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GREENMA

Tempus project

530620-TEMPUS-1-2012-1-IT-JPCR

RENEWABLE ENERGY IN THE EU

Oana Driha

DEPARTMENT OF APPLIED ECONOMIC ANALYSIS
UNIVERSITY OF ALICANTE

oana.driha@ua.es



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1. INTRODUCTION



Energy

- * Economic activity comprising the generation, distribution and marketing of energy products needed in virtually any economic and social activity.
- * Energy prices depend on the economical-social-political situation (national/regional/international) and vice-versa → inflation/oil prices/wars...



VALUE CHAINS

- * Set of interconnected value-creating activities, implemented by a company or group of companies or organizations required to bring a product or service from conception or acquisition, passing the intermediate stages of production to delivery to final consumers



INTEGRATION OF CONCEPTS: INNOVATION SYSTEMS + VALUE CHAINS

- * Generation and appropriation of value added to lead virtuous circles of innovation. A trend which expands also in less developed economies since the new century

2. Economic outlook and energy sector

- Since 2007 → due to *subprime* mortgages **financial crisis in the US** → contagious effect at global level (as a consequence of financial globalization)...=> **world financial crisis** with the bankruptcy of Lehman Brothers transferred to real economy (productive economy) → **world economic crisis**
- The economic context has dramatically changed. In autumn 2008 the global economy entered the **steepest downturn on record since the 1930s** (including the EU).

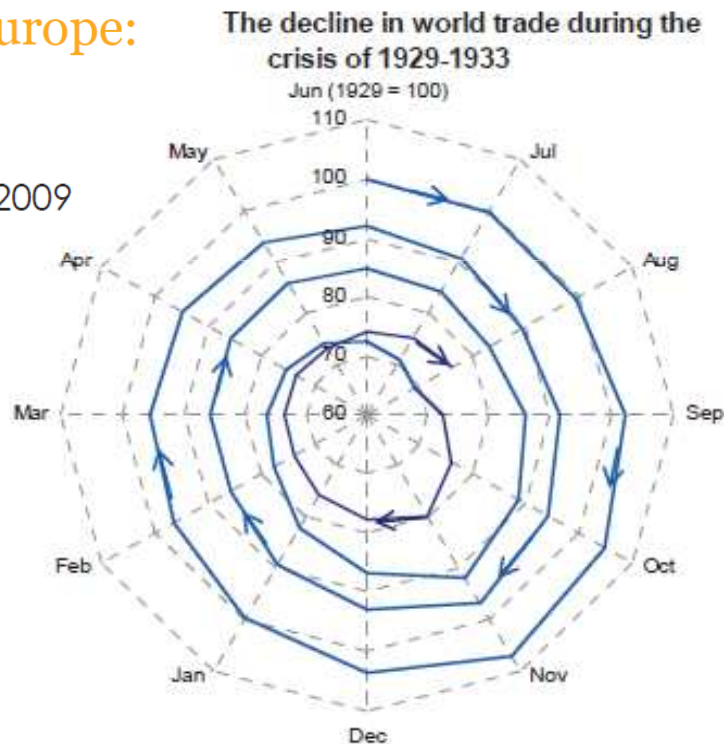




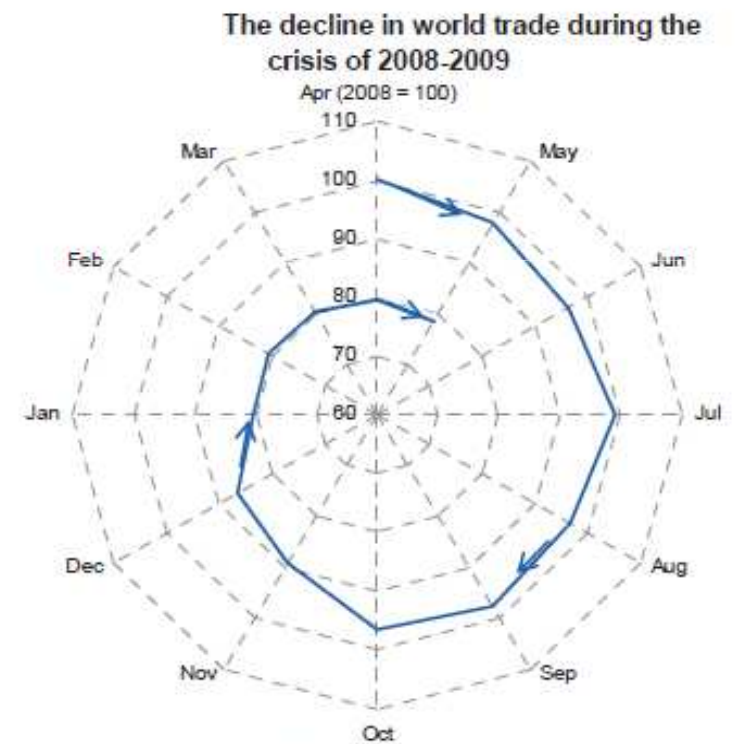
2. Economic outlook and energy sector

Economic Crisis in Europe: Causes, Consequences and Responses

EUROPEAN ECONOMY 7 | 2009



Notes: Light blue from Jun-1929 to Jul-1932 (minimum Jun-1929); dark blue from Aug-1932.
Source: League of Nations Monthly Bulletin of Statistics from Eichengreen and O'Rourke (2009).



Notes: Light blue from Jun-1929 to Jul-1932 (minimum Jun-1929); dark blue from Aug-1932.
Source: League of Nations Monthly Bulletin of Statistics from Eichengreen and O'Rourke (2009).

(Percent change unless noted otherwise)

| | Year over Year | | | | | | Q4 over Q4 | | |
|---|----------------|------------|-------------|------------|---|-------------|-------------------|-------------|------------|
| | 2012 | 2013 | Projections | | Difference from January 2014 WEO Update | | Estimates 2013 | Projections | |
| | | | 2014 | 2015 | 2014 | 2015 | | 2014 | 2015 |
| World Output¹ | 3.2 | 3.0 | 3.6 | 3.9 | -0.1 | -0.1 | 3.3 | 3.6 | 3.7 |
| Advanced Economies | 1.4 | 1.3 | 2.2 | 2.3 | 0.0 | 0.0 | 2.1 | 2.1 | 2.4 |
| United States | 2.8 | 1.9 | 2.8 | 3.0 | 0.0 | 0.0 | 2.6 | 2.7 | 3.0 |
| Euro Area ² | -0.7 | -0.5 | 1.2 | 1.5 | 0.1 | 0.1 | 0.5 | 1.3 | 1.5 |
| Germany | 0.9 | 0.5 | 1.7 | 1.6 | 0.2 | 0.1 | 1.4 | 1.6 | 1.7 |
| France | 0.0 | 0.3 | 1.0 | 1.5 | 0.1 | 0.0 | 0.8 | 1.2 | 1.6 |
| Italy | -2.4 | -1.9 | 0.6 | 1.1 | 0.0 | 0.0 | -0.9 | 0.7 | 1.4 |
| Spain | -1.6 | -1.2 | 0.9 | 1.0 | 0.3 | 0.2 | -0.2 | 1.1 | 0.9 |
| Japan | 1.4 | 1.5 | 1.4 | 1.0 | -0.3 | 0.0 | 2.5 | 1.2 | 0.5 |
| United Kingdom | 0.3 | 1.8 | 2.9 | 2.5 | 0.4 | 0.3 | 2.7 | 3.0 | 1.9 |
| Canada | 1.7 | 2.0 | 2.3 | 2.4 | 0.1 | 0.0 | 2.7 | 2.1 | 2.4 |
| Other Advanced Economies ³ | 1.9 | 2.3 | 3.0 | 3.2 | 0.1 | 0.0 | 2.9 | 2.7 | 3.6 |
| Emerging Market and Developing Economies⁴ | 5.0 | 4.7 | 4.9 | 5.3 | -0.2 | -0.1 | 4.8 | 5.2 | 5.3 |
| Commonwealth of Independent States | 3.4 | 2.1 | 2.3 | 3.1 | -0.3 | 0.1 | 1.3 | 2.0 | 2.5 |
| Russia | 3.4 | 1.3 | 1.3 | 2.3 | -0.6 | -0.2 | 1.1 | 1.6 | 2.5 |
| Excluding Russia | 3.3 | 3.9 | 5.3 | 5.7 | 1.2 | 1.4 | ... | ... | ... |
| Emerging and Developing Asia | 6.7 | 6.5 | 6.7 | 6.8 | 0.0 | 0.0 | 6.4 | 6.7 | 6.8 |
| China | 7.7 | 7.7 | 7.5 | 7.3 | 0.0 | 0.0 | 7.7 | 7.6 | 7.2 |
| India ⁵ | 4.7 | 4.4 | 5.4 | 6.4 | 0.0 | 0.0 | 4.7 | 5.7 | 6.5 |
| ASEAN-5 ⁶ | 6.2 | 5.2 | 4.9 | 5.4 | -0.2 | -0.2 | ... | ... | ... |
| Emerging and Developing Europe | 1.4 | 2.8 | 2.4 | 2.9 | -0.5 | -0.2 | 3.6 | 2.5 | 2.9 |
| Latin America and the Caribbean | 3.1 | 2.7 | 2.5 | 3.0 | -0.4 | -0.3 | 1.9 | 3.1 | 2.5 |
| Brazil | 1.0 | 2.3 | 1.8 | 2.7 | -0.5 | -0.2 | 1.9 | 2.0 | 2.9 |
| Mexico | 3.9 | 1.1 | 3.0 | 3.5 | 0.0 | 0.0 | 0.6 | 4.5 | 2.4 |
| Middle East, North Africa, Afghanistan, and Pakistan | 4.2 | 2.4 | 3.2 | 4.4 | -0.1 | -0.4 | ... | ... | ... |
| Sub-Saharan Africa | 4.9 | 4.9 | 5.4 | 5.5 | -0.7 | -0.3 | ... | ... | ... |
| South Africa | 2.5 | 1.9 | 2.3 | 2.7 | -0.5 | -0.6 | 2.1 | 2.1 | 3.0 |
| <i>Memorandum</i> | | | | | | | | | |
| European Union | -0.3 | 0.2 | 1.6 | 1.8 | 0.2 | 0.1 | 1.1 | 1.7 | 1.7 |
| Low-Income Developing Countries | 5.7 | 6.1 | 6.3 | 6.5 | -0.3 | 0.1 | ... | ... | ... |
| Middle East and North Africa | 4.1 | 2.2 | 3.2 | 4.5 | -0.2 | -0.5 | ... | ... | ... |
| World Growth Based on Market Exchange Rates | 2.5 | 2.4 | 3.1 | 3.3 | 0.0 | 0.0 | 2.8 | 3.0 | 3.2 |
| World Trade Volume (goods and services) | 2.8 | 3.0 | 4.3 | 5.3 | -0.1 | 0.1 | ... | ... | ... |
| Imports | | | | | | | | | |
| Advanced Economies | 1.1 | 1.4 | 3.5 | 4.5 | 0.1 | 0.3 | ... | ... | ... |
| Emerging Market and Developing Economies | 5.8 | 5.6 | 5.2 | 6.3 | -0.7 | -0.1 | ... | ... | ... |
| Exports | | | | | | | | | |
| Advanced Economies | 2.1 | 2.3 | 4.2 | 4.8 | 0.2 | 0.1 | ... | ... | ... |
| Emerging Market and Developing Economies | 4.2 | 4.4 | 5.0 | 6.2 | -0.4 | -0.1 | ... | ... | ... |
| Commodity Prices (U.S. dollars) | | | | | | | | | |
| Oil ⁷ | 1.0 | -0.9 | 0.1 | -6.0 | 0.4 | -0.8 | 2.6 | -2.3 | -6.3 |
| Nonfuel (average based on world commodity export weights) | -10.0 | -1.2 | -3.5 | -3.9 | 2.7 | -1.5 | -3.0 | -3.2 | -3.0 |
| Consumer Prices | | | | | | | | | |
| Advanced Economies | 2.0 | 1.4 | 1.5 | 1.6 | -0.2 | -0.1 | 1.2 | 1.6 | 1.7 |
| Emerging Market and Developing Economies ⁴ | 6.0 | 5.8 | 5.5 | 5.2 | -0.2 | -0.1 | 5.3 | 5.1 | 4.7 |

- The economic analysts, including official bodies (i.e., IMF, OECD and European Commission – DG ECFIN), published **gloomy forecasts about economic activity and growth**. Their medium term and sometimes long term **economic outlooks** have been **drastically revised** compared to 2007, in order to reflect significantly lower economic growth.

