Climate and energy country profiles 2014

Key facts and figures for EU Member States

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1 Introduction

The following country profiles contain key quantitative and qualitative information about greenhouse gas emission, renewable energy and energy efficiency for each EU Member State.

These country profiles support and complement the assessment of progress towards climate and energy targets in Europe, presented in the EEA report: 'Trends and projections in Europe – 2014' ([1]). In the EU, each Member State must meet:

- legally binding targets concerning greenhouse gas emissions not covered by the EU Emissions Trading System (ETS) for each year of the period from 2013 to 2020;
- legally binding targets on the 2020 share of renewable energy sources (RES) in gross final energy consumption;
- and non-binding targets for energy consumption for 2020.

Each country profile is divided into two parts.

- The first part, 'Key climate- and energy-related data', presents data and figures on national trends in greenhouse gas emissions, renewable energy and energy consumption. It also includes brief assessments of progress towards national targets concerning greenhouse gas emissions in the sectors not covered by the EU ETS, renewable energy and energy efficiency.
- The second part, 'Climate and energy policy framework', presents an overview of the main national policies and measures for energy and climate mitigation in key sectors. A first section presents the challenges and opportunities for the country to achieve a low-carbon economy.

The information presented in the country profiles originates mainly from the information submitted under the EU Monitoring Mechanism Decision ([2]), the UNFCCC, the Renewable Energy Directive (RED) ([3]), the Energy Efficiency Directive (EED) ([4]) as well as from Eurostat and, national action plans and progress reports on renewable energy and on energy efficiency.

A detailed overview of the definitions, sources and scope of the information used in the country profiles is presented in Chapter 2.

([1]) EEA report No 6/2014 'Trends and projections in Europe 2014' (http://www.eea.europa.eu/publications/trends-and-projections-in-europe-2014)

([2]) Council Decision 280/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol. This decision was replaced by the Monitoring Mechanism Regulation (MMR), which entered into force on 8 July 2013 (Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC).

([3]) Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

([4]) Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC

2 Definitions and sources

Key data on GHG emissions

Data	Definition, note	Source
Total GHG emissions (UNFCCC, Kyoto Protocol)	• Total greenhouse gas (GHG) emissions, excluding net effects of land use, land-use change and forestry (LULUCF) and excluding emissions from international aviation and maritime transport. This scope is consistent with that of the Kyoto Protocol. The EU's 2020 unilateral target of – 20% also covers emissions from international aviation. • 2005-to-2012 GHG emissions were reported in 2014 national greenhouse gas inventories under the UNFCCC. • 2013 (approximated) GHG emissions were reported by Member States by 31 July 2014 under the article 8 of the MMR. Luxembourg submitted its approximated GHG inventory for 2013 too late for inclusion in this report.	• 2005-to-2012 GHG emissions: EEA GHG data viewer: www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer These data are consistent with national GHG inventories. • 2013 (approximated) greenhouse gas emissions: http://www.eea.europa.eu/publications/approximated-eu-ghg-inventory-2013
GHG per capita	• Ratio between total greenhouse gas emissions (see above) and national population on 1 January.	• GHG emissions: see above. • Population data: Eurostat, 2014. http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tps00001 Last update 24/03/2014, accessed 09/07/2014.
GHG per GDP	• Ratio between total GHG emissions (see above) and gross domestic product (GDP) at current market prices in purchasing power standards (PPS).	• Annual macro-economic (Ameco) database of the European Commission, 2014: http://ec.europa.eu/economy_finance/db_indicators/ameco/
Share of GHG emissions in total EU-28 emissions	• Ratio between national total GHG emissions and EU total GHG emissions. • See 'Total GHG emissions (UNFCCC, Kyoto Protocol)' above.	• See 'Total GHG emissions (UNFCCC, Kyoto Protocol)' above.
EU ETS verified emissions	• Verified emissions of stationary installations covered by the EU Emissions Trading Scheme (ETS). Emissions from aviation (which entered the ETS in 2012) are not included.	• EEA EU ETS data viewer, 2014: www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer These data are consistent with the EU transaction log (EUTL).
Share of EU ETS emissions in total emissions	• Ratio between total ETS emissions (stationary installations) GHG emissions and national total GHG emissions. • See 'EU ETS verified emissions' above.	• EEA EU ETS data viewer, 2014: www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer
ETS emissions vs allowances (free, auctioned, sold)	• Gap between verified emissions and allocated allowances, as a share of allocated allowances. • Data on allocated include freely allocated allowances, sold and auctioned allowances. For 2013, these data do not include allocation to electricity generators under article 10c of the ETS Directive.	• EEA EU ETS data viewer, 2014: www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer • These data include additional information on allowance sales and auctions at national level.
Share of CERs & ERUs in surrendered allowances	• Share of international emission credits from the Kyoto flexible mechanisms in the total amount of surrendered compliance units (allowances and international credits). • These credits are either certified emission reductions (CERs) from the	• EEA EU ETS data viewer, 2014: www.eea.europa.eu/data-and-maps/data/data-viewers/emissions-trading-viewer.

Data	Definition, note	Source
	clean development mechanism, or emission reduction units (ERUs) from joint implementation.	
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope	• Emissions covered under the Effort Sharing Decision, for which Member States have national annual targets for the period from 2013 to 2020. • These emissions are defined as those not included in the ETS. They do not include emissions from LULUCF either.	• EEA, based on GHG inventory data and ETS data. • See 'Total GHG emissions (UNFCCC, Kyoto Protocol)' and 'EU ETS verified emissions' above.

Key data on renewable energy

Data	Definition, note	Source
Gross final energy consumption	• All energy delivered for energy purposes to final consumers (industry, transport, households, services (including public services), agriculture, forestry and fisheries). This includes the consumption of electricity and heat by the energy branch for electricity and heat production and including losses of electricity and heat in distribution and transmission (Directive 2009/28/EC).	• Eurostat New Cronos Database — Energy, accessed 15 June 2014.
Renewable energy	• Energy from renewable sources, meaning energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases. • The gross final consumption of energy from renewable sources is calculated as the sum of: (a) gross final consumption of electricity from renewable energy sources; (b) gross final consumption of energy from renewable sources for heating and cooling; and (c) final consumption of energy from renewable sources in transport. • In accordance with the accounting rules in the RED, electricity generated by hydro and wind must be normalised for annual variations (hydro for 15 years and wind for 5 years). • Compliant biofuels can only be accounted for from 2011, when sustainability requirements kicked in under the RED. This results in a steeper growth curve for compliant biofuels compared to the growth curve for 'all biofuels'.	• Eurostat New Cronos Database — Energy, accessed 15 June 2014. • For the gross final consumption of renewable transport fuels including only those biofuels complying with sustainability criteria from the Renewable Energy Directive: Eurostat, 'SHARES Results 2012' (http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/documents/SHARES2012results.xlsx), accessed 15 June 2014.
Share of renewable energy in gross FEC	• Ratio between final consumption from renewable energy sources and total gross final consumption of energy from all energy sources (see above). • The calculation of the share includes flexibility mechanisms and aviation cap adjustments, in accordance with Article 5 of Directive 2009/28/EC.	• Eurostat, 'Share of energy from renewable sources (nrg_ind_335a, code 119800)': http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_ind_335a&lang=en • For the gross final consumption of renewable transport fuels including only those biofuels complying with sustainability criteria from the Renewable Energy Directive: Eurostat, 'SHARES Results 2012' (http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/documents/SHA

Data	Definition, note	Source
		RES2012results.xlsx), accessed 15 June 2014.
Share of renewable energy for electricity	• Ratio between the electricity generated from renewable energy sources (with normalised hydro and wind) and total gross electricity consumption (excluding electricity from pumped storage).	• Eurostat, 'Share of renewable energy in electricity (nrg_ind_335a, code 119820)': http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_ind_335a&lang=en
Share of renewable energy for heating and cooling	• Ratio between the renewable energy consumed for heating and cooling of all energy commodities in industry and in other sectors, and the gross final energy consumption for heating and cooling (i.e. the final energy consumption for heating and cooling of all energy commodities in industry and in other sectors, plus consumption of electricity and heat of the energy branch, for electricity and heat production, plus distribution losses for electricity and heat).	• Eurostat, 'Share of renewable energy in heating and cooling (nrg_ind_335a, code 119830)': http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_ind_335a&lang=en
Share of renewable energy for transport	• Ratio between the renewable energy consumed in transport, and the total gross energy consumed in transport. The former includes the following: (a) biofuels that comply with the sustainability criteria; (b) renewable electricity in electric road vehicles, which is accounted for with 2.5 times the energy content of the input of electricity from renewable energy sources; (c) the contribution of biofuels produced from wastes, residues, non-food cellulosic material, and ligno-cellulosic material, which is considered twice that of other biofuels (Directive 2009/28/EC). • 'All biofuels consumed in transport' refers to renewable transport fuels including those biofuels which do not comply with sustainability criteria from the Renewable Energy Directive.	• Gross final consumption of renewable transport fuels **including only those biofuels complying with sustainability criteria from the Renewable Energy Directive**: Eurostat, 'SHARES Results 2012' (http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/documents/SHARES2012results.xlsx), accessed 15 June 2014. • Gross final consumption of renewable transport fuels **including all biofuels consumed in transport**: Eurostat, 'Share of renewable energy in transport (nrg_ind_335a, code 119810)': http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_ind_335a&lang=en

Key data on energy consumption

Data	Definition, note	Source
Primary energy consumption	• Gross inland consumption, excluding non-energy uses (e.g. natural gas used for producing chemicals but not for combustion). Gross inland consumption is the total energy demand of a country or region (which has not been subjected to any conversion or transformation process). • It represents the quantity of energy necessary to satisfy inland consumption of the geographical entity under consideration.	• 'Supply, transformation, consumption - all products - annual data (nrg_100a)', Eurostat, 2014. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_100a&lang=en
Primary energy consumption per capita	• Ratio between primary energy consumption (see above) and national population on 1 January.	• Primary energy consumption: see above. • Population data: Eurostat, 2014. http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tps00001. Last update 24/03/2014, accessed 09/07/2014.
Final energy consumption	• All energy supplied to the final user (industry, transport, households,	• Eurostat, 2014. http://ec.europa.eu/eurostat/tgm/table

Data	Definition, note	Source
	services and agriculture) for all energy uses, after any conversion or transformation. It excludes deliveries to the energy transformation sector (e.g. fossil fuels delivered to power plants to produce electricity) and the energy industries themselves, as well as network losses.	.do?tab=table&plugin=1&language=en&pcode=ten00095
Final energy consumption per capita	• Ratio between final energy consumption (see above) and national population on 1 January.	• Final energy consumption: see above. • Population data: Eurostat, 2014. http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tps00001. Last update 24/03/2014, accessed 09/07/2014.
Efficiency of conventional thermal electricity and heat production	• Ration between the electricity and heat transformation outputs from conventional thermal power stations and transformation input to conventional thermal power stations	• Eurostat 2014 http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_100a&lang=en
Energy consumption per dwelling by end use	• Final energy consumption for the households sector divided by the number of dwellings per country disaggregated by end uses: space heating, cooking, water heating, lighting and electrical appliances, cooling. Space heating energy consumption is climate corrected. The energy consumption for electric appliances is calculated by multiplying the stock (e.g. refrigerators, freezers TV sets,) with specific energy consumption for the respective appliance.	• Data from ODYSSEE-MURE database http://www.odyssee-mure.eu/)

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

Data	Definition, note	Source
2013 and 2020 ESD target	• National targets under the Effort Sharing Decision. • These targets concern national emissions not covered by the EU ETS. • The ESD targets for 2013 included in the profile are based on global warming potentials from the IPCC's *Fourth Assessment Report*, while the targets for 2020 are based on global warming potentials from the IPCC's *Second Assessment Report*. This is because available 2013 emission data are based on global warming potentials from the IPCC's *Fourth Assessment Report*, while available 2020 projections are based on global warming potentials from the IPCC's *Second Assessment Report*.	• Commission decision of 26 March 2013 on determining Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/EC of the European Parliament and of the Council (2013/162/EU) (OJ L 90, 28.03.2013, p. 106) (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:090:0106:0110:EN:PDF) accessed 14 August 2014. • Commission Implementing Decision of 31 October 2013 on the adjustments to Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/ EC of the European Parliament and of the Council (2013/634/EU) (OJ L 292, 21.10.2013, p. 19) (http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013D0634) accessed 15 August 2014.
2013 ESD emissions	• Emissions covered by the Effort Sharing Decision. • These emissions are based on global warming potentials from the IPCC's *Fourth Assessment Report*.	• Member States submissions under Article 8 of the Monitoring Mechanism Regulation: http://cdr.eionet.europa.eu/ReportekEngine/searchdataflow?dataflow_uris=http%3A%2F%2Frod.eionet.europa.eu%2Fobligations%2F702&years%3Aint%3Aignore_empty=&partofyear=&reporting

Data	Definition, note	Source
		date_start%3Adate%3Aignore_empty=&reportingdate_end%3Adate%3Aignore_empty=&country=&release_status=released&sort_on=reportingdate&sort_order=reverse
2020 ESD projections WEM and WAM	• Projections of greenhouse gas emissions in the sectors covered by the Effort Sharing Decision (i.e. emissions not covered by the EU ETS, excluding LULUCF). • There projections are based on global warming potentials from the IPCC's *Second Assessment Report*. • These projections are provided by Member States in two separate scenarios: (a) 'with existing measures' (WEM), which considers the implementation of existing (already implemented) measures only; and (b) 'with additional measures' (WAM), which considers in addition the implementation of additional (at planning stage) measures. • The projections used are reported by Member States in 2013 and 2014 under the Monitoring Mechanism Decision. All Member States reported updated GHG emission projections under this biennial requirement in 2013 and via their National Communications. In 2014, Member States were not required to report new projections under the Monitoring Mechanism Regulation. However, seven Member States (Cyprus, Ireland, Lithuania, Liechtenstein Luxembourg, Romania and Poland), as well as Switzerland, provided updated GHG emission projections in 2014. These projections were taken into account in this report. • Further details on the quality checks and gap filling performed by EEA on reported projections are presented in Annex 1.3 of the 2014 EEA report on 'Trends and projections in Europe'.	• Member States submissions under Article 3(2) of the Monitoring Mechanism Decision: http://cdr.eionet.europa.eu/ReportekEngine/searchdataflow?dataflow_uris=http%3A%2F%2Frod.eionet.europa.eu%2Fobligations%2F385&years%3Aint%3Aignore_empty=&partofyear=&reportingdate_start%3Adate%3Aignore_empty=&reportingdate_end%3Adate%3Aignore_empty=&country=&release_status=released&sort_on=reportingdate&sort_order=reverse
Assessment of progress	• The assessment of progress towards ESD targets is based on a comparison between 2013 emissions and projected 2020 emissions of domestic ESD emissions under WEM and WAM scenarios and ESD targets (AEAs) for 2013 and 2020. It does not take into account the possible use of flexibility options as permitted under the ESD. All the data used for this assessment are consistent with the scope of the EU ETS for the period from 2013 to 2020. • Further details on the determination of ESD targets and base years, depending on the scope of the EU ETS and the global warming potential values considered, are presented in Annexes 1.6, 1.7 and 1.8 of the EEA 2014 report on 'Trends and projections in Europe'. • Further details on compliance under the ESD, in particular on the permitted use of flexibility provisions for meeting annual targets, are presented in Annex 3.1 of the EEA 2014 report on 'Trends and projections in Europe'.	• See 2014 EEA report on 'Trends and projections in Europe': http://www.eea.europa.eu/publications/trends-and-projections-in-europe-2014.

Progress towards renewable energy targets

Data	Definition, note	Source
2012 RES share in gross final energy consumption	• See definition above in Section 'Key data on renewable energy'.	• See above in Section 'Key data on renewable energy'.
2020 RES target	• Targets on the share of renewable energy in gross FEC as set out in the Renewable Energy Directive.	• Part A of Annex I of Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L 140, 05.06.2009, p. 16) (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=EN) accessed 15 August 2014.
2011–2012 indicative share from RES Directive	• Indicative targets on the share of renewable energy in gross FEC as set out in the Renewable Energy Directive. • The RED sets for each Member State a mandatory national overall target for 2020 and an indicative trajectory for the period from 2011 until 2018, intended to ensure that each Member State achieves its 2020 target. An interim indicative RED target for the EU can be derived from the minimum indicative trajectories of the Member States in the run-up to 2020.	• Annex I Part B of Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (OJ L 140, 05.06.2009, p. 16) (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=EN) accessed 15 August 2014.
2012 expected share from NREAP	• Share of renewable energy in gross FEC as set out in Member States' National Renewable Energy Action Plans (NREAPs). • The NREAPs adopted by Member States in 2010 outline expected trajectories for the share of RES in gross final energy consumption towards the legally binding national 2020 RES targets.	• Eurostat 'SHARES Results 2012' (http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/documents/SHARES2012results.xlsx) accessed 15 June 2014.
Assessment of progress	• The assessment of progress towards renewable targets is based on: (a) a comparison between 2012 levels of RES share in gross final energy consumption and expected 2012 targets based on NREAPs; (b) a comparison between average 2011–2012 levels of RES share in gross final energy consumption and indicative 2011–2012 targets under the RED. • Further details are provided in the 2014 EEA report on 'Trends and projections in Europe'.	• See 2014 EEA report on 'Trends and projections in Europe': http://www.eea.europa.eu/publications/trends-and-projections-in-europe-2014.

Progress towards energy efficiency targets

Data	Definition, note	Source
2005–2012 average annual change in primary or final energy consumption	• See definitions of primary and final energy consumption above. • The 2005–2012 average annual change for primary energy consumption is calculated according to the formula: $(PEC_{2012}/PEC_{2005})^{(1/7)}-1$; a similar	• Eurostat, 2014.

Data	Definition, note	Source
	formula is applied for final energy consumption (FEC)	
2012–2020 average annual change to target in primary or final energy consumption	• See definitions of primary and final energy consumption above. • The 2012–2020 average annual change for primary energy consumption is calculated according to the formula: $(PEC_{2020}/PEC_{2012})^{(1/8)}-1$; a similar formula is applied for final energy consumption (FEC).	• Eurostat, 2014. • Reported targets under Article 3 of EED in 2013, including updates of Cyprus, Malta, Spain and Sweden.
Assessment of progress	• The assessment of progress towards energy consumption targets is based on a comparison between average annual changes between: (a) 2005 and 2012 levels; and (b) 2005 level and 2020 target. • Further details are provided in the 2014 EEA report on 'Trends and projections in Europe'.	• See 2014 EEA report on 'Trends and projections in Europe': http://www.eea.europa.eu/publications/trends-and-projections-in-europe-2014.

Figure: GHG trends and projections

Data	Definition, note	Source
Total GHG emissions (Kyoto Protocol)	• See 'Total GHG emissions (UNFCCC, Kyoto Protocol)' in Section "Key data on GHG emissions".	• 2005-to-2012 GHG emissions: EEA GHG data viewer: www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer These data are consistent with national GHG inventories. • 2013 (approximated) greenhouse gas emissions: http://www.eea.europa.eu/publications/approximated-eu-ghg-inventory-2013
Total GHG emissions (Europe 2020)	• Total greenhouse gas (GHG) emissions, including emissions from international aviation and maritime transport and excluding net effects of land use, land-use change and forestry (LULUCF). This scope is consistent with that of the EU's 2020 unilateral target of – 20% compared to 1990.	• 2005-to-2012 GHG emissions: EEA GHG data viewer: www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer These data are consistent with national GHG inventories. • 2013 (approximated) greenhouse gas emissions: http://www.eea.europa.eu/publications/approximated-eu-ghg-inventory-2013
Non-ETS emissions	• See 'Non-ETS (ESD) emissions' in Section "Key data on GHG emissions".	• See 'Non-ETS (ESD) emissions' in Section "Key data on GHG emissions".
EU ETS emissions	• See 'EU ETS verified emissions' in Section "Key data on GHG emissions".	• See 'EU ETS verified emissions' in Section "Key data on GHG emissions".
Kyoto targets (CP1)	• Average GHG emission targets for the first commitment period (CP1) under the Kyoto Protocol 2008–2012.	• EEA GHG data viewer: www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer
ESD targets	• See '2013 and 2020 ESD target' in Section 'Progress towards GHG targets (under the Effort Sharing Decision)'.	• See '2013 and 2020 ESD target' in Section 'Progress towards GHG targets (under the Effort Sharing Decision)'.
Projections with existing measures Projections with additional measures	• Projections of greenhouse gas emissions. • These projections are provided by Member States in two separate scenarios: (c) 'with existing measures' (WEM), which considers the implementation of existing (already implemented) measures only; and (d) 'with additional measures' (WAM), which considers in addition the implementation of additional (at planning stage) measures.	• Member States submissions under Article 3(2) of the Monitoring Mechanism Decision: http://cdr.eionet.europa.eu/ReportekEngine/searchdataflow?dataflow_uris=http%3A%2F%2Frod.eionet.europa.eu%2Fobligations%2F385&years%3Aint%3Aignore_empty=&partofyear=&reportingdate_start%3Adate%3Aignore_empty=&reportingdate_end%3Adate%3Aignore_empty=&country=&release_status=released&sort_on=reportingdate&sort_order=reverse

Data	Definition, note	Source
	• The projections used were reported by Member States in 2013 and 2014 under the Monitoring Mechanism Decision. All Member States reported updated GHG emission projections under this biennial requirement in 2013 and via their National Communications. In 2014, Member States were not required to report new projections under the Monitoring Mechanism Regulation. However, seven Member States (Cyprus, Ireland, Lithuania, Liechtenstein Luxembourg, Romania and Poland), as well as Switzerland, provided updated GHG emission projections in 2014. These projections were taken into account in this report. • These projections are based on global warming potentials from the IPCC's *Second Assessment Report*. • Further details on the quality checks and gap filling performed by EEA on reported projections are presented in Annex 1.3 of the 2014 EEA report on 'Trends and projections in Europe'.	

Figure: GHG trends and projections by sector

Data	Definition, note	Source
Energy industries	• Sum of the emissions from the public electricity and heat production sector (IPCC sector 1.A.1) and of fugitive emissions (IPCC sector 1.B).	• EEA GHG data viewer: www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer These data are consistent with national GHG inventories.
Direct fuel combustion by end users	• Sum of the emissions due to the combustion of fossil fuels by end users, i.e. buildings and industry, except in the transport sector (IPCC sectors 1.A.2, 1.A.4 and 1.A.5). • In particular, these emissions do not include those related to the consumption of public electricity (accounted for in 'energy industries').	
Transport	• IPCC sector 1.A.3. These emissions do not include those from international bunkers (international maritime transport and international aviation).	
Industrial processes	• IPCC sector 2. These emissions only include process-related emissions. Emissions related to fossil fuel combustion are accounted in 'directed combustion by end users'.	
Agriculture	• IPCC sector 4. Energy-related emissions are accounted in IPCC sector 1 (direct fuel combustion by end users).	
Waste	• Waste, waste management and wastewater management (IPCC sector 6). Emissions related to the incineration of waste with energy recovery are accounted in 'energy industries'.	
LULUCF	• Land use, land-use change and forestry (IPCC sector 5).	
International aviation	• These emissions concern cross-border flights, including within the EU. These emissions are not covered by the Kyoto Protocol, but are included in the EU's 20 % reduction target compared to 1990.	

Data	Definition, note	Source
Projections with existing measures and with additional measures	• See Section 'Figure: GHG trends and projections'.	• See Section 'Figure: GHG trends and projections'.

Figure: Primary and final energy consumption

See Section 'Progress towards energy efficiency targets'.

Figure: Primary energy consumption by fuel type

See Section 'Progress towards energy efficiency targets'.

Figure: Renewable energy consumption

See Section 'Progress towards renewable energy targets'.

Figure: Renewable energy consumption by carrier

See Section 'Progress towards energy efficiency targets'.

3 Commonly used acronyms and abbreviations

CAP	Common Agricultural Policy
CCS	carbon capture and storage
CHP	combined heat and power
E	electricity
EED	Energy Efficiency Directive (Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC)
ESD	Effort Sharing Decision
EU	European Union
ETS	Emissions Trading System
FEC	final energy consumption
GDP	gross domestic product
GHG	greenhouse gas
H&C	heating and cooling
ktoe	thousand tonnes of oil equivalent
LULUCF	Land Use, Land-Use Change and Forestry
MMR	Monitoring Mechanism Regulation (Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC)
Mt CO_2 eq.	million tonnes of carbon dioxide equivalent
Mtoe	million tonnes of oil equivalent
NREAP	National Renewable Energy Action Plan
PV	photovoltaic(s)

RED	Renewable Energy Directive (Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC)
RES	renewable energy sources
T	transport
toe	tonne of oil equivalent
UNFCCC	United Nations Framework Convention on Climate Change
WAM	with additional measures
WEM	with existing measures

4 Country profiles

Key climate- and energy-related data — Austria

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2 eq.)	92.6	82.8	80.1	80.4	4 544.2
GHG per capita (t CO_2 eq./cap.)	11.3	9.8	9.5	9.5	9.0
GHG per GDP (g CO_2 eq./PPS in EUR)	400	305	287	284	350
Share of GHG emissions in total EU-28 emissions (%)	1.8 %	1.8 %	1.8 %	1.8 %	
EU ETS verified emissions (Mt CO_2 eq.)	33.4	30.6	28.4	29.9	1 848.6
Share of EU ETS emissions in total emissions (%)	36 %	37 %	35 %	37 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	+3.0 %	-1.2 %	-8.3 %	-18.6 %	-14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	6.5 %	32.9 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO_2 eq.)	56.8	50.1	49.7	50.4	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			30.8 %	32.1 %	14.1 %
() = including all biofuels consumed in transport	(24.0 %)	(30.8 %)			
Share of renewable energy for electricity (%)	62.5 %	64.9 %	65.0 %	65.5 %	23.5 %
Share of renewable energy for heating and cooling (%)	22.6 %	30.7 %	30.9 %	32.8 %	15.6 %
Share of renewable energy for transport (%)			7.6 %	7.7 %	5.1 %
() = including all biofuels consumed (%)	(2.8 %)	(8.6 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	32.6	32.7	31.9	31.8	1 583.5
Primary energy consumption per capita (Mtoe/cap.)	4.0	3.9	3.8	3.8	3.1
Final energy consumption (Mtoe)	28.2	28.4	27.5	27.3	1 104.5
Final energy consumption per capita (Mtoe/cap.)	3.4	3.4	3.3	3.3	2.2
Efficiency of conventional thermal electricity and heat production (%)	61.5 %	66.1 %	64.5 %	63.1 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.86	1.81	1.82	1.78	1.42
Space heating and cooling (toe/dwelling)	1.40	1.34	1.32	1.30	0.96
Water heating (toe/dwelling)	0.21	0.21	0.23	0.22	0.18
Cooking (toe/dwelling)	0.04	0.03	0.03	0.03	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.21	0.23	0.24	0.24	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	-9.4 %	2020 ESD target (% vs base year)	-16.0 %
2013 ESD emissions (% vs base year)	-11.4 %	2020 ESD projections WEM (% vs base year)	-9.4 %
		2020 ESD projections WAM (% vs base year)	-15.5 %

Based on approximated emission estimates, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections (adjusted by EEA) indicate that 2020 ESD emissions are expected to be above the 2020 ESD target, despite the implementation of measures planned until 2013. However, national projections indicate ESD emissions lower than the 2020 target.

Progress towards energy efficiency targets

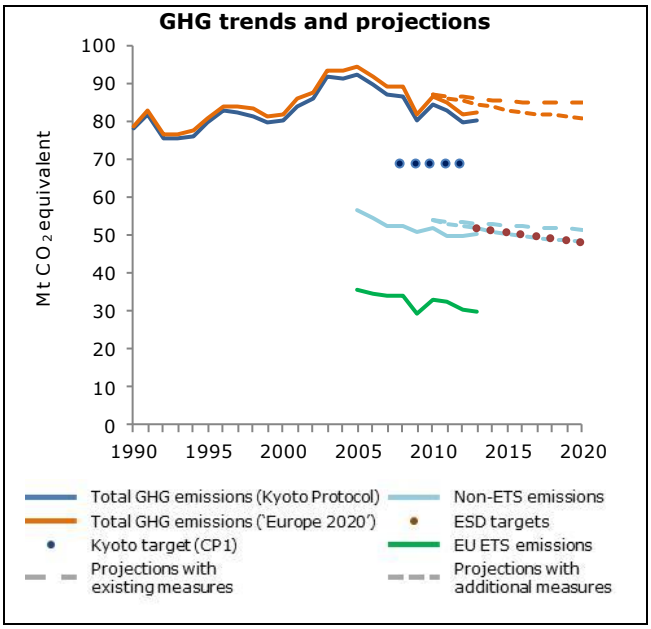
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-0.4 %	2005–2012 average annual change	-0.4 %
2012–2020 average annual change to target	-0.1 %	2012–2020 average annual change to target	-0.5 %

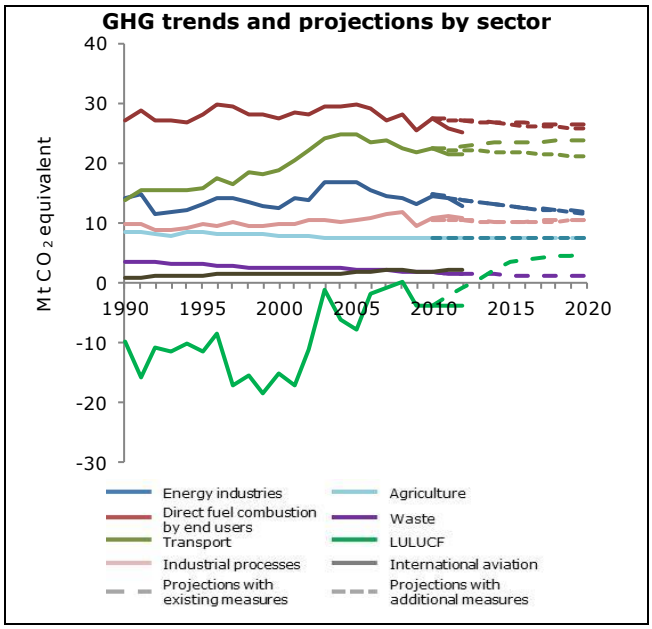
Primary and final energy consumption decreased by approximately 3 % during the period 2005–2012. Addressing distribution losses, as well as planning issues in order to address urban sprawl and increasing energy demand in urban areas (due to the increasing number of inefficient high-rising buildings) could contribute to further reducing primary energy consumption. Further efforts to improve energy efficiency in industry could contribute to further reducing final energy consumption.

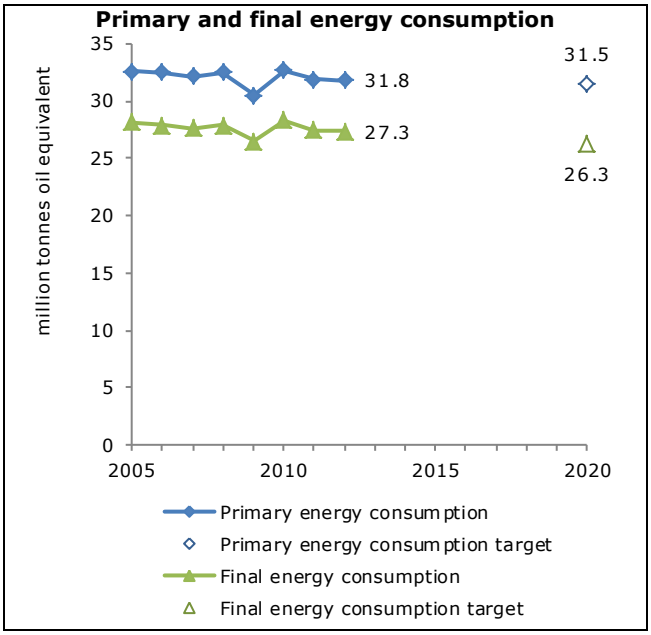
Progress towards renewable energy targets

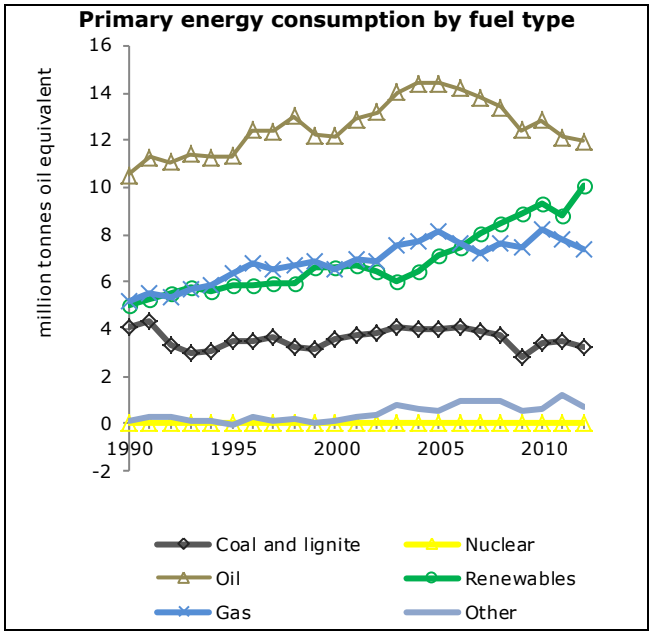
2012 RES share in gross final energy consumption (%)	32.1 %	2011–2012 indicative share from RES Directive (%)	25.4 %
2020 RES target	34.0 %	2011–2012 indicative share from NREAP (%)	31.6 %

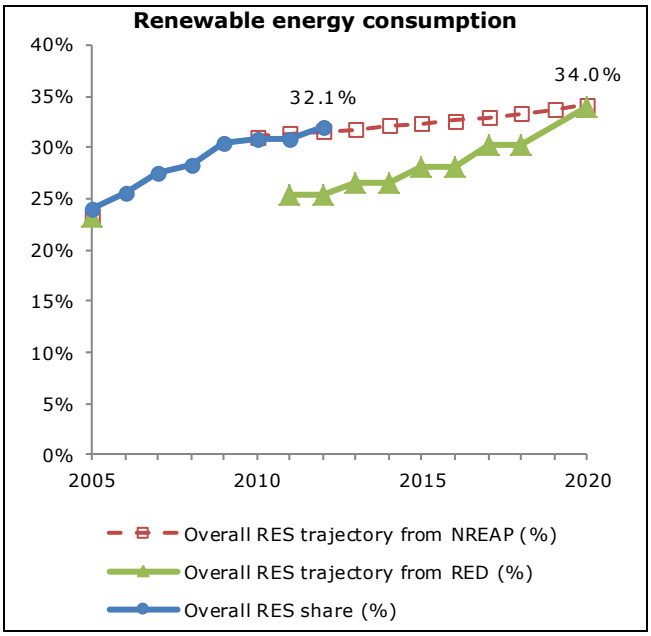
The average share of renewable sources in gross final energy consumption for 2011–2012 was 31.4 % (8.7 Mtoe), which is higher than the indicative RED target for 2011–2012 (25.4 %). At the same time, the share of renewables in 2012 (32.1 %) is higher than the expected 2012 NREAP target (31.6 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 4.0 %. In order to reach its 2020 NREAP target, Austria needs an average annual growth rate of 0.5 % in the run-up to 2020. In absolute terms, this is equivalent to 0.2 time its cumulative effort so far.

