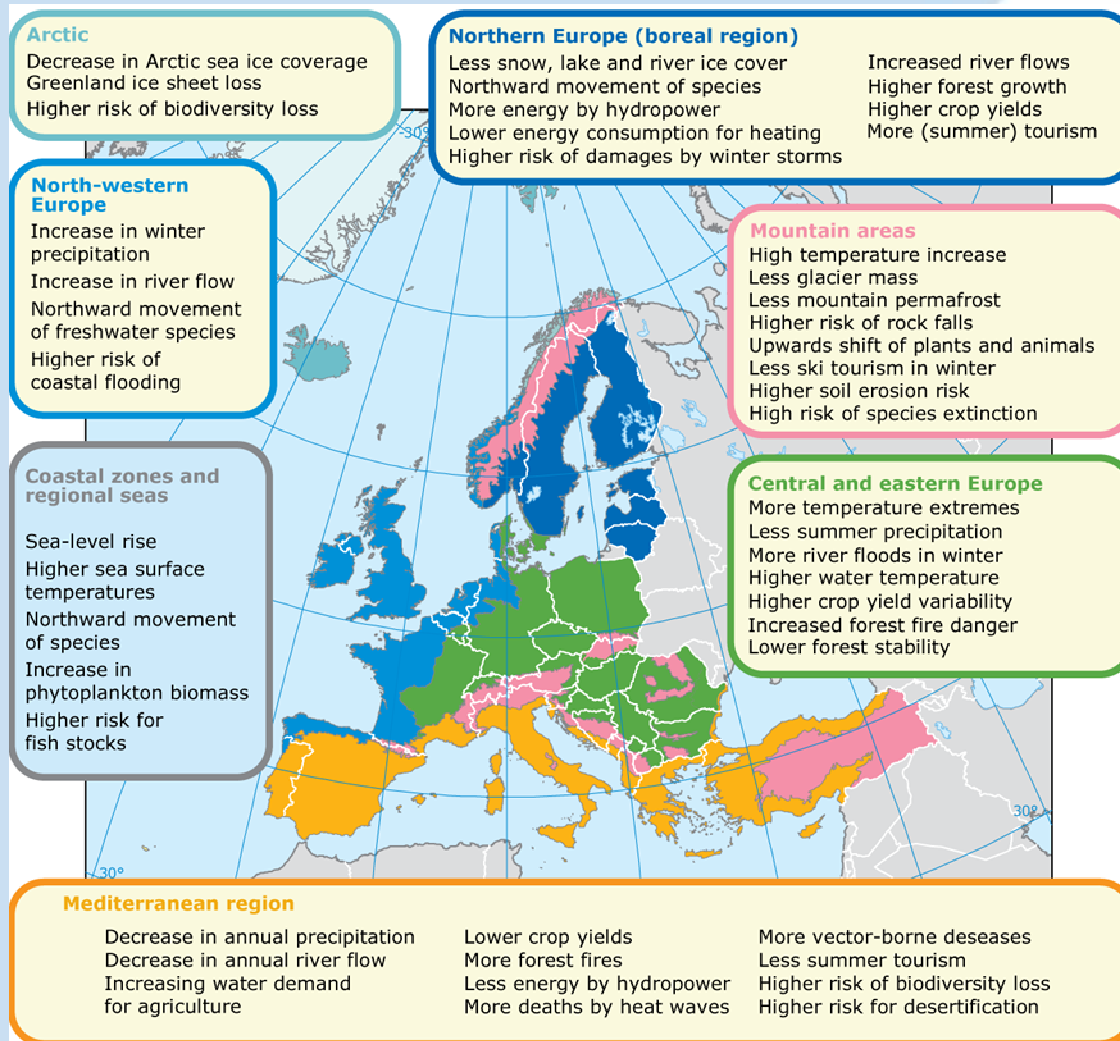
The first objective is to set with as much detail as possible, the specific and global impacts that climate change is producing now and will produce in the future in natural systems (coasts, deltas, seas, fresh water, forests, mountains, glaciers) and socio-economic sectors (agriculture, tourism, energy, forestry, civil protection, water management, health, fisheries), according to the best knowledge available



The second general objective is the identification, promotion and implementation of these adaptation measures that reduce the vulnerability of natural systems and sectors. There have been identified more than 100 measures in order to ensure the provision of long-term quality systems and reduce their vulnerability. This strategy promotes the progressive implementation of:

- decentralized institutional structures, which encourage social participation.
- flexibility of water supply systems, power generation and infrastructure.
- cross-cutting and integrated policies between different areas and sectors.
- savings and efficiency improvements to the comprehensive restoration of ecosystems, rather than creating new demands.