Source: IMF, WEO 2014



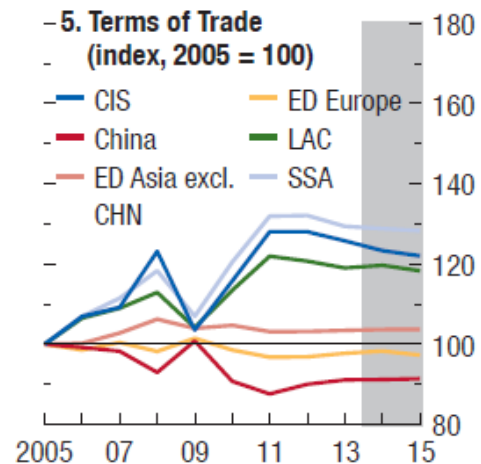
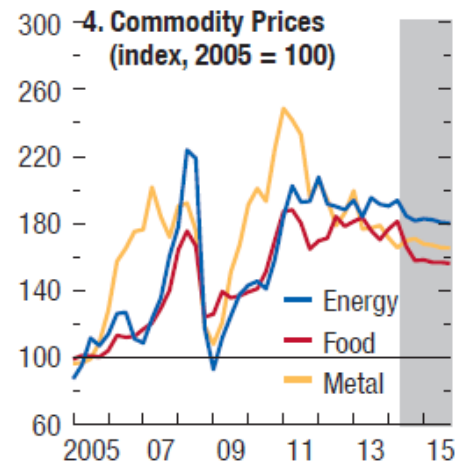
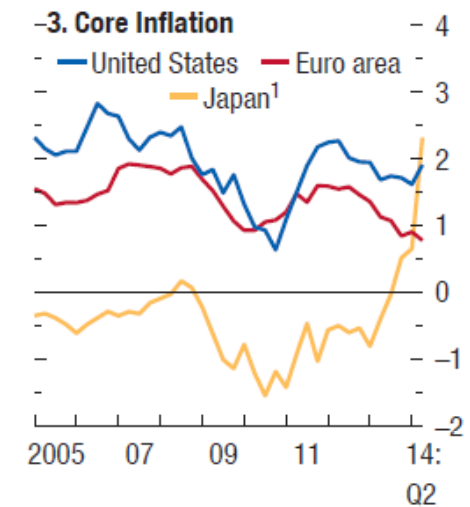
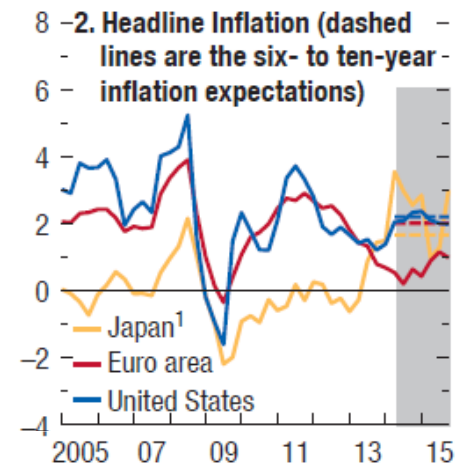
2. Economic outlook and energy sector

- While core inflation does not consider commodity prices, headline inflation does
- This explains the sharper fragmentation of prices evolution in general
- Usually, when energy prices are increasing so do prices of food, metal and other goods and services....

Sources: Consensus Economics; IMF, Primary Commodity Price System; and IMF staff estimates.

Note: CIS = Commonwealth of Independent States; ED Asia excl. China = emerging and developing Asia excluding China; ED Europe = emerging and developing Europe; LAC = Latin America and the Caribbean; SSA = sub-Saharan Africa.

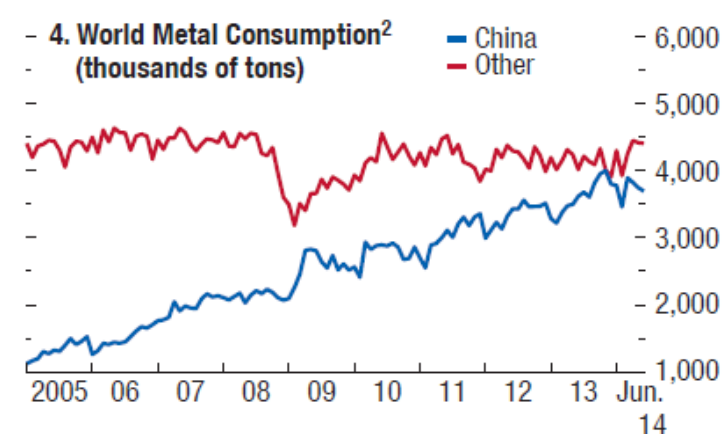
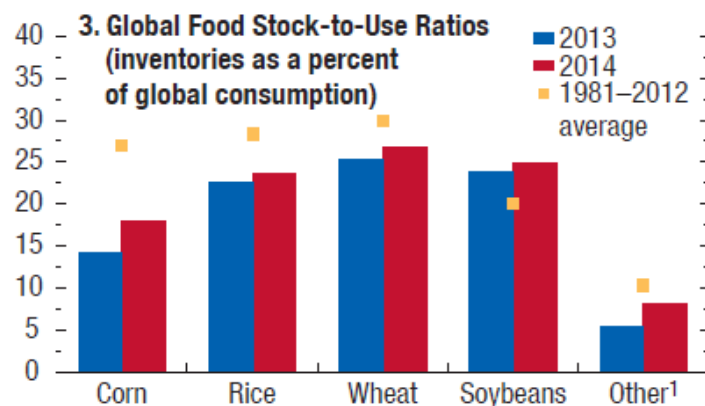
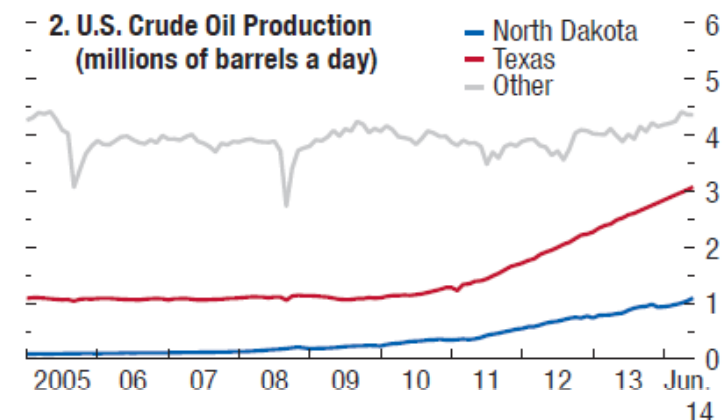
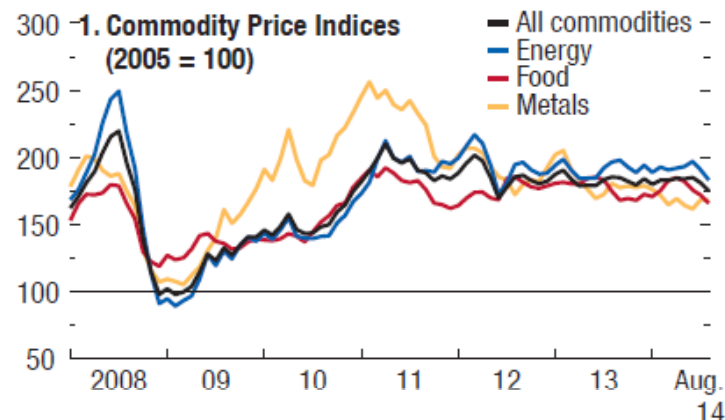
¹In Japan, the increase in inflation in 2014 reflects, to a large extent, the increase in the consumption tax.



Source: IMF, WEO 2014

Commodity Market Developments

The **energy intensive industries** experienced considerable **drops in their production**, while **energy and electricity demand** displayed **negative rates of change** in 2009.



Sources: IMF, Primary Commodity Price System; International Energy Agency; U.S. Department of Agriculture; World Bureau of Metal Statistics; and IMF staff calculations.

¹Includes barley, millet, palm kernel, rapeseed, rye, sorghum, and sunflower seed.

²Metal consumption is the total of aluminum, copper, lead, nickel, tin, and zinc.

2. Economic outlook and energy sector

Crisis policy frameworks: a conceptual illustration

| | <i>Crisis prevention</i> | <i>Crisis control and mitigation</i> | <i>Crisis resolution</i> | <i>EU coordination frameworks</i> |
|-----------------------------|--|---|--|--|
| <i>Financial policy</i> | Regulation, supervision (micro- and macro-prudential) | Liquidity provision, capital injections, credit guarantees, asset relief | State-contingent exit from public support: audits, stress tests, recapitalisation, restructuring | EU supervisory committees, Single Market, Competition policy, joint representation in international fora (G20) |
| <i>Monetary policy</i> | Leaning against asset cycles | Conventional and unconventional expansions | State-contingent exit from expansion, safeguarding inflation anchor | Single monetary policy, European System of Central Banks |
| <i>Fiscal policy</i> | Automatic stabilisers within medium-term frameworks, leaning against asset cycles | Expansions plus automatic stabilisers, while respecting fiscal space considerations | State-contingent exit from expansion, safeguarding sustainability of public finances | Stability and Growth Pact, European Investment Bank |
| <i>Structural policy</i> | Market flexibility, entrepreneurship and innovation | Sectoral aid, part-time unemployment compensation | State-contingent exit from temporary support | Single Market, Competition policy, Lisbon Strategy |
| <i>EU coordinated tools</i> | Micro- and macro-prudential surveillance, fiscal surveillance, peer pressure, learning | Liquidity provision, balance of payment lending facilities, eurobonds | Definition of coordinated exit strategies, structural funds | - |

Source: European Commission



Tempus

2. Economic outlook and energy sector

- Euro crisis: <http://www.bbc.co.uk/news/business-16290598>
- Chronology: <http://www.bbc.co.uk/news/business-13856580>
- EU's actions to euro crisis:
http://www.youtube.com/watch?feature=player_embedded&v=oB3zNcFYqjo



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2. Economic outlook and energy sector

- In addition, **legislation** that will significantly affect **energy demand and production** has been adopted at both the **EU** (i.e. the Climate and Energy Package adopted in December 2008 and several energy efficiency measures adopted in 2008 and 2009) **and the national levels**. Both the crisis and the new legislation made imperative the conception of a new energy baseline scenario.
- <http://www.telegraph.co.uk/news/earth/energy/oil/11258456/Great-news-low-oil-prices-are-destroying-Opecs-power.html>

2012

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Economie

Le monde subit un choc pétrolier «rampant»

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Le monde subit un nouveau choc pétrolier "rampant", les prix du brut ayant atteint des records annuels en 2011 et étant se maintenant à des niveaux très élevés en 2012, selon le bilan annuel de l'Institut français du pétrole et des énergies nouvelles - Jeff Pachoud afp.com

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Mis à jour le 24,01,2012 à 15:13

2. Economic outlook and energy sector

Reformulation of the energy sector

- Changing roles → importing countries become exporters
- Exporters account for most of the growing demand
- The new supply options present a new design idea for resource

Climate change & the few long-term solutions

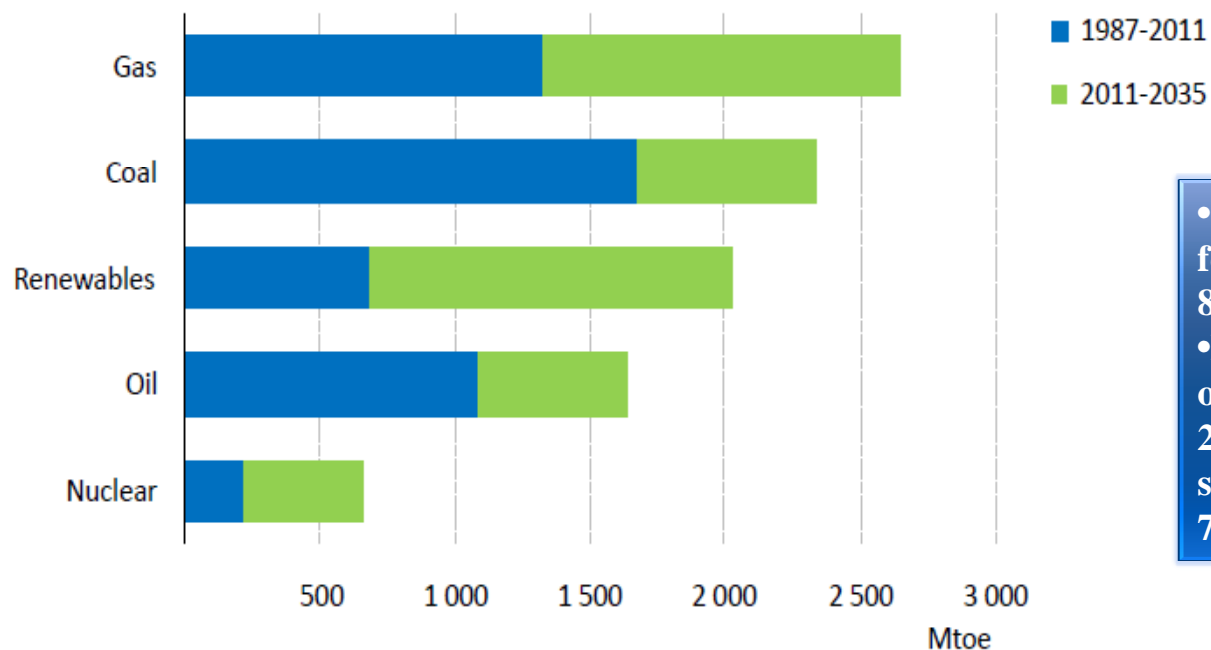
- New vision of energy efficiency, despite the growth of CO₂ emissions
- Subsidies for fossil fuels have increased in 2012 by more than \$ 500 billion
- 1.3 billion people face the lack of electricity

The energy prices lead to more pressure when designing policies

- Extended periods of high oil prices (unprecedented in history)
- Large and persistent regional differences in prices of gas and electricity

2. Economic outlook and energy sector

**Total primary energy demand growth
1987-2011/2011-2035**



A very slow mix to change

- For more than 25 years, fossil fuels share rounded 80%
- Despite the huge growth of renewable energy, for 2035 fossil combustibles should reduce its share to 75% of the energetic mix