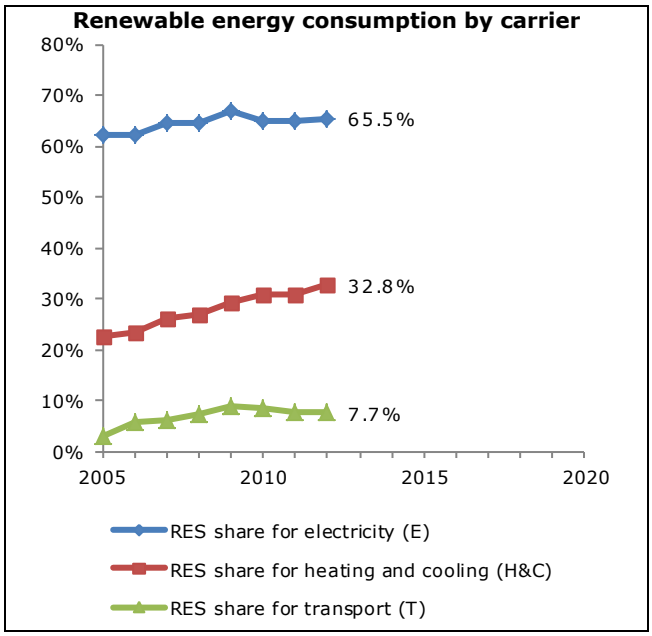

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
million tonnes oil equivalent
31.8
27.3
31.5
26.3
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
32.1%
34.0%
Overall RES trajectory from NREAP (%)
Overall RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
65.5%
32.8%
7.7%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Climate change is an important topic in the political debate in Austria. Nevertheless, Austria is projected to not be reaching its 2020 emission target under the ESD with existing measures (EEA, 2013). The main sectors contributing to greenhouse gas (GHG) emissions are industry and transport: GHG emissions from industry energy use and from industrial processes account for one third of total emissions. Increasing energy efficiency in this area could not only reduce the associated GHG emissions but also bring down energy costs, with mid- and long-term advantages for competitiveness. However, the Energy Efficiency Act, which would implement targets and measures, has not been passed by parliament so far. GHG emissions from transport account for 26 % of total emissions while taxes on energy and in particular on transport fuels are rather low compared to other Member States, although the fuel tax has been increased and some exemptions from fuel and energy taxes have been abolished. A further shift of tax collection towards environmental taxes, including on transport fuels, could incentivise more efficient driving, reduce 'fuel tourism' in border regions and a switch to public transport where possible, thus reducing transport emission levels. Implementing nation-wide speed limits could also further bring down transport emissions.

Climate and energy strategies
In 2011, Austria introduced the Climate Protection Act, the corner stone of current climate policies, setting maximum amounts of emissions for different sectors (transport, heating, waste, industry, agriculture, F-gases and other emissions) for the period from 2008 to 2012. In April 2013, the bill was amended to define the maximum amount of GHG emissions for the years 2013 to 2020. The National Climate Committee develops instruments to achieve these targets, for example in the fields of energy efficiency, renewable energy, spatial planning, mobility, waste management and natural carbon sinks.
The 2010 Energy Strategy further formulates measures to reduce GHG emissions from the energy system. Next to energy efficiency and security of supply, renewable energy represents the third pillar of the strategy. In addition, Austria is pursuing a Sustainability Strategy that aims to decouple economic growth and emissions growth. There are currently 190 000 green jobs in Austria generating approximately 11 % of the gross domestic product (GDP) and representing around 5 % of total employment (Lebensministerium, 2012).

Renewable energy
Austria has been one of the front-runners in the EU regarding renewable energy deployment. The main promotion scheme for renewable electricity is a feed-in tariff (FIT). The 2012 amendment of the Green Electricity Act sets technology-dependent 2020 targets for renewable energy expansion (additional 1 000 MW of hydro power, 2 000 MW of wind energy, 200 MW of biomass and biogas, and 1 200 MW of photovoltaics (PVs)). The scheme provides guaranteed FITs for 13 years, and for biomass power plants for 15 years. The funds are raised by a levy paid by end users who pay a EUR 11 lump sum per year (Ökostrompauschale) plus a contribution that is based on consumption (Ökostromförderbeitrag). On average, this sums up to an annual contribution of EUR 53 per household. The sum is restricted to EUR 20 for low-income households (BMWFJ, 2012). In addition, PV systems on buildings exceeding 5 kW as well as small and medium-sized hydroelectric power stations are supported through investment grants. PV installations with a maximum capacity of 5 kW can qualify for investment subsidies of EUR 300 per kW for roof-top or ground-mounted installations and EUR 400 per kW for building-integrated solutions.
The most substantial form of supporting small-scale renewable heating and cooling is provided by the Environmental Assistance in Austria (UFI) programme. There are special investment incentives, usually investment grants, for solar thermal installations, heat pumps, geothermics and biomass heating plants with funding guidelines published separately for each federal state.

Energy efficiency
The 2010 Energy Strategy mentions energy efficiency as one of three important pillars. However, no long-term strategy and targets have been implemented so far. A proposal for an Energy Efficiency Act has not been passed by parliament.
Energy **taxation** is moderate with the level of excise duties being slightly above EU average. In addition, there are exemptions for energy-intensive businesses, for example chemical reduction processes in blast furnaces, as well as for liquid gas used as fuel for local regular transport services. Austria has no carbon dioxide (CO_2) tax in place.
The Combined Heat and Power Act creates a framework for the promotion and development of high-efficiency **cogeneration** of heat and power and subsidises new cogeneration plants.
There are voluntary agreements with energy suppliers to promote energy savings, as well as an obligation for energy-intensive companies to include regular energy auditing. In the context of the 'klima:aktiv' programme, a support initiative promoting energy efficiency in the industrial sector was launched already in 2006, supporting enterprises in the industrial sector with the implementation of energy-efficiency measures using trainings and instructions.
In the **building sector**, minimum energy performance standards and performance certification have been introduced for new or modernised buildings. A support scheme for thermal insulation of existing buildings was introduced in 2012. The programme provides grants with a maximum funding volume per project of EUR 9 300 in 2013, with an overall budget of EUR 123 million: EUR 70 million was designated for the private sector, a maximum of EUR 30 million was designated to companies and a spillover of EUR 23 million was reserved for business revival. The programme has been re-launched for 2014 with a budget of EUR 100 million.

Transport
A vehicle registration tax is regulating the charges for new cars based on fuel consumption and purchase price, in combination with a gradual CO_2 bonus-malus system. There is no specific ownership tax in place but instead an insurance tax based on kW (passenger cars) and weight (commercial). Additionally, Austria has introduced a vignette system for motorway use by cars. Diesel and petrol are taxed at around EU average, while diesel is charged about 17 % less per litre than petrol. However, a main factor influencing energy consumption and GHG emissions from the transport sector is the low fuel prices compared to adjacent countries, leading to a considerable share of fuel exports. Between 1990 and 2011 the volume of freight transport carried out abroad using fuels from Austria increased six-fold. Biofuels are promoted through a quota system and a fiscal regulation mechanism.
The Transport Master Plan introduced in 2012 aims at decreasing GHG emissions by 6 % by 2020 and by 19 % by 2025. The Plan includes measures mainly concentrated on the improvement of public transport, cycling, and electromobility. Furthermore, it suggests moving 40 % of freight transport from road to railway by 2025. To maintain and expand the railway network, investments in corporate rail connections are promoted. The 'klima:aktiv mobil' programme provides funding of transport projects to reduce CO_2 emissions as well as consulting for climate-friendly mobility until 2020.

Fluorinated gases (F-gases)
Austria plans to introduce a tax on F-gases used and emitted in cooling systems, which is expected to bring emission reductions of 90 kt CO_2 by 2020 through the use of substitutes.

Agriculture
Emissions from agriculture have decreased consistently since 1990, which mainly can be ascribed to reduced animal stock and usage of fertiliser. Around three quarters of all agricultural enterprises participate in the Austrian agri-environmental programme (ÖPUL), which aims at reducing the application of fertilisers, increasing the use of organic farming methods and expanding crop rotation. Today, more than 19 % of total agricultural land is managed according to EU requirements for organic farming; since 1990, the number of organic farms increased nearly 15-fold to some 21 000 in 2012 (BMLFUW, 2014). Moreover, the Climate and Energy Fund provides support to Austrian farmers and foresters, for example by financing energy efficiency checks on farms as well as general consultations.

Waste
The Austrian Waste Management Act, the Landfill Ordinance and the Remediation of Contaminated Sites Act introduced policy measures following the principles of waste prevention, ban on land filling of untreated solid waste, waste recovery (recycling and incineration with energy recovery), and remediation of former uncontrolled landfill sites. Around 15 % of total waste is incinerated for energy recovery; 62 % is collected for conditioning, recycling and recovery, and 23 % is subject to other treatments. However, the amount of waste has increased by around 10 million tonnes, mainly triggered by an increase of excavation material (BMLFUW, 2014).

Land use, land-use change and forestry
Austria's territory is covered with woods by more than 47 %, which makes it one of the most densely wooded countries in central Europe. The principles of forest management, mainly laid down in the Austrian Forest Act, focus on the maintenance of biodiversity, regeneration capacity and vitality, as well as productivity of forests. Moreover, forest biodiversity is supported by the Natural Forest Reserves Programme. The Austrian Forest Dialogue is an ongoing public dialogue to balance interests in forest utilisation and secure long-term benefits of the Austrian forest. One spin-off of this dialogue is the Austrian Forest Programme, which identifies issues, and proposes targets and actions to ensure a continuous sustainable management and development process in the fields of climate protection, biodiversity and international responsibility. Due to its large forest resources, Austria has a leading position in the use of biomass for energy generation (BMLFUW, 2014).

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BMWFJ, 2012, 'Neuer Boom bei Ökostrom', Austrian Federal Ministry of Economy, Family and Youth (Bundesministerium für Wirtschaft, Familie und Jugend) (http://www.bmwfj.gv.at/ENERGIEUNDBERGBAU/ENERGIEVERSORGUNG/Seiten/Oekostrom.aspx) accessed 3 October 2014.
EEA, 2013, *Trends and projections in Europe 2013, Tracking progress towards Europe's climate and energy targets until 2020*, EEA Report No 10/2013, European Environment Agency (http://www.eea.europa.eu/publications/trends-and-projections-2013) accessed 3 October 2014.
Lebensministerium, 2012, 'Green jobs in Österreich' (http://www.lebensministerium.at/umwelt/green-jobs/greenjobs.html) accessed 3 October 2014.

Key climate- and energy-related data — Belgium

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2 eq.)	142.1	120.1	116.5	116.9	4 544.2
GHG per capita (t CO_2 eq./cap.)	13.6	10.9	10.5	10.5	9.0
GHG per GDP (g CO_2 eq./PPS in EUR)	504	363	344	341	350
Share of GHG emissions in total EU-28 emissions (%)	2.7%	2.6%	2.6%	2.6%	100%
EU ETS verified emissions (Mt CO_2 eq.)	55.4	46.2	43.0	45.2	1 848.6
Share of EU ETS emissions in total emissions (%)	39%	38%	37%	39%	41%
ETS emissions vs allowances (free, auctioned, sold) (%)	– 5.1%	– 18.3%	– 36.9%	– 31.6%	– 14.1%
Share of CERs & ERUs in surrendered allowances (%)	0.0%	13.5%	23.3%	n.a.	26.4%
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO_2 eq.)	77.4	69.9	69.4	71.6	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			5.2%	6.8%	14.1%
() = including all biofuels consumed in transport	(2.3%)	(5.0%)			
Share of renewable energy for electricity (%)	2.4%	7.1%	8.8%	11.1%	23.5%
Share of renewable energy for heating and cooling (%)	3.4%	5.0%	4.7%	6.6%	15.6%
Share of renewable energy for transport (%)			4.0%	4.5%	5.1%
() = including all biofuels consumed (%)	(0.2%)	(4.1%)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	51.2	52.8	52.0	48.7	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	4.9	4.9	4.7	4.4	3.1
Final energy consumption (Mtoe)	36.8	37.5	37.8	36.6	1 104.5
Final energy consumption per capita (Mtoe/cap.)	3.5	3.5	3.4	3.3	2.2
Efficiency of conventional thermal electricity and heat production (%)	48.4%	55.2%	56.1%	55.2%	50.0%
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	2.31	1.97	1.89	n/a	1.42
Space heating and cooling (toe/dwelling)	1.79	1.43	1.35	n/a	0.96
Water heating (toe/dwelling)	0.22	0.22	0.22	n/a	0.18
Cooking (toe/dwelling)	0.07	0.07	0.07	n/a	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.22	0.24	0.23	n/a	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 1.6%	2020 ESD target (% vs base year)	– 15.0%
2013 ESD emissions (% vs base year)	– 8.4%	2020 ESD projections WEM (% vs base year)	– 3.8%
		2020 ESD projections WAM (% vs base year)	– 4.4%

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. However, projections indicate that 2020 ESD emissions are expected to be above the 2020 ESD target, despite the implementation of measures planned until 2013.

Progress towards renewable energy targets

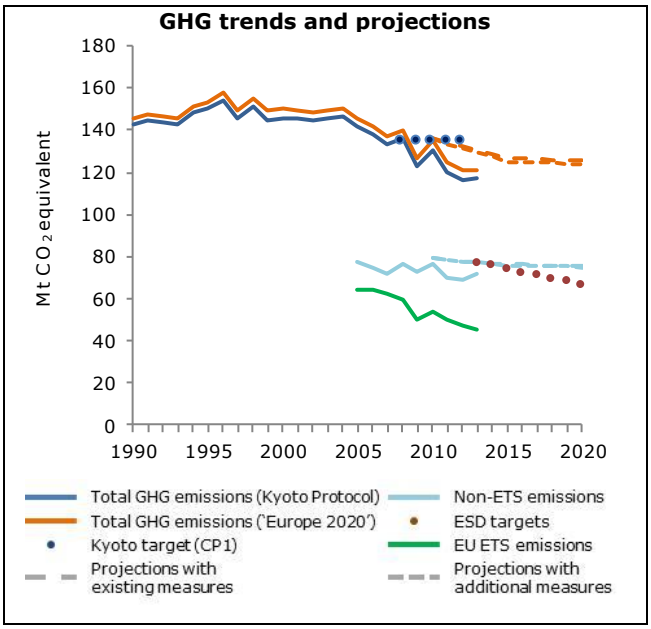
2012 RES share in gross final energy consumption (%)	6.8%	2011–2012 indicative share from RES Directive (%)	4.4%
2020 RES target	13.0%	2012 expected share from NREAP (%)	5.2%

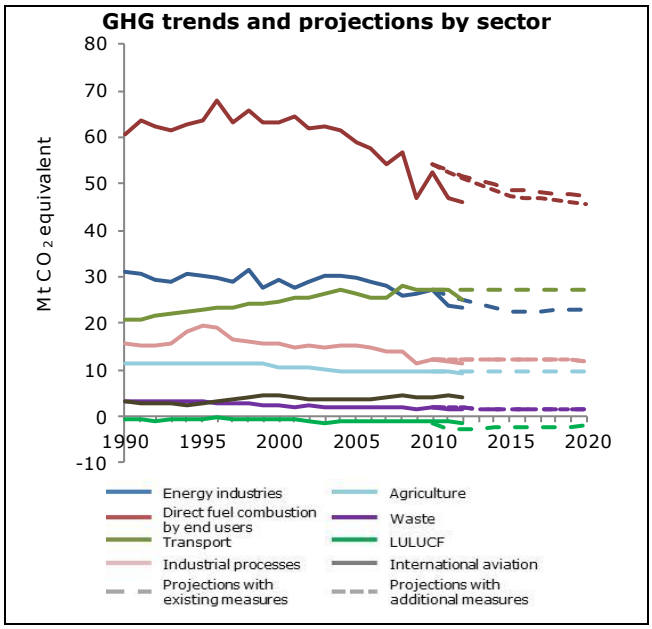
The average share of renewable sources in gross final energy consumption for 2011–2012 was 6.0% (2.2 Mtoe), which is higher than the indicative RED target for 2011–2012 (4.4%). At the same time, the share of renewables in 2012 (6.8 %) is higher than the expected 2012 NREAP target (5.2 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 16.5%. In order to reach its 2020 NREAP target, Belgium needs an average annual growth rate of 9.9% in the run-up to 2020. In absolute terms, this is equivalent to 1.7 time its cumulative effort so far.

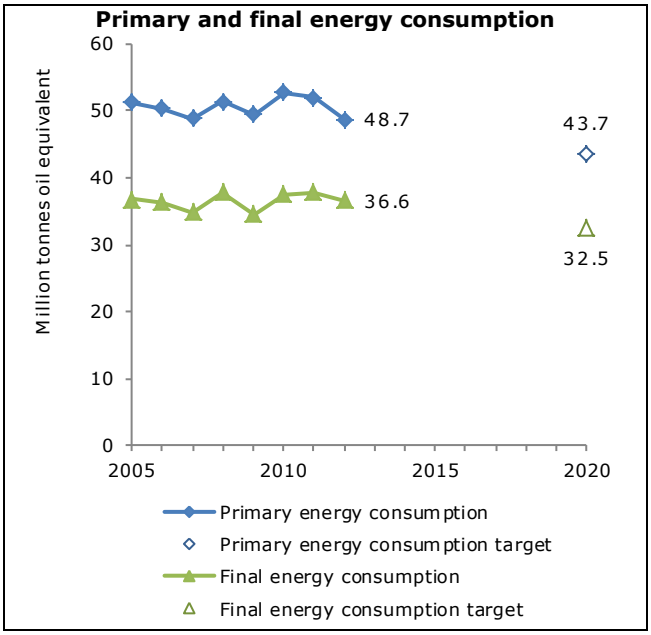
Progress towards energy efficiency targets

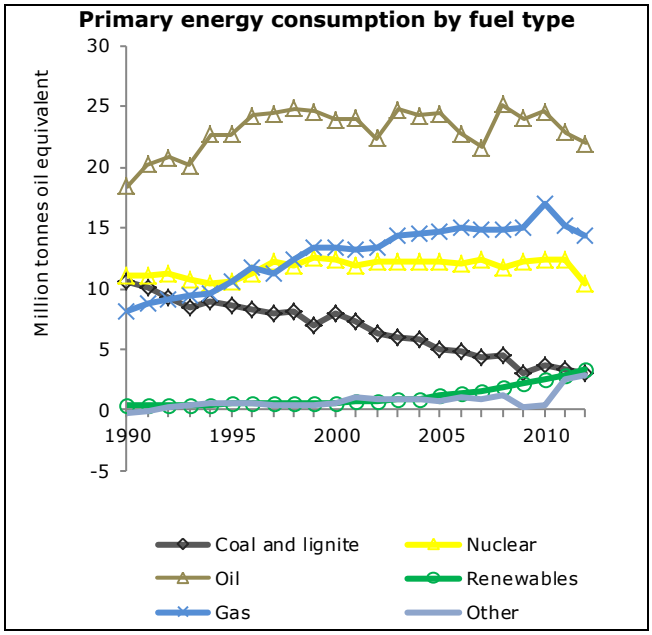
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-0.7%	2005–2012 average annual change	-0.1%
2012–2020 average annual change to target	-1.4%	2012–2020 average annual change to target	-1.5%

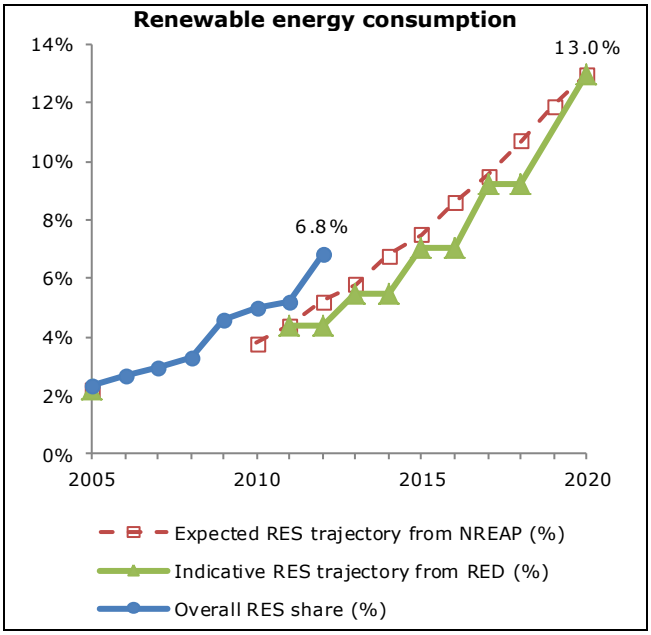
The reductions in primary and final energy consumption between 2005 and 2012 were not sufficient to put Belgium on track to meet its 2020 targets. Improving conversion efficiency for electricity production and energy efficiency in industry could help reducing primary energy consumption. Energy efficiency policies are dealt with at regional level, with no oversight of developments in this area at federal level.

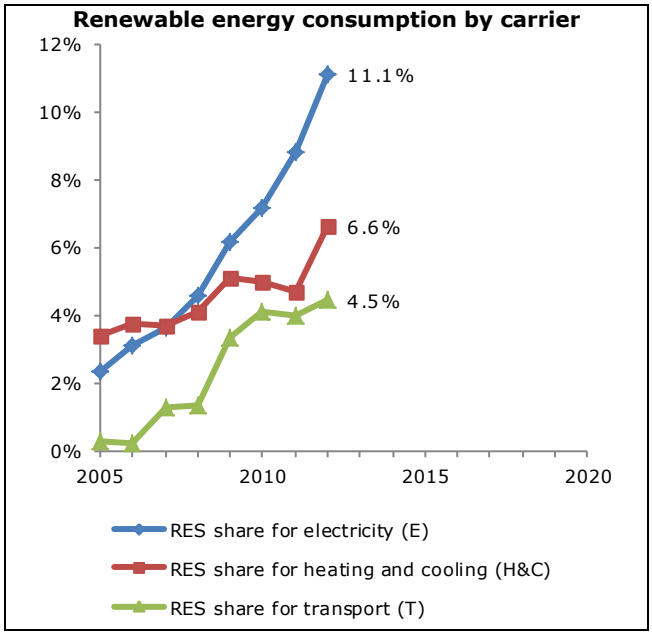

GHG trends and projections
Mt CO2 equivalent
180
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
80
70
60
50
40
30
20
10
0
-10
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
60
50
40
30
20
10
0
2005
2010
2015
2020
48.7
36.6
43.7
32.5
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
30
25
20
15
10
5
0
-5
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
6.8%
13.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
11.1%
6.6%
4.5%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities

One of the major barriers for effective climate policies in Belgium is the difficult coordination between different levels of government and the recent renegotiation of competences among them. The competences for climate policies are now divided between the federal level and the three regions. The regions are yet to agree on the internal burden sharing for the Belgian national greenhouse gas (GHG) emission reduction target as well as the renewable energy target, and it is not clear whether the individual regional targets add up to fulfil the national targets. The reshuffle of competences has also led to the discontinuation of policy instruments, for example for energy efficiency former national measures were not adequately replaced by regional ones. Agreeing on a burden sharing among the regions would provide a long-term framework and increase investment security.

Per capita GHG emissions and energy consumption are relatively high in Belgium compared to other EU Member States. The country is highly dependent on energy imports, and fossil fuels make up a considerable share of the primary energy consumption. As with a few other EU Member States, Belgium did not succeed in reducing its energy consumption in recent years. Especially in the industrial and household sectors, energy efficiency improvements have been slow. A study suggests that Belgium has an energy savings potential representing 29 % of its business-as-usual scenario in 2030, with the largest potential in buildings. Implementing measures to realise this potential, such as support to make the entire building stock comply with passive house energy standards or energy efficiency targets for lighting, appliances and heating, is estimated to create 20 000 jobs and would reduce Belgium's energy dependency (McKinsey, 2009).

Emissions from transport are also a major challenge for Belgium. While the vehicle fleet is relatively efficient, the number of passenger-kilometres travelled is very high and road congestion especially around Brussels is a major problem. The high use of passenger vehicles partly results from misleading vehicle tax incentives and an inefficient public transport system with long journey times (7sur7, 2014). Reconsidering the taxation structure and investing in public transport infrastructure could not only reduce emissions, but also address congestion problems and air pollution. It is estimated that tapping the full potential of the transport sector could create an additional 10 000 to 20 000 jobs until 2030 (McKinsey, 2009).

Climate and energy strategies

In Belgium, energy and climate change policy is foremost a regional competence (Flanders, Wallonia, Brussels-Capital region), which leads to an unclear division of competences within the regions and between the federal and the regional authorities, and to a lack of coherence between the different relevant administrative bodies responsible for the implementation of climate policies. A National Climate Commission is responsible for coordinating the policies implemented at a regional level, and established Belgium's national climate plan for 2009−2012 (Service Fédéral, 2011), which included an internal burden-sharing agreement. However, a follow-up plan is still missing due to a lack of consensus between the regions on the internal burden sharing of non-ETS targets for 2013−2020 and the share of renewable energies. As a result, each region adopts its own policy strategies and policy instruments with only limited coordination.

Flanders' Climate Policy Plan 2013–2020 aims to reduce non-ETS emissions by 15 % until 2020 given that no internal burden sharing in Belgium has been decided yet. In Wallonia, the 2013 Climate Decree sets targets for reducing GHG emissions by 30 % until 2020 and by 80 to 95 % until 2050, implemented through 5-year carbon budgets. The Decree also establishes an Air-Climate-Energy Plan, which is still subject to public enquiry in June 2014. Brussels adopted a Code for air, climate and energy (COBRACE) in 2013. It introduces several measures in order to meet the regional objectives of reducing GHG emissions by 30 % by 2025 compared to 1990. Among others, the Code aims at improving energy efficiency in the building sector, and introduces specific standards for air quality and GHG emissions. Moreover, it serves as a legal basis for its Integrated Air-Climate-Energy Plan, which is in the process of adoption and which shall contain concrete objectives by 2024 as well as measures to be implemented within the next 5 years.

Renewable energy

Belgium has no overarching strategy for the development of renewable energies, since this policy area is primarily a regional competence, apart from offshore wind energy. The Walloon government agreed in 2013 on a roadmap to achieve the Walloon target of 8 000 GWh of renewable energy by 2020, with almost half of the capacity from wind energy.

Renewable electricity is promoted in Belgium through a quota system that requires energy suppliers to cover a share of their supply from renewable sources. As the promotion of renewable energies is mainly a regional competence, the quota systems differ between the regions, and certificates are not tradable between the regions. In all regions, wind, solar, biogas, biomass and hydro power are eligible, but only in Brussels and Flanders is geothermal energy covered. The federal quota scheme covers only offshore wind energy. The regions also offer additional support schemes, namely subsidies, investment assistance for companies and net metering. In Wallonia, for instance, photovoltaic (PV) installations of less than 10 kW are not supported anymore under the quota scheme but through the Qualiwatt scheme. The scheme offers owners of residential PV installations a deduction on their electricity bills, proportionate to their household income, which allows refunding the installation within 8 years on average.

In Wallonia and Brussels, renewable heat is promoted through subsidies and investment assistance for biomass heating, and geothermal and solar thermal energy. Flanders recently introduced a new support scheme for heat produced from renewable energy sources as well as the district heating grid in general. With a budget of EUR 6.7 million, the Flemish government aims to stimulate increased industrial generation of renewable heat, the construction of heat networks, the recovery of waste heat and heat production from renewable energy sources (VEA, 2013).

Energy efficiency
Per capita energy consumption is well above EU average, mainly due to consumption in industry and households. The climate policies of all three regions encompass measures on energy efficiency, but policies vary considerably between regions. The first Action Plan for Energy Efficiency (APEE) in Brussels-Capital sets a target of 9 % reduction of final energy consumption by 2016. The target has not been updated in the second regional action plan published in 2011. In Wallonia, the regional government announced the finalisation of the third APEE in March 2014, but it has not been published yet.
Belgium's implicit **tax rate** on energy is the lowest among the EU-15 Member States and a wide range of exemptions from excise duties apply, for example for energy-intensive processes, low-income households or businesses with an environmental objectives agreement.
In Flanders, **energy suppliers** are obliged to deliver premiums for energy-saving investments to private and legal entities, up to an annual quota imposed by the government.
In Brussels and Wallonia, **combined heat and power** (CHP) is eligible under the quota system for renewable energy, while Flanders uses a separate quota system granting cogeneration certificates per MWh primary energy savings since 2005. Additionally, CHP installations are eligible under a number of regional subsidy schemes, and the federal government grants a reduction of the taxable profits for energy-saving measures, including CHP.
Wallonia adopted voluntary agreements with **industrial** sectors for the period 2003–2013 to reduce energy consumption, in exchange for access to additional subsidies for feasibility studies and energy audits. The voluntary agreements proved successful, since they allowed the participating Walloon industries to improve their energy efficiency by 16.5 %. The voluntary agreements of the Walloon region were therefore renewed for the period 2014–2020 (Energie Wallonie, 2014). Flanders adopted an Energy Efficiency Benchmarking Covenant (2003–2012) with energy-intensive industry with the aim to improve energy efficiency by 7.4 % over the period 2003–2012. The Flemish Auditing Covenant (2005–2013) with medium-sized companies aimed at saving 1.25 TWh by 2012. In both Wallonia and Flanders, the agreements cover 90 % of industrial energy consumption. In Brussels, which has only a small industrial sector, a voluntary labelling system called Eco-dynamic Enterprise is in place.
All three regions offer subsidies for energy efficiency improvements to **private sector entities**. Flanders introduced an Ecological Premium scheme that grants premiums of a maximum of EUR 1 million per company over a period of 3 years. An additional bonus is granted if the company conducts energy, environmental or ecological efficiency scans, provides a valid environment certificate or shows a certified environment management system. Since 2012, a Strategic Ecologic Premium for technologies and companies that do not qualify for support under the regular premium system is in place, covering up to 70 % of investment costs. Also in Wallonia and Brussels, energy-saving investment is supported through premiums, financed by an energy fund.
In the **buildings** sector, minimum energy performance standards exist for new and modernised buildings and energy performance certification was introduced. Belgium created a public energy service company (Fedesco) in 2005 that is particularly active in the building sector. It finances energy efficiency projects in public federal buildings, including energy audits, technical installations or awareness-raising campaigns. Over the last year, Fedesco has shared experience with regional provincial and local authorities through its Knowledge Center (Fedesco, 2014).
In Brussels, the new COBRACE aims at improving energy efficiency in the building sector, not only through regulation on the energy performance of buildings, but also through the emphasis put on the exemplary role of public buildings. It also introduces the obligation for owners and occupants of buildings over 100 000 m² to submit an action plan for the reduction of energy consumption. The main financial support instrument for energy efficiency in buildings is the Energy Bonus, which is available for several categories of refurbishment works in buildings, such as insulation, or efficient heating. It is calculated based on the income level of the applicant and according to the technical characteristics of the equipment used. The budget allocated to the Energy Bonus for the year 2014 amounts to EUR 20 million (Bruxelles Environnement, 2014).
The Flemish government pursues an Energy Renovation Programme 2020 with the target to make all homes energy-efficient by 2020. In the coming years, the Flemish government aims to introduce additional policies to improve energy efficiency performance of heat boilers and the replacement of old heating infrastructure (Vlaamse Regering, 2013). Flanders also offers subsidies for building renovation such as insulating glass, or installation of high-efficiency boilers and solar heaters.
Wallonia launched the support instrument Ecopack in 2012 aiming at stimulating energy efficiency upgrades in residential buildings. The programme offers interest-free loans and grants ranging from EUR 2 500 to 30 000 for households that carry out at least two energy efficiency improvements (Cluster Cap 2020 2012). After a successful first year, the programme was extended until mid-2014 (Nollet, 2013). In order to encourage **households** to reduce their electricity consumption, Wallonia will introduce a progressive pricing system for electricity in 2015 that increases the electricity price for households the more they consume. The system will apply neither to households heating with electricity or heat pumps nor to business customers.