Regional risks (EEA Juny 2012)



- Observed and projected statistically significant increase in temperature
- Reduced river flow (2071-2100) between 16%-34%
- Decrease in wind speed
- Observed increase in water temperature (Estartit)
- Observed sea level rise (Estartit)

Most vulnerable ecosystems

- Pyrenees (T increase + 4.6°C end of the century)
- Delta de l'Ebre (sea level changes)



Catalan context

➤ Catalan strategy for Adapting to Climate Change 2020

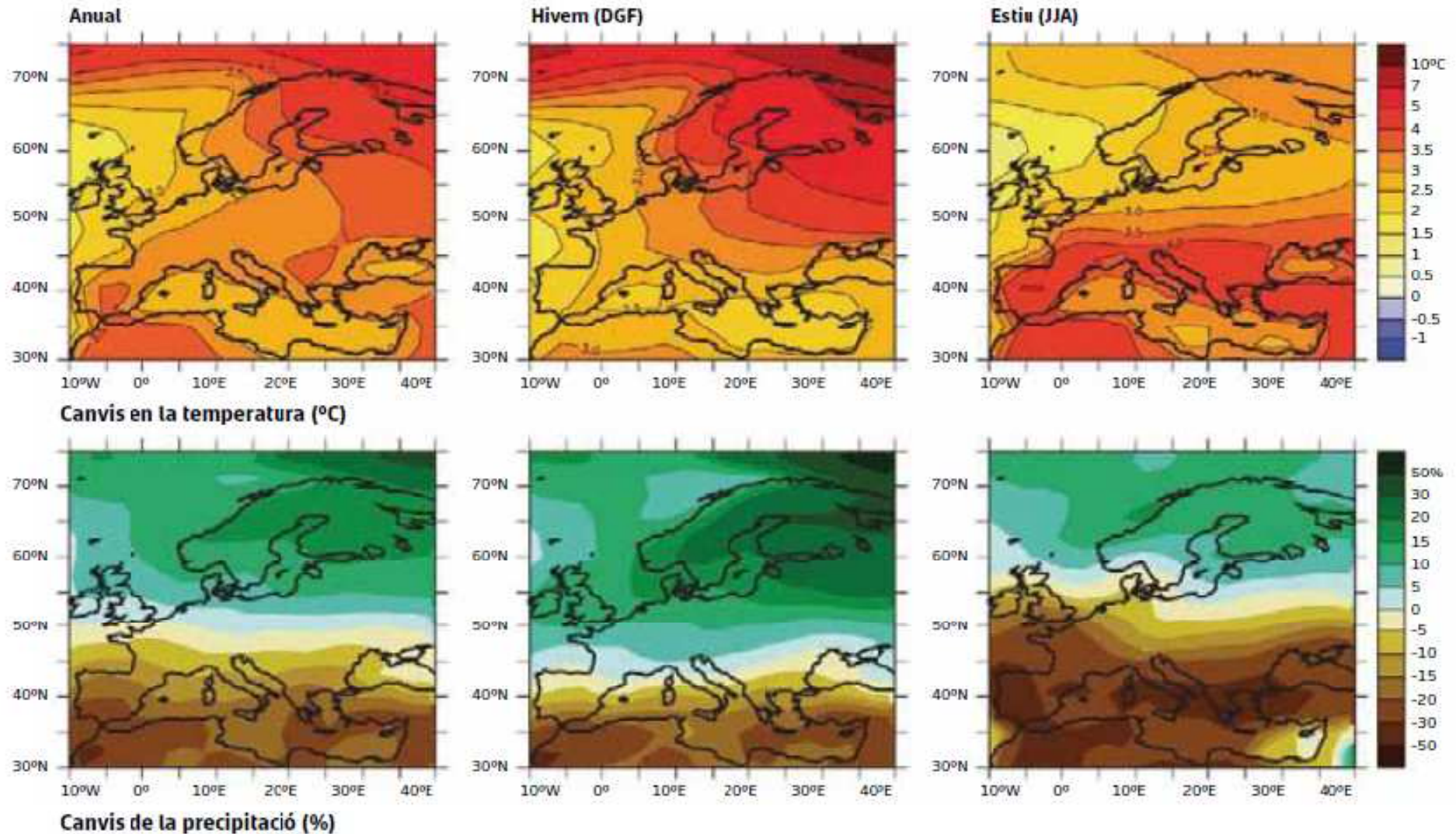
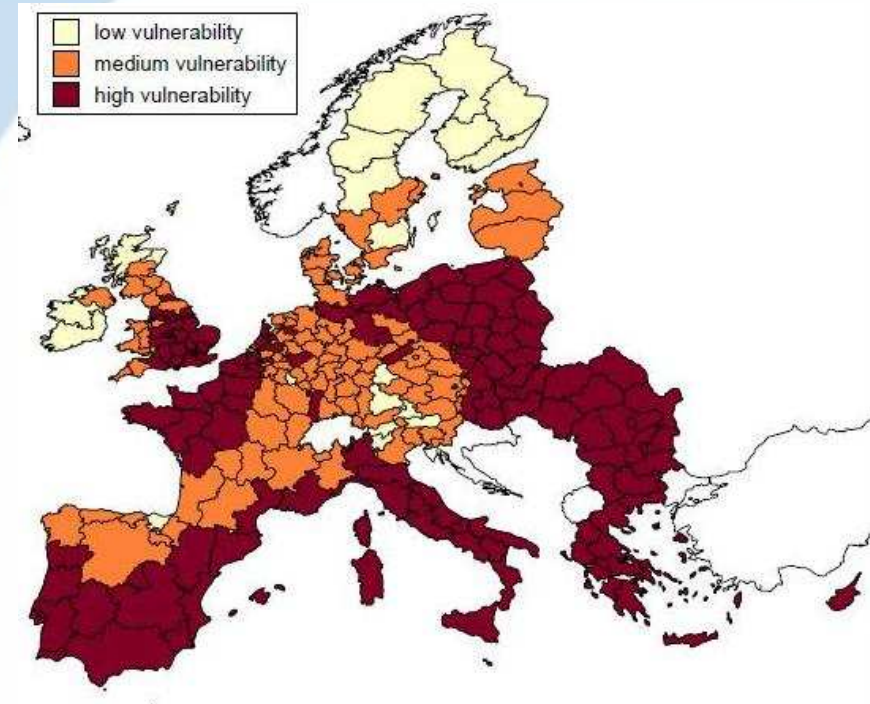
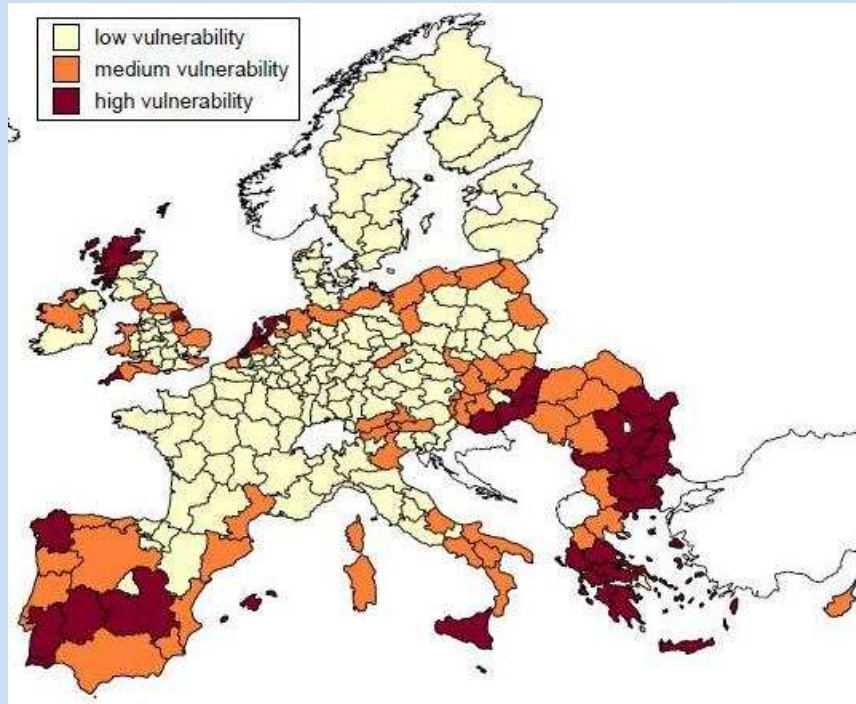