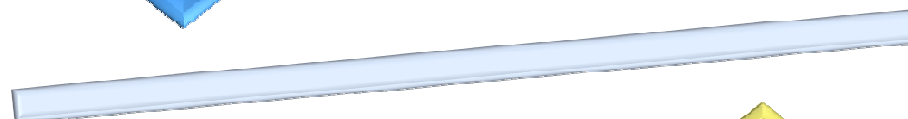
Source: World Energy Outlook (2013)



2. Economic outlook and energy sector



Brazil: Among the most relevant global oil producers



Brazil: Domestic energetic mix...one of the world less intensive in carbon

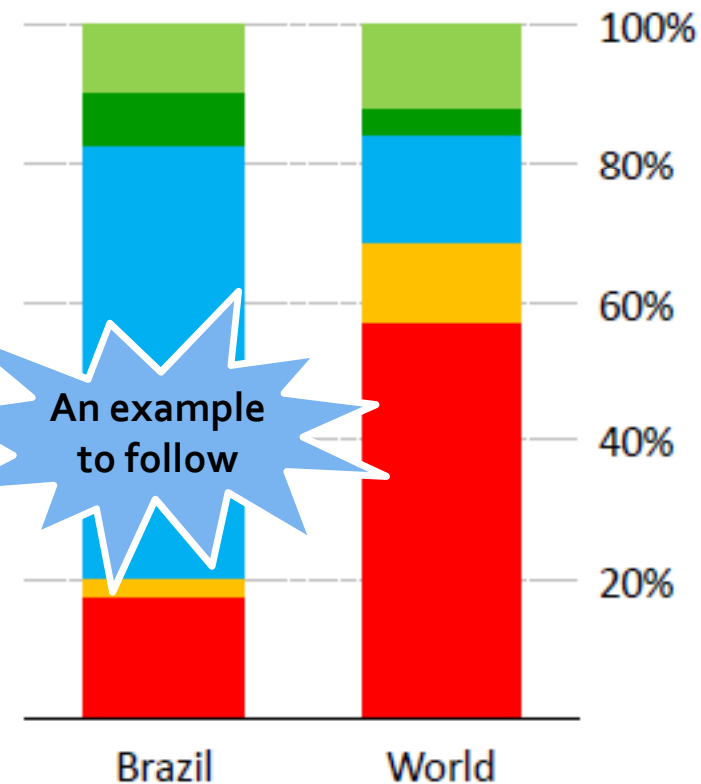


Oil production:

- Other
- Deepwater

Electricity generation:

- Other renewables
- Bioenergy
- Hydropower
- Nuclear
- Fossil fuels

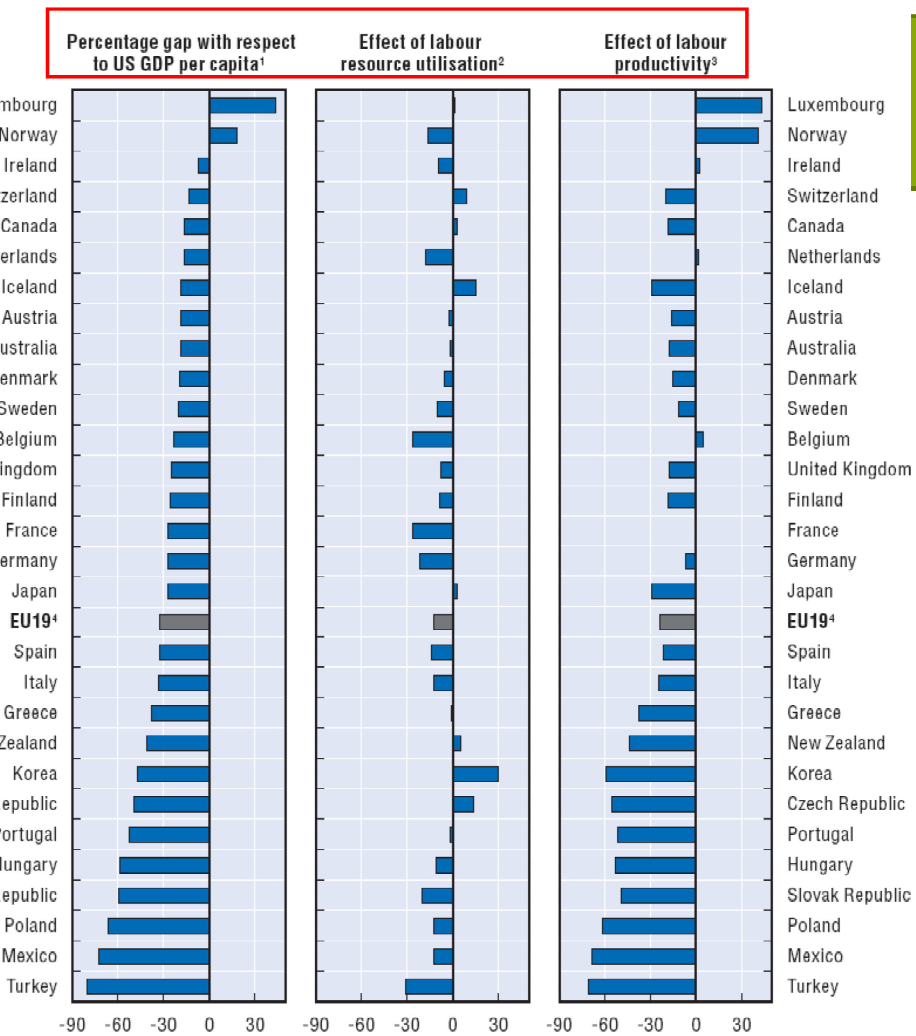


Source: World Energy Outlook (2013)

3. EUROPE 2020

- **Europe 2020** is the European Union's ten-year growth and jobs strategy that was launched in 2010. It's earlier version was the *Lisbon Agenda*, established for the decade **2000-2010** with almost the same objectives: improving EU's economy up to the point of competing with the US and stand out in all aspects (a clear comparison between GDP per capita of both regions pinpoints huge gaps in terms of productivity).
- Under the current economic crisis (after its spread in the EU, especially in the Euro Zone), EU decided to widen the time period for achieving these objectives to 2020.
- It is about more than just overcoming the crisis from which it's now gradually recovering. It is also about addressing the shortcomings of its growth model and creating the conditions for a **smart, sustainable and inclusive growth**.





¹ Based on 2006 purchasing power parities. For Luxembourg, the population is augmented by the number of cross-border workers to take into account their contribution to GDP. Data for Greece take into account the revision to the level of GDP agreed to by Eurostat in October 2007.

² Labour resource utilisation is measured as total number of hours worked per capita.

³ Labour productivity is measured as GDP per hour worked.

⁴ EU19 covers countries that are members of both the European Union and the OECD.



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3. EUROPE 2020

- Some headlines have been set for the EU to achieve by the end of 2020 → to measure its progress in meeting the goals, **5 headline targets** have been agreed for the whole EU as follows:
 1. **Employment:** 75% of the 20-64 year-olds to be employed
 2. **R&D:** 3% of the EU's GDP to be invested in R&D (both public & private investment)
 3. **Climate change and energy sustainability:**
 - **greenhouse gas emissions 20%** (or even **30%**, if the conditions are right)**lower than 1990**
 - **20% of energy from renewables**
 - **20% increase in energy efficiency**
 4. **Education**
 - Reducing the rates of early school leaving below **10%**
 - at least **40%** of 30-34-year-olds completing third level education
 5. **Fighting poverty and social exclusion**
 - at least **20 million fewer people in or at risk of poverty and social exclusion**

3. EUROPE 2020

- This limited set of EU-level targets is translated into national targets in each EU country, reflecting different situations and circumstances.

http://ec.europa.eu/europe2020/pdf/targets_en.pdf

- They give an overall view of where the EU should be on key parameters by 2020. They are translated into national targets so that each Member State can check its own progress towards these goals.
- They do **not imply burden-sharing** – they are common goals, to be pursued through a mix of national and EU action.
- They are **interrelated and mutually reinforcing**:
 - ✓ educational improvements help employability and reduce poverty
 - ✓ more R&D/innovation in the economy, combined with more efficient resources, makes us more competitive and creates jobs
 - ✓ **investing in cleaner technologies combats climate change while creating new business/job opportunities.**

3. EUROPE 2020

- The objectives of the strategy are also supported by seven '[flagship initiatives](#)' providing a framework through which the EU and national authorities mutually reinforce their efforts in areas supporting the Europe 2020 priorities such as innovation, the digital economy, employment, youth, industrial policy, poverty, and resource efficiency.
- Flagship initiatives: Europe has identified new engines to boost growth and jobs. These areas are addressed by **7 flagship initiatives**.
- Within each initiative, both the EU and national authorities have to coordinate their efforts so they are mutually reinforcing. Most of these initiatives have been presented by the Commission in 2010.

3. EUROPE 2020

EU 7 flagship initiatives

- **Smart growth:**
 1. Digital agenda for Europe
 2. Innovation Union
 3. Youth on the move
- **Sustainable growth:**
 4. Resource efficient Europe
 5. An industrial policy for the globalization era
- **Inclusive growth:**
 6. An agenda for new skills and jobs
 7. European platform against poverty



3. EUROPE 2020

- Other EU levers such as the European single market, the EU budget and the EU external agenda also contribute to the achievement of the goals of the Europe 2020 strategy.
- The Europe 2020 strategy is implemented and monitored ([European Semester](#) – the yearly cycle of coordination of economic and budgetary policies).
- In March 2014, the Commission published a Communication taking stock of the Europe 2020 strategy, four years after its launch. In May 2014, a public consultation feeding into the mid-term review of the Europe 2020 strategy was launched.

3. EUROPE 2020

- The financial crisis has had a major impact on the capacity of European businesses and governments to finance investment and innovation projects. To achieve its objectives for Europe 2020, the EU needs:
 - ✓ a **regulatory environment** that ensures effective, secure financial markets
 - ✓ innovative instruments to finance the necessary investment - including public-private partnerships.
- These long-term growth priorities have been taken up in the Commission's proposals for the next [multi-annual financial framework \(2014-2020\)](#) of the EU.
- At present, the [European Regional Development Fund](#), [European Social Fund](#) and [Cohesion Fund](#) together account for more than one third of the EU's overall budget.



3. EUROPE 2020

- These tools help to ensure that money is invested effectively in order to support smart, sustainable and inclusive growth.
- EU funding is helping to support:
 - ✓ More and better jobs
 - ✓ The development of new technologies
 - ✓ Cutting edge research
 - ✓ High-speed internet access
 - ✓ Smart transport and energy infrastructure
 - ✓ **Energy efficiency and renewable energies**
 - ✓ Business development
 - ✓ Skills and training

3. EUROPE 2020

3rd EUROPE 2020 objective: Climate change and energy sustainability

GREENHOUSE GASES

- Around 10% of the greenhouse gases emitted worldwide in 2012 come from the European Union. The EU's share of global emissions is falling as Europe reduces its own emissions and as those from other parts of the world, especially the major emerging economies, continue to grow.
- Both actions are implemented, at European level and at national level (by each Member State) => EU is **well on track towards meeting its targets for cutting greenhouse gas emissions** both under its own internal target in the Europe 2020 Strategy and under the Kyoto Protocol's second commitment period (2013-2020) => it is possible to continue the economic expansion and growth while reducing emissions (since 1990) => **economic growth and emission cuts are not contradictory**.
- The Commission publishes annually the Kyoto and EU 2020 Progress Report, which provides information about the progress made by European Union and its Member States towards their greenhouse gas emission targets.

3. EUROPE 2020

3rd EUROPE 2020 objective: Climate change and energy sustainability

EU Emissions Trading System (EU ETS)

The European Commission is taking action to address the surplus of emission allowances that has built up in the EU ETS, largely as a result of the economic crisis.

- Since 2009 the EU ETS has experienced a growing surplus of allowances and international credits compared to emissions which has significantly weakened the carbon price signal.

Surplus of over 2.1 billion allowances

- At the start of phase 3 the surplus stood at almost two billion allowances, double its level in early 2012, and by the end of 2013 it had grown further to over 2.1 billion. The surplus has been caused by several factors, principally the economic crisis and high imports of international credits.



3. EUROPE 2020

3rd EUROPE 2020 objective: Climate change and energy sustainability

EU Emissions Trading System (EU ETS)

Without action, structural surplus will persist for most of phase 3

- While the rapid build-up is expected to end from 2014, it is not anticipated that the overall surplus will decline significantly during phase 3. Potentially there will be a structural surplus in most of phase 3 of around 2 billion allowances. This risks undermining the orderly function of the carbon market. Moreover, if these imbalances are not addressed they will profoundly affect the ability of the EU ETS to meet more demanding emission reduction targets in future phases in a cost-effective manner.
- The Commission is taking action on two fronts.



3. EUROPE 2020

3rd EUROPE 2020 objective: Climate change and energy sustainability

EU Emissions Trading System (EU ETS)

'Back-loading' of auctions in phase 3

- As a short-term measure, the Commission is [postponing the auctioning](#) of 900 million allowances until 2019-2020 to allow demand to pick up. This 'back-loading' of auctions is being implemented through an [amendment to the EU ETS Auctioning Regulation](#).
- Back-loading does not reduce the overall number of allowances to be auctioned during phase 3, only the distribution of auctions over the period. In 2014 the auction volume will be reduced by 400 million allowances, in 2015 by 300 million, and in 2016 by 200 million.
- The [proportionate impact assessment\(815 kB\)](#) demonstrates that back-loading can rebalance supply and demand in the short term and reduce price volatility without any significant impacts on competitiveness. It can also strengthen government revenues early in phase 3.