Transport
The transport sector was formerly mainly under federal competency but most responsibilities were transferred to the regional level in 2011, for example taxation on registration and ownership of cars, environmental incentives and speed limits.
Average emissions for newly registered cars are low at 127.9 CO_2/km in Belgium, but transport emissions still make up a high share, given the large amount of passenger-kilometres travelled. Flanders and the Walloon region have taken measures targeting CO_2 emissions of cars with the registration tax (regional competence). Flanders levies a registration tax based on CO_2 emissions and the EURO standard. Wallonia's registration tax is based on engine power, but an additional CO_2-based bonus-malus charge applies (ACEA, 2012). Brussels'

registration tax is based only on engine power. The ownership tax for all three regions is based on cylinder capacity for passenger cars, or on weight and number of axles for commercial vehicles. Reforms are being discussed to account for CO_2 emissions (Ecoscore, 2013). The regions also agreed to introduce a distance-based toll system for vehicles above 3.5 tonnes from 2016 onwards (European Commission, 2013b).
Excise duties on petrol are average compared to neighbouring countries, but taxes levied on diesel are around 30 % lower (European Commission, 2013a). Since 2009, a federal quota for biofuels is in place that obliges providers of petrol or diesel fuels to ensure that 4 % of the annual fuel sale is biofuel. In 2010, a national fuel tax reduction was introduced that applies to petrol containing at least 7 % v/v of bioethanol and diesel containing at least 5 % v/v of biodiesel. However, these measures have not been updated (Bond Beter Leefmilieu, 2012).
In the field of public transport, all four Belgian transport operators De Lijn, STIB, TEC and SNCB decided to work together in the so-called ReTiBo project aiming at the integration of registration, ticketing and steering software systems by 2016 (Vlaamsparlament, 2013). In Brussels, residents can, since 2006, exchange their vehicle registration for 1 year of free public transport use under the Prime Bruxell'Air scheme.

Agriculture
In Flanders, the 2012 Flemish Agriculture Investment Fund offers investment subsidies to companies in order to invest in environmentally friendly and energy-efficient technologies, such as renewable energy and CHP. The Flemish Climate Policy Plan of 2013 lists plans and strategies targeting consumer behaviour and sustainable production via awareness raising, strategic support for organic agriculture, and the efficient use of production chains and circular flows (Vlaamse Regering, 2013).
Wallonia launched a strategic plan for the development of organic farming and the consumption of organic products in 2013, aiming to increase the number of organic farms from 1 100 to 1 750 by 2020 and to double the share of organic agricultural areas from 7.5 to 15 % of the total utilised agricultural land by 2020. The plan foresees the allocation of EUR 2 million for research and development of the organic industry. At the end of March 2014, the Walloon parliament adopted the first Walloon Agriculture Code, which is currently pending publication in the official journal (Agriculture Wallonie, 2014).

Waste
The Brussels government and competent stakeholders concluded a new environment–employment alliance devoted to the resource and waste sector in 2013. The objective of such alliances is to create employment opportunities.
Brussels does not have landfills but sends waste to the other regions. The 2010 Waste Prevention and Management Plan sets priority on awareness-raising campaigns, legislation on take-back obligations and infrastructure for waste reception. It establishes targets for reduction of household waste and waste from the tertiary sector and industry. The plan also gives priority to biomethanisation rather than open-air composting.
Flanders has a long tradition in waste management plans, and is the most advanced region in Belgium in this context. The current plan (2008–2015) aims to limit waste production per annum per capita to 560 kg, and residual waste to 150 kg. Flanders implements separated waste collection, subsidies for reuse centres, quotas on waste production per inhabitant and communication instruments. The high landfill tax in Flanders, which increases annually, had a significant effect on the reduction of the landfilling rate. Landfill bans are in place on certain waste streams (EEA, 2013).
Wallonia introduced a landfill tax in 2008, and rates were more than doubled in 2010 (EEA, 2013). The government of the Walloon region planned to elaborate a new waste plan 'Horizon 2020'. However, the former government did not succeed in finalising the plan and the publication will be postponed to the next legislative term — i.e. after 25 May 2014 (Maene, 2014).

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Key climate- and energy-related data — Bulgaria

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	63.7	66.0	61.0	56.7	4 544.2
GHG per capita (t CO2-eq./cap.)	8.2	9.0	8.3	7.8	9.0
GHG per GDP (g CO2-eq./PPS in EUR)	1 004	769	689	630	350
Share of GHG emissions in total EU-28 emissions (%)	1.2 %	1.4 %	1.3 %	1.3 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	0.0	40.0	35.0	32.7	1 848.6
Share of EU ETS emissions in total emissions (%)	0 %	61 %	57 %	58 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	n/a	– 3.7 %	– 18.4 %	n.a.	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	n/a	26.8 %	27.6 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO_2-eq.)	22.7	24.2	24.2	24.0	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(9.5 %)	(14.4 %)	14.6 %	16.3 %	14.1 %
Share of renewable energy for electricity (%)	9.8 %	13.7 %	13.9 %	17.0 %	23.5 %
Share of renewable energy for heating and cooling (%)	14.3 %	24.4 %	24.9 %	27.5 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.4 %)	(1.0 %)	0.4 %	0.3 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	18.9	17.3	18.6	17.8	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	2.4	2.3	2.5	2.4	3.1
Final energy consumption (Mtoe)	10.1	8.8	9.3	9.2	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.3	1.2	1.3	1.3	2.2
Efficiency of conventional thermal electricity and heat production (%)	43.1 %	45.3 %	44.7 %	46.0 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	0.72	0.77	0.81	n/a	1.42
Space heating and cooling (toe/dwelling)	0.48	0.54	0.57	n/a	0.96
Water heating (toe/dwelling)	0.05	0.04	0.05	n/a	0.18
Cooking (toe/dwelling)	0.05	0.05	0.04	n/a	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.14	0.15	0.15	n/a	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 12.2 %	2020 ESD target (% vs base year)	+ 20.0 %
2013 ESD emissions (% vs base year)	+ 4.8 %	2020 ESD projections WEM (% vs base year)	+ 22.6 %
		2020 ESD projections WAM (% vs base year)	+ 9.5 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, only if measures planned until 2013 are fully implemented.

Progress towards renewable energy targets

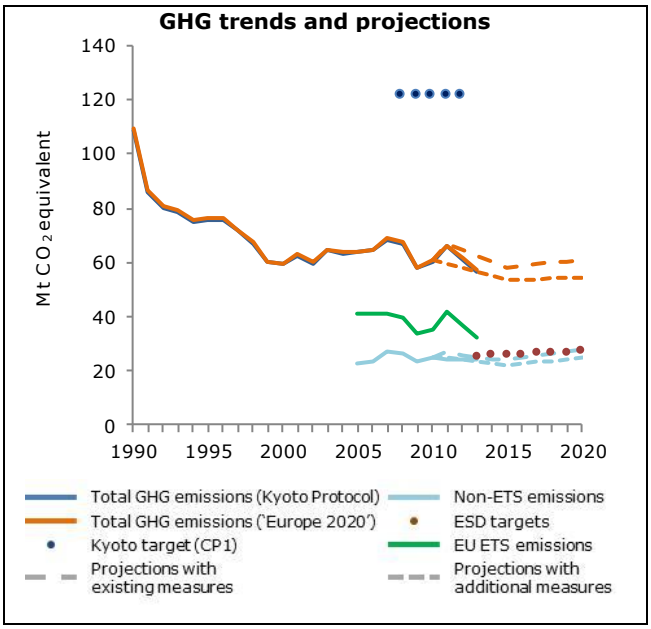
2012 RES share in gross final energy consumption (%)	16.3 %	2011–2012 indicative share from RES Directive (%)	10.7 %
2020 RES target	16.0 %	2012 expected share from NREAP (%)	10.7 %

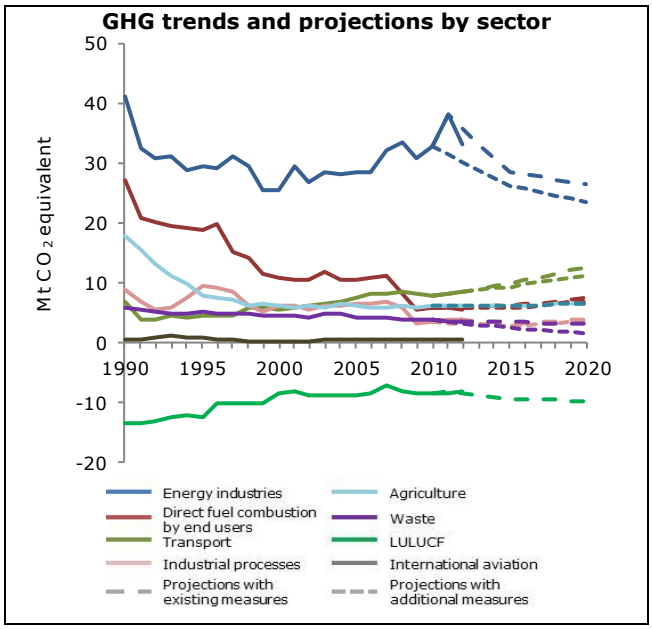
The average share of renewable sources in gross final energy consumption for 2011–2012 was 15.5% (1.6 Mtoe), which is higher than the indicative RED target for 2011–2012 (10.7%). At the same time, the share of renewables in 2012 (16.3 %) is higher than the expected 2012 NREAP target (10.7 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 7.0%. In order to reach its 2020 NREAP target, Bulgaria needs an average annual growth rate of 2.6% in the run-up to 2020. In absolute terms, this is equivalent to 0.6 time its cumulative effort so far.

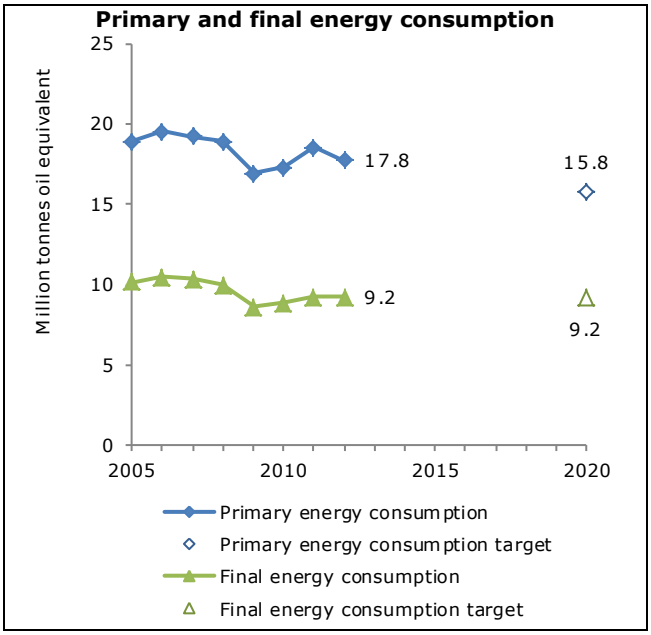
Progress towards energy efficiency targets

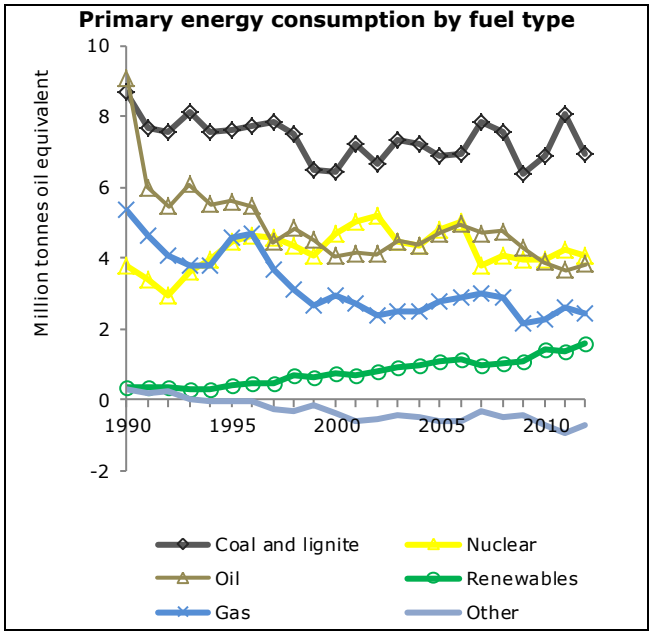
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-0.9 %	2005–2012 average annual change	-1.3 %
2012–2020 average annual change to target	-1.5 %	2012–2020 average annual change to target	-0.1 %

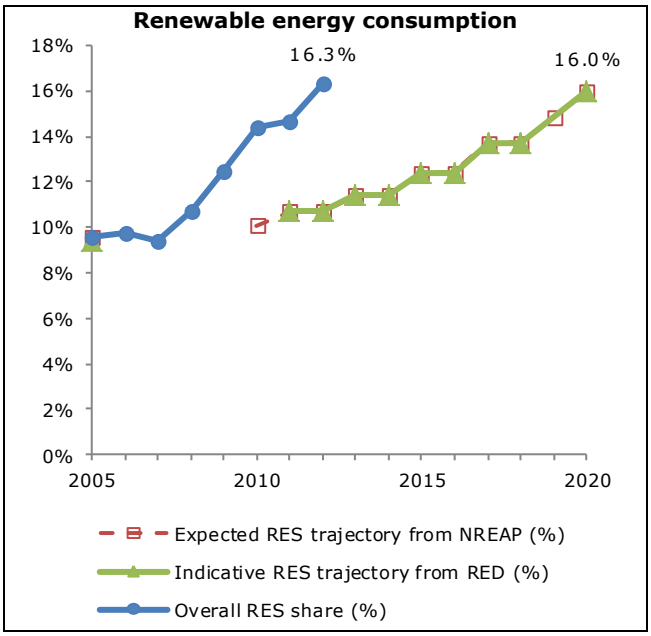
Primary and final energy consumption decrease during the period 2005–2012 and should further decrease to achieve the 2020 targets, in particular primary energy consumption. The input to conventional thermal power stations increased over the period 2005–2012 and represents 42 % of the primary energy consumption in Bulgaria. Increasing energy efficiency in transformation for electricity production could help further reduce primary energy consumption. The transport and residential sectors are particularly important to achieve further reductions in final energy consumption.

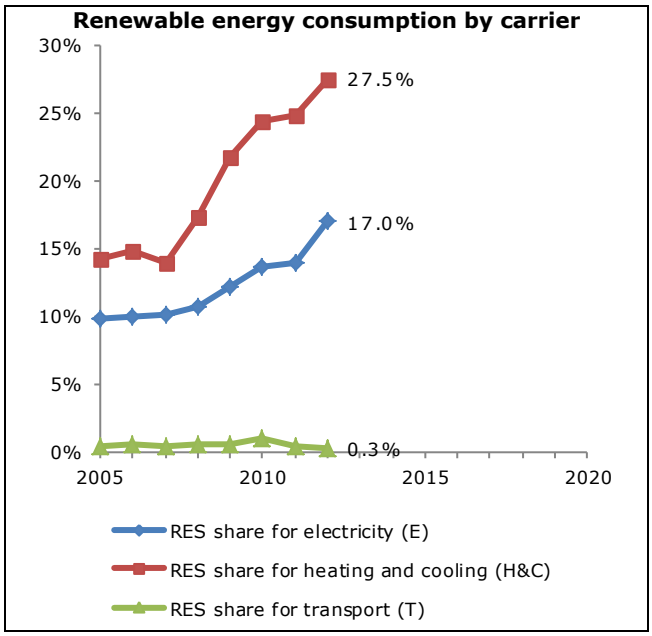

GHG trends and projections
Mt CO2 equivalent
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
50
40
30
20
10
0
-10
-20
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
25
20
15
10
5
0
2005
2010
2015
2020
17.8
9.2
15.8
9.2
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
10
8
6
4
2
0
-2
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
16.3%
16.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
27.5%
17.0%
0.3%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Bulgaria has the highest energy intensity of the economy in the EU and the energy supply is the main source of greenhouse gas (GHG) emissions due to the high share of coal for energy generation. Energy prices, which are state regulated, play a crucial political, economic and social role in Bulgaria. They are below the EU average and the Bulgarian energy utilities face financial difficulties as they cannot cover the costs of generation. However, at the same time, a large share of the population is at risk of energy poverty. Hence, in early 2013, winter electricity price hikes led to public protests and political turmoil with a government resigning, subsequent elections and continued protests over many months. Increasing energy efficiency in power generation as well as in energy end-use would help to stabilise the spending on energy in the light of increasing energy prices through reduced consumption. The amendment of the Energy Efficiency Act that, for example, stipulates to increase the number of near-zero energy buildings constitutes an improvement in this regard, but is only a small step considering that Bulgaria wants to halve its energy intensity by 2020.
In addition, emissions from transport represent a considerable share of overall emissions and Bulgaria also observed a strong shift from rail to road transport, both for passenger and freight. Emissions from newly registered cars are among the highest in the EU but there is no registration tax incentivising the purchasing of low-emission cars. In addition, the vehicle ownership tax is low compared to the EU average as well as the taxes on transport fuels, thus not creating incentives for more efficient vehicles and efficient driving. The promotion of public transport and the purchasing of efficient cars, for example through tax incentives and public subsidies, would reduce GHG emissions and airborne pollutants.

Climate and energy strategies
Bulgaria has outlined its climate change actions until 2020 in the Third National Action Plan on Climate Change (NAPCC). The document basically outlines how Bulgaria wants to achieve its 2020 climate and energy targets without limiting economic growth. It takes into consideration the National Development Programme as well as the Energy Strategy. The second document further outlines energy policy priorities: Bulgaria wants to address the high energy intensity of its economy and the high dependency on imports through diversification of sources and routes as well as the use of domestic sources, including its coal. At the same time, the Strategy highlights the need to shift to low-carbon energy sources — i.e. nuclear energy and renewables. The Bulgarian government strongly backs the realisation of the controversial Belene nuclear power plant.

Renewable energy
Bulgaria increased its share of renewables mainly in heating and cooling, but there is little progress in the electricity sector (see Figure above). The main support mechanism for renewable electricity is a feed-in tariff (FIT). However, the renewable sector faces some uncertainties: since the adoption of the new Renewable Energy Act in May 2011, the rates are no longer regulated by law and can be reduced at any time by the regulatory authority Bulgarian State Energy and Water Regulatory Commission (DKEVR). Furthermore, DKEVR introduced a retroactive grid access fee for renewables in September 2012, which was then overruled by the Supreme Administrative Court of Bulgaria. Following this decision, the government amended the Renewable Energy Law at the end of 2013 to introduce a new 20 % fee on revenues of photovoltaic plants and wind farms. In addition, in February 2014, DKEVR declared to introduce a new grid access fee for renewable energy producers. DKEVR already introduced a 'temporary' grid access fee in 2012, which was subsequently rejected by Bulgaria's Supreme Administrative Court. DKEVR now decided to backdate the new fee to the date when the previous fee came into force, thus retroactively applying the fee to all renewable energy plants that have been connected to the grid since that date. The fee needs to be paid to the transmission grid operator Electroenergien Sistemen Operator (ESO), which is deeply in debt. The new grid access fee was harshly criticised by both renewable energy associations and distribution grid operators.
Renewables in heating and cooling are promoted through grants provided by the European Regional Development Fund (ERDF) and loans from the Bulgarian Energy Efficiency and Renewable Energy Credit Line, the Energy Efficiency Fund and the Residential Energy Efficiency Credit Line (REECL). In addition, owners of efficient buildings using renewables for heating can get exemption from property tax for 5 or 10 years depending on the building's efficiency.

Energy networks
Bulgaria has to 'accelerate electricity and gas interconnector projects and enhance the capacity to cope with disruptions'. However, future investments in the transmission and distribution grid for electricity could be notably hampered by the fact that both the transmission system operator ESO and the three distribution grid operators are facing severe financial difficulties.

Energy efficiency
Bulgaria is delayed in publishing its national energy efficiency strategy that should set the national target for energy savings and the necessary steps and measures to achieve this goal. Energy **taxation** is the third lowest in the EU and thus well below the EU average. There are exemptions for natural gas, coal and electricity used in households.
The introduction of a **mandatory energy efficiency scheme** to reduce the energy consumption in the energy end-use sectors is taken into consideration and might be implemented for the period 2014–2020.
Cogeneration is promoted through a FIT on electricity fed to the grid. In addition, the Energy Efficiency Fund provides subsidies for cogeneration projects.

Energy efficiency in **industry** is promoted through individual energy-saving targets that have been set for industrial facilities with a consumption of more than 3 000 MWh. In addition, there is an obligation for enterprises to carry out energy audits every 3 years. Financial support for the use of energy-saving technologies in enterprises and improvement of energy management is provided through the programmes 'Energy efficiency and green economy' and 'Investments in green industry' under the Operational Programme 'Development of the competitiveness of the Bulgarian economy'. For small and medium-sized enterprises, financial support is provided for energy audits and obligatory implementation of the recommendations coinciding with the audits through the Bulgaria Energy Efficiency for Competitive Industry Financing Facility.
In the **building sector**, minimum energy performance standards exist for new and modernised buildings and energy performance certification was introduced. The project Energy Renovation of Bulgarian Homes under the Operational Programme 'Regional development' offers financial support for multi-family residential buildings with a total budget of BGN 50 million (EUR 26 million). The scheme finances the implementation of energy efficiency measures in multi-family buildings in 36 municipalities. An additional funding of EUR 9.5 million is available from the Housing Renovation Fund offering low-interest loans and bank guarantees for home owners. Energy efficiency is also the focus of the new Operational Programme 'Regions in growth' for 2014–2020 (NRP, 2014). In addition, the REECL for energy efficiency in **households** provides financial support for the purchasing of energy-efficient appliances and equipment.

Transport
Incentives for efficient driving and the purchasing of efficient cars include an ownership tax that is based on kilowatts and age for passenger and on load-carrying capacity or axles cars for trucks. There is no registration tax. Bulgaria has a time-based vignette system in place for passenger and commercial cars (CE Delft, 2012). Both diesel and petrol are taxed below EU average. Renewables in transport are promoted through a biofuel quota and a reduced excise duty tax rate for fuels containing at least 4 % of biofuels. In addition, Bulgaria incentivises the purchasing and use of electric and hybrid vehicles through an exemption of the ownership tax. The development of a long-term strategic document for the development of sustainable mobility, including measures to promote the use of renewable energy in transport, is envisaged.
Bulgaria also wants to improve the public transport system and increase non-motorised mobility. From the Operational Programme 'Regional development' a total of BGN 403 million (approximately EUR 200 million) should be spent by mid-2015 to improve public transport systems in seven major cities: Sofia, Burgas, Varna, Plovdiv, Stara Zagora, Pleven and Ruse (Stroeji, 2012). The projects envisage a set of measures for the modernisation of public transport, including automated ticketing systems, passenger information in real time, building new bike lanes, and facilitating the access of buses and trams.

Agriculture
Bulgaria aims at improving manure management, which is the most important source of methane emissions in agriculture, through investment subsidies and financing of education and trainings. In addition, there are standards for nitrogen fertilisation, low-interest loans for investments in more efficient irrigation systems, and education and training on the optimisation of nitrogen use (NC6).

Waste
The National Waste Management Programme outlines the main objectives for integrated waste management and includes increasing the collection of separated waste, and introducing differentiated charges for waste. The National Strategic Plan for Gradual Reduction of Biodegradable Waste focuses on the introduction of a separate collection of green waste and the further use of landfill gases for energy generation. However, the main activities in the waste sector are related to the implementation of EU legislation. Bulgaria has to catch up with the delayed construction of regional household waste depots if it wants to avoid penalties under an ongoing EU infringement procedure. Twenty-four waste depots had to be constructed in Bulgaria by 2009 under the Operational Programme 'Environment'; however, only two have been built so far. In addition, there are delays in the implementation of the integrated waste management system in Sofia — mainly financed by the EU's Operational Programme — including also the construction of the long-awaited waste plant that started in January 2014 and is planned to be concluded in August 2015.

Land use, land-use change and forestry
Bulgaria wants to increase carbon sequestration through afforestation of non-wooded areas in forest areas, afforestation of abandoned agricultural land, arid lands and deforested areas, and restoration and maintenance of protective forest belts and new anti-erosion afforestation. It is also planned to improve prevention of forest fires through early warning systems, and the restoration, protection and sustainable management of wetlands should be supported. The government also wants to increase urban and suburban parks and green zones (MMR, 2013).

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Key climate- and energy-related data — Croatia

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	30.7	28.5	26.4	24.5	4 544.2
GHG per capita (t CO_2-eq./cap.)	7.1	6.7	6.2	5.8	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	539	439	395	368	350
Share of GHG emissions in total EU-28 emissions (%)	0.6 %	0.6 %	0.6 %	0.5 %	100 %
EU ETS verified emissions (Mt CO_2-eq.)	n.a.	n.a.	n.a.	8.5	1 848.6
Share of EU ETS emissions in total emissions (%)	n.a.	n.a.	n.a.	35 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	n.a.	n.a.	n.a.	+ 60.8 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	n.a.	n.a.	n.a.	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO_2-eq.)	18.4	18.7	17.2	15.9	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(12.8 %)	(14.3 %)	15.4 %	16.8 %	14.1 %
Share of renewable energy for electricity (%)	32.8 %	34.2 %	34.2 %	35.5 %	23.5 %
Share of renewable energy for heating and cooling (%)	10.8 %	13.0 %	15.6 %	18.3 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.4 %)	(0.5 %)	0.4 %	0.4 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	8.2	8.0	7.9	7.6	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	1.9	1.9	1.8	1.8	3.1
Final energy consumption (Mtoe)	6.3	6.3	6.2	5.9	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.5	1.5	1.4	1.4	2.2
Efficiency of conventional thermal electricity and heat production (%)	52.7 %	57.0 %	56.4 %	56.0 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.29	1.18	1.15	1.17	1.42
Space heating and cooling (toe/dwelling)	0.79	0.73	0.68	0.70	0.96
Water heating (toe/dwelling)	0.14	0.12	0.13	0.13	0.18
Cooking (toe/dwelling)	0.16	0.14	0.15	0.16	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.20	0.19	0.19	0.18	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 3.9 %	2020 ESD target (% vs base year)	+ 11.0 %
2013 ESD emissions (% vs base year)	– 8.7 %	2020 ESD projections WEM (% vs base year)	– 5.9 %
		2020 ESD projections WAM (% vs base year)	n.a.

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

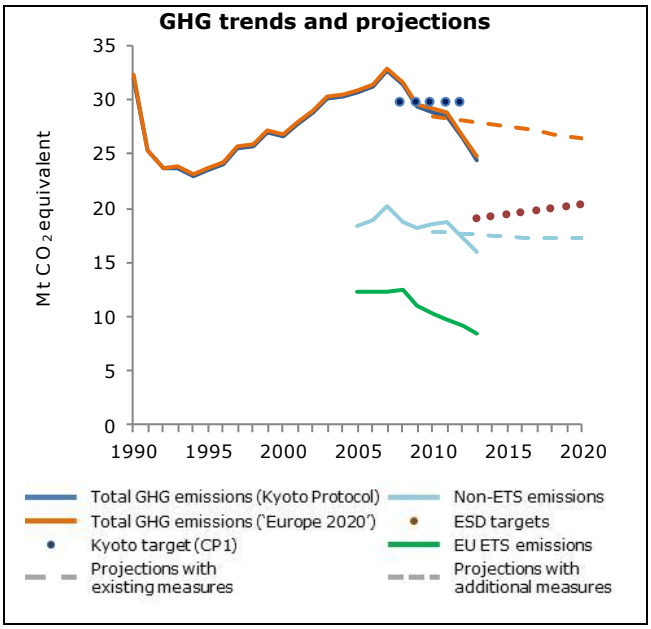
2012 RES share in gross final energy consumption (%)	16.8 %	2011–2012 indicative share from RES Directive (%)	14.3%
2020 RES target	20.1 %	2012 expected share from NREAP (%)	15.1%

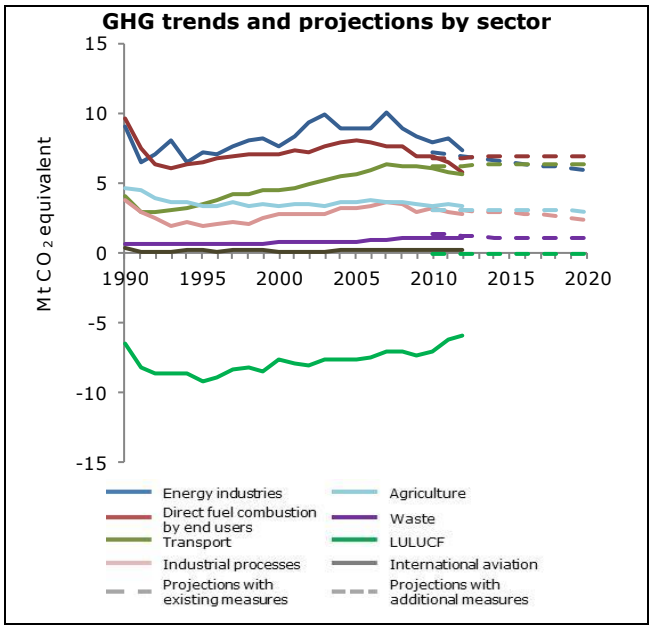
The average share of renewable sources in gross final energy consumption for 2011–2012 was 16.1% (1.0 Mtoe), which is higher than the indicative RED target for 2011–2012 (14.1 %). At the same time, the share of renewables in 2012 (16.8 %) is higher than the expected 2012 NREAP target (15.1 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 2.9%. In order to reach its 2020 NREAP target, Croatia needs an average annual growth rate of 4.5% in the run-up to 2020. In absolute terms, this is equivalent to 2.3 times its cumulative effort so far.

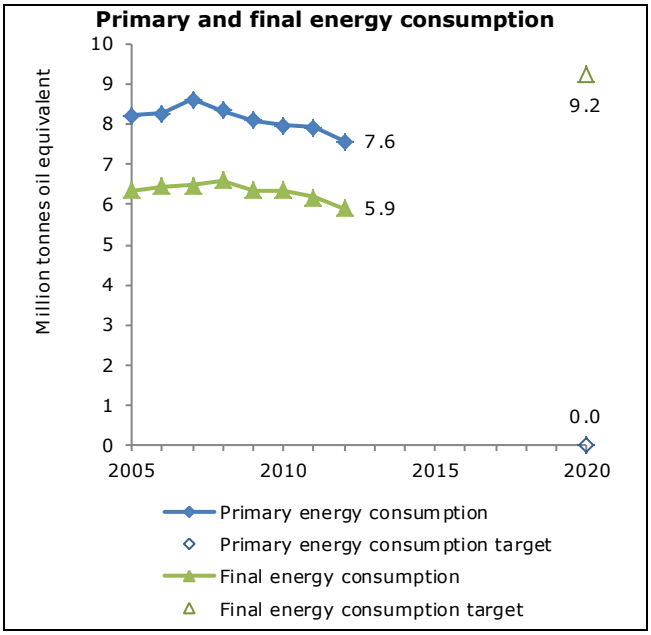
Progress towards energy efficiency targets

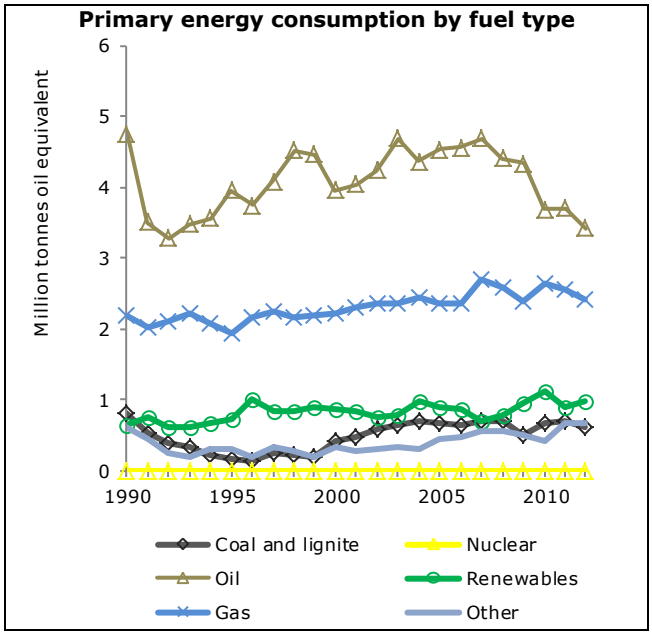
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-1.1 %	2005–2012 average annual change	-1.0 %
2012–2020 average annual change to target	n.a.	2012–2020 average annual change to target	5.7 %

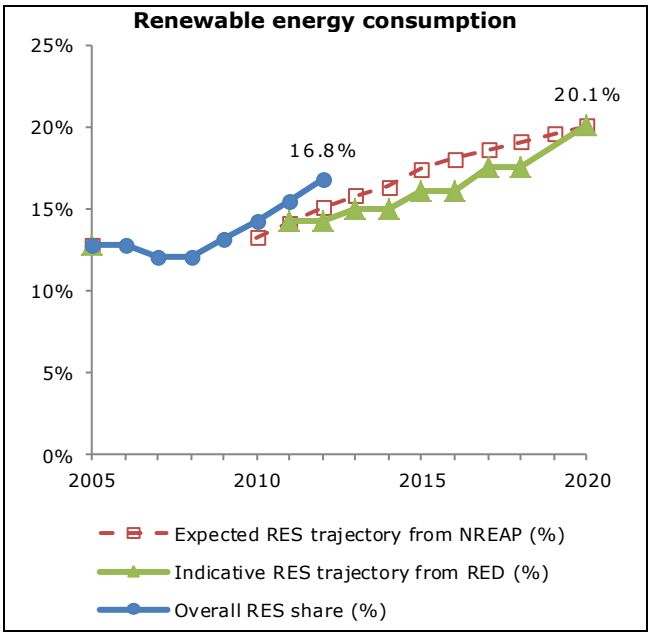
Croatia has a positive target on final energy consumption for 2020, compared to 2005. It can therefore focus on stabilising its energy consumption. Particular attention needs to be paid to the transport sector where energy consumption increased by more than 12 % during the period 2005–2012.