Figura 1. Canvis en la temperatura (a dalt) i de la precipitació (a baix) a Europa a partir de les simulacions de 21 models globals, per a l'escenari A1B. S'hi mostren les diferències entre el període 2080-2099 i 1980-1999. D'esquerra a dreta, per la mitjana anual, la d'hivern i la d'estiu. Font: IPCC Christensen et al. 2007.



Catalan context

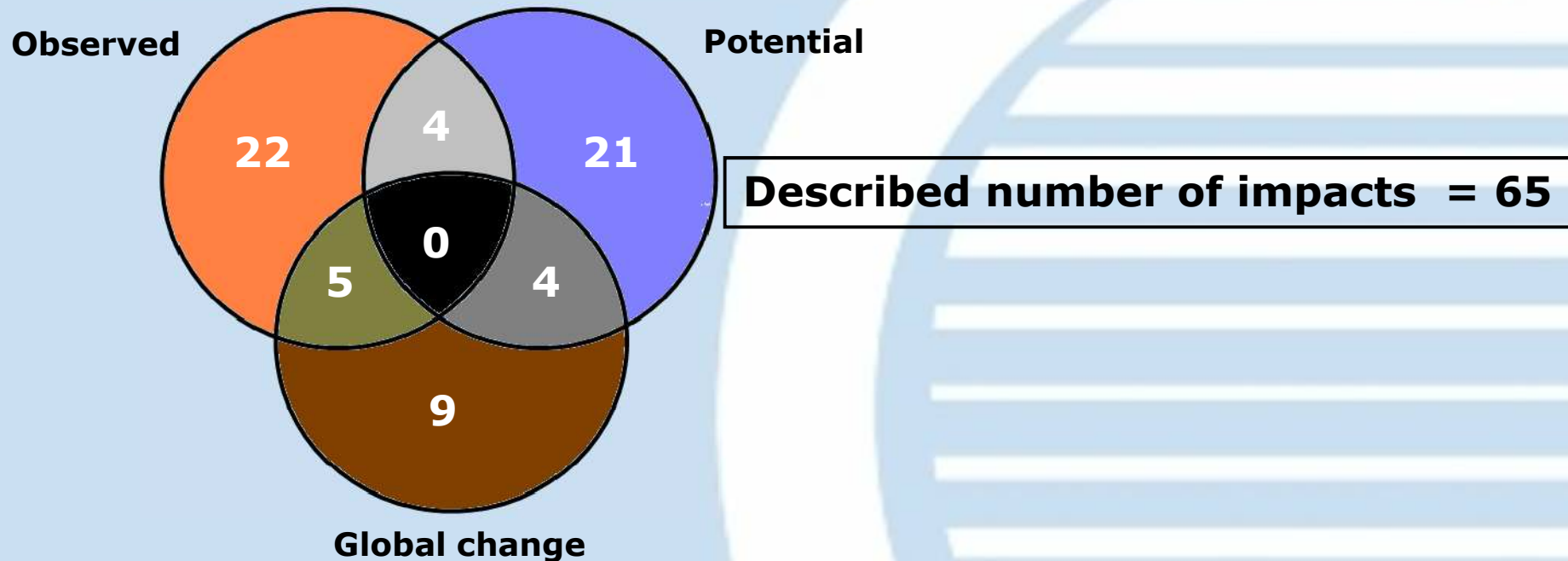
➤ Catalan strategy for Adapting to Climate Change 2020



Map of regional vulnerability to increases in temperature (left figure) and extreme weather events (figure right).