3. EUROPE 2020

3rd EUROPE 2020 objective: Climate change and energy sustainability

EU Emissions Trading System (EU ETS)

'Back-loading' of auctions in phase 3

- The amendment was adopted by the Commission following approval by the EU Climate Change Committee and scrutiny by the European Parliament and Council.
- The Parliament and Council had cleared the way for adoption of the amendment by approving, in December 2013, an [amendment to the ETS Directive](#) which clarifies that the timing of auctions may be changed to ensure the orderly functioning of the carbon market.

Proposal for market stability reserve

- As back-loading is only a temporary measure, a sustainable solution to the imbalance between supply and demand requires structural changes to the EU ETS. The Commission proposes to establish a market stability reserve at the beginning of the next trading period in 2021.



3. EUROPE 2020

3rd EUROPE 2020 objective: Climate change and energy sustainability

EU Emissions Trading System (EU ETS)

Proposal for market stability reserve

- The reserve would both address the surplus of emission allowances that has built up and improve the system's resilience to major shocks by adjusting the supply of allowances to be auctioned. It would operate entirely according to pre-defined rules which would leave no discretion to the Commission or Member States in its implementation.
- The [legislative proposal\(64 kB\)](#) , put forward in January 2014 at the same time as the [framework for climate and energy policies up to 2030](#), requires approval by the Council and the European Parliament to become law.

3. EUROPE 2020

3rd EUROPE 2020 objective: Climate change and energy sustainability

EU Emissions Trading System (EU ETS)

Proposal for market stability reserve

- Efforts to address the market imbalance would also be helped by an increase in the annual linear reduction factor which determines the EU ETS [cap](#). To achieve the target of a **40% reduction in EU greenhouse gas emissions below 1990 levels by 2030**, set out in its 2030 framework for climate and energy policy, the Commission proposes an increase in **the linear reduction factor to 2.2% per year from 2021, from 1.74% currently**.



3. EUROPE 2020

3rd EUROPE 2020 objective: Climate change and energy sustainability

EU Emissions Trading System (EU ETS)

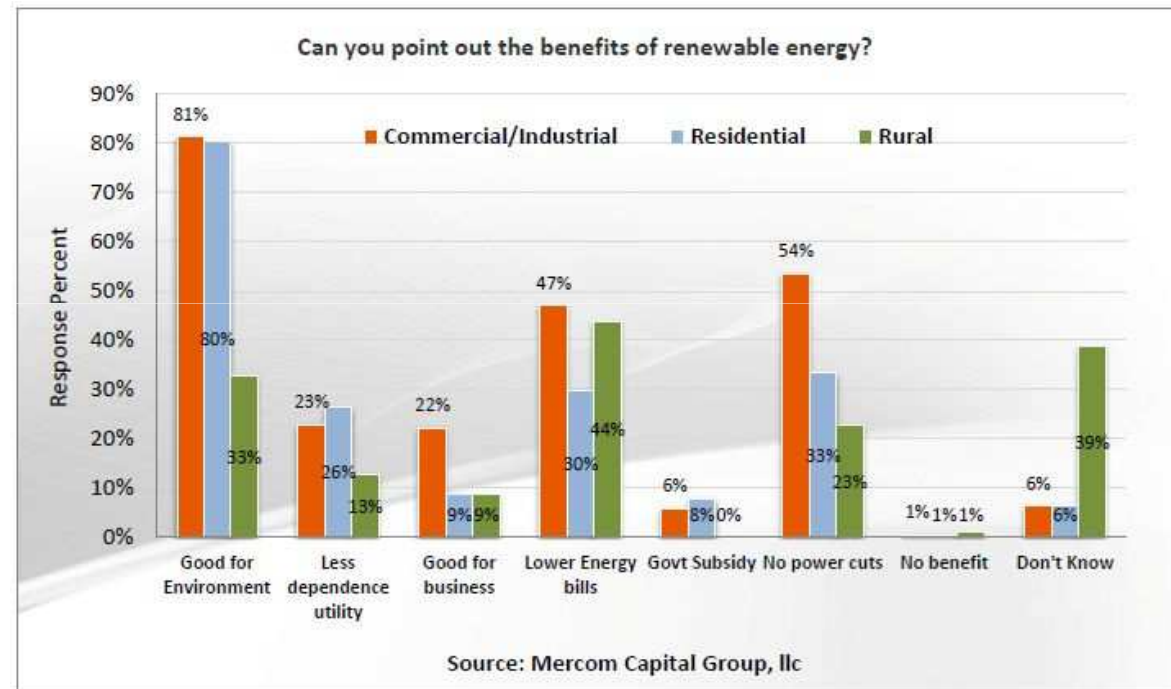
Debate and public consultation on structural measures

- The debate on structural measures was launched by the [first report on the state of the European carbon market\(133 kB\)](#) , published in November 2012, in which the Commission identified six options for correcting the surplus.
- A formal stakeholder consultation ran from December 2012 until the end of February 2013; see [all contributions](#).
- The Commission organised two consultation meetings, [in March](#) and [April 2013](#), which each focused on three of the options identified. The second consultation meeting also looked at possible additional options supported by several stakeholders in the online consultation, including the stability reserve to render auction supply more flexible.
- In October 2013 DG CLIMA hosted a panel of experts to discuss technical aspects related to the creation of a stability reserve.

3. EUROPE 2020

- Mercom Capital Group developed 'India Renewable Energy Awareness Survey'
- only 56% of Indian consumers have heard of 'renewable energy' or 'clean energy', and only 27% of consumers have heard of 'energy efficiency'.
- Although awareness was low, 71% of Indian consumers surveyed are willing to pay higher rates for electricity from renewable energy sources.

<http://mercomcapital.com/awareness-of-renewable-energy-and-energy-efficiency-low-in-india-according-to-survey-by-mercom-capital-group1#sthash.6VNXPkrj.dpuf>



3. EUROPE 2020

- However this is not the case of EU Member → Eurobarometer survey shows increased public concern, and awareness of economic benefits of action

June 2011

- **More than two Europeans in three see climate change as a very serious problem and almost 80% consider that taking action to combat it can boost the economy and jobs, a special Eurobarometer survey published today shows.**

March 2014

- 50% of all Europeans think that **climate change is one of the world's most serious problems** and 16% (around one in six) Europeans think it is the single most serious problem. The proportion of people who think that it is one of the most serious problems ranges from **81% in Sweden to 28% in Estonia.**
- Compared with 2011, there have been small decreases in the proportion of Europeans thinking climate change is the single most serious problem (-4 percentage points) and the proportion mentioning it as one of the world's most serious problems (-1 point). Climate change is perceived to be the third most serious issue facing the world, behind poverty, hunger and lack of drinking water, and the economic situation. In 2011 it was seen as the **second most serious, with the economic situation now seen as more serious.**

3. EUROPE 2020

March 2014

- The majority of Europeans recognise climate change as a serious problem. On a scale of 1-10, where 10 means an “extremely serious problem” and 1 represents “not at all a serious problem” the overall average score for the EU28 stands at 7.3. This compares with a score of 7.4 in 2011. Nine in ten Europeans (90%) think that climate change is a very serious or a serious problem, with 69% scoring it 7-10 and 21% scoring it 5-6." Only a minority (9%) believe that climate change is not a serious problem (scoring it 1-4). These results are similar to those reported in 2011.
- Four in five Europeans (80%) agree that fighting climate change and using energy more efficiently can boost the economy and jobs in the EU, with around three in ten (31%) saying that they “totally agree”. The results are similar to those from 2011.
- Europeans are most likely to think that responsibility for tackling climate change lies with national governments (48%), with slightly smaller proportions thinking responsibility lies with business and industry (41%) and the EU (39%). One in four Europeans (25%) think they have a personal responsibility for tackling climate change. Since 2011 there have been increases in the proportions mentioning national governments (+7 percentage points); business and industry (+6 points); the EU and personal responsibility (+4 points in each).

3. EUROPE 2020

March 2014

- 50% of all Europeans report that they have taken some form of action in the past six months to tackle climate change. Since 2011 there has been a small decrease in the proportion claiming to have taken any action over the past six months (-3 percentage points). Respondents in Sweden are the most likely to say that they have taken some form of action (80%), compared with a quarter or less of people in Estonia (25%) and Romania (23%).
- When prompted with a list of specific actions to fight climate change, and with no timescale specified, the proportion reporting that they have taken some form of action rises to 89% of all Europeans, with this figure showing an increase since 2011 (+4 percentage points).



4. Renewable energy in the European Union

- According to De Quinto & López Milla (2010): "The consequences of **climate change**, the **high dependence on fossil fuels**, and **rising (or at least volatile) energy prices** have compelled the European Commission to propose a comprehensive energy policy combining actions at the European and Member States level. In the framework of this energy policy, the **renewable energy** sector stands out for its **ability to reduce greenhouse gas emissions and pollution**, exploit local and decentralised energy sources, and stimulate world-class high-tech industries. Renewable energy sources are largely indigenous, they do not rely on the future availability of conventional sources of energy, and their predominantly decentralised nature make our economies less vulnerable to volatile energy supply. Consequently, they constitute a **key element of a sustainable energy future**. To reach the dual objective of **increased security of supply** and **reduced greenhouse gas missions**, it is important to ensure that all Member States take the necessary measures to **increase the share of renewables in their energy mix**. The European Commission has proposed overall targets for the share of energy from renewable energies in final energy consumption by year 2020".



4. Renewable energy in the European Union

- March 2007, European Union leaders have agreed to adopt a binding target on the use of renewable energy:



BBC NEWS

'Crucial issue'

Mr Barroso described the agreement as historic, saying it was the most significant in which he had played a part.

"We can say to the rest of the world, Europe is taking the lead, you should join us in fighting climate change," he said.

EU agrees renewable energy target

European Union leaders have agreed to adopt a binding target on the use of renewable energy, such as wind and solar power, officials say.

European Commission President Jose Manuel Barroso said Europe was now able to lead the way on climate change.

The 27 EU states will each decide how they contribute to meeting a 20% boost overall in renewable fuel use by 2020.

The measures could include a ban on filament light bulbs by 2010, forcing people to switch to fluorescent bulbs.

The bulbs last longer but more are more expensive to buy.

In another key measure, agreed on Thursday, EU leaders said they would cut carbon dioxide emissions by 20% from 1990 levels by 2020.

"We can avoid what could well be a human calamity"
Angela Merkel
German Chancellor

UK Prime Minister Tony Blair said: "These are a set of groundbreaking, bold, ambitious targets for the European Union."

"It gives Europe a clear leadership position on this crucial issue facing the world."

Q&A: EU green energy

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

EU leaders are struggling to keep the 27-nation bloc's green energy targets on track amid strains caused by global economic turmoil and fears about unfair competition.

The EU's post-Kyoto targets for cutting greenhouse gases and boosting use of renewables are meant to set an example for the rest of the world. A key part of the plan is the Emissions Trading Scheme (ETS).

France - current holder of the EU presidency - is determined to get a deal on a far-reaching climate change package before next year, but the details are being fiercely debated.

What are the main arguments for these targets?

Responding to the challenge of climate change is "the ultimate political test for our generation," according to European Commission president Jose Manuel Barroso.

Many regions of Europe are vulnerable to climate change impacts, the European Environment Agency says - especially mountainous areas, coastal zones, the Mediterranean and Arctic.

Climate specialists, including the EEA, say northern Europe is getting wetter and the south drier, Arctic summer sea ice is melting faster than expected, many plant and animal species are moving further north and uphill.

Soaring oil and gas prices have made Europe's reliance on imported fossil fuels much more costly - and provided a strong incentive for developing renewables.

The rising cost of energy has also prompted the European Commission to call for a 20% increase in energy efficiency by 2020.

Yet the challenges are so great that the EU ought to have more ambitious targets, some environmentalists say.

What is the ETS?

Launched in 2005, the ETS created a market in carbon emission permits, aimed at giving industry a commercial incentive to reduce greenhouse gases.

Power stations, refineries and other heavy polluters receive permits which can be traded. If an installation's carbon dioxide (CO₂) emissions are higher than the number of permits it has, it must buy extra allowances from other installations which are lower CO₂ emitters.

The ETS currently covers about 10,000 industrial plants across the EU, accounting for about 40% of the EU's total CO₂ emissions. Each permit is equivalent to one tonne of CO₂.

The success of the ETS is crucial to the EU achieving its goal of a 20% reduction in emissions by 2020, compared to 1990 levels. That goal will be extended to 30% if a new international agreement is reached.





Q&A: EU green energy

How will the ETS develop?

The EU is now planning for the period 2013-2020. The first phase of the ETS covered 2005-2007, the second phase 2008-2012. The second phase coincides with the Kyoto Protocol time scale.

Under the 1997 Kyoto deal, the EU is required to cut its CO2 emissions by 8% from 1990 levels by 2012. According to the latest projections, the EU is on track to meet the Kyoto targets. The figures apply to 15 EU nations - the others joined the bloc later.

In the first and second phases, the ETS only covered CO2, whereas in phase three it will also include nitrous oxide and perfluorocarbons.