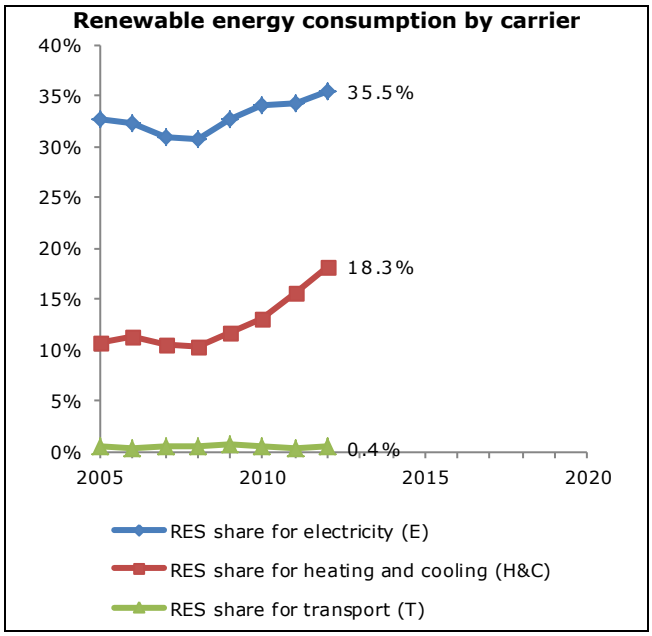

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
7.6
5.9
9.2
0.0
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
16.8%
20.1%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
35.5%
18.3%
0.4%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Energy supply, energy use and transport contribute similar shares of emissions to Croatia's total and thus must each be addressed with dedicated policy strategies. Emissions in the energy supply sector slightly increased again in 2011. Progress in promoting renewables has been moderate and support has recently been strictly capped, in particular for photovoltaic systems. Moreover, energy efficiency improvements have been slow in the housing sector, increasing by only 4 % from 1995 to 2010 (Odyssee, 2012). Based on 2020 projections forecasting EUR 8–10 billion in investments in energy-efficient buildings, greater biomass utilisation, the installation of solar thermal systems and wind energy, approximately 14 500 new jobs could be expected to be directly created, in addition to 65 000 indirect or induced jobs. Investing in these measures has the potential to help reduce Croatia's unemployment, while also increasing energy security via reduced oil and gas imports. Emissions in the transport sector have risen nearly 44 % between 1990 and 2011. Moreover, transport remains a challenge due to the large volume of traffic that goes through Croatia without originating or terminating there, and due to increasing personal car ownership and the associated greenhouse gas (GHG) emissions. Meanwhile, fuel taxes remain among the lowest in the EU. Increasing environmental taxation in the transport sector could strengthen incentives to purchase more fuel-efficient vehicles and encourage vehicle operators to conserve fuel, thereby reducing oil imports as well as 'fuel tourism' and associated GHG emissions.

Climate and energy strategies
The lately amended Act on the Protection of the Air (OG 130/2011, 47/2014) and the Framework for Low-Emission Development Strategy for Croatia from 2013 form the centrepiece of a long-term strategy (until 2050) to reduce GHG emissions in Croatia. In the Economic Programme from 2013 the government commits itself to promoting investments in energy efficiency, renewables and other low-emission technologies. Moreover, the Plan for the Protection of the Air, the Ozone Layer and Climate Change Mitigation determines the objectives, priorities and measures for implementation from 2013–2017.
The latest Energy Development Strategy of Croatia was adopted in 2009 (Government of the Republic of Croatia, 2009). The primary objectives outlined in the Strategy are increasing energy security, securing a competitive economy and promoting environmental sustainability. The Strategy sets targets to reduce final energy consumption by 10 % compared to average consumption from 2001–2005 and increase renewables as a share of final energy consumption to 20 % in 2020, including 35 % of electricity production, 10 % in transport and 20 % in heating and cooling.

Renewable energy
Renewables in Croatia are dominated by hydro and bioenergy, with other renewables still insignificant. Progress on renewables is moderate, but the share of renewable energy in final energy consumption and electricity has slowly increased. Electricity from renewables is mainly promoted through a feed-in tariff (FIT), which has been in place for over 10 years and covers all technologies on a differentiated basis. In addition, loans are provided for investments into renewables through the Croatian Bank for Reconstruction and Development (HBOR). The fee paid by final consumers to finance the FIT was recently raised. The National Action Plan for RES (NAP OIE) adopted in October 2013 foresees that installed capacities of wind and solar should not increase from 2015 to 2020, while planning a small growth in hydro, geothermal and biomass. Croatia is expected to adopt a Renewable Energy Sources Act, originally planned for the end of 2013, that would summarise the hitherto isolated laws and to provide a more specific regulation of this sector than in the Energy Act. Renewable heating and cooling is not promoted by the state.

Energy efficiency
Croatian **energy taxes** are in line with the EU-set minimum standards. Exemptions apply to natural gas for households and as motor fuel, and electricity used for chemical reduction and in electrolytic and metallurgical processes as well as to electricity for households. In addition, Croatia applies reduced VAT rates to certain energy products (Ministry of Finance, 2013). In 2007, the government introduced a tax on CO_2 emissions for all stationary sources emitting more than 30 tCO_2 (OG 73/2007, 48/2009).
In **industry**, the main incentive for energy efficiency improvements comes from the Fund for Environment Protection and Energy Efficiency (FZOEU), which provides funding for energy audits and investments in energy efficiency measures. Energy audits are mandatory for large energy consumers (over 10 000 MWh per year), and voluntary for all other companies (OG 152/2008, 55/2012).
Croatia has set a target for **cogeneration of electricity and heat** of 4 % of final energy consumption, with the largest contribution expected from new industrial cogeneration (OG 33/2007, 8/2011). Cogeneration is mainly encouraged through the FIT scheme also applicable to renewables.
In the **building** sector, the Law on Spatial Planning and Construction (NN 76/2007) was replaced on 1 January 2014 by three new laws, namely the Law on Construction (NN 153/2013), the Law on Spatial Planning (NN 154/2013) and the Law on Building Inspection (NN 153/2013), requiring new buildings to undergo energy audits and introducing a 5- to 10-year window for owners of a newly constructed building to insulate the building exterior. Financial support for investments into energy-efficient products and energy-efficient renovation of buildings is provided through the FZOEU, and is mainly financed through revenues from environmental taxation. The Fund publishes calls on a yearly basis depending on the amount of available funds. In addition, the government adopted the Programme for Energy Renovation of Buildings in the Public Sector for the years 2013 and 2014, which is expected to result in around 200 tenders for energy efficiency renovations of public buildings across the country, amounting to approximately HRK 400 million (EUR 52.4 million) and GHG emission reductions of up to 20 500 tCO_2 equivalent per year.

Transport
Croatia levies a registration tax on vehicles, based on market value. Additionally, an ownership tax on passenger cars is in place, based on the engine power and the age of the vehicle. Taxes on petrol and diesel are among the lowest in the EU. In addition, Croatia levies a special registration duty on cars for their CO_2 emissions. If the vehicle emits less than 120 g CO_2/km, taxes decrease significantly, while those with emissions above 130 g CO_2/km are subject to a higher tax (OG 15/2013, 108/2013). Grants are provided for exchanging highly polluting vehicles for new, cleaner ones. Croatia is also planning to require the buyers of public transport vehicles in public procurement to take into consideration the energy consumption and the environmental impacts of the vehicles to be purchased.
The Act on Biofuels for Transport sets a minimum biofuels content requirement of 1.58 % in 2012 that will rise to 10.05 % by 2020. Moreover, Croatia gives a cash incentive for biofuels producers in the form of payments per litre of biofuels produced and placed on the Croatian market.
In the past 20 years, highways have been given priority over other means of transportation; this has left railways and maritime transport fairly neglected. However, the government foresees investments in railroads, as well as in river transportation in their Strategic Plan of the Ministry of Maritime Affairs, Transport and Infrastructure for the period 2014–2016. Moreover, Croatia has undertaken a number of initiatives to increase the attractiveness of rail transport.

Agriculture
From 1990 to 2010, GHG emissions dropped in the agricultural sector mainly as a result of the broader Balkan conflict and due to optimisation of production processes and techniques. However, GHG emissions are projected to increase by 2020, due to an expected increase of agricultural land and associated mineral fertiliser outputs, as well as increased animal breeding. Some measures are in place to reduce GHG emissions from agriculture, such as a prohibition on burning of agricultural waste and the co-financing of agro-environmental measures. In addition, the Croatian state is promoting the objectives of its agricultural climate policies through the HBOR, which supports measures that aim to protect the environment (Ministry of Environmental and Nature Protection, 2012). In January 2014, the draft Rural Development Programme 2014–2020 was published for a public discussion and is to be adopted in May 2014. It foresees the promotion of new technologies, which should reduce GHG emissions and the usage of ammonia in the agricultural sector.

Waste
Croatia's waste policies are defined in the Waste Management Strategy and Waste Management Plan, and are based on the three principles of avoidance, evaluation and deposition. A focus is on landfill management and the reduction of GHG emissions through landfill gas capture and use. Moreover, Croatia promotes the thermal utilisation of biodegradable waste. The Sustainable Waste Management Act (OG 94/13) introduced separated waste collection for households, the regulation of bulky waste and fines for non-compliance. Currently, 92 % of municipal waste in Croatia is thrown unsorted into a single bin.

Land use, land-use change and forestry
Croatia has a long tradition of forest management with a comprehensive, vertically structured, national system for monitoring, data collection and reporting on the condition and activities in the forestry sector. The Croatian government has adopted an ambitious plan to achieve 100 % sustainable forest management of state-owned forests. The Forest Act and the Forest Management Area Plan from 2006 set out the rules for protection, use and management of forests and forest land. A Payment for Ecosystem Services scheme for the forestry sector was implemented in 1991 (Vuletic et al., 2010).

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Key climate- and energy-related data — Cyprus

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	9.9	9.7	9.3	8.7	4 544.2
GHG per capita (t CO_2-eq./cap.)	13.5	11.5	10.7	10.1	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	642	484	459	455	350
Share of GHG emissions in total EU-28 emissions (%)	0.2 %	0.2 %	0.2 %	0.2 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	5.1	4.6	4.4	4.0	1 848.6
Share of EU ETS emissions in total emissions (%)	51.4 %	47.5 %	47.3 %	46.0 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 7.2 %	– 21.2 %	– 29.7 %	+ 234.7 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	#DIV/0!	0.6 %	37.5 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	4.8	5.0	4.8	4.7	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(3.1 %)	(6.0 %)	6.0 %	6.8 %	14.1 %
Share of renewable energy for electricity (%)	0.0 %	1.4 %	3.4 %	4.9 %	23.5 %
Share of renewable energy for heating and cooling (%)	10.0 %	18.3 %	19.3 %	21.2 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.0 %)	(2.0 %)	0.0 %	0.0 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	2.5	2.6	2.6	2.5	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.4	3.2	3.1	2.9	3.1
Final energy consumption (Mtoe)	1.8	1.9	1.9	1.8	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.5	2.3	2.3	2.0	2.2
Efficiency of conventional thermal electricity and heat production (%)	34.9 %	38.5 %	36.4 %	35.8 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.18	1.12	0.97	n.a.	1.42
Space heating and cooling (toe/dwelling)	0.49	0.43	0.32	n.a.	0.96
Water heating (toe/dwelling)	0.19	0.21	0.20	n.a.	0.18
Cooking (toe/dwelling)	0.19	0.18	0.16	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.31	0.30	0.29	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 5.4 %	2020 ESD target (% vs base year)	– 5.0 %
2013 ESD emissions (% vs base year)	– 20.8 %	2020 ESD projections WEM (% vs base year)	– 51.3 %
		2020 ESD projections WAM (% vs base year)	– 53.1 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

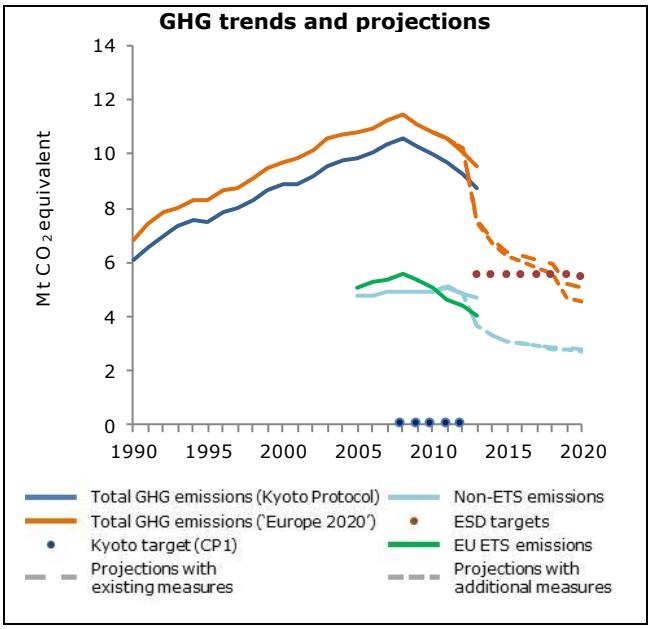
2012 RES share in gross final energy consumption (%)	6.8 %	2011–2012 indicative share from RES Directive (%)	4.9 %
2020 RES target	13.0 %	2012 expected share from NREAP (%)	7.1 %

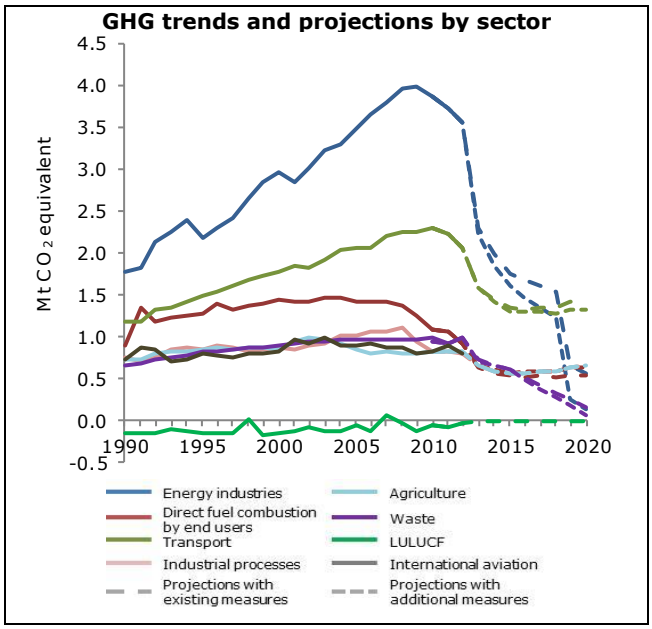
The average share of renewable sources in gross final energy consumption for 2011–2012 was 7.3% (96 ktoe), which is higher than the indicative RED target for 2011–2012 (4.9%). At the same time, the share of renewables in 2012 (7.8 %) is higher than the expected 2012 NREAP target (7.1 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 12.3%. In order to reach its 2020 NREAP target, Cyprus needs an average annual growth rate of 13.1% in the run-up to 2020. In absolute terms, this is equivalent to 3.0 times its cumulative effort so far.

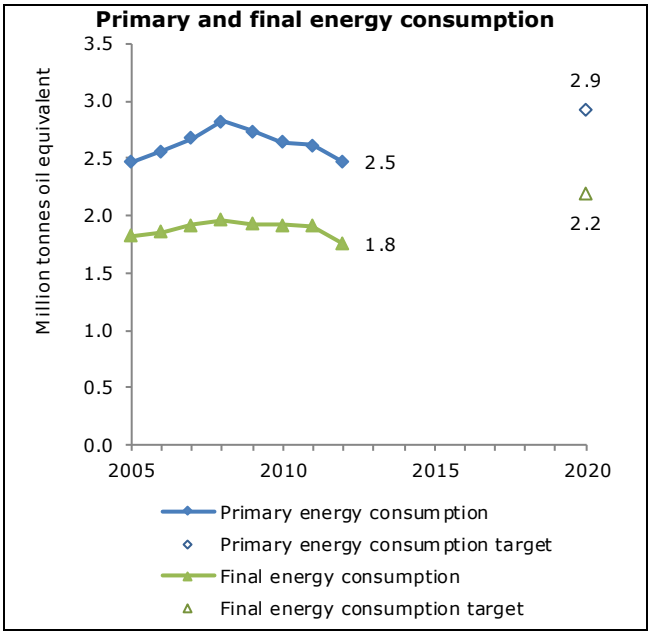
Progress towards energy efficiency targets

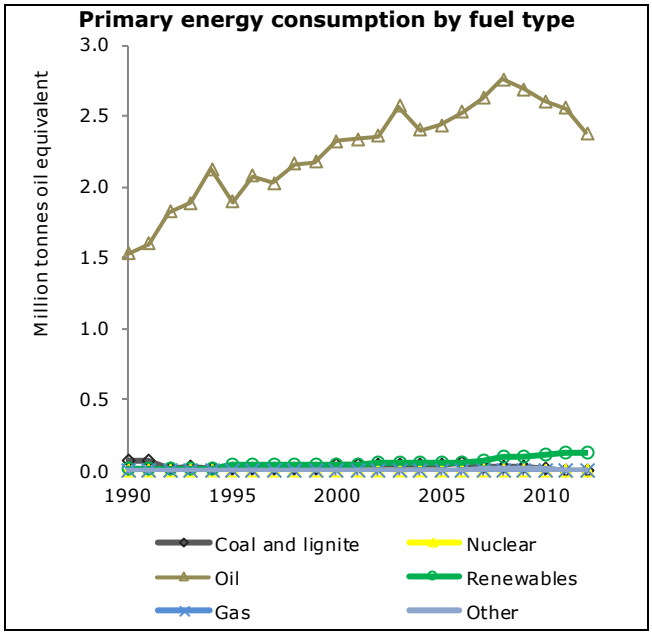
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	+ 0.0 %	2005–2012 average annual change	– 0.5 %
2012–2020 average annual change to target	+ 2.1 %	2012–2020 average annual change to target	+ 2.8 %

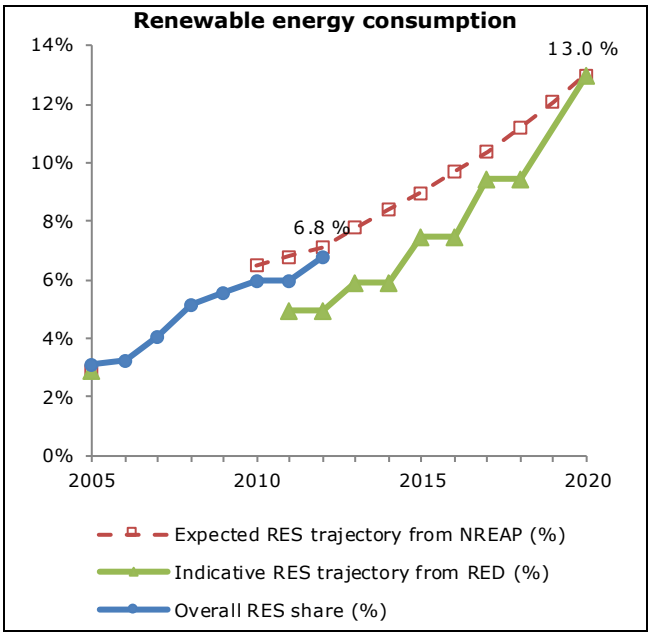
Cyprus has positive 2020 targets in both primary and final energy consumption, compared to 2005. It can therefore focus on stabilising its energy consumption. Particular attention should be paid to improving efficiency in transformation.

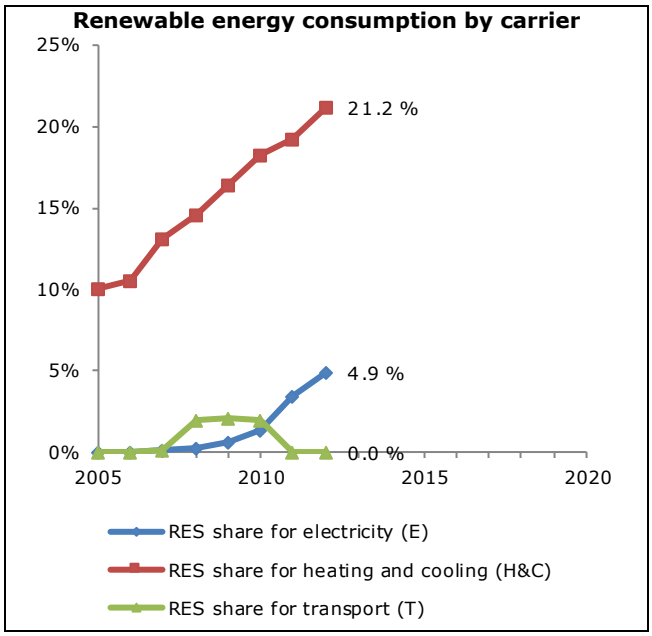

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
2.9
2.5
2.2
1.8
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
13.0 %
6.8 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
21.2 %
4.9 %
0.0 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
As an island, Cyprus faces high costs resulting from oil imports for the country's energy generation and the only oil refinery in Cyprus closed in 2004 (EIA, 2014). Furthermore, the emissions associated with the oil imports are high. The development of domestic renewable energy sources such as offshore natural gas for which there is considerable potential would help Cyprus to reduce fuel imports and become more energy independent. Also, interconnections with other electricity grids reduce import dependency. Cyprus has already undertaken important steps to increase the share of renewable energies by introducing new renewable energy support schemes. In addition, implemented measures encouraging energy efficiency improvements further reduce oil imports. Also, the introduction of new net-metering schemes provides a great opportunity to increase the share of renewables. Furthermore, it is expected that Cyprus could create up to 2 780 new jobs by 2020 through the deployment of renewable energy sources (Ενεργειακό Γραφείο Κυπρίων Πολιτών, 2011).

Climate and energy strategies
Cyprus' emissions have increased by 1.5 % in 2012 compared to 2005 levels and reaching the annual goal has been considered a great challenge. To that end, Cyprus has already set up an ad hoc committee for the synthesis of a detailed low-carbon economy development roadmap (Republic of Cyprus, 2014). Cyprus focuses on expanding domestic energy sources and the exploitation of natural gas in particular to reduce its dependence on oil imports. This approach will make the energy system more efficient and less carbon intensive. Should Cyprus' efforts be materialised, natural gas delivery to its domestic market is expected in 2017/2018. Cyprus has followed a consistent policy concerning hydrocarbon exploration. Since 2008, several licences for hydrocarbon exploration have been granted. Additionally, Cyprus plans to construct an onshore liquefied natural gas plant, estimated to be completed between 2020 and 2022.

Renewable energy
Cyprus shows good progress with respect to renewable energies by overachieving the intermediate targets set in the National Renewable Action Plan. Renewable electricity was promoted through grant schemes, a premium tariff, net-metering schemes, including a self-generation scheme for photovoltaics (PVs), and a tender for PV installations during the period 2009–2013. Currently, a net-metering system is available upon successful application for households, public administration and industrial/commercial units for PV installations and grants for net-metering PV systems for vulnerable consumers. Under the net-metering system consumers get credit for the electricity they feed into the grid by substituting that amount from their electricity consumption within a billing period of 1 year. Any excess of electricity within the billing cycle is fed free to the grid.
Most recently, the Council of Ministers granted political support for the construction of two solar thermal parks with a capacity of 50 MW each. Both projects were successful submissions of the NER-300 programme and will receive financing from the EU and private investments. However, the licensing procedure of the above two projects is still under process.
Renewables in heating and cooling were supported through a scheme that offers grants of a certain percentage (between 15 and 55 %) of the investment in the installation of heating and cooling systems. The scheme was part of the Grant Schemes implemented by the Fund for Renewable Energy and Energy Efficiency.

Energy networks
Cyprus wants to be connected to other electricity grids to increase security of supply and reduce oil imports for electricity generation. The EuroAsia Interconnector Project should realise the electricity interconnection of Cyprus with Greece and Israel. It consists of two phases: 1) interconnection of the Greek mainland grid with Crete and the interconnection of Cyprus and Israel, and 2) interconnection of Crete and Cyprus. A feasibility study is underway.

Energy efficiency
Cyprus aims to increase energy savings of primary energy consumption by 14.5 % by 2020 (3rd National Energy Efficiency Action Plan of Cyprus, 2014). The Fund for Renewable Energies and Energy Efficiency, operating under the Ministry of Energy Commerce, Industry and Tourism (Κυπριακή Δημοκρατία, 2013), offers financial support for efficiency measures administering the EU Structural Funds for energy efficiency. Under the new Operational Programme 'Competiveness and Sustainable Development 2014–2020' financial support will be provided for the promotion of energy efficiency in the industrial/tertiary sector and for energy efficiency in public buildings and in households.
Energy **taxation** is slightly below the EU average. Excise duty exemptions exists for energy products used for the production of electricity and cement or in agriculture.
There is currently no specific support scheme for **combined heat and power** as two support schemes, one for investments in high-efficiency cogeneration and one for the promotion of cogeneration using biomass, were operated only up to 2013.
In the **building sector,** Cyprus has implemented minimum energy performance requirements in 2007 for new buildings and buildings that undergo major renovation and are above 1 000 m^2. In December 2013, the requirements were tightened and are now mandatory for all buildings that undergo major renovation and building elements that are installed in existing buildings. Energy performance certificates became mandatory in 2010 for all new buildings and all buildings that are sold or rented. The Ministry of Energy, Commerce, Industry and Tourism has published in September 2012 a National Action Plan for promoting nearly-zero–energy buildings (NZEBs). An official definition of the NZEB became available in August 2014 with the issue of a Ministerial Order that defines the technical requirements of an NZEB while a report on 'Nearly Zero Energy

Residential Buildings' provides recommendations on how to implement the building standard (Υπουργείο Εμπορίου, Βιομηχανίας και Τουρισμού, 2012). Financial support was and will be provided through EU Structural Funds. The new Operational Programme 'Competiveness and Sustainable Development 2014–2020' forsees grant schemes for the promotion of energy efficiency in public and residential buildings (Γενική Διεύθυνση Ευρωπαϊκών Προγραμμάτων Συντονισμού και Ανάπτυξης, 2014).
In addition, Cyprus has implemented **public procurement** procedures with an Action Plan on Green Public Procurement for the period 2012–2014 (RES Legal).

Transport
Cyprus incentivises the purchasing of efficient cars through a carbon dioxide (CO_2)-based bonus-malus system that applies to the registration tax, and vehicles that emit less than 150 g CO_2/km get a tax reduction bonus of 15 % on the ownership tax (ACEA, 2012). Cyprus levies a tax on petrol that is well below EU average; however, the diesel tax is among the highest in the EU (European Commission, 2013). No road-use charge applies (CE Delft, 2012). An excise duty is imposed on biofuels.
Regarding **renewables** in the transport sectors, fuel suppliers are obliged to meet a mandatory quota of biofuels (Κυπριακή Δημοκρατία, 2013). Suppliers are obliged to mix biofuels with conventional fuels to ensure that the average energy content of fossil fuels mixed with biofuels accounts for at least 2.4 % of the total energy content of fossil fuels available on the market. Renewables in the transport sector are also supported through grants for investments in the production of biofuels. The amount of the grant is a certain percentage of the investment (Επιτροπή Διαχείρισης Ειδικού Ταμείου ΑΠΕ και ΕΞΕ, 2014; RES Legal). In 2013, the government amended Law 148(I)2003 on petroleum products and fuels to define sustainability criteria for biofuels as well as their assessment and the establishment of a national system for monitoring the sustainability criteria.
Cyprus does not operate a **rail transport** system. A Public Transport Programme was announced in 2010 to promote public transport. Currently, a feasibility study on the construction of a tram line in Nicosia is being carried out. The construction will be co-financed by the EU Structural Funds (Γραφείο Τύπου και Πληροφοριών, 2013).

Agriculture
Cyprus has adopted the Rural Development Programme 2007–2013 including measures aiming at the expansion and improvement of production, the creation of sustainable farms, and the protection of the environment and landscape (Ministry of Agriculture, Natural Resources and Environment, 2014). Furthermore, voluntary measures are in place to promote the anaerobic digestion for treatment of livestock breeding waste (EEA, 2013). Relevant national legislation that encourages the promotion of anaerobic digestion is 1) the Control of Water Pollution (Waste Water Disposal) Regulations 2003, Κ.Δ.Π. 772/2003; and 2) the Control of Water Pollution (Sensitive Areas for urban waste water discharges) Κ.Δ.Π. 111/2004. The voluntary measure is expected to increase by 1 % annually, starting from an additional 1 % in 2012, until 2015; after 2015, the increase in the reduction will reduce to 0.5 % annually (UNFCCC, 2013).

Waste
The Ministry of Agriculture, Natural Resources and Environment, responsible for the transposition of the Waste Management Directive, announced that, as of June 2013, a draft version of the waste management plan for the domestic sector has been prepared. The plan includes provisions that promote precaution, reduction, separation, recycling and alternative management of waste. Cyprus has already established two successful waste management pilot programmes, one concerning the implementation of Integrated Management of Organic Waste in different municipalities in Cyprus and the introduction of a 'pay-as-you-throw' scheme in the Municipality of Aglantzia.

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Key climate- and energy-related data — Czech Republic

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	146.0	135.3	131.5	126.9	4 544.2
GHG per capita (t CO_2-eq./cap.)	14.3	12.9	12.5	12.1	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	802	633	605	585	350
Share of GHG emissions in total EU-28 emissions (%)	2.8%	2.9%	2.9%	2.8%	100%
EU ETS verified emissions (Mt CO2-eq.)	82.5	74.2	69.3	67.7	1 848.6
Share of EU ETS emissions in total emissions (%)	56%	55%	53%	53%	41%
ETS emissions vs allowances (free, auctioned, sold) (%)	– 14.9%	– 14.2%	– 22.1%	+ 37.0%	– 14.1%
Share of CERs & ERUs in surrendered allowances (%)	0.0%	8.4%	32.1%	n.a.	26.4%
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	60.5	58.1	59.1	59.2	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			9.3%	11.2%	14.1%
() = including all biofuels consumed in transport	(6.0%)	(9.3%)			
Share of renewable energy for electricity (%)	3.7%	7.5%	10.6%	11.6%	23.5%
Share of renewable energy for heating and cooling (%)	9.1%	12.1%	12.6%	13.6%	15.6%
Share of renewable energy for transport (%)			0.7%	5.6%	5.1%
() = including all biofuels consumed (%)	(0.5%)	(4.6%)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	42.2	41.9	40.6	40.1	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	4.1	4.0	3.9	3.8	3.1
Final energy consumption (Mtoe)	26.0	25.4	24.5	24.1	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.6	2.4	2.3	2.3	2.2
Efficiency of conventional thermal electricity and heat production (%)	48.2%	48.0%	47.3%	46.9%	50.0%
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.60	1.56	1.51	1.55	1.42
Space heating and cooling (toe/dwelling)	1.14	1.10	1.06	1.09	0.96
Water heating (toe/dwelling)	0.23	0.22	0.22	0.22	0.18
Cooking (toe/dwelling)	0.12	0.11	0.11	0.11	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.11	0.12	0.13	0.12	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 0.7%	2020 ESD target (% vs base year)	+ 9.0%
2013 ESD emissions (% vs base year)	– 1.6%	2020 ESD projections WEM (% vs base year)	– 7.4%
		2020 ESD projections WAM (% vs base year)	– 9.3%

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

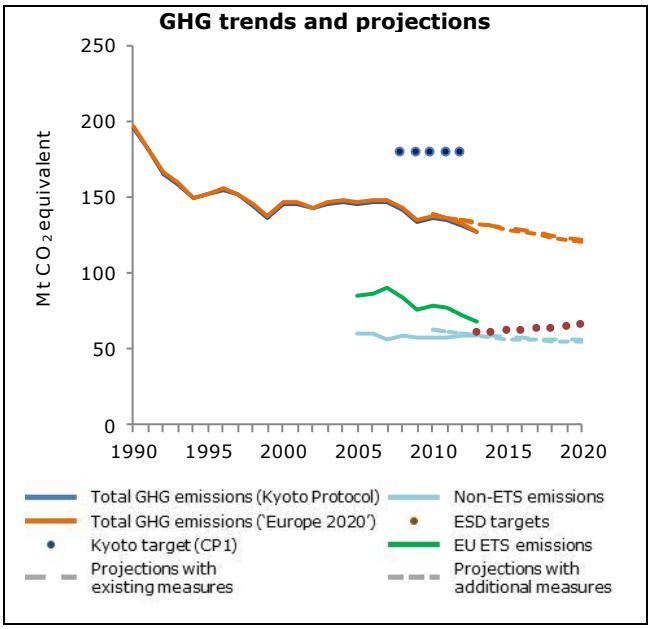
2012 RES share in gross final energy consumption (%)	11.2%	2011–2012 indicative share from RES Directive (%)	7.5%
2020 RES target	13.0%	2012 expected share from NREAP (%)	10.5%

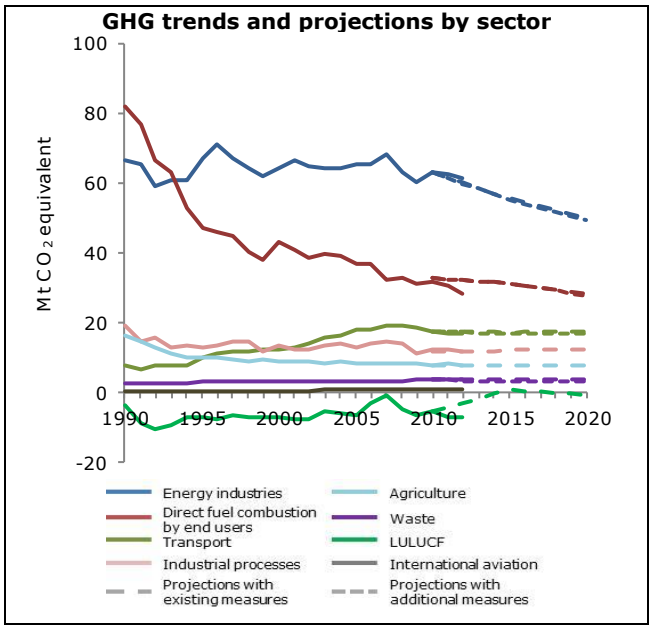
The average share of renewable sources in gross final energy consumption for 2011–2012 was 10.3% (2.6 Mtoe), which is higher than the indicative RED target for 2011–2012 (7.5%). At the same time, the share of renewables in 2012 (11.2 %) is higher than the expected 2012 NREAP target (10.5 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 8.1%. In order to reach its 2020 NREAP target, Czech Republic needs an average annual growth rate of 4.8% in the run-up to 2020. In absolute terms, this is equivalent to 1.1 time its cumulative effort so far.