Source: EU Regional Policy DG Internal Challenges in the Perspective of 2020 (April 2009)

SUMMARY OF IMPACTES



SUMMARY OF MEASURES

Total number of proposed measures SYSTEMS = 59

Total number of proposed measures SECTORS = 53

TOTAL NUMBER MEASURES = 112

Financing tools

Should seek funding formulas that encourage adaptation, both from knowledge and from the implementation of effective measures

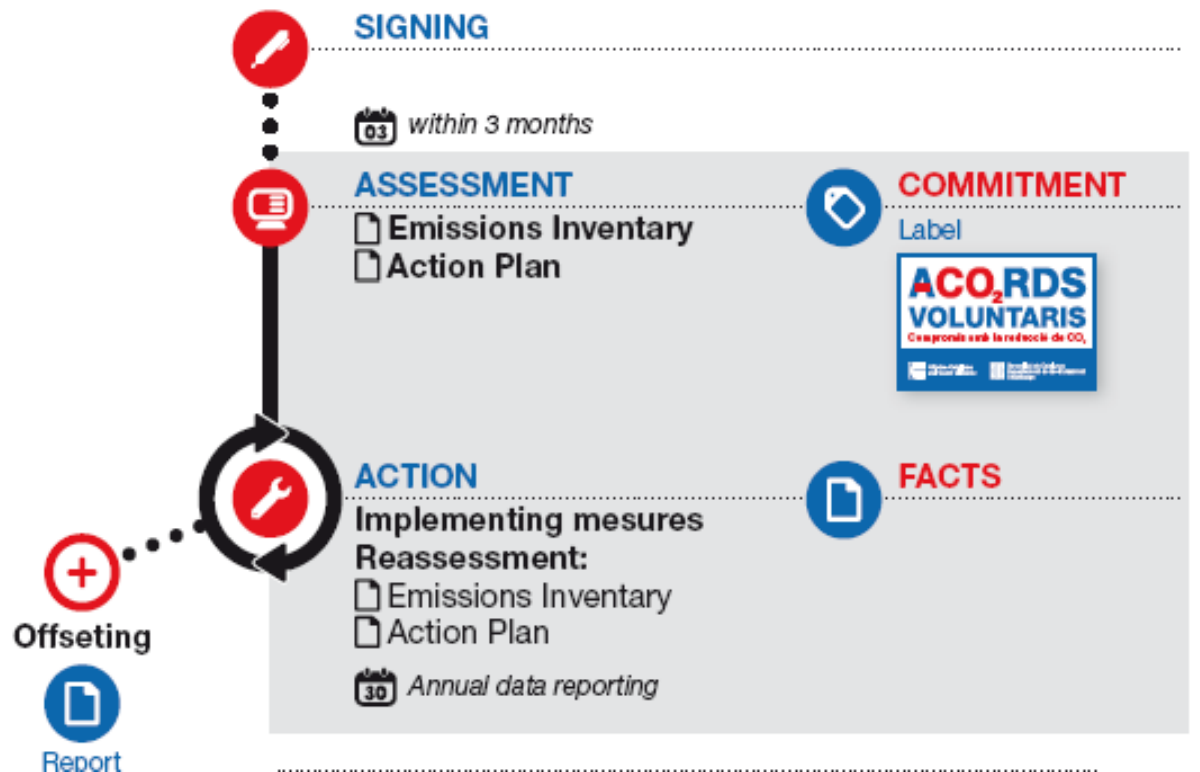
New
environmental
taxation

Payment
for
environme
ntal
services

Reshape tax
burden

Carbon Funds

Voluntary commitment to reduce GHG emissions in Catalonia beyond that required by legislation, based on:



Requirements:

- To draw up an **annual inventory** of greenhouse gas emissions and verify it (except organisations that adopt the simplified procedure) → available an *emissions calculator* for organizations which adopt the simplified procedure
- To propose and implement **yearly measures** to reduce emissions in the inventory

The procedure offers simple communication forms and is not associated with any administration fee

THE CHALLENGES OF THE VOLUNTARY AGREEMENT PROGRAMME

- To involve different actors of Catalan Society in GHG emission reduction
- To contribute to the reduction of GHG emissions in Catalonia and improve the competitiveness of the country and its economic sectors
- Awareness
- To share experiences and best practices

BENEFITS FOR THE COMMITTED ORGANIZATIONS

- To improve competitiveness
- To reduce cost of the energy bill
- To improve continuously organization management
- To reach a strategic position in terms of environmental and climate change

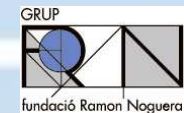
➤ Voluntary Agreement Programme



TO ANY ORGANIZATION WITH
CAPACITY TO REDUCE GHG
EMISSIONS IN CATALONIA

64 organisations have
joined nowadays the
programme!!

- ✓ Primary sector
- ✓ Companies
- ✓ Hotels, restaurants,...
- ✓ Shops
- ✓ Schools, associations and foundations
- ✓ Public administration institutions



MANGO

Voluntary Agreement Programme

WEBSITE

To appear on the programme website as a committed group
www.gencat.cat/canviclimatic (Voluntary Agreement)
and
To access to different dissemination and communication activities

LABEL

To use the label that acknowledges the voluntary effort to contribute to greenhouse gas emissions reduction, once they have submitted their first inventory and package of reduction measures

Report

(download from website)



INFORME ANUAL ACORDS VOLUNTARIS
2010

NOM ORGANITZACIÓ
ORGANITZACIÓ COMPROMESA AMB LA REDUCCIÓ
D'EMISSIONS DE GASOS AMB EFECTE D'ERRENALE
I HA COMPENAT TOTALMENT LES EMISSIONS
DE L'INVENTARI DE L'ANY 2010


Datipic:
NIF:
Codi postal:
Codi ciutat:
Sector:
Emissió d'emissions:
Nº =
Nº =
Nº =
Nº =
Nº =
Nº =

Finalitat i tipus de treball voluntari

Indicadors:
CO2 (emissions en tones)
CO2 (potencial)

Llistat d' mesures de reducció d'emissions

Medida	Any d'implementació	Implementat
Canvi de processos i hàbits	2010-10	25/10/10
Canvi de vehicles i motor	2010-10	Ne



- The absolute majority of the measures proposed by all organizations are addressed to reduce energy consumption. Their way of achieving it, is different:
 - 30% of actions have been aimed at improving the lighting and heating with traditional measures such as installing low energy light bulbs and fluorescent tubes, improving insulation or adjustment of temperature control devices (one or two degrees)
 - other more innovative are the incorporation of automatic systems to suit the lighting and thermal comfort while reducing energy consumption.
- Another 24% of emission reduction measures are related with **mobility**. It includes measures to deal with:
 - the substitution of more efficient cars: Acquisition of hybrid vehicles in some cases already represents 17% of the fleet and the development of own technology to transform the conventional vehicle in hybrid ones (Metropolitan Bus transport).
 - Other actions include efficient driving courses and "carsharing" among employees to minimize displacement or the involvement of suppliers (car rental services) in compensation programs.
 - Among the most innovative in terms of reduced mobility should be noted the implementation of telework (telecommuting) initiatives.

The different programmes that have been described before are actions that the Government of Catalonia has decided to bring out in order to fulfil its commitment towards the Catalan society and also towards the objectives set up in the EU, as a developed region.

But the Catalan government as a result of this experience has considered appropriate to go further and recently announced its intention to elaborate a Climate Change Law. This initiative will boost a political and social debate in the Catalan society that ultimately will make the Catalan climate action stronger to face future challenges

Thanks very much

www.gencat.cat/canviclimatic

**93 444 50 00
Av. Diagonal, 523-525
08029 Barcelona**



**Oficina Catalana
del Canvi Climàtic**