In phase three, there will be one EU-wide cap on the number of carbon permits, instead of the current system of national allowances for each member state.

The national allowances are now the subject of hard bargaining. Eight new member states in Central and Eastern Europe argue that their CO2 caps do not reflect the progress they made in cutting emissions by closing down communist-era industrial plants in the 1990s.

A row has erupted over the commission's proposal to take 2005 as the baseline year for setting new targets. Poland, heavily dependent on coal-fired power stations, wants the EU's baseline year to remain 1990, as in the Kyoto accord.

The current ETS allocates firms a fixed number of free carbon permits. But from 2013, the European Commission says, the power sector will have to buy all its permits. The full auctioning of permits will be phased in gradually for other industrial sectors.

There is also opposition to that plan, with industry groups in Germany and Italy lobbying hard to delay the start of full auctioning.

Italy's Prime Minister Silvio Berlusconi says the current climate package would impose too big a burden on business, at a time of economic hardship.

EU leaders agreed on 16 October that the climate package would apply "in a rigorously established, cost-effective manner to all sectors of the European economy", but "respecting each member state's specific situation".

The European Parliament has passed a law to include aviation in the ETS from 2012. Airlines will have to cut emissions by 3% in the first year, compared to 2005, and by 5% from 2013 onwards.

The reason for including aviation is that while it accounts for only 3% of EU emissions, it is producing 87% more CO2 now than in 1990.





Q&A: EU green energy

Is the ETS working?

The cost of the ETS to European companies is a major concern as their rivals in the US, China, India and elsewhere do not yet face the same pressure to reduce CO2 emissions.

There are fears that, with the economic downturn forcing firms to cut costs, European jobs could be lost through "carbon leakage" - industry moving operations to ETS-free countries.

But EU leaders see the ETS as an effective tool for the rest of the world to adopt in the global drive to minimise the impact of climate change.

Changes to the ETS have been driven partly by complaints about windfall profits made by the big power companies.

In April 2008 the environment group WWF said the free carbon permit scheme allowed firms to pass on to consumers the cost of cutting emissions. A WWF report said German generators dependent on coal power could make 14bn-34bn euros (£11bn-£26bn) from the free handouts.

The full auctioning of permits is expected to resolve that anomaly. In 2013-2020 the EU member states should be able to generate about 461bn euros from the ETS, according to Linda McAvan MEP, Labour Party spokeswoman on climate change. That revenue could be used to invest in carbon capture technology, renewable energy sources and help for developing countries to expand green energy.



4. Renewable energy in the European Union

http://ec.europa.eu/europe2020/pdf/targets_en.pdf

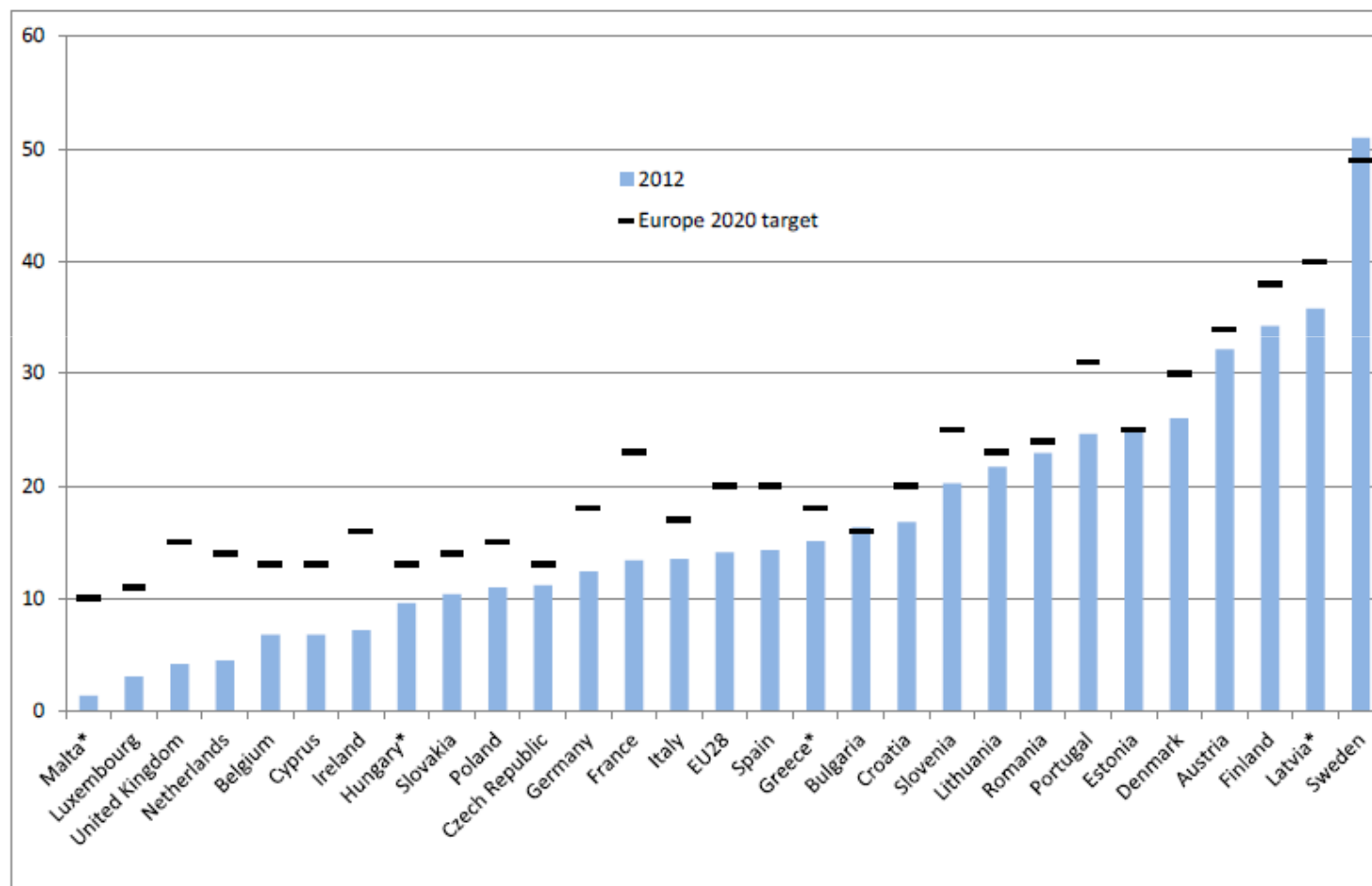
NATIONAL TARGETS FOR SHARE OF ENERGY FROM RENEWABLE SOURCES IN GROSS FINAL CONSUMPTION OF ENERGY

| 2020 proposed shares | | 2020 proposed shares | |
|----------------------|-----|----------------------|-----|
| EU-27 | 20% | PL | 15% |
| MT | 10% | ES | 20% |
| LU | 11% | BG | 16% |
| UK | 15% | FR | 23% |
| BE | 13% | LT | 23% |
| NL | 14% | SI | 25% |
| CY | 13% | DK | 30% |
| IE | 16% | RO | 24% |
| HU | 13% | EE | 25% |
| IT | 17% | PT | 31% |
| DE | 18% | AT | 34% |
| CZ | 13% | FI | 38% |
| SK | 14% | LV | 40% |
| EL | 18% | SE | 49% |

Sources: European Commission (2008a) and European Parliament (2008).



Share of energy from renewable sources per Member State (in % of gross final energy consumption)

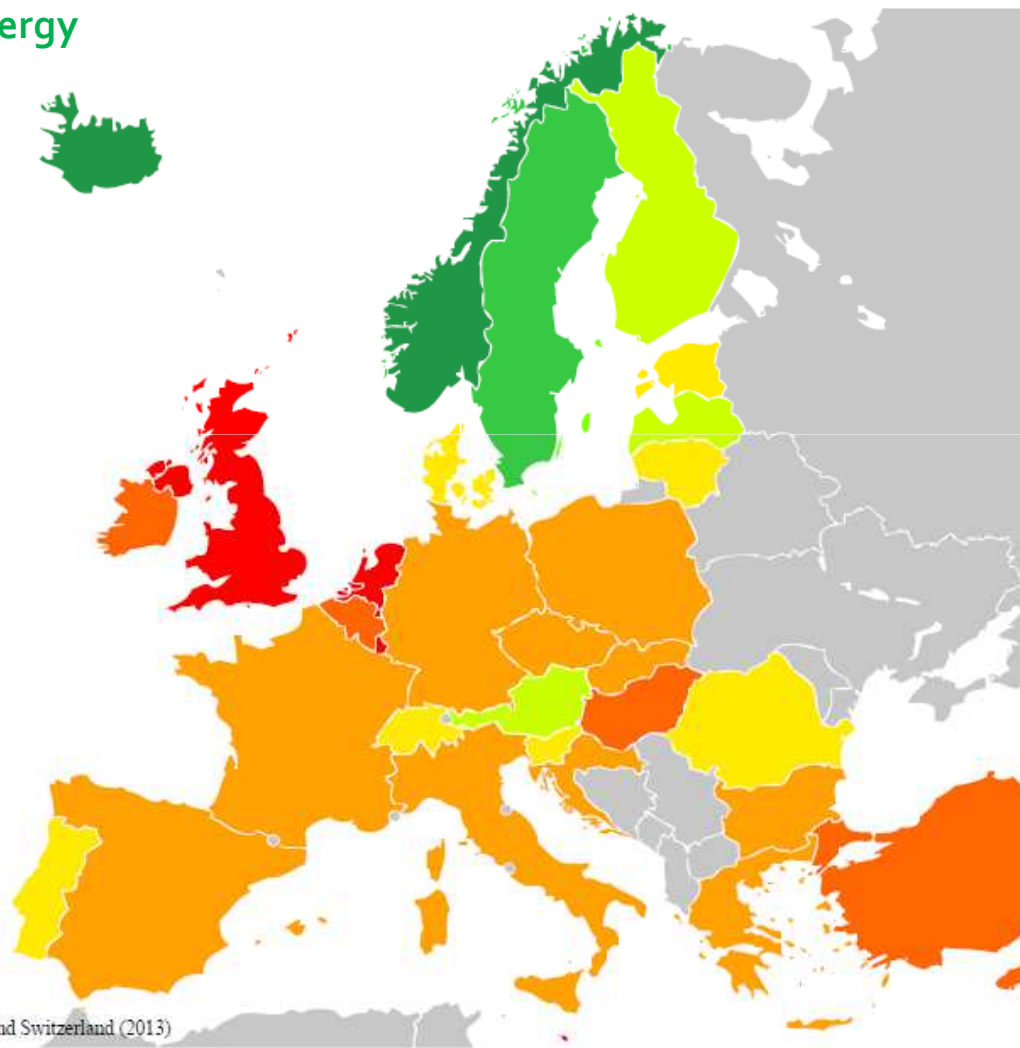
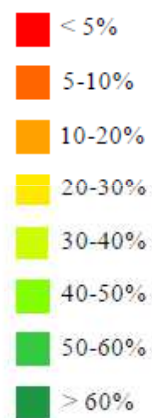


In 2012, Bulgaria and Estonia already reached 2020 target, while Sweden over passed this objective

Source: Eurostat

* estimated

Share of renewable energy in gross final energy consumption (2012)



Eurostat, 2012
(Iceland, Turkey (2010) and Switzerland (2013))



4. Renewable energy in the European Union

- Europe **cannot afford to waste energy** nor other economies.
 - Energy efficiency is one of the central objectives for 2020 as well as a key factor in achieving our long-term energy and climate goals
- ⇒ EU needs to develop a new energy efficiency strategy which will enable all Member States to further decouple their energy use from economic growth.
- ⇒ This strategy will take into account the diversity between Member States in terms of energy needs.
- ⇒ Energy efficiency is the most cost-effective way to reduce emissions, improve energy security and competitiveness, make energy consumption more affordable for consumers as well as create employment, including in export industries.
- ⇒ Above all, it provides tangible benefits to citizens: average **energy savings** for a **household** can amount to **€1 000/year**.

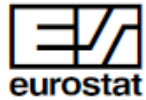
4. Renewable energy in the European Union

- Special attention should be given to the sectors with the largest potential to make energy efficiency gains, namely the existing building stock and transport sector.

<http://ec.europa.eu/eurostat/web/energy/statistics-illustrated>

- The share of energy from renewable sources in **gross final energy consumption** in the EU-27 reached **12.5 % in 2010** and is showing steady progress towards the **Europe 2020 target (20 %)**. During 2009 and 2010 the share of energy from renewable sources continued to grow despite the financial and economic crisis. The year-to-year growth in the gross inland energy consumption of all renewables was in 2010 at the highest level since 1990.