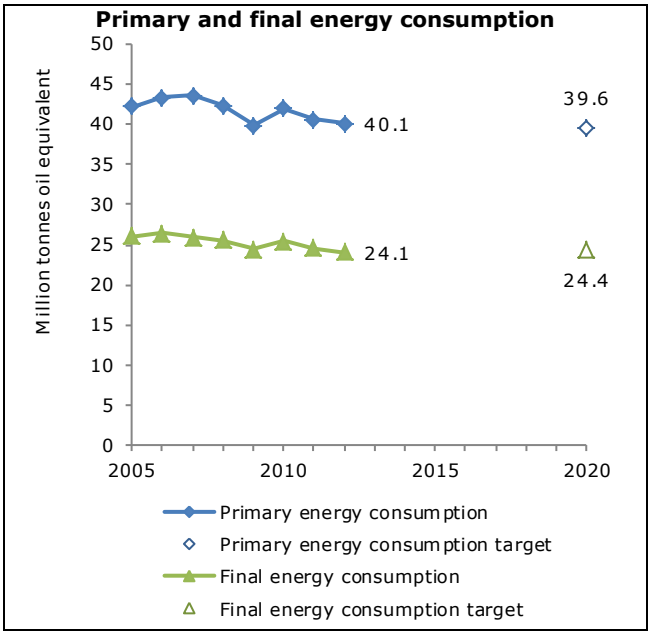
Progress towards energy efficiency targets

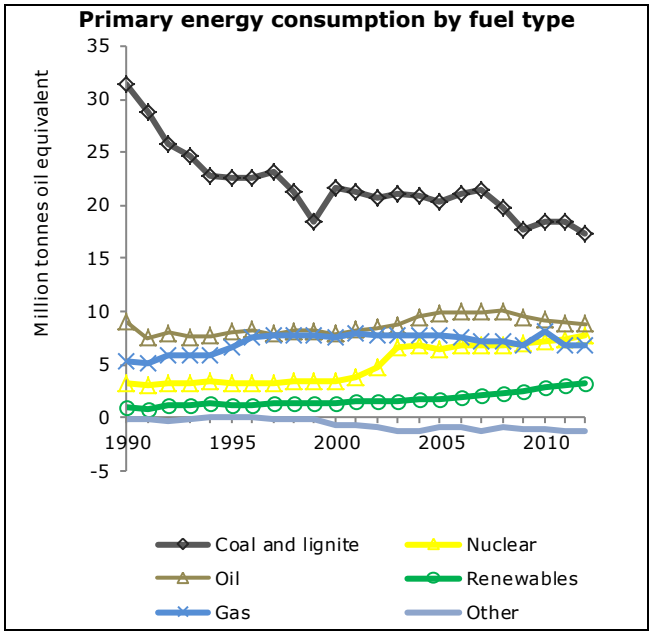
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-0.7%	2005–2012 average annual change	-1.1%
2012–2020 average annual change to target	-0.1%	2012–2020 average annual change to target	0.2%

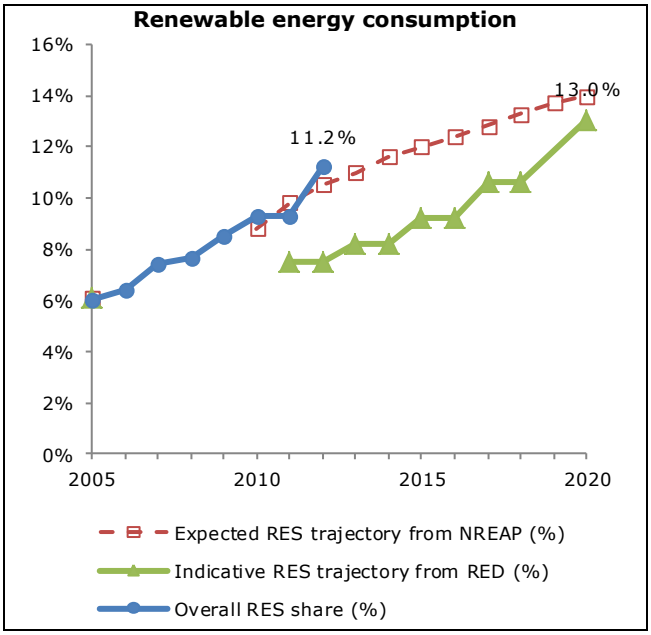
In the Czech Republic , primary and final energy consumption decreased at a faster pace than is necessary to meet the 2020 targets. A reduced economic activity, particularly in industry, contributed to this development. Further improvements in energy efficiency will be necessary to remain on track to the target, in particular in transformation for electricity production as well as in the transport sector.

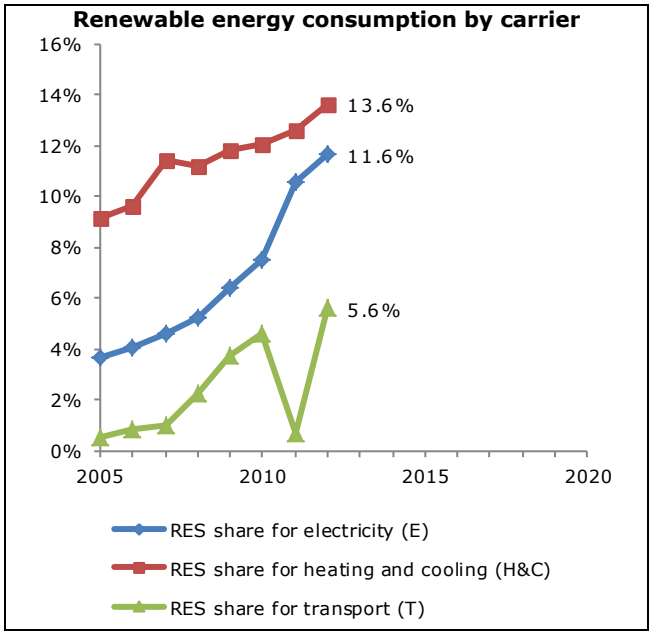

GHG trends and projections
Mt CO2 equivalent
250
200
150
100
50
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
100
80
60
40
20
0
-20
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
50
45
40
35
30
25
20
15
10
5
0
2005
2010
2015
2020
40.1
24.1
39.6
24.4
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
35
30
25
20
15
10
5
0
-5
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
11.2%
13.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
13.6%
11.6%
5.6%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
On the energy demand side, the Czech Republic remains one of the most energy-intensive economies in the EU and energy savings have been recognised as a policy priority. The effective use of available EU funds for such energy efficiency measures is estimated to lead to annual gross domestic product (GDP) growth of 1 % and to create 35 000 new jobs. The energy savings support programme 'New Green Savings' (Nová zelená úsporám) is expected to create around 70 000 jobs mainly in the fields of construction and services up to 2020, and is to be partly financed through sales of emissions allowances. However, due to low Emissions Trading System (ETS) allowance prices, CZK 12 billion (approximately EUR 437 million) of the envisaged total budget of CZK 27 billion (approximately EUR 984 million) is now missing (Třetí ruka, 2014). Additional funding will be required for the long-term energy efficiency strategy to work (EnviWeb, 2014).
The high carbon intensity of the Czech economy also poses a challenge for the pursuit of green growth and climate targets. Energy supply is the largest source of emissions in the Czech Republic and the high share of fossil fuels is only slowly decreasing. Plans to build two new units at the Temelín nuclear power plant (NPP) have been halted due to increased cost estimates. Moreover, recent revisions to the Czech renewable energy support scheme may risk the achievement of the 2020 renewables target and threaten employment in the renewable energy industry. Proposals for implementing an environmental tax reform include a carbon tax component, which could improve incentives for switching from fossil fuels to renewables in a cost-efficient way. In addition, environmental tax reform and complementing measures could incentivise the reduction of overall fuel consumption and the purchase of low-carbon vehicles, and lead to significantly reduced fuel imports.

Climate and energy strategies
The Czech Republic's National Programme To Abate the Climate Change Impacts in the Czech Republic is the country's main document coordinating climate policies at the national level and was adopted in 2004 prior to its accession to the European Union. Currently, a new document titled 'Climate Protection Policy' is being drafted, looking at both the short- (by 2020), medium- (by 2030) and long-term (2050) horizons, and is aimed at implementing the EU Climate and Energy package. The State Energy Concept (Státní energetický koncepce (SEK)) represents a strategic energy management document with a 30-year outlook, which was first adopted in 2004 and is constantly being updated. The last update from November 2013 envisages significantly increasing the share of nuclear energy from 33 to 52 %, while strongly reducing the share of coal energy from 60 to 16 %. However, following the Czech public utility České Energetické Závody's (ČEZ) decision not to build two additional reactor units at Temelín NPP, it is not clear if the Czech government still plans to expand the country's nuclear capacities.

Renewable energy
Good progress has been made in the Czech Republic in increasing the share of renewables in final consumption, in particular for electricity. The main support mechanism for renewable electricity has been a feed-in tariff (FIT), but high FITs that were not adapted to quickly declining production costs for solar photovoltaics (PVs) led to an overly rapid and costly expansion of PV installations. As a result, in 2012 the Czech government merged all electricity support measures (renewable energy sources (RES), secondary energy sources, combined heat and power) into one single act of law, the Act on Supported Energy Sources (Zákon č. 165/2012 Sb. o podporovaných zdrojích energie), which significantly reduced support for renewables and limited the amount and type of eligible operators. In August 2013, the Czech parliament adopted an amendment to this Act that primarily intended to halt the increase of electricity prices for consumers. According to this amendment, the feed-in and premium tariff scheme will be entirely abolished by the end of 2014. The Czech government has also decided to extend a 'solar tax' for plants put into operation in 2010, set at 10 % of the revenue from feed-in and premium tariffs (Třetí ruka, 2013). The retroactivity of this measure could lead the Czech Republic to face arbitration proceedings from the side of the European Commission. Heat from RES is mainly supported through subsidies under the Operational Programmes funded by the European Regional Development Fund (ERDF) and exemptions for renewable heating plants from real estate tax, as well as a building obligation for the use of renewable heating.

Energy networks
The Czech government is currently working to respond to unscheduled power flows, largely from windfarms in northern Germany, which are seen as endangering the stability of its grid. Czech transmission grid operators are coordinating with their German counterparts and in the medium term have agreed to install so-called phase-shifter transformers in the trans-border area with Germany by 2016 to more effectively regulate cross-border power flows.

Energy efficiency
No integrated energy efficiency strategy exists for the Czech Republic. The Czech Republic has finished a first phase of **environmental tax reform** in which it introduced taxes on natural gas, solid fuels and electricity to supplement an excise duty on mineral oils. In the second phase, the Czech Republic is looking at taking into account the energy and carbon content of fuels and plans to implement a carbon tax on natural gases, other gases, solid fuels and fuel oils. This carbon tax component of the reform was originally supposed to take effect on 1 January 2014, but has been delayed.
The Czech Republic has not yet introduced an **obligation for energy market operators**.

The Czech Republic promotes the use of **combined heat and power** through preferential FITs, scaled by the installed capacity and through an obligation for power distribution companies to connect cogeneration to the grid and purchase the electricity they produce.
No obligations or voluntary agreements exist so far to reduce energy consumption in **industry** and negotiations on the introduction of voluntary agreements have stalled. Two programmes, the Operational Programme Industry and Enterprise and the Operational Programme Enterprise and Innovation, provide subsidies for energy efficiency measures and the use of renewables in enterprises and industries.
In the **building sector**, new buildings and existing buildings undergoing major renovations must adhere to new, stricter energy efficiency standards and obtain Energy Performance Certificates. Efficiency measures are supported through the 'New Green Savings' programme, which was approved by the Czech government in November 2013. It will offer grants with a total amount of CZK 27 billion (approximately EUR 1.1 billion) by 2020. The Ministry of Environment has earmarked CZK 1 billion (approximately EUR 36 million) for the first round, while a planned second round would add another CZK 1.9 billion (approximately EUR 69 million) from the sale of emissions allowances. Loans and grants are also provided for green projects through the State Environmental Fund (SEF), including CZK 80 million (approximately EUR 3.4 million) subsidising the purchase of new, more efficient and low-emission boilers. The new state programme EFEKT will provide CZK 30 million (approximately EUR 1.2 million) in 2014 to promote energy savings and the use of renewable and secondary energy sources, and could play an important role in regions that are not eligible for support under the EU Structural Funds.

Transport
Incentives for efficient driving and the purchasing of efficient cars include a registration fee that is charged on vehicles that do not fulfil the EURO 3 vehicle standard as well as ownership taxes for passenger cars and freight vehicles based on engine size, and weight and number of axles, respectively (ACEA, 2012). A time-based vignette system for passenger cars, a distance-based fee for heavy-duty vehicles and an ownership tax on vehicles for business use are also in place (CE Delft, 2012). Both tax rates for petrol and diesel are near the EU average, but diesel is taxed lower than petrol (European Commission, 2013). The Clean Air Act (Zákon o ochraně ovzduší) represents a significant emissions reduction policy that, in relation to transport, requires a minimum biofuel content.
The Czech Republic has also introduced a number of measures to promote a modal shift to more sustainable modes of transportation, including the introduction of 'Park and Ride', 'Bike and Ride', combined freight systems and an integrated transport system with preference for public transport vehicles. An EU grant of CZK 1 billion (approximately EUR 36 million) for energy efficiency measures in the transport sector has led to a new call in January 2014 aimed at replacing the oldest and most polluting public transportation buses with a total of 154 buses on compressed natural gas (CNG) as well as the construction of 10 new CNG filling stations.

Agriculture
Agriculture policy related to climate change mitigation is largely based on the EU Common Agricultural Policy (CAP) and the Czech Rural Development Programme (2007–2013). The 3rd Action Plan of the Nitrate Directive (1991/676/EEC) aims to reduce water pollution by nitrates from agricultural sources through remarcation of vulnerable areas and setting rules for management, including a limit of 170 kg N/ha for the application of organic fertilisers. Moreover, the Action Plan for the Development of Organic Farming 2011–2015 aims at raising the amount of agricultural land devoted to organic farming from 11.5 % in 2012 (above the EU average) to 15 % in 2015, and at increasing the share of the organic food market to 3 %.

Waste
Some recent developments have seen a weakening of waste management policies in the Czech Republic. In March 2013 the Czech parliament approved an amendment to the nation's Waste Act aimed at reducing the administrative burden on business, which among other things withdraws the obligation of individual waste producers to prepare waste management plans. In February 2014, the Czech parliament voted to lower recycling targets for packaging waste. In addition, a leaked study by the Ministry of the Environment indicates that about 80 % of the European funds intended to increase the recycling of municipal waste were used for other, non-priority projects. However, the country is taking steps to reduce the emissions-intensive practice of landfilling. The Waste Act gradually increases fees for landfilling in order to encourage waste incineration and the government is planning to place more weight on waste incineration in the current update of its National Waste Management Plan. However, in March 2014, the Ministry of Environment announced that all three of the waste incineration projects it had planned to support with EU funds had failed to receive approval by the European Commission.

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Key climate- and energy-related data — Denmark

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	64.1	56.5	51.6	53.2	4 544.2
GHG per capita (t CO_2-eq./cap.)	11.8	10.2	9.3	9.5	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	426	322	288	293	350
Share of GHG emissions in total EU-28 emissions (%)	1.2 %	1.2 %	1.1 %	1.2 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	26.5	21.5	18.2	21.6	1 848.6
Share of EU ETS emissions in total emissions (%)	41 %	38 %	35 %	41 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 29.0 %	– 9.9 %	– 32.3 %	– 18.1 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	13.8 %	43.6 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	37.5	34.9	33.3	31.5	2 566.6

Key data on renewable energy	2005	2010	2011	2012	EU 2012
Share of renewable energy in gross FEC (%)			24.0 %	26.0 %	14.1 %
() = including all biofuels consumed in transport	(15.6 %)	(22.6 %)			
Share of renewable energy for electricity (%)	24.7 %	32.7 %	35.9 %	38.7 %	23.5 %
Share of renewable energy for heating and cooling (%)	22.1 %	30.7 %	31.8 %	33.3 %	15.6 %
Share of renewable energy for transport (%)			3.8 %	5.8 %	5.1 %
() = including all biofuels consumed (%)	(0.2 %)	(0.9 %)			

Key data on energy consumption	2005	2010	2011	2012	EU 2012
Primary energy consumption (Mtoe)	19.3	19.9	18.5	17.9	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.6	3.6	3.3	3.2	3.1
Final energy consumption (Mtoe)	15.5	15.2	14.5	14.1	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.9	2.7	2.6	2.5	2.2
Efficiency of conventional thermal electricity and heat production (%)	73.4 %	74.2 %	75.5 %	79.8 %	50.0 %

Energy consumption per dwelling by end use	2005	2009	2010	2011	EU 2011
Total energy consumption per dwelling (toe/dwelling)	1.80	1.70	1.63	n.a.	1.42
Space heating and cooling (toe/dwelling)	1.50	1.43	1.35	n.a.	0.96
Water heating (toe/dwelling)	0.00	0.00	0.00	n.a.	0.18
Cooking (toe/dwelling)	0.03	0.03	0.03	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.27	0.25	0.25	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 3.4 %	2020 ESD target (% vs base year)	– 20.0 %
2013 ESD emissions (% vs base year)	– 15.0 %	2020 ESD projections WEM (% vs base year)	– 21.6 %
		2020 ESD projections WAM (% vs base year)	n.a.

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

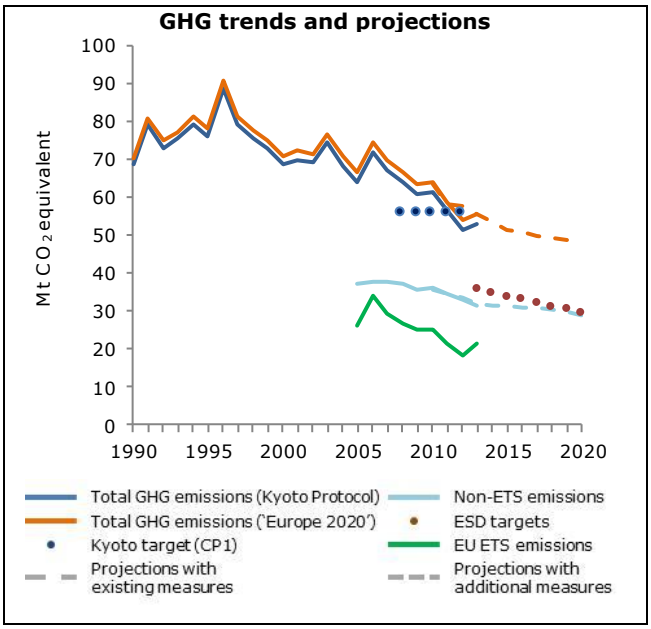
2012 RES share in gross final energy consumption (%)	26.0 %	2011–2012 indicative share from RES Directive (%)	19.6 %
2020 RES target (%)	30.0 %	2012 expected share from NREAP (%)	24.2 %

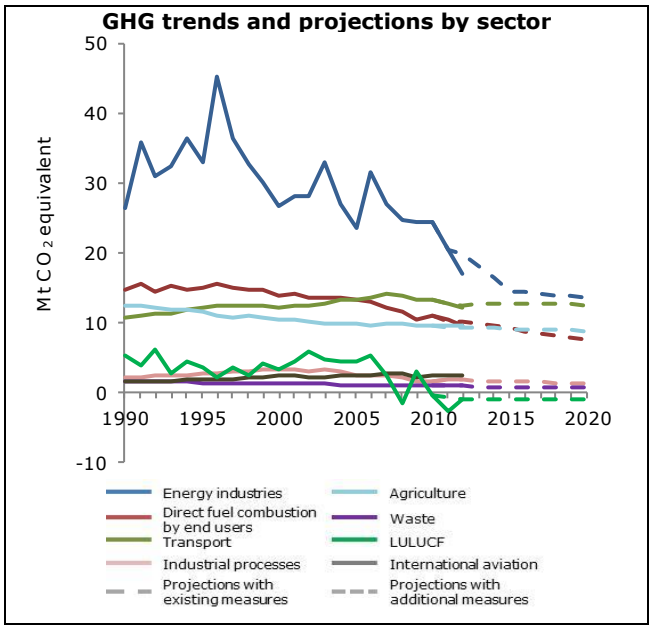
The average share of renewable sources in gross final energy consumption for 2011–2012 was 25.0 % (3.9 Mtoe), which is higher than the indicative RED target for 2011–2012 (19.6 %). At the same time, the share of renewables in 2012 (26.0 %) is higher than the expected 2012 NREAP target (24.2 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 6.6 %. In order to reach its 2020 NREAP target, Denmark needs an average annual growth rate of 2.9 % in the run-up to 2020. In absolute terms, this is equivalent to 0.7 time its cumulative effort so far.

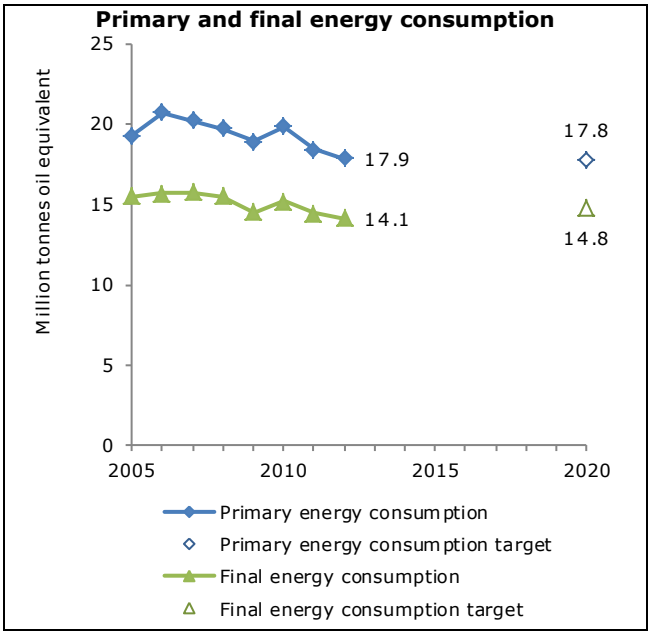
Progress towards energy efficiency targets

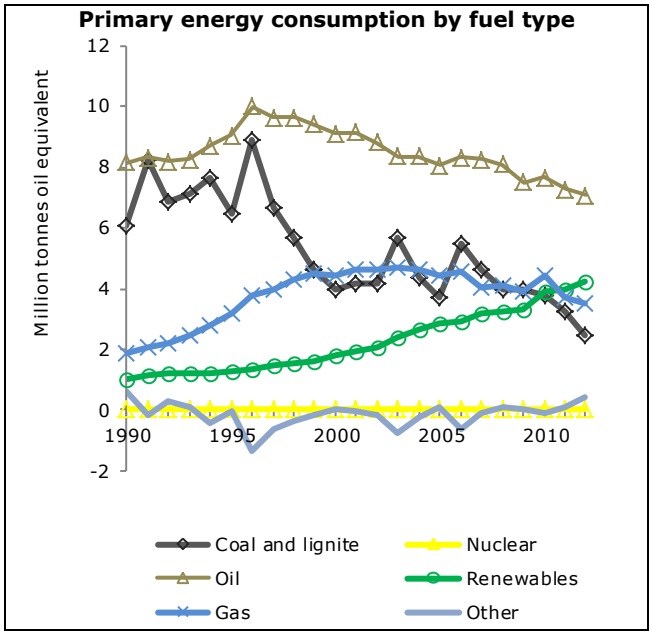
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-1.1 %	2005–2012 average annual change	-1.3 %
2012–2020 average annual change to target	0.0 %	2012–2020 average annual change to target	0.6 %

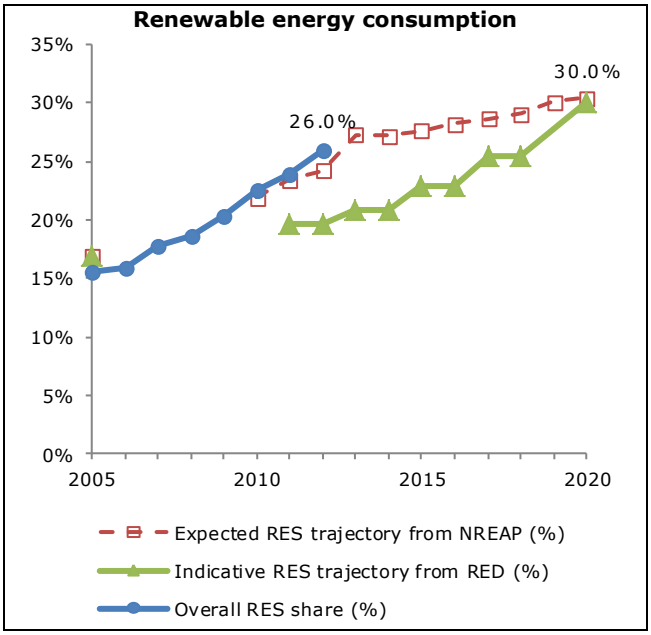
In Denmark, primary and final energy consumption decreased over the period 2005–2012 at a faster pace than is necessary to meet the 2020 targets. While the economic crisis may have played a role, energy efficiency polices made a significant contribution via the energy efficiency obligation scheme as one example. The efficiency in transformation has been improved. New goals included in the new Energy Deal, adopted in 2012, and enhanced innovation due to eco-design requirements can contribute to further reducing the energy consumption in buildings. For example, the best windows available on the Danish market today exceed the requirements originally set for 2020.

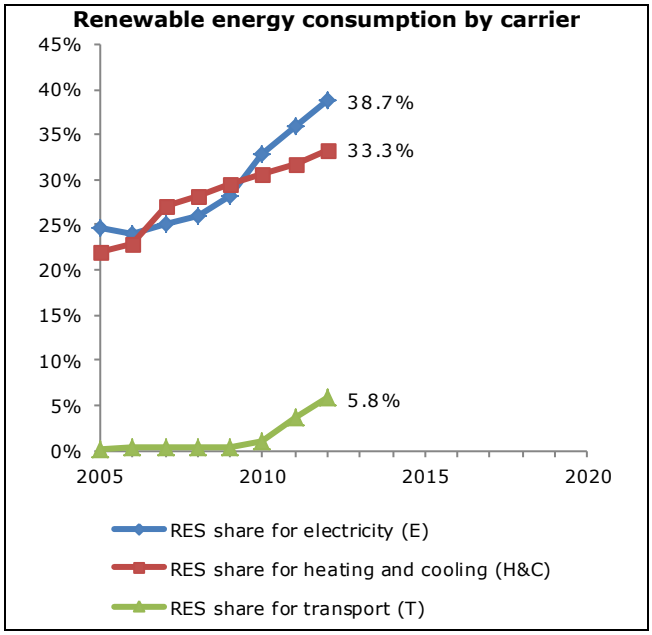

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
17.9
14.1
17.8
14.8
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
26.0%
30.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
38.7%
33.3%
5.8%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Denmark puts an emphasis on the importance of green growth as part of its economic strategy and brands itself as a 'green lab'. Over the last decades, Denmark has been increasingly substituting oil and coal with natural gas and renewable energy, first and foremost wind energy.
However, challenges remain in specific sectors. Emissions from transport have increased around 20 % since 1990 and they make up almost a quarter of total emissions in Denmark (as of 2011). Some slight reductions have be realised since 2007, mainly due to the economic recession and implementation of the 2009 Green Transport Policy agreement. As part of the initiatives outlined in the new Climate Plan, the government is currently working on a roadmap to phase out fossil fuel use in transport by 2050. But, next to this ambitious long-term target, Denmark also needs to tackle transport emissions in the short run, especially with respect to road transport. As in many EU Member States, diesel is taxed at much lower rates than petrol, creating misleading incentives with respect to emission reductions. Even when taking into account the Danish carbon dioxide (CO_2) tax, excise duties for petrol and diesel are below the rates applied, for example, in neighbouring Germany. Increasing taxes on transport fuels could increase incentives for alternative modes of transport and the use of fuel-efficient cars, and generate additional revenues, which could be used to support green economy-related programmes.
Also, emissions from buildings remain a challenge. Denmark has a long history of providing information on the energy performance of buildings through labelling, and energy performance standards are regularly tightened. However, energy consumption in buildings is still relatively high when compared to other EU Member States, and it accounts for almost 40 % of all energy consumption. This is partly due to the fact that a large share of the buildings was constructed before the first energy performance standards were introduced in the 1970s. Hence, retrofitting of existing buildings is crucial for reducing energy consumption and related expenditure by households. Moreover, such investments could lead to local job creation in the construction and renovation industry.

Climate and energy strategies
Denmark published its 'Government's Climate Plan Towards a Society without GHGs' in 2013, which stipulates a 40 % reduction target by 2020 compared to 1990, as a step towards the long-term EU target of an 80–95 % reduction by 2050. The 78 measures address emissions from transport, agriculture, buildings and waste. On the basis of the Climate Plan, the government plans to develop a climate change bill that will be introduced to parliament in the coming parliamentary year (ENS, 2013a).
The Climate Plan complements the Energy Agreement 2012–2020, a broad climate and energy strategy with an investment package of DKK 90–150 billion (EUR 12–20 billion). The Agreement sets objectives and measures intended to reach Denmark's long-term domestic target of 100 % renewable energy in both the energy and transport sectors by 2050, and several other benchmarks by 2020. The latter include obtaining 35 % of final energy consumption from renewables, 50 % wind power in electricity consumption and a 7.6 % reduction in gross energy consumption compared to 2010. The measures in the Agreement are expected to reduce greenhouse gas (GHG) emissions by 34 % by 2020 compared to 1990, and to create 4 000 additional jobs in 2013 and 2014, and 6 000 to 8 000 jobs between 2015 and 2018 (Danish Ministry of the Environment, 2012). In addition, the 2013 Growth Plan for Energy and Climate aims to create growth, jobs, and better export opportunities for Danish companies in the energy technology and solutions industries.

Renewable energy
Denmark is strongly encouraging the production of renewable energy and the country has long been the world leader in wind power. Since 2008, Denmark supports generation of electricity from renewable sources through a premium tariff system based on bonus payments, which is paid on top of the market price. The sum of the market price and the bonus may not exceed a statutory maximum per kWh, differentiating by source of energy and date of connection. The scheme is financed through a fee consumers pay on their electricity bill. Loans for feasibility studies for wind energy plants, and subsidies for small renewable electricity generation installations that are considered to be of strategic importance, are also available. As part of the measures foreseen in the Energy Agreement, Denmark is currently reviewing the support schemes for renewable electricity, including for small-scale photovoltaics.
For renewable heating, a premium tariff exists for the use of biogas. To further promote renewables in heating, the installation of oil and natural gas boilers in new buildings is banned since 2013. The Energy Agreement foresees a further ban of these boilers for existing buildings from 2016 onwards, and sets aside a funding budget of DKK 42 million annually from 2012–2015 to support the replacement in existing buildings with renewable energy-based heating. Additionally, financial support totalling DKK 3.75 billion (EUR 0.5 billion) is available for companies that switch to renewable energy or district heating in their production processes, make energy efficiency improvements or use biomass cogeneration ('VE til process'). The scheme is estimated to increase the share of renewable energy by 1.1 % per year, and to reduce CO_2 emissions by 1.5 % per year (compared to 1990) (ENS, 2013b).