**Share of Renewables to final* energy
consumption**

**Share of Renewables to final* energy
consumption with normalised hydro**

| | <u>2000</u> | <u>2001</u> | <u>2002</u> | <u>2003</u> | <u>2004</u> | <u>2005</u> | <u>2000</u> | <u>2001</u> | <u>2002</u> | <u>2003</u> | <u>2004</u> | <u>2005</u> |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Belgium | 1.2% | 1.3% | 1.4% | 1.6% | 1.8% | 2.2% | 1.2% | 1.3% | 1.4% | 1.6% | 1.8% | 2.2% |
| Bulgaria | 8.0% | 7.1% | 8.4% | 9.0% | 9.6% | 10.6% | 8.2% | 8.1% | 9.0% | 8.8% | 9.4% | 9.4% |
| Czech Republic | 2.1% | 2.4% | 3.2% | 4.2% | 6.0% | 6.3% | 2.4% | 2.7% | 2.9% | 4.3% | 5.9% | 6.1% |
| Denmark | 11.7% | 12.3% | 13.4% | 14.9% | 16.1% | 17.0% | 11.7% | 12.3% | 13.4% | 14.9% | 16.1% | 17.0% |
| Germany | 3.7% | 3.9% | 4.4% | 4.4% | 4.9% | 5.8% | 4.0% | 4.2% | 4.8% | 4.6% | 4.7% | 5.8% |
| Estonia | 16.0% | 15.3% | 14.9% | 14.9% | 19.0% | 18.0% | 16.0% | 15.3% | 14.9% | 14.9% | 19.0% | 18.0% |
| Ireland | 2.2% | 2.2% | 2.4% | 2.2% | 2.6% | 3.0% | 2.2% | 2.3% | 2.3% | 2.4% | 2.7% | 3.1% |
| Greece | 7.3% | 6.5% | 6.7% | 7.2% | 7.3% | 7.5% | 7.4% | 7.3% | 7.2% | 6.8% | 6.8% | 6.9% |
| Spain | 8.0% | 9.1% | 7.5% | 9.4% | 8.4% | 7.6% | 8.3% | 8.2% | 8.3% | 8.6% | 8.5% | 8.7% |
| France | 10.7% | 10.9% | 10.0% | 9.9% | 9.8% | 9.5% | 10.6% | 10.4% | 10.3% | 10.3% | 10.1% | 10.3% |
| Italy | 5.0% | 5.2% | 4.7% | 4.4% | 5.0% | 4.8% | 4.8% | 4.9% | 5.5% | 4.7% | 5.0% | 5.2% |
| Cyprus | 2.6% | 2.5% | 2.5% | 2.5% | 2.6% | 2.9% | 2.6% | 2.5% | 2.5% | 2.4% | 2.6% | 2.9% |
| Latvia | 35.1% | 34.4% | 33.1% | 31.9% | 35.0% | 35.5% | 35.5% | 34.8% | 34.4% | 33.6% | 34.8% | 34.9% |
| Lithuania | 15.1% | 15.3% | 15.4% | 15.4% | 15.4% | 15.0% | 16.7% | 16.8% | 16.8% | 16.9% | 15.4% | 15.0% |
| Luxembourg | 0.9% | 0.7% | 0.9% | 0.8% | 0.9% | 0.9% | 0.9% | 0.8% | 0.7% | 0.8% | 0.9% | 0.9% |
| Hungary | 2.8% | 2.6% | 4.8% | 4.7% | 4.4% | 4.3% | 2.8% | 2.6% | 4.8% | 4.7% | 4.4% | 4.3% |
| Malta | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| Netherlands | 1.6% | 1.6% | 1.6% | 1.8% | 2.0% | 2.4% | 1.6% | 1.6% | 1.6% | 1.8% | 2.0% | 2.4% |
| Austria | 26.6% | 25.8% | 24.9% | 21.8% | 23.3% | 23.0% | 25.6% | 25.4% | 24.7% | 23.8% | 22.8% | 23.3% |
| Poland | 6.5% | 6.9% | 7.3% | 7.0% | 7.1% | 7.2% | 6.5% | 6.9% | 7.2% | 7.1% | 7.1% | 7.2% |
| Portugal | 19.7% | 20.5% | 17.8% | 21.5% | 17.4% | 17.0% | 19.6% | 19.2% | 19.4% | 19.5% | 18.3% | 20.5% |
| Romania | 16.6% | 13.7% | 14.8% | 15.4% | 16.4% | 19.2% | 16.9% | 14.0% | 14.8% | 16.3% | 16.3% | 17.8% |
| Slovenia | 16.9% | 16.1% | 15.4% | 14.3% | 16.1% | 14.9% | 16.4% | 16.2% | 16.7% | 16.4% | 16.2% | 16.0% |
| Slovakia | 3.7% | 6.2% | 5.9% | 5.2% | 6.1% | 6.9% | 3.2% | 5.7% | 5.1% | 5.8% | 6.3% | 6.7% |
| Finland | 29.5% | 27.9% | 27.6% | 26.7% | 29.7% | 28.5% | 29.0% | 28.0% | 28.5% | 28.0% | 29.2% | 28.5% |
| Sweden | 40.0% | 40.0% | 36.5% | 33.9% | 36.3% | 40.8% | 37.4% | 37.2% | 36.5% | 37.3% | 38.2% | 39.8% |
| United Kingdom | 0.9% | 0.9% | 1.0% | 1.0% | 1.2% | 1.3% | 0.9% | 0.9% | 1.0% | 1.1% | 1.2% | 1.3% |
| EU 15 | 7.7% | 7.8% | 7.5% | 7.5% | 7.8% | 8.0% | 7.5% | 7.5% | 7.8% | 7.7% | 7.9% | 8.3% |
| EU 25 | 7.5% | 7.7% | 7.5% | 7.5% | 7.8% | 8.1% | 7.4% | 7.4% | 7.7% | 7.7% | 7.9% | 8.3% |
| EU 27 | 7.7% | 7.8% | 7.6% | 7.7% | 8.1% | 8.3% | 7.6% | 7.6% | 7.9% | 7.9% | 8.1% | 8.5% |

In 2005, 8.5%
of final energy
consumption
were covered
by renewable
energy

Source: Eurostat

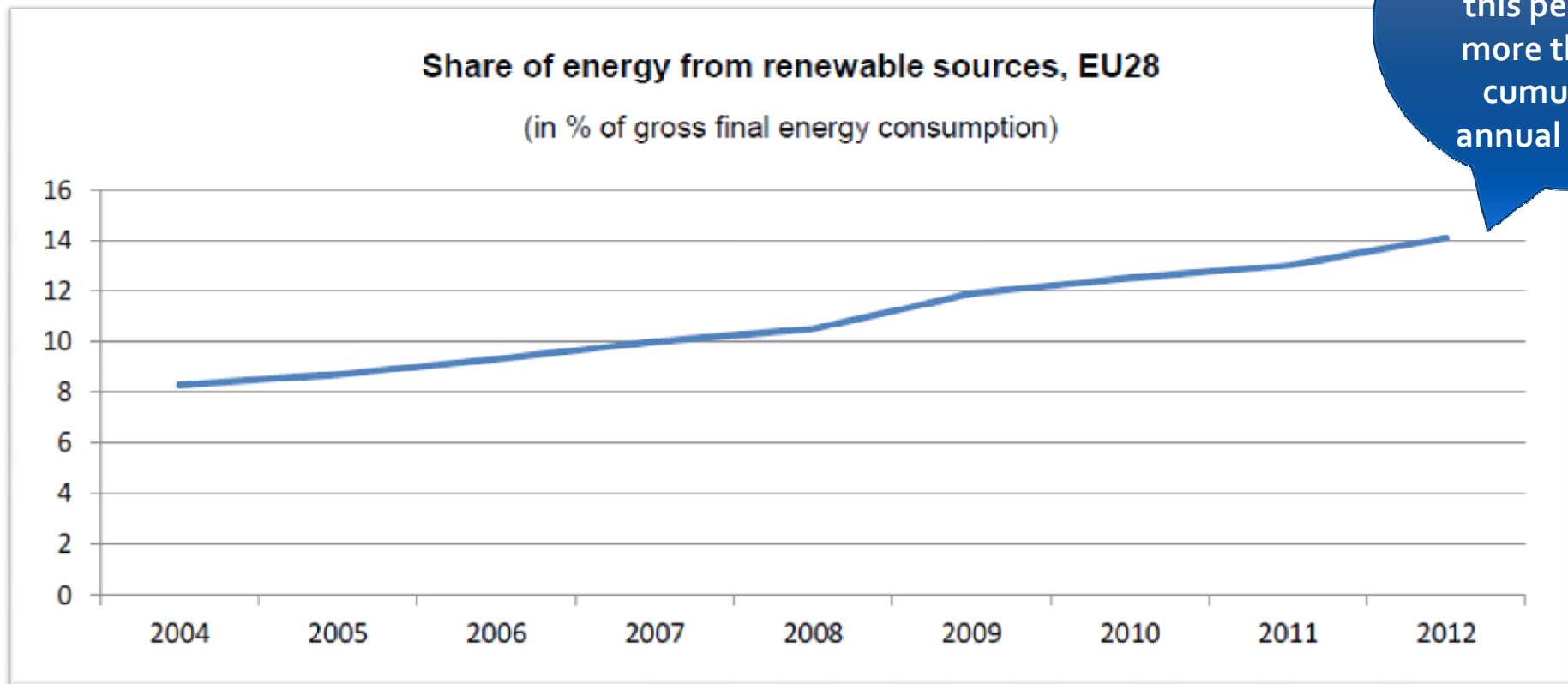


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Universidad de Alicante



4. Renewable energy in the European Union

72.84% increase during this period => more than 7% cumulative annual growth

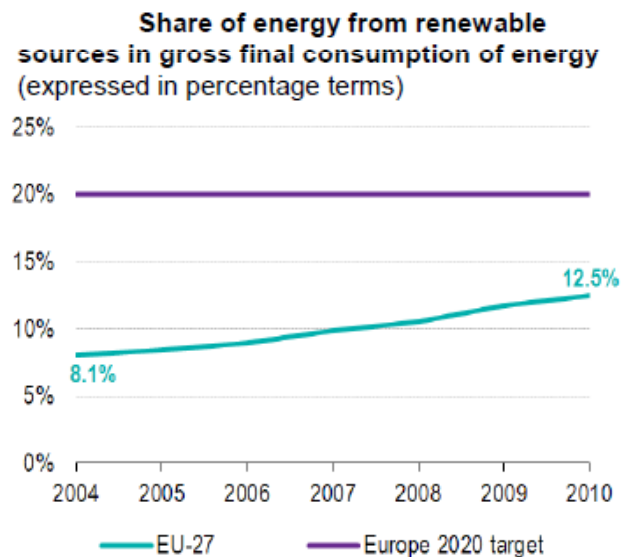


Source: Eurostat



4. Renewable energy in the European Union

- Electricity production from biofuels (liquid and gaseous) as well as wind based electricity generation more than doubled between 2005 and 2010. Wood and wood waste continues to make the largest contribution to the share of energy from renewable sources in gross final energy consumption.



Source: Eurostat (online data code: [t2020_31](#))

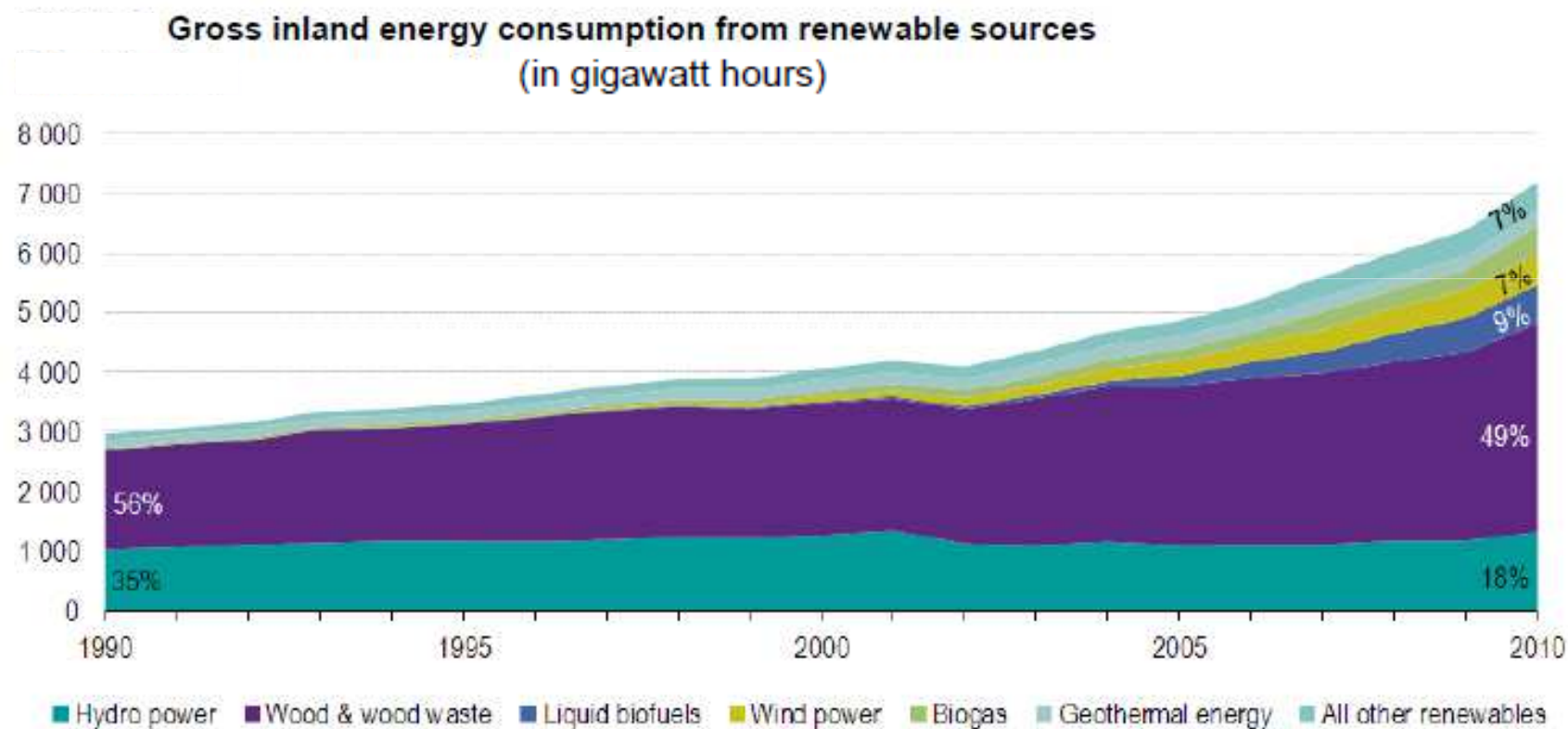
4. Renewable energy in the European Union