Energy efficiency
The energy intensity of the Danish economy was the second-lowest among Member States in 2011. The Energy Agreement 2012–2020 sets the ambitious goal of reducing gross energy consumption by 7.6 % by 2020 compared to 2010.

Denmark has the highest implicit **tax rate** on energy products in the EU. Since 1992, Denmark also applies a specific CO_2 tax, currently at rates of around DKK 90 (EUR 12) per tonne CO_2 with an annual increase of 1.8 %. However, energy-intensive industry is partly reimbursed for these taxes.
Energy distributors of electricity, natural gas, district heating and heating oil have to improve the energy efficiency of their consumers under an obligation scheme in place since 2006. The scheme was revised as part of the Energy Agreement, increasing the reduction obligation of total energy consumption to 2.6 % in 2013 and 2014, and to annually 2.9 % between 2015 and 2020. An evaluation of the scheme in 2012 showed that it led to cost-effective energy reductions with average costs of about EUR ct 5.6 per kWh (DEA, 2012).
Denmark has the highest share of **combined heat and power** (CHP) in electricity production in the EU, due to strong support by the government since the late 1970s. The Energy Agreement envisages DKK 30 million (EUR 4 million) per year (2013 to 2020) for maintaining and promoting industrial CHP.
Voluntary agreements with **industry** on energy efficiency improvements were in place until 2013, in return for exemptions from the carbon tax. From 2014 onwards, industry is generally exempt from the carbon tax on electricity, as part of the Danish Growth Plan. The government also announced the introduction of a new support scheme with a total budget of DKK 525 million (EUR 70.3 million) for energy-intensive enterprises for the period 2015–2020 once the new European state aid guidelines are published (ENS, 2013c).
For **buildings**, the government published a comprehensive strategy for energy retrofitting in May 2014. The strategy includes 21 initiatives, which are expected to reduce energy consumption for heating in existing buildings by 35 % (KEBMIN, 2014). Denmark already has minimum energy performance standards in place, which are regularly tightened. Energy Performance Certificates are mandatory for buildings. Denmark also requires that for existing buildings cost-effective energy improvements are carried out in combination with even minor renovations (Odyssee, 2012). The main financing mechanism is the obligation scheme for energy distributors.

Transport
In 2008, Denmark adopted a Sustainable Transport Plan outlining actions on tax incentives, funding for research on green technologies, investment in public transport, intelligent traffic systems and a new road strategy.
Taxes on transport fuels are slightly above EU average but diesel is taxed 25 % less than petrol (European Commission, 2013). Denmark applies vehicle registration and ownership taxes. These are not based directly on CO_2 emissions but on fuel efficiency of vehicles (ACEA, 2012). The use of renewables in transport is promoted through a quota system since 2012 requiring that all fuels contain an average of 5.75 % of biofuels. The Energy Agreement envisages a 10 % target for 2020, pending analyses of alternative instruments carried out by 2015. The Agreement also allocated DKK 70 billion (EUR 9.4 billion) to infrastructure projects for electric vehicles, gas and hydrogen, and prolongs the tax exemption for hydrogen-fuelled cars and electric cars until 2015. A strategy for the promotion of energy-efficient vehicles will be set up based on a number of analyses to be carried out in 2013–2015, including a number of wells-to-wheels analyses.
Denmark aims to make significant investments in rail transport to make it a viable alternative to car usage. In 2013, Denmark allocated DKK 27.5 billion (EUR 3.7 billion) for upgrades of rail infrastructure, with expected emission reductions of 100 000 tonnes CO_2 equivalent per year. Additional funds are available for the electrification of the railway system. Improving conditions for cycling is another priority, and the government allocated DKK 1 billion (EUR 140 million) in its Climate Plan to improve and promote Danish cycle transport facilities from 2009 to 2014. The government is also currently working together with stakeholders on a National Cycle Strategy (Transportministeriet, 2014).

Fluorinated gases (F-gases)
Since 1988, Denmark levies a tax on the import of CFC, HFC, PFC and SF_6 *(CFC – afgiftsloven*). Substances used in vehicle air conditioning systems are exempted. Rates range from DKK 30 to 600 (EUR 4 to 80) per kilogram, depending on the gas.

Agriculture
Denmark expects that agricultural emissions will increase in importance and make up 20 % of total emissions by 2020. Measures that are expected to reduce emissions include a ban on burning straw, environmental approval for livestock holdings or the promotion of biogas plants. Since the late 1980s, Denmark has implemented action plans to reduce nitrogen leaching.
In 2013, an independent Commission on Nature and Agriculture, established by the government, presented a report recommending actions on how to improve the performance of the agriculture and food sectors as regards the environment and climate change. Proposed initiatives include the setting aside of farmland for nature, adoption of a new emissions-based environmental regulation, subsidies for establishing new biogas plants and subsidies for climate projects at the farm level. Denmark announced in the Climate Plan that a new policy framework would be elaborated in 2016, based on the recommendations.

Waste
Since 1989, Denmark levies a tax on waste delivered to landfill sites or incineration plants and on raw materials (stone, gravel, sand, etc.) when commercially extracted or imported (Statutory Notice No 570 of 3 August 1998). For waste, the rates amount to DKK 330–375 per tonne (EUR 44–50), and for raw materials to DKK 5 (EUR 0.67) per cubic metre. Since 1997, landfilling of combustible waste is banned (Statutory Order on Waste).

Land use, land-use change and forestry
Since 1989, the Denmark pursues the objective to double the forest area within 100 years. The 2005 National Forest Program further specified the objective to obtain 20 to 25 % forest coverage within 80-100 years. The government has introduced various measures to achieve these objective, such as legislation, forest management guidelines, awareness and capacity building campaigns, and economic incentives. For example,

the government provides grants for afforesation on agricultural land, and has introduced a ban on burning straw on fields.

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Key climate- and energy-related data — Estonia

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	18.4	20.5	19.2	21.1	4 544.2
GHG per capita (t CO_2-eq./cap.)	13.6	15.4	14.5	16.0	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	990	880	786	853	350
Share of GHG emissions in total EU-28 emissions (%)	0.4 %	0.4 %	0.4 %	0.5 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	12.6	14.8	13.5	15.9	1 848.6
Share of EU ETS emissions in total emissions (%)	69 %	72 %	71 %	75 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 24.6 %	– 7.1 %	– 4.9 %	n.a.	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	1.1 %	18.8 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	5.6	5.7	5.6	5.2	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(17.5 %)	(24.6 %)	25.6 %	25.8 %	14.1 %
Share of renewable energy for electricity (%)	1.1 %	10.4 %	12.3 %	15.8 %	23.5 %
Share of renewable energy for heating and cooling (%)	32.2 %	43.3 %	44.1 %	43.1 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.2 %)	(0.2 %)	0.2 %	0.3 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	5.4	6.1	6.1	6.0	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	4.0	4.6	4.6	4.6	3.1
Final energy consumption (Mtoe)	2.9	2.9	2.8	2.9	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.1	2.2	2.1	2.2	2.2
Efficiency of conventional thermal electricity and heat production (%)	48.9 %	47.7 %	44.9 %	46.9 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.50	1.58	1.57	n.a.	1.42
Space heating and cooling (toe/dwelling)	0.95	0.98	0.96	n.a.	0.96
Water heating (toe/dwelling)	0.31	0.31	0.31	n.a.	0.18
Cooking (toe/dwelling)	0.16	0.20	0.20	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.08	0.09	0.10	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 8.1 %	2020 ESD target (% vs base year)	+ 11.0 %
2013 ESD emissions (% vs base year)	– 7.4 %	2020 ESD projections WEM (% vs base year)	+ 6.2 %
		2020 ESD projections WAM (% vs base year)	+ 1.7 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

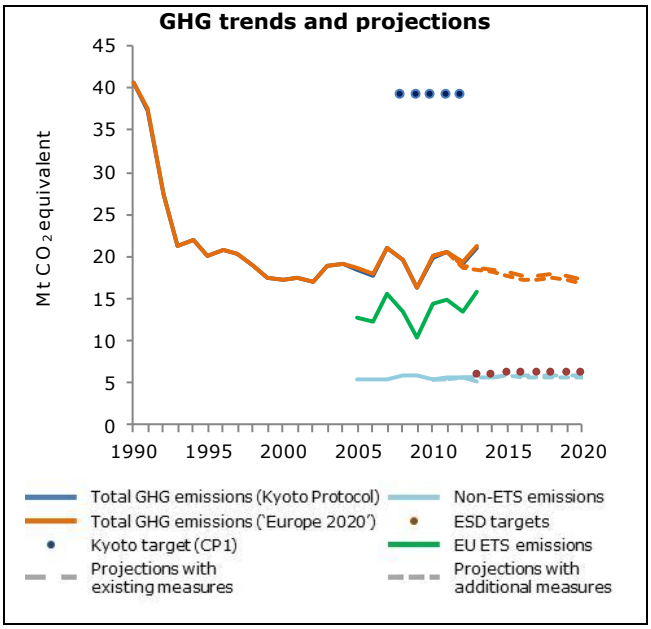
2012 RES share in gross final energy consumption (%)	25.8 %	2011–2012 indicative share from RES Directive (%)	19.4 %
2020 RES target	25.0 %	2012 expected share from NREAP (%)	22.0 %

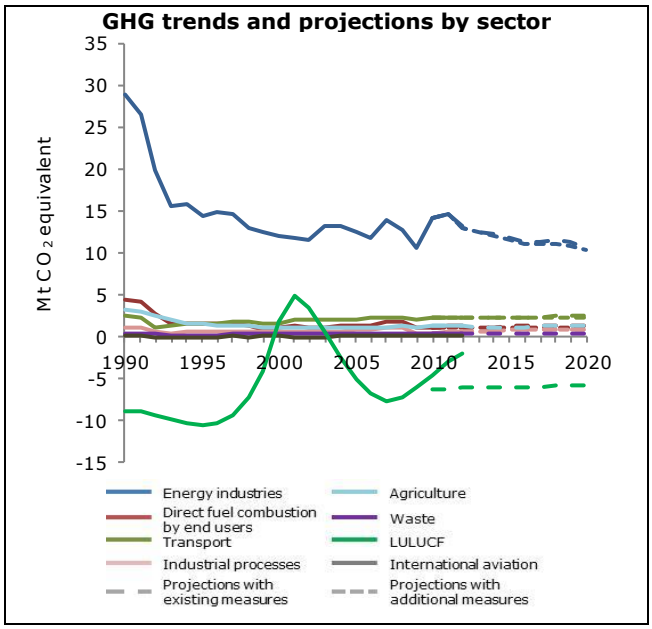
The average share of renewable sources in gross final energy consumption for 2011–2012 was 25.7% (808 ktoe), which is higher than the indicative RED target for 2011–2012 (19.4%). At the same time, the share of renewables in 2012 (25.8 %) is higher than the expected 2012 NREAP target (22.0 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 6.0%. In order to reach its 2020 NREAP target, Estonia needs an average annual growth rate of 0.6% in the run-up to 2020. In absolute terms, this is equivalent to 0.1 time its cumulative effort so far.

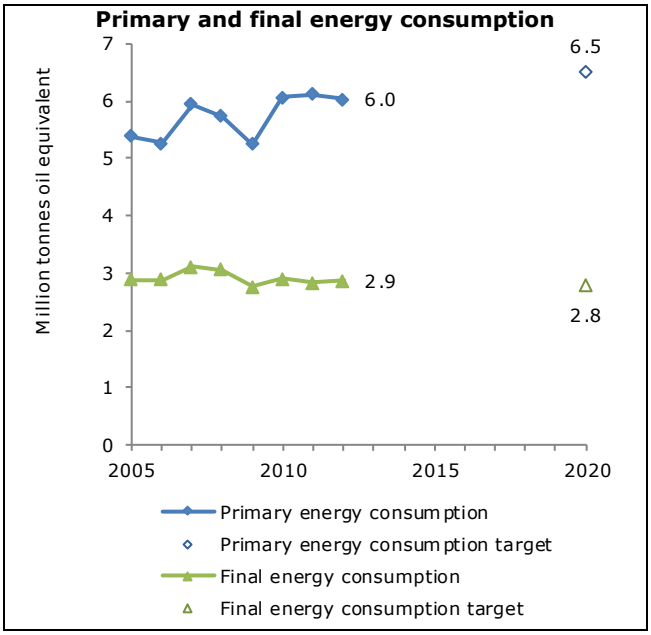
Progress towards energy efficiency targets

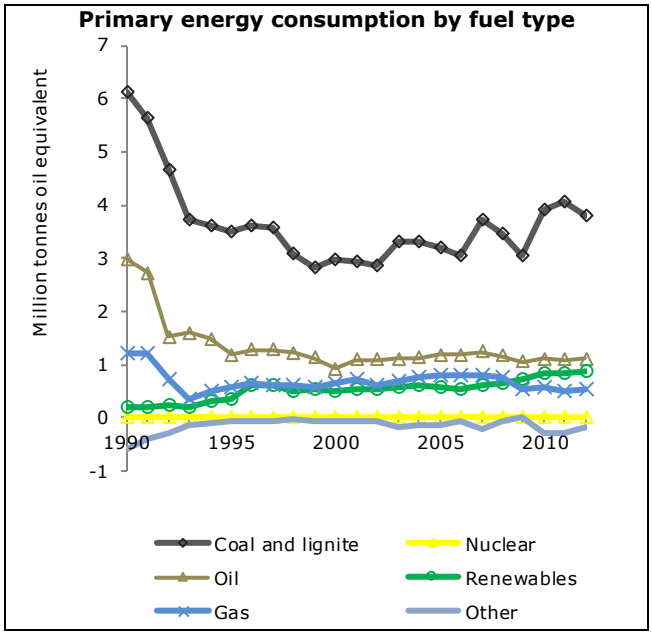
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	1.6 %	2005–2012 average annual change	0.0 %
2012–2020 average annual change to target	0.9 %	2012–2020 average annual change to target	-0.3 %

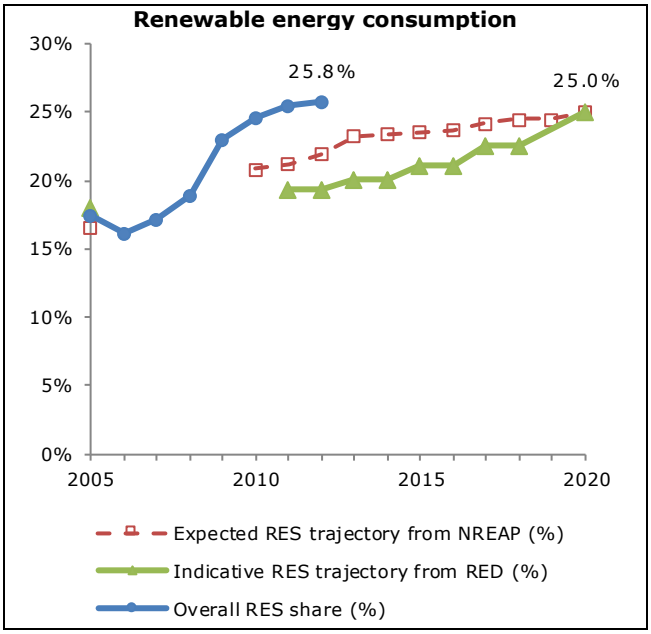
Despite having a positive 2020 target for primary energy consumption compared to 2005, Estonia did not limit sufficiently the increase of its primary energy consumption and did not reduce enough its final energy consumption during the period from 2005 to 2012 to be considered on track to meet its 2020 targets. The transformation input to conventional thermal power stations represents over 48 % of primary energy consumption and the energy input increased by 9.5 % over the period. Improving energy efficiency in transformation could therefore contribute to limiting primary energy consumption. Energy efficiency improvements in the transport and residential sectors could contribute to further reducing final energy consumption.

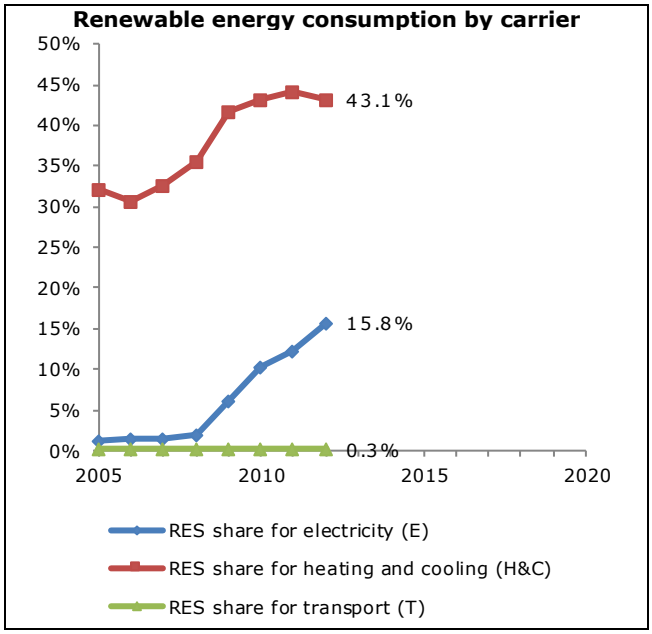

GHG trends and projections
Mt CO2 equivalent
45
40
35
30
25
20
15
10
5
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
35
30
25
20
15
10
5
0
-5
-10
-15
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
7
6
5
4
3
2
1
0
2005
2010
2015
2020
6.5
6.0
2.9
2.8
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
7
6
5
4
3
2
1
0
-1
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
25.8%
25.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
43.1%
15.8%
0.3%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Estonia's economy is more than twice as carbon dioxide (CO_2) intensive as the EU average. Energy generation accounts for approximately 70 % of the country's total greenhouse gas (GHG) emissions. The combustion of oil share accounts for the highest share of emissions. However, Estonia is currently still highly dependent on oil shale. There are several ways in which this situation could be improved: retrofitting of existing thermal plants to increase efficiency and, for example, enable cogeneration, the shifting to renewable sources of energy and a more efficient end-use of energy. These measures would help to reduce energy demand from fossil fuels and the associated emissions.
In addition, GHG emissions from the transport sector are particularly important and have increased since 2005. Newly registered cars have very high average emissions and even though the fuel excise tax rates have been raised 10 times in the last 15 years, there have been no noticeable results. Tackling emissions through shifting of taxation from, for example, labour to fuel consumption and more reliable and attractive public transport could help to incentivise the purchasing of more efficient cars, more efficient driving modes or a switch to public transport.

Climate and energy strategies
Estonia does not have a comprehensive climate strategy in place. In May 2014, the Ministry of the Environment announced a tender for the development of a climate strategy. Estonia recently finalised the new Estonian Energy Economy Development Plan up to 2030. It addresses energy production, energy transmission including district heating, the transport sector and others. Its main purpose is to ensure security of energy supply and to improve energy efficiency. It is expected that energy prices will further rise after the opening of the electricity market in January 2013; however, the energy mix will become more diverse, reducing also the consumption of Russian gas. The Development Plan will be published officially by the end of 2014.

Renewable energy
Estonia has increased the use of renewables in both electricity generation and in heating and cooling. For renewable electricity, Estonia's main support scheme is a feed-in tariff (FIT). However, Estonia wants to switch from the FIT to a premium priced system and is currently waiting for a decision from the European Commission whether the new support scheme is considered as state aid. The switch is envisaged as the renewable energy target for 2020 has already been achieved and the surcharge for final consumers should not increase further.
Next to this, there are plans to build the world's largest wind energy park on the coast of Estonia's second biggest island, Hiiumaa. Currently, it is unclear whether the project will be carried out as there is strong resistance. Currently, it is unknown when a decision will be taken by the Hiiu County Local Authority as local people, fishermen and several non-governmental organisations are strongly opposed to the project.
According to the Estonian Renewable Energy Association, 71 % of electricity consumers are considering the benefits of solar panels, and the number of installations of solar panels is higher than ever due to increasing electricity prices and decreasing costs related to solar power installations and grid connection.
Regarding renewables in heating, investment support can be provided for the construction of renewable energy source (RES) combined heat and power (CHP) plants, for the reconstruction of boiler houses to make them operational for renewable energies and for the reconstruction of the district heating network. Furthermore, RES CHP plants are eligible for a premium tariff (RES legal). Investment support is also made available for owners of private houses and apartment buildings for the purchasing of RES plants for the production of heat.

Energy networks
Estonia is connected to Latvia and Lithuania; there is no connection to the main continental European grid but a connection to Poland is planned. Underwater cable connections (Estlink 1 and 2) to Finland should allow Estonia to increase its security of supply and support the development of its electricity market. Estlink 2 has been tested successfully and was recently opened. It raised the connection capacity from 350 MW to 1 000 MW from Estonia to Finland and to 860 MW from Finland to Estonia. Minor works will continue during 2014. The costs for establishing the second underwater cable amounted to EUR 320 million of which EUR 100 million was funded by the European Union. The third Estonian–Latvian electricity cable connection is expected to be finished by 2020. It is estimated that it will improve transmission between Estonia and Latvia by 500–600 MW.

Energy efficiency
Estonia has an Energy Efficiency Programme for 2007–2013 that has not yet been extended or renewed. The main focus of the Programme was to increase energy audits in industrial and smaller companies and provide training for energy consultants working in the area of energy savings. The Programme also provided possibilities for companies to improve their energy efficiency. To increase energy efficiency in manufacturing **industries** and construction, training courses on energy conservation and energy management and analyses and development of energy-efficient technical solutions were carried out. For 2014–2020 the government has reserved EUR 150 million for increasing energy efficiency in companies. This budget is mainly intended for: 1) developing best technologies, 2) supporting companies' investments in waste management, 3) supporting companies and local authorities' investments in waste renewable developments, and 4) audits of and training for resource management programmes (Lõhmus, 2013).
Energy **taxation** is below the EU average. Excise duty exemptions apply, for example, to energy products used in mineralogical processes, shale-derived fuel oil and solid fuels used in households as heating fuel, electricity when it accounts for more than 50 % of the cost price of the product, electricity used for chemical reduction, and in metallurgic and electrolytic processes.

Obligations for energy market operators are planned but responsibilities and clear targets are missing. Efficient **cogeneration** of heat and electricity is supported through a FIT.
In the **building** sector, in 2014, the amended minimum requirements for energy-efficient building and renovations supplementing the Estonian Building Code came into force. As a result, all state-owned new buildings must be nearly zero-energy buildings from 1 January 2019 onwards while all other new buildings must be nearly zero-energy buildings from January 2021 onwards. The Green Investment Scheme supports energy efficiency and use of renewables at small boiler houses and the improvement of district heating networks. Furthermore, it enables renovations of public sector and local government buildings as well as apartment buildings. The budget of the programme for the period 2014–2020 amounts to EUR 102 million.

Transport
Average emissions for newly registered cars are very high in Estonia and vehicle **taxes** are well below the EU average as there is no registration tax and ownership taxes do not have to be paid for passenger cars. Heavy goods vehicles are charged with a tax that does not take into account CO_2 emissions (ACEA, 2012). Furthermore, there is no charge applying to road use (CE Delft, 2012). Taxes on petrol and diesel are below and at EU average, respectively (European Commission, 2013). The Liquid Fuel Act establishes a **biofuels** mixing obligation for retailers. Starting from 2016, the obligation would be a 5 % biofuel share in liquid motor fuels and increase to a 10 % share by 2020. The use of biomethane, for example in the transport sector, should receive funding of around EUR 43 million from the auctioning of EU Emissions Trading System (ETS) emission allowances as regulated under the Ambient Air Protection Act of August 2013. By 2020, the use of biomethane should substitute 30 000 tonnes of petrol. In February 2014, the Environmental Investment Centre also announced the decision to subsidise the first biomethane production facility. In addition, Estonia has adopted a programme to subsidise electric car purchases. Up to 50 % or a total maximum of EUR 18 000 of the purchasing price of new electric cars is subsidised. Subsidies are also available for companies. Since February 2013, the network of chargers is being expanded and electric cars can already be rented in Tallinn and Tartu. The Ministry of Economic Affairs and Communications governs the environmentally friendly public transport investment programme 2012–2015 with a budget of EUR 86 million to reduce the environmental burden of transport and increase the number of users of public transport. Additional buses working on gas and gas–electric hybrid buses have been purchased and some municipalities have included the obligation to use alternative fuels in public procurements. The programme also aims to improve the tram infrastructure. For residents of Tallinn, public transport is free of charge since 2013.

Agriculture
In the agriculture sector, the Estonian Agricultural Registers evaluates applications for support measures to promote the wider use of renewable energy produced from biomass by farmers for their own use. The support can cover up to 40 % of the total cost of the respective project. Furthermore, support measures promote the modernisation of agricultural holdings and investments to livestock holdings. The Water Act was amended recently to better protect groundwater from pollution stemming from agriculture by applying stricter rules for the use of fertilisers, making monitoring more efficient and facilitating the allocation of fines.
The Action Plan of Organic Farming for 2007–2013 aimed to support organic farming and increase its area from 72 800 to 120 000 ha while also reducing the use of mineral fertilisers. The Ministry of Agriculture is now working on the new development plan for organic farming 2014–2020, which will be released in 2014.

Waste
Estonia aims to reduce landfilled waste with rules on municipal waste planning, producer responsibility for certain goods, including the obligation to provide consumers with information about recycling, and an ordinance on biodegradable waste. The Waste Act also sets obligatory targets for recycling of different waste categories by 2020. Pursuant to the Environmental Charges Act, a tax on landfilling of waste will come into force in 2015. Furthermore, the Environmental Investment Centre governs subsidy applications for projects aimed at recycling and reusing waste. The total sum of the subsidy is EUR 2 million, of which EUR 1.6 million can be awarded to private companies registered in Estonia for projects concerning, for example, construction of waste management factories that use certain types of waste to make new products. Waste used can be used glass, paper, metal and used car tires, but also biowaste. EUR 0.4 million can be awarded to companies owned by local governments for the opening of new waste disposal sites.

Land use, land-use change and forestry
Approximately half of Estonia's land area is covered by forest, of which roughly 40 % belongs to the state. The State Forest Management Centre tries to strike a balance between economical, ecological and social aspects of forest management. In December 2012, the Estonian Ministry of Agriculture published a National Forest Management Plan for 2013–2017 that applies to national forests and sets maximum harvest levels for different tree species. This preserves Estonia's carbon sink capacity. The Estonian Forestry Development Plan until 2020 and the Forestry Act aim to reduce GHG emissions by encouraging forest owners to plant more trees. The support scheme subsidises the planting of trees and ensures sustainable management. Furthermore, a recent amendment to the Forest Act includes developing an electronic forest registry to make forest management more transparent.

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Key climate- and energy-related data — Finland

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	68.6	66.9	61.0	60.6	4 544.2
GHG per capita (t CO_2-eq./cap.)	13.1	12.4	11.3	11.2	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	510	427	383	383	350
Share of GHG emissions in total EU-28 emissions (%)	1.3%	1.5%	1.3%	1.4%	100%
EU ETS verified emissions (Mt CO2-eq.)	33.1	35.1	29.5	31.5	1 848.6
Share of EU ETS emissions in total emissions (%)	48%	52%	48%	52%	41%
ETS emissions vs allowances (free, auctioned, sold) (%)	– 25.9%	– 7.7%	– 22.7%	– 20.8%	– 14.1%
Share of CERs & ERUs in surrendered allowances (%)	0.0%	11.1%	27.8%	n.a.	26.4%
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	33.0	29.8	29.5	28.9	2 566.6

Key data on renewable energy	2005	2010	2011	2012	EU 2012
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(28.9%)	(32.4%)	32.7%	34.3%	14.1%
Share of renewable energy for electricity (%)	26.9%	27.6%	29.4%	29.5%	23.5%
Share of renewable energy for heating and cooling (%)	39.3%	44.1%	45.7%	48.1%	15.6%
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.4%)	(3.8%)	0.4%	0.4%	5.1%

Key data on energy consumption	2005	2010	2011	2012	EU 2012
Primary energy consumption (Mtoe)	33.4	35.8	34.4	33.1	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	6.4	6.7	6.4	6.1	3.1
Final energy consumption (Mtoe)	25.3	26.4	25.1	25.3	1 104.5
Final energy consumption per capita (Mtoe/cap.)	4.8	4.9	4.7	4.7	2.2
Efficiency of conventional thermal electricity and heat production (%)	78.8%	74.7%	75.7%	79.8%	50.0%

Energy consumption per dwelling by end use	2005	2009	2010	2011	EU 2011
Total energy consumption per dwelling (toe/dwelling)	2.13	2.23	2.20	2.18	1.42
Space heating and cooling (toe/dwelling)	1.43	1.53	1.50	1.50	0.96
Water heating (toe/dwelling)	0.30	0.32	0.32	0.32	0.18
Cooking (toe/dwelling)	n.a.	0.03	0.03	0.02	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.40	0.35	0.35	0.33	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 5.9%	2020 ESD target (% vs base year)	– 16.0%
2013 ESD emissions (% vs base year)	– 13.2%	2020 ESD projections WEM (% vs base year)	– 11.6%
		2020 ESD projections WAM (% vs base year)	– 14.9%

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections (adjusted by EEA) indicate that 2020 ESD emissions are expected to be above the 2020 ESD target, despite the implementation of measures planned until 2013. However, national projections indicate ESD emissions lower than the 2020 target.

Progress towards renewable energy targets

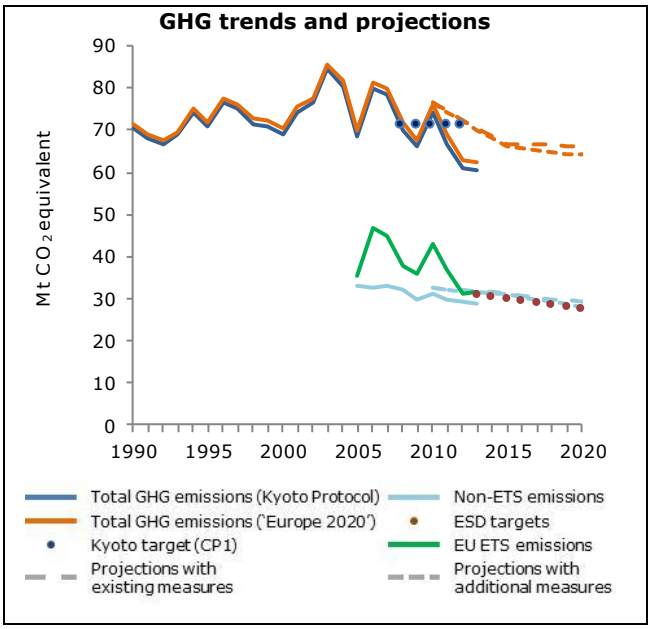
2012 RES share in gross final energy consumption (%)	34.3%	2011–2012 indicative share from RES Directive (%)	30.4%
2020 RES target	38.0%	2012 expected share from NREAP (%)	31.0%

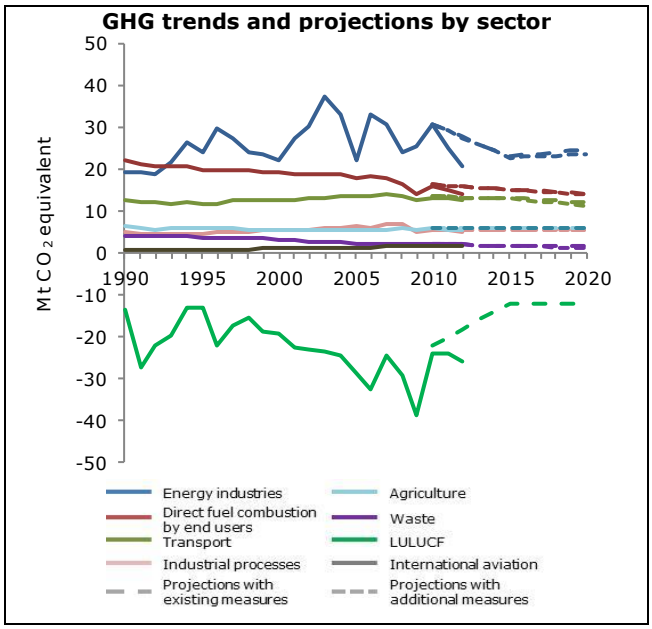
The average share of renewable sources in gross final energy consumption for 2011–2012 was 33.5% (8.8 Mtoe), which is higher than the indicative RED target for 2011–2012 (30.4%). At the same time, the share of renewables in 2012 (34.3 %) is higher than the expected 2012 NREAP target (31.0 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 2.7%. In order to reach its 2020 NREAP target, Finland needs an average annual growth rate of 2.2% in the run-up to 2020. In absolute terms, this is equivalent to 1.1 time its cumulative effort so far.

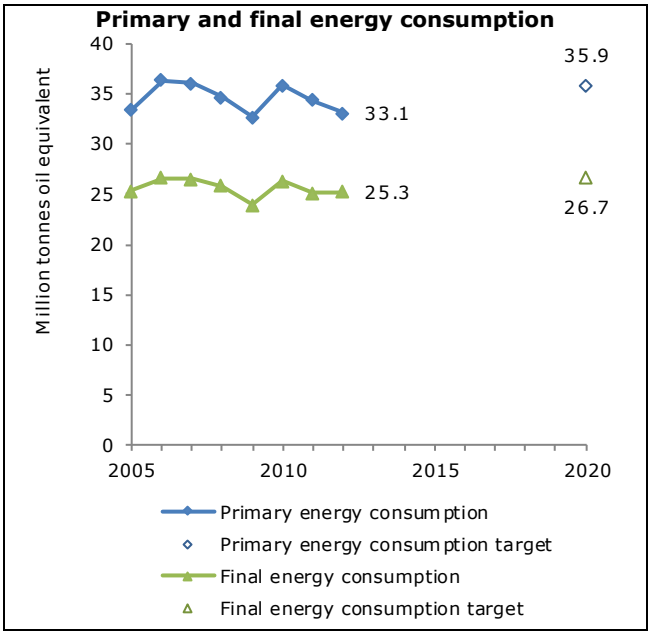
Progress towards energy efficiency targets

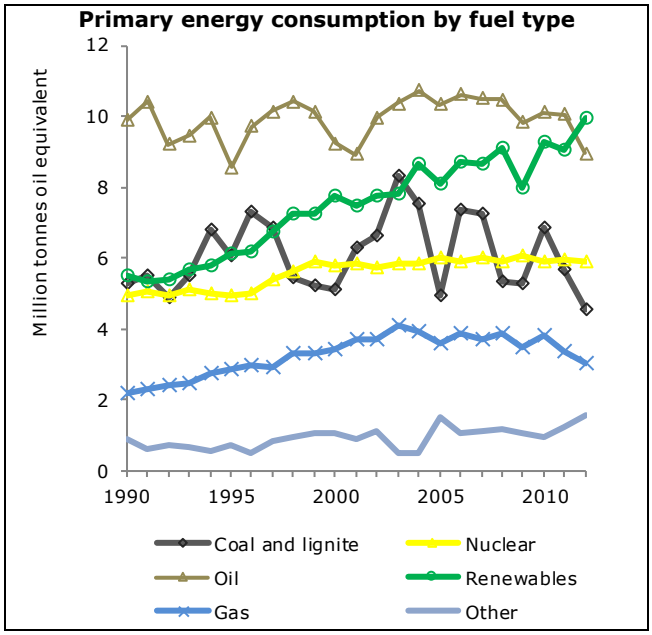
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-0.1%	2005–2012 average annual change	0.0%
2012–2020 average annual change to target	1.0%	2012–2020 average annual change to target	0.7%

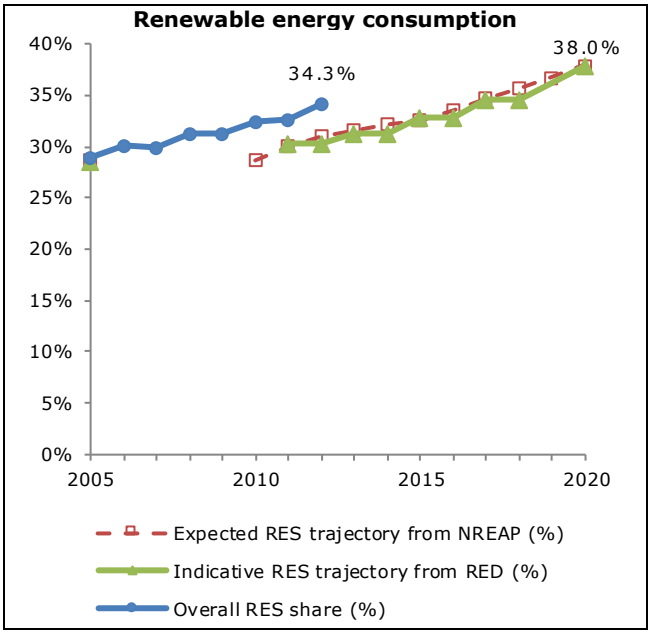
Finland has positive targets for primary and final energy consumption for 2020, compared to 2005. Over the period 2005 and 2012, primary energy consumption actually decreased while the final energy consumption remained stable. This development results from energy efficiency policies, combined with decreased activity in industry. For example, both efficiency in conversion and energy efficiency in industry increased over the period. Adressing energy consumption in the transport and residential sectors (where electricity consumption increased by 9 % between 2005 and 2012) could contribute to further reducing energy consumption.

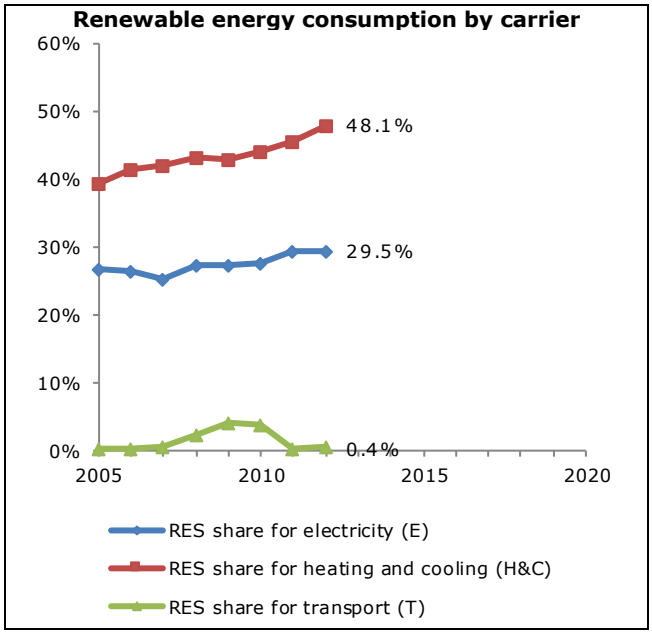

GHG trends and projections
Mt CO2 equivalent
90
80
70
60
50
40
30
20
10
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
50
40
30
20
10
0
-10
-20
-30
-40
-50
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
40
35
30
25
20
15
10
5
0
2005
2010
2015
2020
33.1
25.3
35.9
26.7
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
40%
35%
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
34.3%
38.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
60%
50%
40%
30%
20%
10%
0%
2005
2010
2015
2020
48.1%
29.5%
0.4%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Due to its cold climate, long distances and energy-intensive industries, the energy intensity of Finland's economy is the highest in the EU-15, and little progress has been made in recent years. In particular, the energy consumption of buildings is high and even increased from 2005 to 2011, while the electricity consumption of households has increased as well. In addition, relatively low energy prices do not incentivise energy efficiency (Kozluk, 2011; EEW, 2013). Improving energy efficiency, in particular in the industrial and building sectors, could save energy costs, reduce import dependence and generate opportunities for construction-related green jobs, while reducing emissions from energy use.
In 2013, a government working group published a report ('Strategisen tutkimus- ja arviointisuunnitelman tuloksia') revealing that environmentally harmful subsidies in Finland amount to EUR 3 billion, and that these subsidies are significantly higher than those for climate measures. Subsidies to the energy sector that have a harmful effect on the environment are mainly tax exemptions or reduced rates on certain industrial activities or fuels. Reducing these environmentally harmful subsidies could incentivise less carbon-intensive energy use and provide additional tax revenues that could be used to facilitate low-carbon investments in industry — thus not raising the overall tax levels of the sectors concerned.
While Finland has a long tradition of using renewable energy sources, mainly biomass and hydro, there are still challenges for reducing emissions in the energy supply, such as administrative barriers in relation to the construction of wind turbines, as well as the high use of emissions-intensive peat. Addressing these issues could help to reduce greenhouse gas (GHG) emissions from energy production and strengthen Finland's clean-tech sector, which is forecast to create 40 000 jobs by 2020 and have a turnover of EUR 40 billion by 2018 (TEM, 2012).

Climate and energy strategies
Finland has a long-term National Climate and Energy Strategy that was first published in 2001. A 2013 update outlines measures that would enable Finland to become a carbon-neutral society and reduce its carbon dioxide (CO_2) emissions by 80–95 % by 2050. The two underlying themes of the Strategy are cost-effective sustainable energy production and security of supply. The Strategy will be accompanied by an action plan, which is expected in spring 2014. The government is also currently preparing a Climate and Energy Roadmap 2050 and a Climate Act. The Climate Act will outline a framework to steer the reduction of emissions not covered under the Emissions Trading System (ETS) and is expected in 2015. The Roadmap will set targets for Finland's progress towards becoming a carbon-neutral society and is being carried out in a highly inclusive process, engaging a variety of stakeholders. Moreover, nearly all Finnish regions have prepared their own climate strategies (Kansallinen energia- ja ilmastostrategia, 2013).

Renewable energy
Finland has a high share of renewables, in particular woody biomass. Since early 2011, the main promotion scheme for electricity from renewable sources in Finland is a feed-in tariff (FIT) for electricity from wind, biomass and biogas, which varies depending on the technology and only applies to large installations. In contrast to most other support schemes in the EU, the Finnish FIT is not funded through the final consumers via a surcharge, but through the budget of the Energy Agency, with EUR 82.4 million foreseen in 2014. Finland also offers grants of up to 40 % of the investment costs for renewable power implementation and research projects via its Energy Aid Scheme. To achieve wind energy production goals of 6 TWh for 2020 and 9 TWh for 2025, Finland is also aiming to simplify administrative procedures and the permitting process. For example, the Land Use and Building Act was adjusted in 2013 to facilitate the construction of wind turbines in industrial harbour areas. The government also has a budget of EUR 20 million to support offshore wind projects and in March 2014 made a proposal to allow offshore projects to receive support through the FIT.
The Finnish government has proposed to introduce a tax (Voimalaitosvero) on domestic hydro, wind and nuclear power plants, with an exemption for smaller plants, in order to tax 'windfall profits'. The government's reasoning for the proposed tax is related to the increased price of electricity in the Nordic countries since the implementation of the EU ETS. Since these energy sources produce little to no GHG emissions they benefit most from higher prices (Energiateollisuus, 2013). The proposed tax is expected to increase the fiscal revenue of the government by EUR 50 million annually, but is being challenged by state-owned energy company Fortum (Fortum, 2013).
Renewable heat is mainly promoted with a 'heat bonus' allocated to cogeneration plants working on biogas and wood fuel. Finland also launched an energy efficiency promotion campaign in April 2014 to improve awareness of renewable heating efficiency (Ympäristö, 2014).

Energy efficiency
Finland has an Action Plan on energy efficiency and building matters (ERA17) containing proposals for a wide range of intervention areas. During 2013–2014 the focus is on improving energy efficiency assessment tools, promoting combined heat and power production, and trainings. Energy **taxation** is rather low with the level of tax rates on energy being below the EU average. Since 1990, Finland has a carbon tax on fossil fuels based on Law on Electricity and Fossil Fuel Taxation (Laki sähkön ja eräiden polttoaineiden valmisteverosta) with exemptions for heavy fuel oil, electricity and liquefied petroleum gas. The rate has been increased over the years from EUR 1.20 to 20/tCO_2 (Elbeze and de Perthius, 2011). In January 2011, the fuel tax was revised to include both an energy component and a CO_2 component, while the relative weight of CO_2 in the total tax for some fuels was reduced. The reform raised tax rates on fuels for non-road vehicles and traffic fuels.

Combined heat and power generation, a prior area of action under the ERA17, is supported by a fixed 'heat bonus' given to biogas and wood-fuelled plants.
There is an agreement with **industries** and business to increase energy efficiency, including a target of 9 % energy saving from 2008–2016 with financial support provided for investments and energy auditing (EEW, 2013; Odyssee, 2012). Finland has indicated that it plans to achieve its required savings of 1.5 % between 2014 and 2020 under the Energy Efficiency Directive through voluntary energy efficiency contracts.
In the **building** sector, energy efficiency requirements for construction are updated on a regular basis (Acts 422/2011, 181/2013 and 176/2013). The new rules represent a change in the way energy efficiency is calculated and require certification of energy performance for new and existing buildings. Additional new requirements will come into effect in 2014 and a new technical guidance on construction is due to come into force in the middle of the year 2015. Finland subsidises energy efficiency improvements of residential buildings through a continuously updated grant scheme (Act 1184/2005 and Decree 128/2006). These subsidies ended in January 2013, but continue for some conservation measures for row houses and blocks of flats. Energy-efficient reconstruction and renovation of large apartment buildings and office buildings for the public sector are a main focus of the 2014 Ministry of the Environment budget. Finland is also developing legal acts to achieve that from 2017 all new public buildings will be zero-energy.

Transport
Finland's vehicle taxes are largely based on CO_2 emissions: for passenger cars and vans, a tax is paid before the first registration or use based on the value of the vehicle and the CO_2 emissions per kilometre. Finland also has an ownership tax based exclusively on CO_2 emissions (ACEA, 2012), which is, however, lower than the EU average. Petrol and diesel tax rates are, in contrast, well above the EU average and include taxes on CO_2 components (European Commission, 2013). In 2013, a Finnish government working group on transport proposed a kilometre tax on vehicles that is not yet in force (LVM, 2013). Renewables in transport are promoted through a biofuel quota: petrol and diesel must meet minimum energy content obligations for biofuels of 6 % for 2011–2014, followed by a phased increase to 20 % by 2020.
Finland's Transport Environmental Strategy 2013–2020 aims to decrease CO_2 emissions by gathering better transport data, increasing cost effectiveness and supporting the use of new low-emission technologies. The 2013 Second Generation Strategy for Intelligent Transport guides projects from 2013–2017 with an estimated budget of EUR 300 million. Under the government's framework policy decision 'More for Less - Wisely!', transport efficiency is a key pillar with an emphasis on developing public transport. Voluntary energy efficiency agreements for transport are also in place. The agreement on goods transport and logistics encompasses 750 companies with 4 150 cars. The public transport agreement was joined by 11 companies with a fleet of 550 cars (TEM, 2014a).

Agriculture
For the first time, the Rural Development Programme for 2014–2020 incorporates climate change measures regarding plant production. The recommendations of the Common Agricultural Policy (CAP) mostly regarding manure management and agricultural soils were implemented in Governmental Decision No 488/2010 and should lead to decreasing emissions. Current legislation and recommended good agricultural practice mainly concerns the storage of waste from animal production and the integration of waste into agricultural land. The Ministry of the Environment is also providing subsidies to help improve the recycling of manure through projects related to reducing emissions and developing biogas production.

Waste
A New Waste Act and corresponding regulations came into force on 1 May 2012 (laws no 646–666/2011) and the Government Decree on waste (179/2012) foresees that by 2016 more than 50 % of all organic waste will be recycled. In addition, the Government Decree on landfills (861/1997, revised 2006) and a biowaste strategy (2004) aim to minimise organic waste transported to landfills. In May 2013, the government issued two decrees restricting the disposition of organic, construction and demolition waste to landfills (Act no 331/2013). A Waste Tax Act also applies to waste fractions that could be technically and environmentally recovered, but are landfilled. In addition, a national material efficiency programme was prepared (Ympäristö, 2013).

Land use, land-use change and forestry
Forests cover more than 70 % of the land area of Finland and according to the National Climate and Energy Strategy, wood is the single most important raw material for achieving the 2020 renewable energy target. The aim is to raise the share of wood chips in heat and electricity production from about 16 to 25 TWh by 2020. Finland's comprehensive National Forest Programme 2015 (NFP), adopted on 16 December 2010, sets out plans, regulations and measures pertaining to forest management and the forest products industry. The NFP also indicates that forest management and forest-related industries are important employers in Finland.
In January 2014, amendments to the Forest Act, Forest Management Act, Law on Prevention of Forest Damage and the Wood Product's Measurement Act came into force, cancelling the forest management tax and providing forest owners with more freedom and flexibility to decide about the management of their forest.

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Key climate- and energy-related data — France

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	558.8	490.0	490.1	491.5	4 544.2
GHG per capita (t CO_2-eq./cap.)	8.9	7.5	7.5	7.5	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	359	275	270	268	350
Share of GHG emissions in total EU-28 emissions (%)	10.8 %	10.6 %	10.8 %	11.0 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	131.3	105.6	103.7	115.1	1 848.6
Share of EU ETS emissions in total emissions (%)	23 %	22 %	21 %	23 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 12.7 %	– 21.2 %	– 22.9 %	– 17.7 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	26.5 %	31.7 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	403.0	364.7	366.5	371.4	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			11.3 %	13.4 %	14.1 %
() = including all biofuels consumed in transport	(9.5 %)	(12.7 %)			
Share of renewable energy for electricity (%)	13.8 %	14.9 %	16.4 %	16.6 %	23.5 %
Share of renewable energy for heating and cooling (%)	12.2 %	16.0 %	16.1 %	16.9 %	15.6 %
Share of renewable energy for transport (%)			0.5 %	7.1 %	5.1 %
() = including all biofuels consumed (%)	(1.3 %)	(6.2 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	261.7	255.0	245.5	246.4	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	4.2	3.9	3.8	3.8	3.1
Final energy consumption (Mtoe)	162.8	158.4	147.2	150.8	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.6	2.5	2.3	2.3	2.2
Efficiency of conventional thermal electricity and heat production (%)	57.5 %	51.8 %	50.8 %	47.3 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.71	1.58	1.54	1.50	1.42
Space heating and cooling (toe/dwelling)	1.23	1.09	1.06	1.02	0.96
Water heating (toe/dwelling)	0.16	0.15	0.15	0.14	0.18
Cooking (toe/dwelling)	0.10	0.09	0.09	0.09	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.23	0.24	0.24	0.24	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 5.7 %	2020 ESD target (% vs base year)	– 14.0 %
2013 ESD emissions (% vs base year)	– 8.7 %	2020 ESD projections WEM (% vs base year)	– 15.9 %
		2020 ESD projections WAM (% vs base year)	– 23.3 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

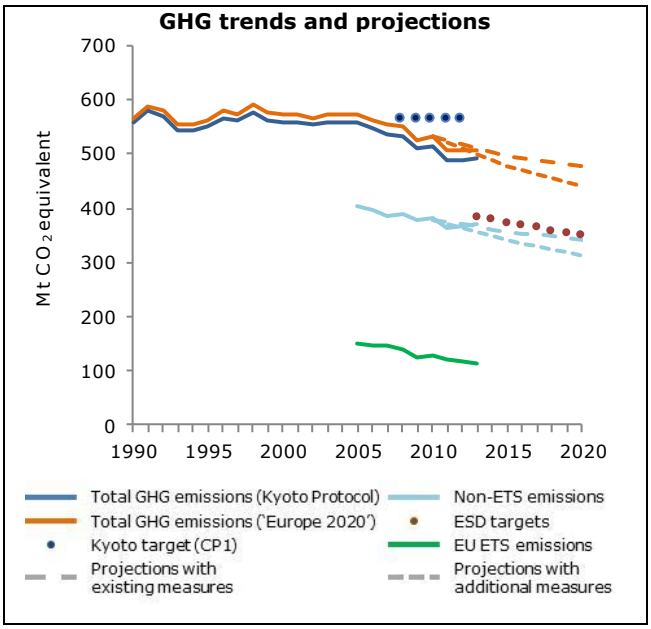
2012 RES share in gross final energy consumption (%)	13.4 %	2011–2012 indicative share from RES Directive (%)	12.8 %
2020 RES target	23.0 %	2012 expected share from NREAP (%)	14.0 %

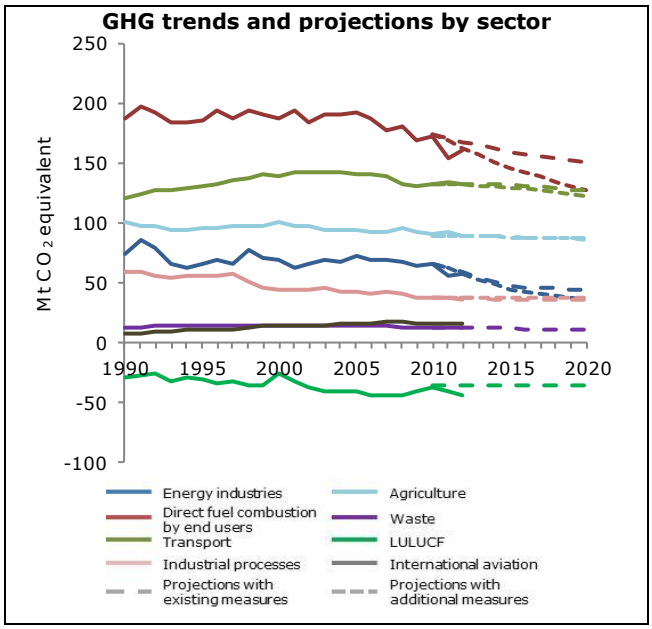
The average share of renewable sources in gross final energy consumption for 2011–2012 was 12.4% (19.2 Mtoe), which is lower than the indicative RED target for 2011–2012 (12.8%). At the same time, the share of renewables in 2012 (13.4 %) is lower than the expected 2012 NREAP target (14.0 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 4.6%. In order to reach its 2020 NREAP target, France needs an average annual growth rate of 6.9% in the run-up to 2020. In absolute terms, this is equivalent to 2.6 times its cumulative effort so far.

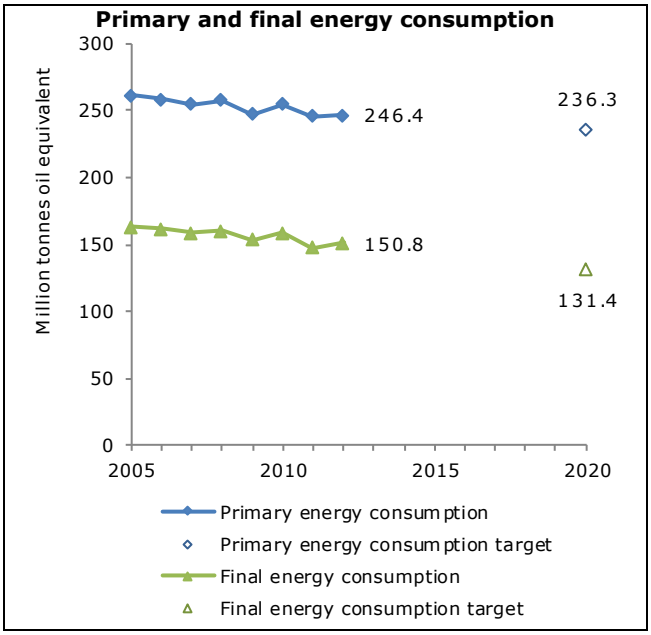
Progress towards energy efficiency targets

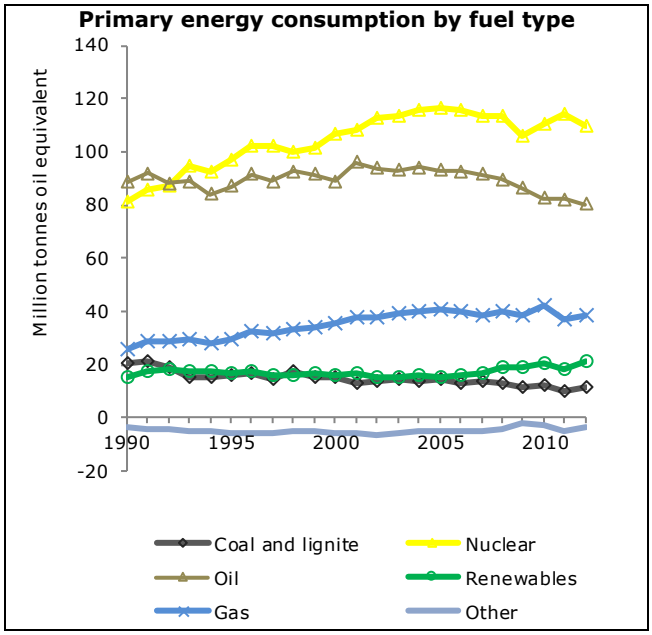
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-0.9 %	2005–2012 average annual change	-1.1 %
2012–2020 average annual change to target	-0.5 %	2012–2020 average annual change to target	-1.7 %

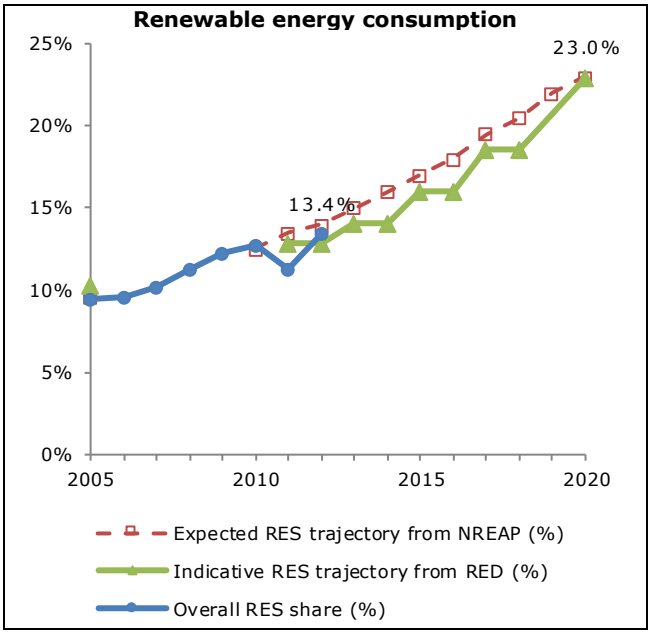
Between 2005 and 2012, primary energy consumption decreased at a faster pace than is necessary to meet the 2020 target. Improving energy efficiency in transformation and reducing distribution losses (which increased by 18 % over the period) could contribute to further reducing primary energy consumption. However, final energy consumption has not been decrease fast enough so far. While energy efficiency improvements have been taking place in all sectors, further efforts in the transport and residential sectors could be necessary.

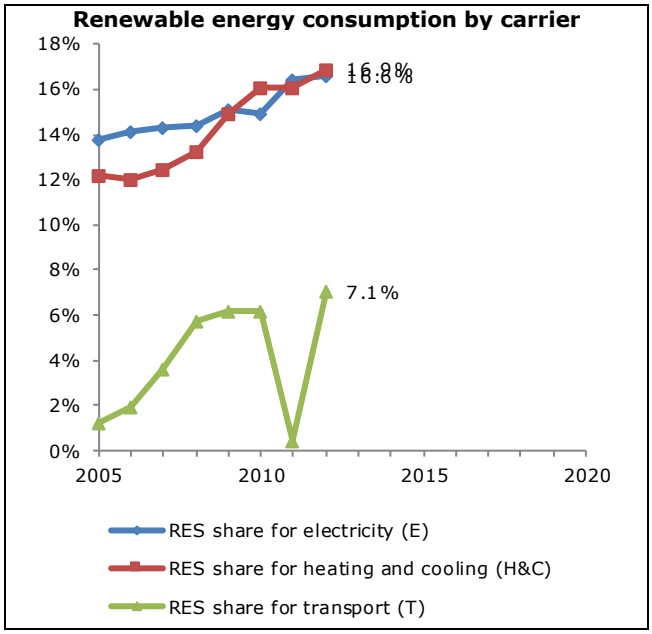

GHG trends and projections
Mt CO2 equivalent
700
600
500
400
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
250
200
150
100
50
0
-50
-100
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
300
250
200
150
100
50
0
2005
2010
2015
2020
246.4
150.8
236.3
131.4
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
140
120
100
80
60
40
20
0
-20
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
23.0%
13.4%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
16.8%
16.6%
7.1%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Traditionally, France has a low greenhouse gas (GHG) emissions profile (both per capita and per gross domestic product (GDP)), mainly due to the fact that its energy system is primarily based on nuclear power. This strong focus on nuclear energy has also affected France's approach to climate policy and the promotion of renewables. France has not achieved its 2011 interim target for renewable energy and might also fail to achieve its 2020 target. Especially, the growth rate in wind power generation is lagging behind, mainly due to the long waiting time for the connection of offshore installations to the grid. Other barriers to the development of the wind and photovoltaic sectors, that are named by stakeholders, are legal uncertainty of the regulatory framework and complexity of administrative procedures (RTE et al., 2014). The potential for renewable energies in France is high given extensive hydroelectric and wind resources, and significant potential for solar power development in overseas territories.
Energy efficiency also presents a challenge for France. A rather comprehensive set of measures is already in place for energy efficiency but energy intensity is declining at a slower pace than the EU average. For the industrial sector, only voluntary agreements are in place and certain industries make only slow progress. In the residential sector, existing instruments do not sufficiently spur deep renovation (EEW, 2013). Both energy efficiency and diversification of the energy mix are the key objectives of France's energy transition, and studies indicate that these two sectors together could create between 745 000 and 825 000 jobs up to 2050 (Actu Environnement, 2013).
France made progress in the area of environmental taxation with the introduction of a carbon tax in December 2013 (2014 Finance Act), expecting to collect revenues of EUR 4 billion in 2016. However, the level of environmental tax revenues per GDP remains the second lowest in the EU. This is mainly due to low transport taxes, and low energy tax rates for industrial and commercial use and for heating use. A study suggests that France could generate revenues of annually EUR 42.9 billion by 2025 if it increased its environmental taxes, with the biggest potential in vehicle and transport fuel taxes (Hogg et al., 2013).

Climate and energy strategies
The 2005 National Energy Policy Act sets the political target of reducing France's GHG emissions by 2050 by at least 75 %. To track the progress, France regularly updates a Climate Plan (last update in March 2013) describing the impact of implemented measures on climate change in all relevant sectors, such as transport, building, energy or waste (MEDDE, 2013a). Since 2007, regular environmental conferences (Grenelle Environment Round Table; 2012 and 2013 Environmental Conferences), organised by the government in close consultation with industry, government agencies and non-governmental organisations, are an important driving force for the development of long-term strategies for climate change.
France is currently also developing its national strategy for energy transition, which particularly focuses on energy efficiency, the diversification of the energy mix and the introduction of green taxation. In this context, the government pledges to cut the share of nuclear energy in the country's electricity mix to 50 % from 75 % by 2025 and to increase the share of renewable energy to 25 % by 2020, to reduce fossil fuel consumption by 30 % by 2030, and to halve total energy consumption by 2050. The final adoption of the programming law on energy transition, which will also include 'carbon budgets' to set emission limits for France and renewable energy targets until 2025, is expected by the end of 2014. The Investment Programme for the Future, adopted in July 2013, foresees the allocation of EUR 2.3 billion for environmental and energy transition measures.

Renewable energy
France needs to undertake increased efforts to meet its 2020 renewable target. France promotes **renewable electricity** via a feed-in tariff (FIT) scheme and a tender system. Both are available for electricity from wind, solar, geothermal, biogas, hydropower and biomass, and are financed through a contribution that is added to the electricity bill of final consumers. In 2013, France gave priority to emerging sectors such as offshore wind power and tidal energy. Additionally, a reduced VAT rate of 7 % applies to services, equipment and delivery of renewable energy sources.
For **renewable heating**, subsidies, tax reductions and loans are made available. Under the 2008 established heat fund (Fonds Chaleur), France offers subsidies for the installation of biomass plants with a heat production over 1 000 toe per year. In the framework of the programme 'Habiter mieux' for modest households, all renewable heat technologies can benefit from a lump sum subsidy. Various tax credits allow the deduction of a certain percentage of investments in renewable heating systems from the income tax, and a reduced VAT rate for boilers, heat pumps, fireplace inserts, wood-burning stoves and solar water heaters. Since 2009, France also offers 0 % interest loans for energy refurbishment, including installation of a heating plant or of a sanitary hot water system using renewable energies.
France recently conducted consultations on the reform of support schemes for renewable energies, which might be incorporated in the expected law on energy transition. Also, a catalogue of measures on reducing administrative burdens for companies was approved, inter alia addressing waiting periods for building permits as well as the creation of a single permit for offshore electricity projects (Conseil pour la simplification, 2014).

Energy efficiency
In 2011, France presented a roadmap for energy efficiency composed of 27 measures aiming at enhancing competitiveness in the private sector, reducing the energy consumption of households and improving the exemplary role of the public sector in matters of energy performance. The strategy is currently under review. In 2013, France pledged to halve total energy consumption by 2050.

Energy **taxes** on fuels for heating and commercial use, and taxes on electricity are well below EU average, and numerous exemptions apply. However, France introduced as of 2014 a tax on energy products based on their carbon dioxide (CO_2) emissions, with rates set at EUR 7 per tonne of CO_2 in 2014, EUR 14.5 in 2015 and EUR 22 in 2016.
Since 2006, France is promoting energy efficiency measures with a **white certificate scheme**. The system imposes energy-saving obligations on suppliers of all types of final energy. The energy-saving targets for the third period from 2015 to 2017 were almost doubled compared to the previous period, aiming now at 220 TWh of cumulative energy savings per year. Previous periods succeeded in exceeding the targets.
Combined heat and power installations with a capacity of less than 12 MW benefit from FITs, the amount of which depends on the resource used (wood energy, biogas, household or industrial waste). For large-scale projects, the government issued calls for tenders for a total capacity of 800 MW between 2010 and 2013.
France committed to reduce primary energy consumption in existing **buildings** by 38 % between 2008 and 2020. In this context, the government published in 2013 its Energy Refurbishment Plan for Housing that foresees the refurbishment of 500 000 housing units per year by 2017. A zero rate eco-loan is made available to owners, occupiers and landlords to finance extensive renovation works. In 2013, a charter for voluntary commitments promoting energy efficiency in public and private commercial buildings was signed by government and stakeholders. It commits the signatory parties to declare a self-determined target for energy saving and to communicate their progress regularly. France also aims to renovate 800 000 social housing units with high energy consumption by 2020, partly through subsidies and housing loans.