Share of renewables in final consumption of energy
(share calculated according to Directive 2009/28/EC and expressed in percentage terms)

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2020 target |
|-----------------------|------|------|------|------|------|------|------|-------------|
| EU-27 | 8.1 | 8.5 | 9.0 | 9.9 | 10.5 | 11.7 | 12.5 | 20 |
| Belgium | 1.9 | 2.3 | 2.6 | 2.9 | 3.3 | 4.6 | 5.1 | 13 |
| Bulgaria | 9.6 | 9.5 | 9.6 | 9.3 | 9.8 | 11.9 | 13.8 | 16 |
| Czech Republic | 6.1 | 6.1 | 6.5 | 7.4 | 7.6 | 8.5 | 9.2 | 13 |
| Denmark | 15.1 | 16.2 | 16.5 | 18.0 | 18.8 | 20.2 | 22.2 | 30 |
| Germany | 5.1 | 5.9 | 6.9 | 9.0 | 9.1 | 9.5 | 11.0 | 18 |
| Estonia | 18.4 | 17.5 | 16.1 | 17.1 | 18.9 | 23.0 | 24.3 | 25 |
| Ireland | 2.2 | 2.7 | 2.9 | 3.3 | 3.9 | 5.1 | 5.5 | 16 |
| Greece | 6.9 | 7.0 | 7.0 | 8.1 | 8.0 | 8.1 | 9.2 | 18 |
| Spain | 8.2 | 8.3 | 9.0 | 9.5 | 10.6 | 12.8 | 13.8 | 20 |
| France | 9.3 | 9.5 | 9.6 | 10.2 | 11.3 | 12.3 | 12.9 | 23 |
| Italy | 5.3 | 5.3 | 5.8 | 5.7 | 7.1 | 8.9 | 10.1 | 17 |
| Cyprus | 2.4 | 2.4 | 2.5 | 3.1 | 4.1 | 4.6 | 4.8 | 13 |
| Latvia | 32.8 | 32.3 | 31.1 | 29.6 | 29.8 | 34.3 | 32.6 | 40 |
| Lithuania | 17.1 | 16.9 | 16.9 | 16.6 | 17.9 | 20.0 | 19.7 | 23 |
| Luxembourg | 0.9 | 1.4 | 1.4 | 2.7 | 2.8 | 2.8 | 2.8 | 11 |
| Hungary | 4.4 | 4.5 | 5.1 | 5.9 | 6.6 | 8.1 | 8.7 | 13 |
| Malta | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 | 10 |
| Netherlands | 1.9 | 2.3 | 2.7 | 3.1 | 3.4 | 4.1 | 3.8 | 14 |
| Austria | 22.9 | 25.0 | 26.6 | 28.9 | 29.2 | 31.0 | 30.1 | 34 |
| Poland | 7.0 | 7.0 | 7.0 | 7.0 | 7.9 | 8.9 | 9.4 | 15 |
| Portugal | 19.2 | 19.6 | 20.8 | 22.0 | 23.0 | 24.6 | 24.6 | 31 |
| Romania | 16.8 | 17.6 | 17.1 | 18.3 | 20.3 | 22.4 | 23.4 | 24 |
| Slovenia | 16.2 | 16.0 | 15.5 | 15.6 | 15.1 | 18.9 | 19.8 | 25 |
| Slovakia | 6.1 | 6.2 | 6.6 | 8.2 | 8.4 | 10.4 | 9.8 | 14 |
| Finland | 29.1 | 28.7 | 29.9 | 29.5 | 31.1 | 31.1 | 32.2 | 38 |
| Sweden | 38.7 | 40.6 | 42.7 | 44.2 | 45.2 | 48.1 | 47.9 | 49 |
| United Kingdom | 1.1 | 1.3 | 1.5 | 1.8 | 2.3 | 2.9 | 3.2 | 15 |
| Norway | 58.4 | 60.1 | 60.6 | 60.5 | 62.0 | 65.1 | 61.1 | 67.5 |
| Croatia | 15.2 | 14.1 | 13.8 | 12.4 | 12.2 | 13.2 | 14.6 | 20 |

Source: Eurostat (online data code: [t2020_31](#))

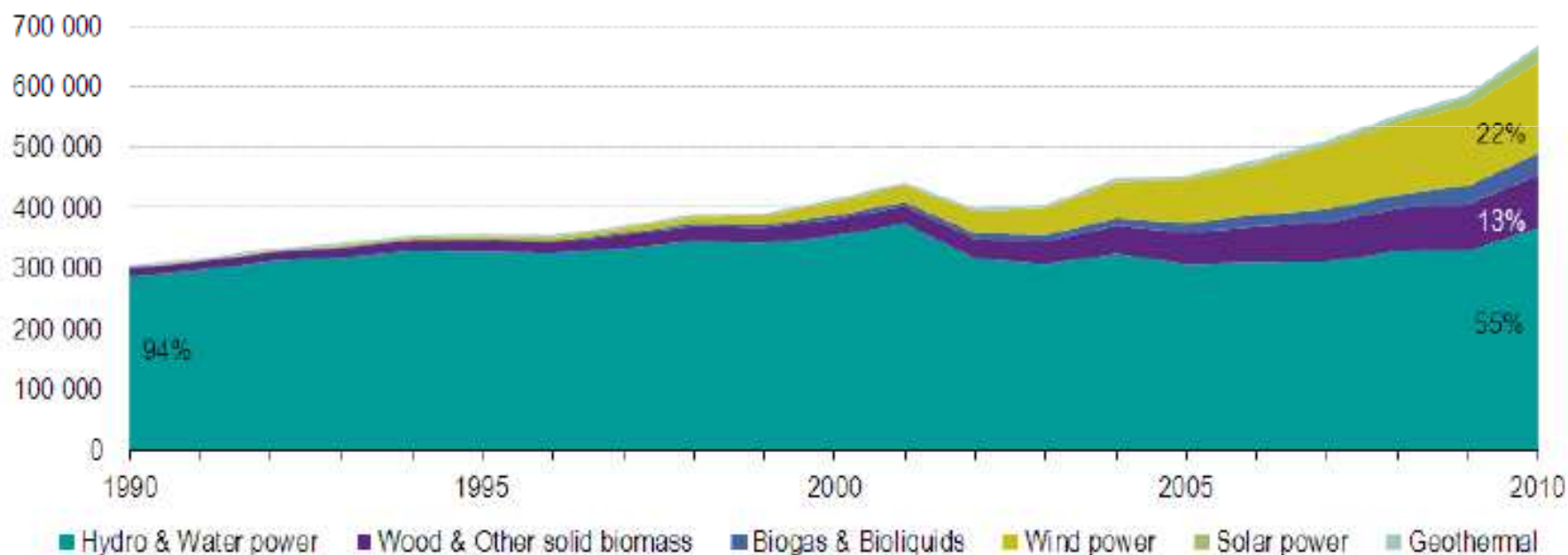
4. Renewable energy in the European Union



Source: Eurostat (online data codes: [nrg_1071a](#), [nrg_1072a](#), [nrg_1073a](#))

4. Renewable energy in the European Union

Gross electricity generation from renewable energy sources
(in gigawatt hours)

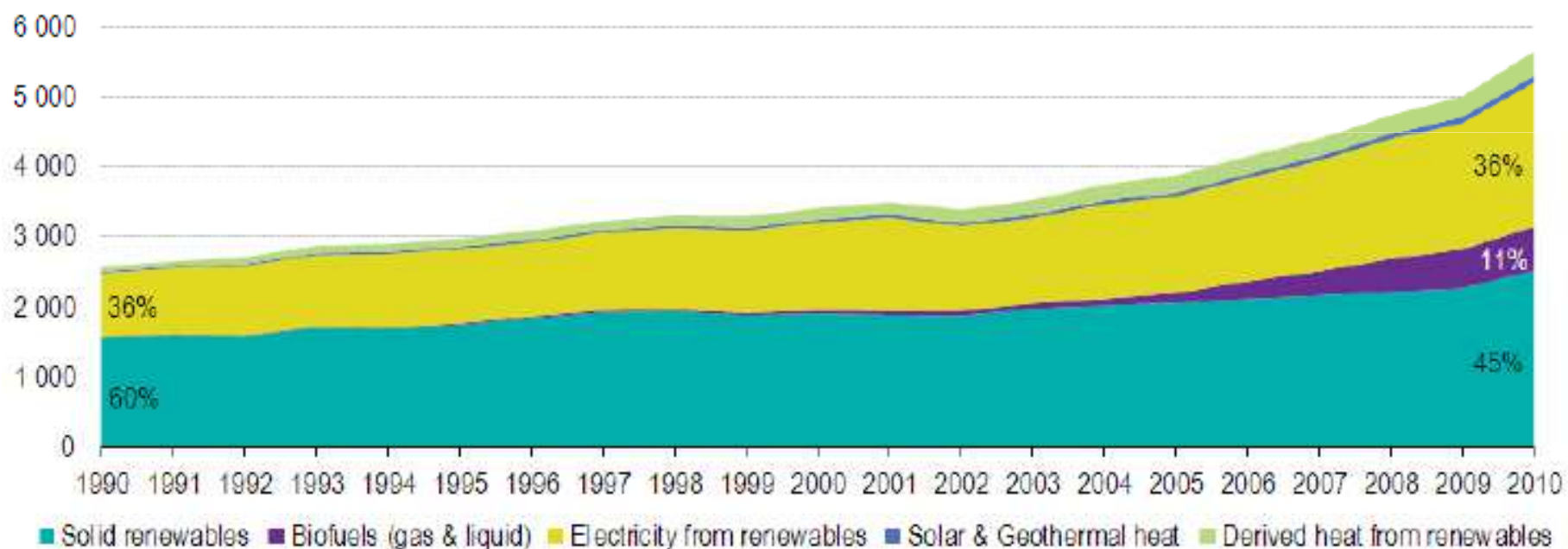


Source: Eurostat (online data code: [nrg_105a](#))



4. Renewable energy in the European Union

Renewable energy available for final consumption
(in petajoules)

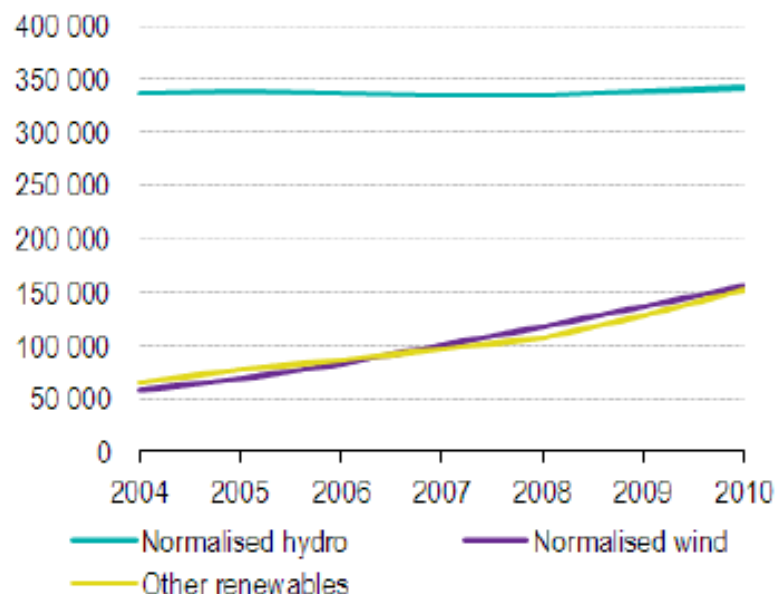


Source: Eurostat (online data codes: [nrg_1071a](#), [nrg_1073a](#), [nrg_105a](#), [nrg_106a](#))



4. Renewable energy in the European Union

Renewable electricity generation with normalised hydro and wind (in gigawatt hours)



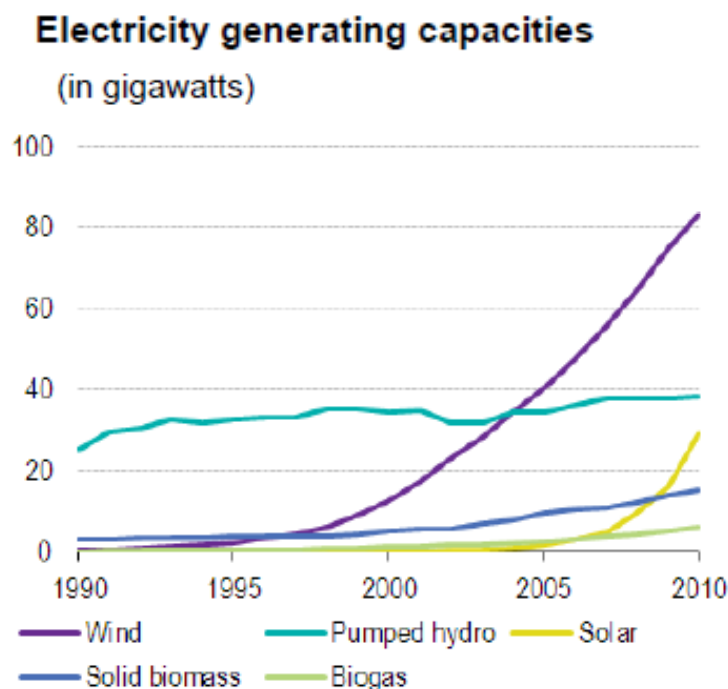
Source: Eurostat ([SHARES 2010 application](#))

Share of electricity from renewable sources in gross electricity consumption (in percentage terms)

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|-----------------------|------|------|-------|------|------|-------|------|
| EU-27 | 14.1 | 14.7 | 15.2 | 15.9 | 16.7 | 18.8 | 19.6 |
| Belgium | 1.7 | 2.3 | 2.9 | 3.4 | 4.4 | 5.8 | 6.9 |
| Bulgaria | 9.0 | 9.3 | 9.4 | 9.4 | 10.0 | 11.3 | 12.9 |
| Czech Republic | 3.9 | 3.9 | 4.2 | 4.7 | 5.2 | 6.4 | 7.5 |
| Denmark | 23.9 | 24.8 | 24.1 | 25.2 | 26.1 | 28.3 | 32.9 |
| Germany | 8.8 | 10.2 | 11.5 | 13.0 | 14.0 | 17.2 | 18.1 |
| Estonia | 0.6 | 1.2 | 1.5 | 1.5 | 2.1 | 6.1 | 10.4 |
| Ireland | 5.5 | 6.7 | 9.3 | 9.8 | 10.9 | 13.7 | 14.8 |
| Greece | 7.8 | 8.1 | 8.9 | 9.3 | 9.6 | 10.5 | 11.9 |
| Spain | 18.7 | 18.9 | 19.8 | 21.6 | 23.6 | 27.8 | 29.5 |
| France | 13.8 | 13.8 | 14.1 | 14.3 | 14.4 | 15.0 | 14.9 |
| Italy | 16.1 | 16.3 | 15.9 | 16.0 | 16.6 | 18.8 | 20.1 |
| Cyprus | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 0.6 | 1.4 |
| Latvia | 46.0 | 43.0 | 40.4 | 38.6 | 38.7 | 42.0 | 42.0 |
| Lithuania | 3.5 | 3.8 | 4.0 | 4.6 | 4.8 | 5.9 | 7.4 |
| Luxembourg | 2.8 | 3.2 | 3.2 | 3.3 | 3.6 | 4.1 | 3.8 |
| Hungary | 2.2 | 4.4 | 3.5 | 4.2 | 5.3 | 7.0 | 7.1 |
| Malta | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Netherlands | 4.4 | 6.3 | 6.6 | 6.0 | 7.5 | 9.1 | 9.7 |
| Austria | 62.2 | 62.3 | 62.3 | 64.6 | 65.2 | 68.0 | 65.5 |
| Poland | 2.3 | 2.8 | 3.1 | 3.5 | 4.4 | 5.9 | 6.7 |
| Portugal | 28.2 | 28.9 | 30.0 | 32.7 | 34.6 | 38.2 | 41.2 |
| Romania | 28.4 | 28.8 | 28.1 | 28.1 | 28.1 | 30.9 | 30.5 |
| Slovenia | 29.5 | 28.7 | 28.2 | 27.7 | 30.0 | 33.8 | 32.2 |
| Slovakia | 13.5 | 14.4 | 15.9 | 16.4 | 17.1 | 17.8 | 17.8 |
| Finland | 26.7 | 26.9 | 26.4 | 25.5 | 27.2 | 27.2 | 27.6 |
| Sweden | 51.2 | 50.9 | 51.8 | 53.2 | 53.6 | 58.3 | 58.0 |
| United Kingdom | 3.5 | 4.1 | 4.5 | 4.8 | 5.4 | 6.6 | 7.4 |
| Norway | 97.6 | 97.0 | 100.5 | 98.7 | 99.8 | 104.8 | 97.3 |
| Croatia | 41.8 | 38.5 | 36.5 | 32.6 | 31.5 | 33.5 | 35.7 |

Source: Eurostat ([SHARES 2010 application](#))

4. Renewable energy in the European Union



Source: Eurostat (online data code: [nrg_113a](#))

Share of renewable energy sources in heating and cooling
(in percentage terms)

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|----------------|------|------|------|------|------|------|------|
| EU-27 | 9.6 | 10.0 | 10.6 | 11.8 | 12.3 | 13.6 | 14.3 |
| Belgium | 2.9 | 3.4 | 3.7 | 3.7 | 4.1 | 5.1 | 5.2 |
| Bulgaria | 14.7 | 14.7 | 14.9 | 14.2 | 15.9 | 21.0 | 23.7 |
| Czech Republic | 8.6 | 9.2 | 9.6 | 11.5 | 11.2 | 11.9 | 12.0 |
| Denmark | 21.3 | 23.5 | 24.5 | 27.8 | 29.0 | 30.8 | 31.9 |
| Germany | 5.3 | 5.6 | 5.7 | 8.5 | 8.5 | 8.5 | 10.5 |
| Estonia | 33.3 | 32.2 | 30.7 | 32.7 | 35.5 | 41.8 | 42.8 |
| Ireland | 2.8 | 3.4 | 3.3 | 3.5 | 3.3 | 3.9 | 4.0 |
| Greece | 12.8 | 12.8 | 12.5 | 14.5 | 14.4 | 15.9 | 18.2 |
| Spain | 9.2 | 9.1 | 10.9 | 10.8 | 11.2 | 12.8 | 12.7 |
| France | 12.1 | 12.3 | 12.2 | 12.7 | 13.6 | 15.4 | 16.9 |
| Italy | 3.5 | 3.5 | 4.6 | 4.4 | 6.1 | 8.2 | 9.5 |
| Cyprus | 8.4 | 8.7 | 9.3 | 11.7 | 12.7 | 14.6 | 16.3 |
| Latvia | 42.5 | 42.7 | 42.6 | 42.4 | 42.9 | 47.9 | 43.8 |
| Lithuania | 30.3 | 29.9 | 29.4 | 29.6 | 32.7 | 34.5 | 33.0 |
| Luxembourg | 1.9 | 3.9 | 3.8 | 4.5 | 4.8 | 4.8 | 5.0 |
| Hungary | 6.5 | 6.0 | 7.5 | 8.9 | 8.3 | 10.5 | 11.1 |
| Malta | 1.1 | 2.2 | 2.6 | 3.2 | 3.6 | 2.1 | 3.1 |
| Netherlands | 1.9 | 2.1 | 2.5 | 2.6 | 2.7 | 3.1 | 2.8 |
| Austria | 20.5 | 24.8 | 26.7 | 30.2 | 28.9 | 31.2 | 30.8 |
| Poland | 10.4 | 10.4 | 10.4 | 10.6 | 11.2 | 11.9 | 12.0 |
| Portugal | 32.2 | 31.9 | 34.1 | 34.8 | 37.3 | 37.9 | 34.5 |
| Romania | 17.4 | 17.9 | 17.6 | 19.4 | 23.2 | 26.4 | 27.2 |
| Slovenia | 18.4 | 19.0 | 18.6 | 20.4 | 19.2 | 24.9 | 26.6 |
| Slovakia | 5.3 | 5.2 | 4.6 | 6.5 | 6.9 | 8.5 | 8.0 |
| Finland | 39.4 | 39.0 | 41.3 | 41.7 | 43.2 | 43.3 | 44.4 |
| Sweden | 48.5 | 54.2 | 59.4 | 62.4 | 64.9 | 68.1 | 66.2 |
| United Kingdom | 0.8 | 0.9 | 1.0 | 1.1 | 1.4 | 1.7 | 1.8 |
| Norway | 29.8 | 33.3 | 32.9 | 34.3 | 36.1 | 37.3 | 36.9 |
| Croatia | 11.7 | 10.8 | 11.4 | 10.6 | 10.4 | 11.6 | 13.0 |

Source: Eurostat ([SHARES 2010 application](#))

4. Renewable energy in the European Union

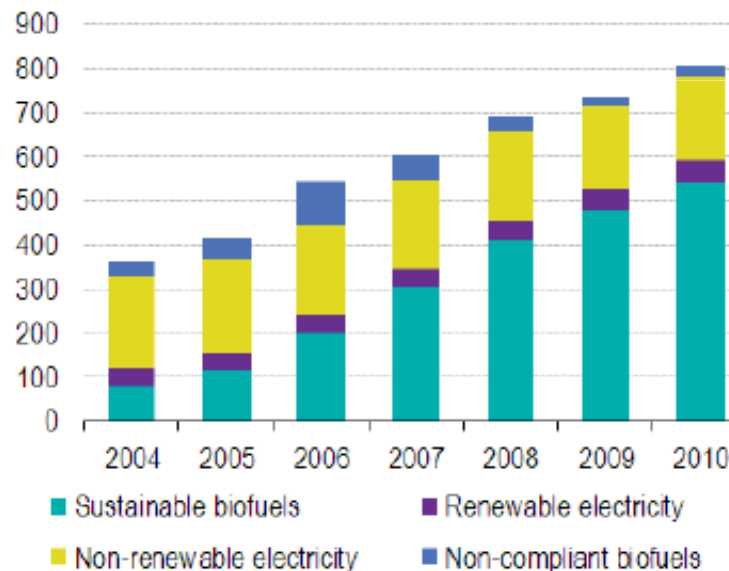
Energy from renewable sources for heating and cooling (in petajoules)



* excludes derived heat and heat pumps

Source: Eurostat ([SHARES 2010 application](#))

Consumption of electricity and biofuels in transport (in petajoules)



Source: Eurostat ([SHARES 2010 application](#))



4. Renewable energy in the European Union

Share of renewable energy sources in transport
(in percentage terms)

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|----------------|------|------|------|------|------|------|------|
| EU-27 | 1.0 | 1.2 | 1.9 | 2.7 | 3.5 | 4.2 | 4.7 |
| Belgium | 0.2 | 0.2 | 0.2 | 1.3 | 1.3 | 3.3 | 4.3 |
| Bulgaria | 0.4 | 0.3 | 0.6 | 0.4 | 0.5 | 0.6 | 1.0 |
| Czech Republic | 1.1 | 0.5 | 0.8 | 1.0 | 2.2 | 3.8 | 4.6 |
| Denmark | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 |
| Germany | 1.9 | 3.1 | 5.5 | 6.6 | 6.1 | 5.3 | 5.7 |
| Estonia | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Ireland | 0.0 | 0.0 | 0.1 | 0.5 | 1.3 | 1.9 | 2.4 |
| Greece | 0.0 | 0.0 | 0.0 | 1.3 | 1.1 | 1.1 | 1.9 |
| Spain | 0.8 | 1.0 | 0.7 | 1.2 | 1.9 | 3.5 | 4.7 |
| France | 1.1 | 1.3 | 2.0 | 3.6 | 5.6 | 6.1 | 6.1 |
| Italy | 1.0 | 0.9 | 0.9 | 0.9 | 2.4 | 3.8 | 4.8 |
| Cyprus | 0.1 | 0.1 | 0.1 | 0.0 | 1.9 | 2.0 | 2.0 |
| Latvia | 1.1 | 1.3 | 1.1 | 0.8 | 0.9 | 1.2 | 3.3 |
| Lithuania | 0.2 | 0.5 | 1.7 | 3.6 | 4.1 | 4.2 | 3.6 |
| Luxembourg | 0.1 | 0.1 | 0.1 | 2.1 | 2.1 | 2.2 | 2.0 |
| Hungary | 0.3 | 0.3 | 0.4 | 1.0 | 4.1 | 4.2 | 4.7 |
| Malta | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 |
| Netherlands | 0.2 | 0.2 | 0.5 | 2.9 | 2.6 | 4.2 | 3.0 |
| Austria | 2.4 | 2.8 | 4.0 | 4.8 | 6.4 | 6.5 | 5.4 |
| Poland | 0.2 | 0.6 | 0.9 | 0.9 | 3.4 | 4.8 | 5.9 |
| Portugal | 0.2 | 0.2 | 1.3 | 2.4 | 2.4 | 3.9 | 5.6 |
| Romania | 0.9 | 1.0 | 0.8 | 1.7 | 1.7 | 1.6 | 3.2 |
| Slovenia | 0.4 | 0.3 | 0.4 | 1.1 | 1.5 | 2.0 | 2.9 |
| Slovakia | 0.6 | 1.1 | 3.0 | 5.0 | 6.4 | 9.2 | 7.8 |
| Finland | 0.5 | 0.4 | 0.4 | 0.4 | 2.4 | 4.1 | 3.9 |
| Sweden | 3.9 | 3.9 | 4.9 | 5.9 | 6.6 | 7.3 | 7.7 |
| United Kingdom | 0.1 | 0.3 | 0.5 | 0.9 | 2.0 | 2.6 | 3.0 |
| Norway | 1.2 | 1.2 | 1.5 | 1.9 | 3.3 | 3.7 | 3.9 |
| Croatia | 0.5 | 0.5 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |

Source: Eurostat (SHARES 2010 application)