Transport
In France, a CO_2-based bonus-malus registration **tax** applies, and also ownership and company car taxes are based on CO_2 emissions. However, excise duties on transport fuels are below EU average, and diesel is charged around a third less than petrol. The plan to introduce an environmental tax on heavy goods vehicles was suspended recently due to public opposition.
The 2005 National Biofuels Development Plan fixed annual targets for the share of biofuels in the total transport fossil fuels, reaching 7 % by 2010. The targets were implemented through a quota system. However, the quota has not been increased since, mainly due to the uncertainty of biofuel policies at the European level regarding the blending targets of first-generation biofuels. The 2012 'Plan automobile' aims to foster electromobility through an increase of the bonus on registration taxes of electric vehicles, the commitment that 25 % of new vehicles on the government fleet will be electric or hybrid, and funds for innovation.
In July 2013, the government presented a new National Framework for **Sustainable Mobility**. It sets a budget of EUR 5 billion per year for investments aimed at improving existing transport networks and financing major projects such as the construction of rolling motorways connecting France to Luxembourg or to Italy. Four lines of rolling motorways will be commissioned by 2015, in order to transfer 500 000 heavy goods vehicles per railway and per year by 2020 (MEDDE, 2013b).
To increase **awareness** among the public, France introduced the mandatory display of CO_2 emissions for transport services in 2013. Public transport companies as well as companies transporting goods and removal companies are obliged to inform their clients of the amount of CO_2 emissions produced by their service.

Fluorinated gases (F-gases)
France is contemplating a tax on F-gases. The French Environmental Taxation Committee proposed in April 2013 to introduce a tax on F-gases (Comité pour la fiscalité écologique, 2013), but the French government postponed a decision until final agreement on the EU Regulation is reached (Hydrocarbons21, 2013).

Agriculture
In February 2009, an energy performance plan for farms was launched in order to reduce the energy consumption and GHG emissions of the agricultural sector. The plan covered the period from 2009 to 2013 (MAAF, 2013). Additionally, the 2013 methane recovery and use scheme defines methane recovered from waste from agriculture, forestry and related industries or from domestic waste as a source of renewable energy eligible for the FIT system. In 2013, the government presented a draft law for agriculture, food and forestry that also underlines the importance of ecological transition for the agricultural and forestry sectors. The draft law was adopted at first reading by the parliament in January 2014 and is expected to be published in the coming months.

Waste
In 2012, France committed to cut annual waste production per capita by 7 % within 5 years, to increase the rate of household waste recycling to 35 % by 2012 and 45 % by 2015, to direct 75 % of household packaging waste and ordinary commercial waste to recycling, and to cut the amount of incinerated and stored waste by 15 % (Law no 2009-967 of 3 August 2009 on the implementation of the Grenelle Environment Forum, Art. 46). Local authorities are required to establish waste prevention schemes, including reduction targets and measures. France also levies a landfill tax of EUR 40/tonne of waste, but despite this per capita amount of waste has been growing over the last decade (Hogg et al., 2013). The Environmental Taxation Committee, which was established by the government in the context of the Environmental Conferences, plans to focus on waste taxation during the first half of 2014. Within this framework, the Committee will discuss topics such as the definition of the amount of landfill tax for the period after 2015, or the implementation of a financial contribution for the end-of-life management of non-recyclable products.

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Key climate- and energy-related data — Germany

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	994.5	928.7	939.1	950.8	4 544.2
GHG per capita (t CO_2-eq./cap.)	12.1	11.4	11.5	11.6	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	464	368	364	364	350
Share of GHG emissions in total EU-28 emissions (%)	19.2 %	20.2 %	20.7 %	21.3 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	475.1	450.4	452.6	480.9	1 848.6
Share of EU ETS emissions in total emissions (%)	48 %	48 %	48 %	51 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 3.7 %	+ 2.2 %	– 4.0 %	+ 28.4 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	16.5 %	31.1 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	483.0	453.3	461.4	468.0	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			11.6 %	12.4 %	14.1 %
() = including all biofuels consumed in transport	(6.7 %)	(10.7 %)			
Share of renewable energy for electricity (%)	10.5 %	18.1 %	20.9 %	23.6 %	23.5 %
Share of renewable energy for heating and cooling (%)	6.8 %	10.3 %	10.8 %	11.1 %	15.6 %
Share of renewable energy for transport (%)			5.9 %	6.9 %	5.1 %
() = including all biofuels consumed (%)	(3.7 %)	(6.0 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	317.2	311.1	294.7	297.6	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.8	3.8	3.6	3.6	3.1
Final energy consumption (Mtoe)	218.5	220.5	209.2	213.1	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.6	2.7	2.6	2.6	2.2
Efficiency of conventional thermal electricity and heat production (%)	49.6 %	50.4 %	49.9 %	48.9 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.67	1.60	1.62	1.62	1.42
Space heating and cooling (toe/dwelling)	1.24	1.15	1.12	1.13	0.96
Water heating (toe/dwelling)	0.19	0.21	0.23	0.24	0.18
Cooking (toe/dwelling)	0.06	0.05	0.05	0.05	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.18	0.19	0.21	0.20	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 4.5 %	2020 ESD target (% vs base year)	– 14.0 %
2013 ESD emissions (% vs base year)	– 3.8 %	2020 ESD projections WEM (% vs base year)	– 13.3 %
		2020 ESD projections WAM (% vs base year)	– 17.6 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be above the annual ESD target in 2013. Projections indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, only if measures planned until 2013 are fully implemented.

Progress towards renewable energy targets

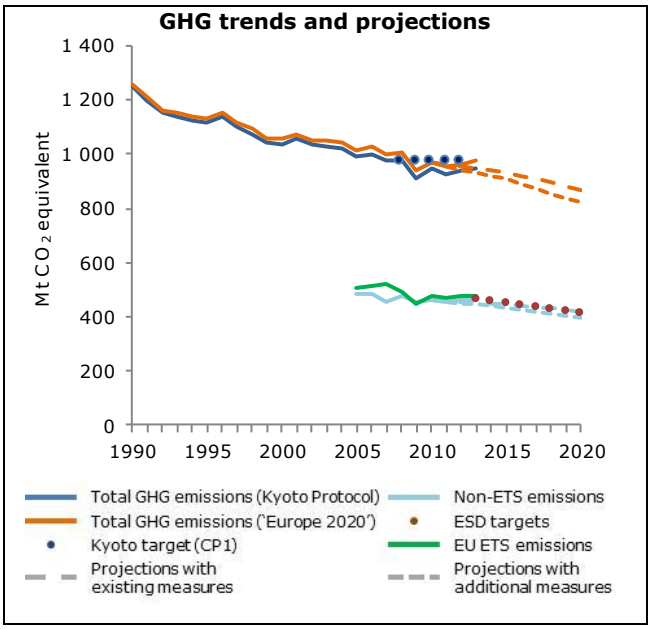
2012 RES share in gross final energy consumption (%)	12.4 %	2011–2012 indicative share from RES Directive (%)	8.2 %
2020 RES target	18.0 %	2012 expected share from NREAP (%)	11.4 %

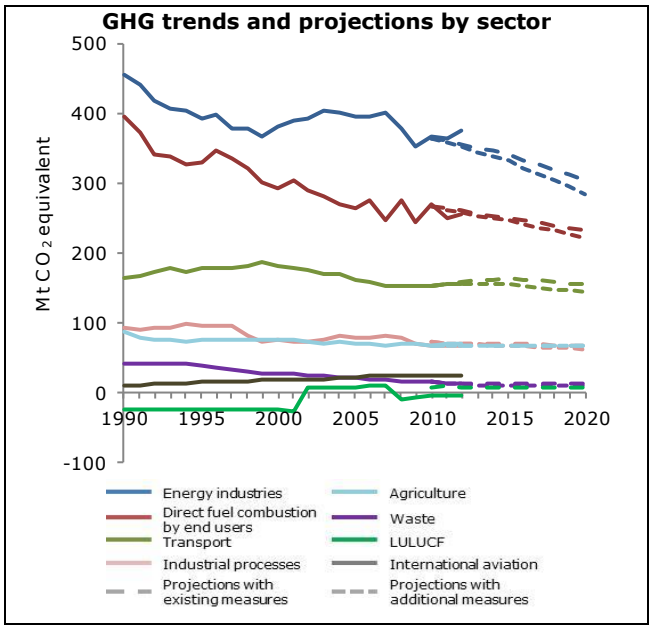
The average share of renewable sources in gross final energy consumption for 2011–2012 was 12.0% (26.2 Mtoe), which is higher than the indicative RED target for 2011–2012 (8.2%). At the same time, the share of renewables in 2012 (12.4 %) is higher than the expected 2012 NREAP target (11.4 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 11.0%. In order to reach its 2020 NREAP target, Germany needs an average annual growth rate of 4.4% in the run-up to 2020. In absolute terms, this is equivalent to 0.8 time its cumulative effort so far.

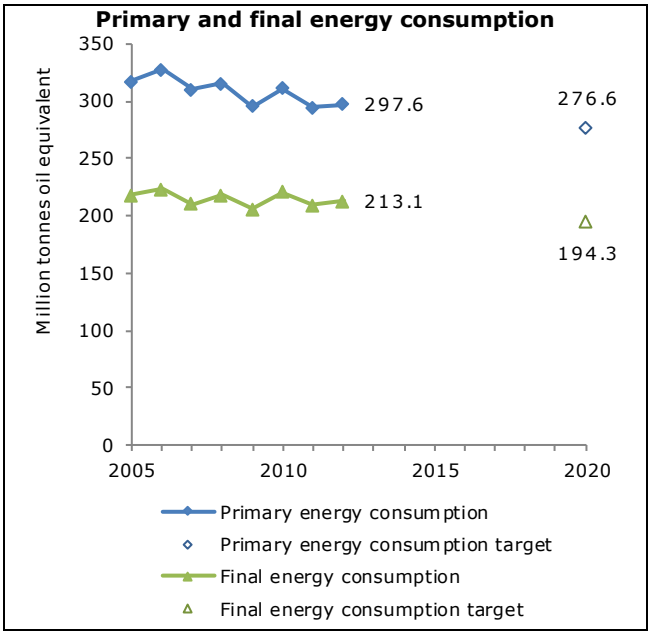
Progress towards energy efficiency targets

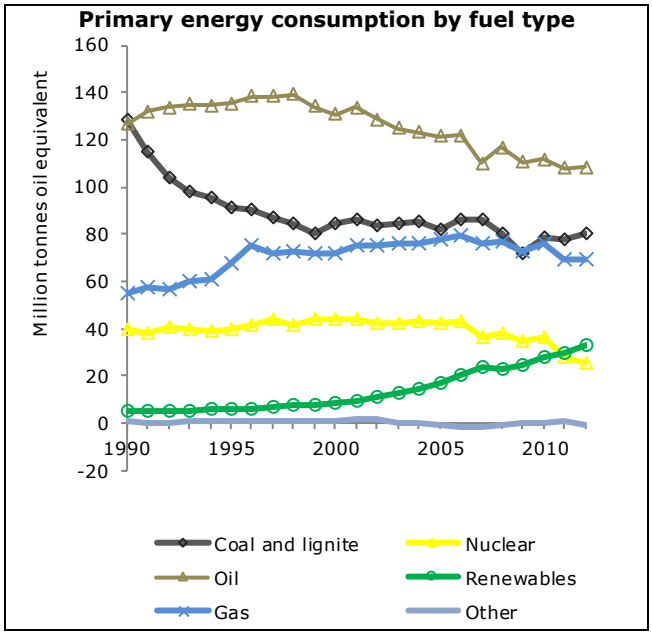
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-0.9 %	2005–2012 average annual change	-0.4 %
2012–2020 average annual change to target	-0.9 %	2012–2020 average annual change to target	-1.1 %

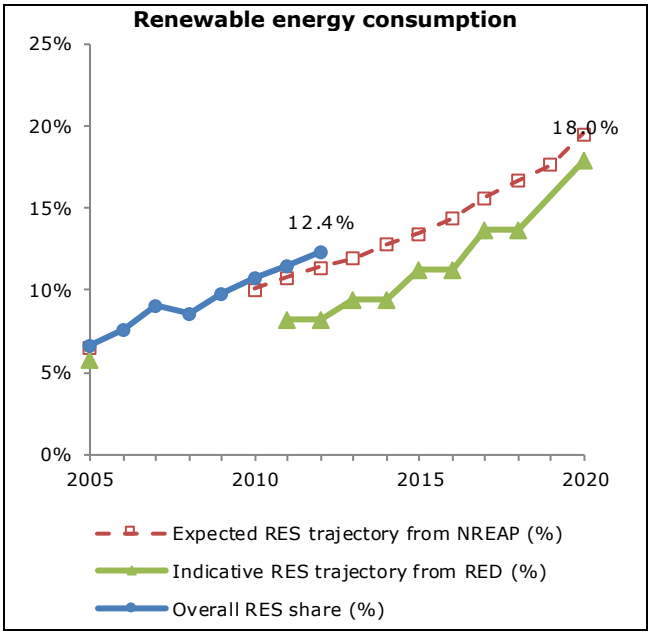
The reductions in primary and final energy consumption have not been taking place at sufficient pace to put Germany on track towards its 2020 targets. Transformation input to conventional thermal power stations represents 31.5 % of total primary energy consumption, and the increased use of coal has resulted in a deterioration of efficiency in transformation. Improving energy efficiency in transformation could therefore contribute to further reducing primary energy consumption. Further efforts to improve energy efficiency in the industrial sector, where energy consumption increased by 3.3 % over the period 2005–2012, could contribute to further reducing final energy consumption.

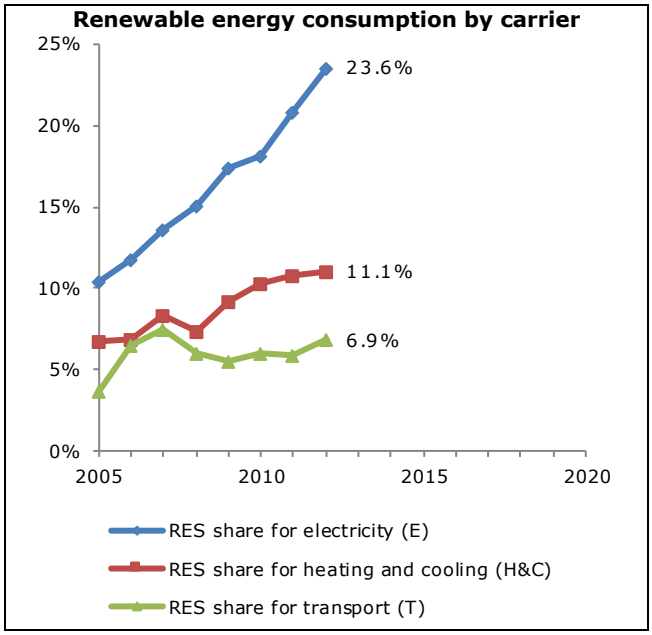

GHG trends and projections
Mt CO2 equivalent
1 400
1 200
1 000
800
600
400
200
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
500
400
300
200
100
0
-100
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
350
300
250
200
150
100
50
0
2005
2010
2015
2020
297.6
213.1
276.6
194.3
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
160
140
120
100
80
60
40
20
0
-20
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
12.4%
18.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
23.6%
11.1%
6.9%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Germany has set itself national climate and energy targets beyond its requirements under EU legislation, but the country is currently experiencing slightly rising greenhouse gas (GHG) emissions. Additional efforts are required in energy efficiency of buildings and the transport sector in particular. The government wants the building stock to become almost carbon neutral by 2050, for example. However, consumption per dwelling is quite high and the measures implemented so far to address energy efficiency in buildings are at present insufficient to reach this target, as per the responsible Ministry's own analysis (BMVBS, 2013). However, energy efficiency has already become an important economic sector, through investments in building materials and construction, energy consultancy and building management. In 2012, these amounted to a turnover of EUR 146 billion in 2012, which is a 16 % increase compared to 2011. More than 800 000 jobs are already connected to the sector (DENEFF, 2013). If the funding set aside to support efficient buildings were to be increased from around EUR 0.8–2.0 billion per year in the last few years to EUR 5 billion, an additional positive effect on investment is expected, forecast to lead to a possible gross value added of EUR 10 billion per year and 250 000 additional jobs (Prognos, 2013).
In the transport sector, Germany aims at reducing energy consumption by 10 % from 2005 levels by the year 2020. However, between 2005 and 2012 consumption remained almost stable. At the same time, carbon dioxide (CO_2) emissions from newly registered passenger cars are the highest compared to other EU-15 countries (and the 8th highest in the EU-28) due to a high share of cars with high engine power and mass. Incentivising the purchasing of efficient and low-carbon vehicles and further promoting the shift to public transport and non-motorised individual transport would reduce energy consumption and related GHG emissions and it also would help to reduce air pollution and noise in cities.

Climate and energy strategies
Germany has committed to ambitious emission reductions that go beyond the target set by the EU: the Integrated Energy and Climate Package of 2007 and 2008 stipulates a 40 % emission reduction target by 2020, compared to 1990 levels. The Energy Concept 2010 provides a long-term strategy for German energy policy and sets a path for a reduction of GHG emissions by 80–95 % until 2050 (BMU & BMWi, 2010). Its principal objective is to ensure the provision of environmentally friendly, reliable and affordable energy supply while turning Germany into one of the greenest economies in the world. The Energy Concept sets targets for the share of renewable energies in electricity, heat and transport, as well as for electricity generated from cogeneration, reduction of electricity consumption, overall energy efficiency improvements, and for energy consumption reductions in buildings and transport. In addition, Germany will phase out nuclear energy by 2022.
By 2016, the German government plans to publish a National Climate Protection Plan 2050 to analyse existing measures and requirements for additional measures to reach the domestic long-term targets.

Renewable energy
Renewable energies play an important role in Germany as about one third of the GHG emission reductions by 2020 should be realised through the shift to renewables (Löschel et al., 2014 based on Energy Concept). The objective is to increase the share of renewable electricity to at least 35 % in 2020 (Energy Concept), by 2025 in a corridor of 40–45 % and by 2035 in a corridor of 50–65 % (CDU/CSU/SPD, 2013; EEG, 2014). The main support mechanism for renewable electricity generation has so far been a feed-in tariff (FIT) introduced in the Renewable Energy Law from 2000. The law was revised several times to introduce the option to shift to a market premium scheme, adjust feed-in rates to cost reductions, and change the coverage of technologies as well as the coverage of different biomass resources to new findings in particular with respect to a sustainable biomass use. The revised law came into force on 1 August 2014. Among others, the following changes have been made: 1) the premium system and direct marketing have become mandatory for new installations with support covering the difference between a rolling average wholesale price and the statutory support level; 2) the remuneration structure for new biogas plants was modified to incentivise power generation according to demand and to favour the use of residue and/or organic waste; 3) support levels were reduced and will further automatically be reduced depending on over- or under-achievement of the predefined deployment corridor. This had already been in place for photovoltaics (PVs) and is now also introduced for wind and bioenergy; 4) the support will in the future be focused on the most cost-efficient technologies; and 5) in the next 2 years tendering will be tested for ground-mounted PVs and by 2017 be used for the expansion of renewable electricity production from different sources (EEG, 2014). In addition to the EEG support scheme, the KfW bank offers low interest loans for specific investments in renewable electricity generation capacities (KfW, 2014).
The domestic target for renewable heating and cooling is a share of 14 % in 2020. The principal instrument to promote renewables in heating and cooling is the Renewable Energies Heat Act. It obliges owners of new as well as of buildings in possession of public authority undergoing major renovations to cover a specific share of the heating and cooling with renewable energies. The share depends on the chosen technology. Financial support for renewable heating and cooling systems in existing buildings is provided by a market incentive programme that offers low-interest loans and grants for investments.

Energy networks
The government has taken several measures to speed up the expansion of the electricity network: the 2009 Power Grid Expansion Act (EnLAG) defined 24 priority grid expansion projects for which the proof of need is not required, thus reducing the time needed for the approval process. Following further delays in the network expansion, the government approved the Grid Expansion Acceleration Act (NABEG) and the amendment of the

Energy Industry Act (EnWG) in 2011, which defines a simplified approval process for the most important cross-border and grid connections crossing German states. The current Energy Industry Act requires that the German transmission system operators collaborate to develop a new grid development plan (Netzentwicklungsplan) every year. This plan 'must contain all effective measures for the necessary optimisation, development and expansion of the network, which are required over the next ten years to ensure safe and reliable network operation' (Section 12b I 2 EnWG). Every three years the Bundesnetzagentur gives the German government an approved grid development plan and an environmental report to be used as a draft for the Federal Requirement Plan (Bundesbedarfsplan).

Energy efficiency

The German government wants to publish a national action plan for improving energy efficiency by the end of 2014, which will embrace the targets for the different areas, the instruments, the funding and respective responsibilities of the different stakeholders.

Energy **taxation** is above EU average but the electricity and energy tax is partly reduced or reimbursed for energy-intensive **industry**. From 2013 onwards, these tax reliefs are only granted for companies introducing energy or environmental management systems or alternative systems for small and medium-sized enterprises (SMEs) and provided that the producing industry as a whole complies with the annual energy efficiency goals regulated by law. In addition, there are reduced grid network charges for energy-intensive industry according to the Network Charges Ordinance and German industry can benefit from state aid in accordance with Art. 10a of the EU Emissions Trading System (ETS) Directive (2009/29/EC) allowing energy-intensive industries to offset the costs from EU emissions trading by receiving compensation payments from the state (BMWi, 2013).

SMEs get financial support for efficiency improvements, for example through the national Energy and Climate Fund that supports companies to realise efficiency potentials in the short term through different calls such as 'Investment grants for highly efficient cross-sectional technologies in SMEs' (BMWi, 2014). In addition, energy consulting for SMEs is financed with grants of up to 80 % of the eligible consultancy costs through the programme 'Energy Consulting in SMEs'. For the realisation of the identified efficiency potentials the KfW bank offers low-interest loans.

Combined heat and power (CHP) can receive an investment grant if the capacity is below 20 kW, and according to the CHP Act a premium is paid for the generated electricity fed into the grid (BAFA, 2014).

In the **building** sector, the Energy Saving Ordinance (EnEV) sets minimum requirements for the energy performance of buildings and introduces Energy Performance Certificates. The last amendment entered into force on 1 May 2014, increasing the energy efficiency requirements by 25 % for new buildings starting from 1 January 2016. Furthermore, house owners have to replace oil and gas heaters installed before 1 January 1985 or older than 30 years until 2015. By 2021, all new buildings need to fulfil the nearly energy-neutral standard. For public buildings, this obligation applies already from 2019 onwards (BMVBS, 2013). Grants and low-interest loans are available for efficient new buildings and for energy efficiency refurbishments of existing buildings through the CO_2 rehabilitation programme. In recent years, it had a budget of around EUR 1.5–2.0 billion per year (since 2012) funded by the Climate and Energy Fund. The programme is coordinated by the German public development bank KfW (BMVBS, 2012).

Transport

The Mobility and Fuel Strategy, a so-called 'learning strategy', aims at giving information and orientation but focuses on fuels and does not address overall questions of future mobility. German incentives for the purchasing of efficient cars, more efficient driving and shifting to public transport include an annual ownership tax that is based on CO_2 emissions and cylinder capacity. However, it is only at EU average and there is no registration tax (ACEA, 2012). Cars emitting less than 110 g/km are exempted from the CO_2-related part of the ownership tax for 10 years. The exemptions include all types of electric vehicles. Lorries pay a distance-based toll for using motorways and federal highways (CE Delft, 2012). Taxes on transport fuels are well above the EU average for petrol and for diesel. However, diesel is taxed at strikingly lower rates than petrol (European Commission, 2013). An air tax was introduced in 2011 that depends on the flight distance (EEA, 2013).

The main support mechanism for renewables in transport is a quota obligation that requires companies to ensure that biofuels make up a defined percentage of the company's total annual sale of fuel as set out in the Biofuel Quota Act. From 2015, a GHG reduction quota will replace the biofuels quota (RES Legal, 2013). In addition, there is a tax relief for pure biofuels that are not used to fulfil the biofuels quota. The Programme for Electric Mobility published in 2011 highlights policies and measures to increase the number of electric cars to 1 million by 2020 and to turn Germany into a leader in electromobility. The National Innovation Programme for Hydrogen and Fuel Cell Technology provides support amounting to EUR 1.4 billion until 2016.

Germany wants to improve public transport by developing a nation-wide schedule and integrated ticketing system. The capacities of the railway network will be increased to avoid bottlenecks and better link intermodal connections. The National Bicycle Traffic Plan 2020 aims at expanding the infrastructure for bicycles, including more parking places, increased connections to main roads, and other means of transport and security measures. In addition, the improvement of pedestrian traffic is foreseen by reduced waiting times at traffic lights and extended pedestrian areas (EEA, 2013).

Agriculture

Measures are mainly determined by the Common Agricultural Policy (CAP) of the EU. This includes that aid to farmers is linked to environmental requirements (cross-compliance), and national and regional agri-environmental measures co-financed by the EU (European Agricultural Fund for Rural Development (EAFRD)). Meanwhile, direct payments have been fully decoupled in Germany and are paid per hectare, with no linkage to livestock numbers any more. In this context, Germany also set up requirements for nitrogen fertiliser use (2009 Fertiliser Act and related Ordinance on Fertilisation), and it promotes organic farming, extensification and environmentally sound livestock raising (NC6 2013, 2013).

Waste
The main measures in the waste sector limiting GHG emissions include the Closed Cycle and Waste Management Act stipulating the recycling of wastes and the Landfill Ordinance prohibiting the landfilling of biodegradable waste that would otherwise lead to methane emissions on landfills. The Ordinance on Incineration and Co-incineration of Waste largely prohibits landfilling of untreated waste and incentivises incineration or mechanical–biological waste treatment over landfilling (NC6 2013, 2013; EEA, 2013).

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Key climate- and energy-related data — Greece

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	135.3	114.7	111.0	107.8	4 544.2
GHG per capita (t CO_2-eq./cap.)	12.2	10.3	10.0	9.7	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	599	507	513	514	350
Share of GHG emissions in total EU-28 emissions (%)	2.6 %	2.5 %	2.4 %	2.4 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	71.3	58.8	61.4	58.6	1 848.6
Share of EU ETS emissions in total emissions (%)	52.7 %	51.3 %	55.4 %	54.4 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	+ 0.1 %	– 22.6 %	– 16.9 %	+ 14.0 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	18.7 %	20.8 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	61.4	53.3	47.0	48.7	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(7.0 %)	(9.8 %)	10.9 %	13.8 %	14.1 %
Share of renewable energy for electricity (%)	8.3 %	12.5 %	13.9 %	16.5 %	23.5 %
Share of renewable energy for heating and cooling (%)	12.8 %	17.8 %	19.4 %	24.4 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.0 %)	(1.9 %)	0.7 %	1.1 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	30.6	27.6	26.9	27.1	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	2.8	2.5	2.4	2.4	3.1
Final energy consumption (Mtoe)	21.0	19.0	18.9	17.1	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.9	1.7	1.7	1.5	2.2
Efficiency of conventional thermal electricity and heat production (%)	37.5 %	37.3 %	39.2 %	38.6 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.28	1.14	1.09	1.22	1.42
Space heating and cooling (toe/dwelling)	0.92	0.78	0.73	0.85	0.96
Water heating (toe/dwelling)	0.07	0.07	0.07	0.08	0.18
Cooking (toe/dwelling)	0.07	0.07	0.07	0.08	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.21	0.22	0.22	0.21	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 7.6 %	2020 ESD target (% vs base year)	– 4.0 %
2013 ESD emissions (% vs base year)	– 20.0 %	2020 ESD projections WEM (% vs base year)	– 5.0 %
		2020 ESD projections WAM (% vs base year)	– 8.2 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

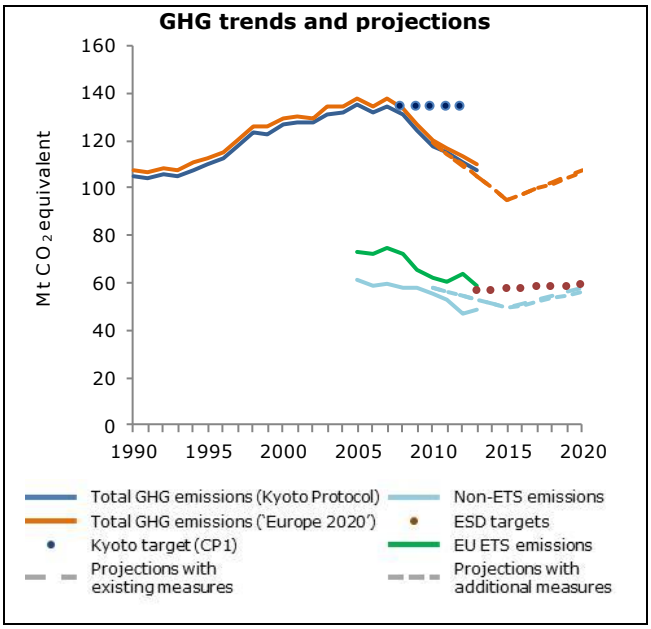
2012 RES share in gross final energy consumption (%)	13.8 %	2011–2012 indicative share from RES Directive (%)	9.1 %
2020 RES target	18.0 %	2012 expected share from NREAP (%)	9.5 %

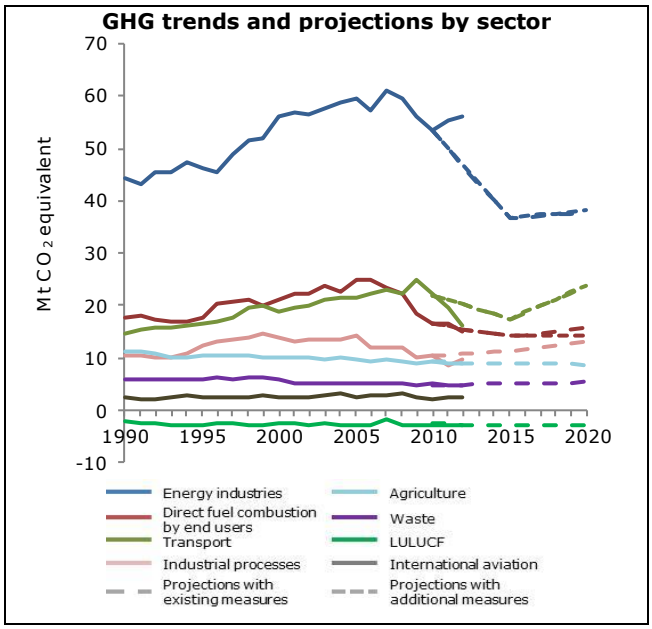
The average share of renewable sources in gross final energy consumption for 2011–2012 was 12.3% (2.2 Mtoe), which is higher than the indicative RED target for 2011–2012 (9.1%). At the same time, the share of renewables in 2012 (13.8 %) is higher than the expected 2012 NREAP target (9.5 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 6.5%. In order to reach its 2020 NREAP target, Greece needs an average annual growth rate of 9.5% in the run-up to 2020. In absolute terms, this is equivalent to 3.0 times its cumulative effort so far.

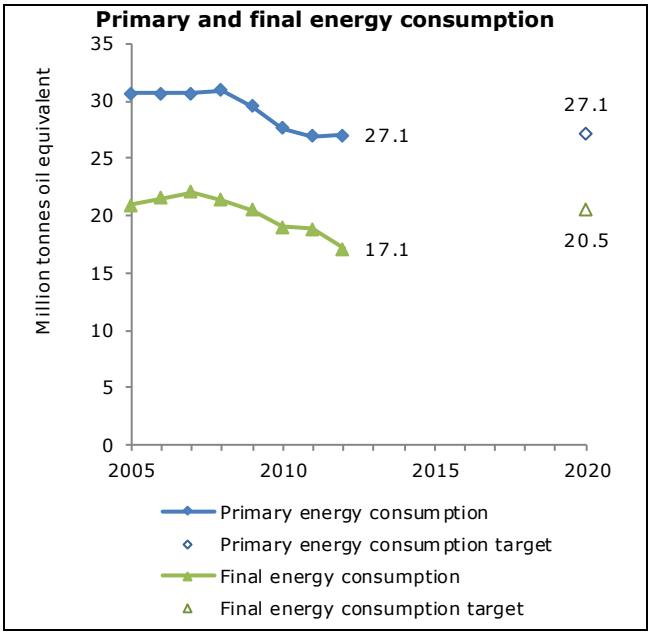
Progress towards energy efficiency targets

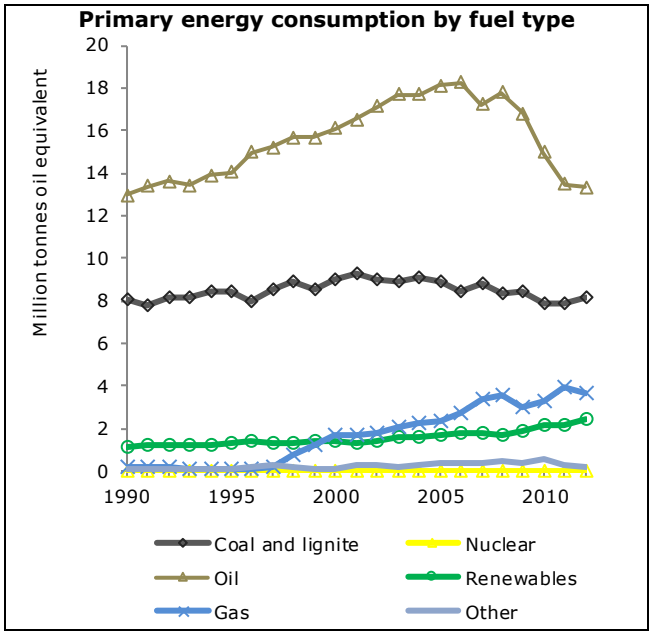
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 1.8 %	2005–2012 average annual change	– 2.8 %
2012–2020 average annual change to target	+ 0.0 %	2012–2020 average annual change to target	+ 2.3 %

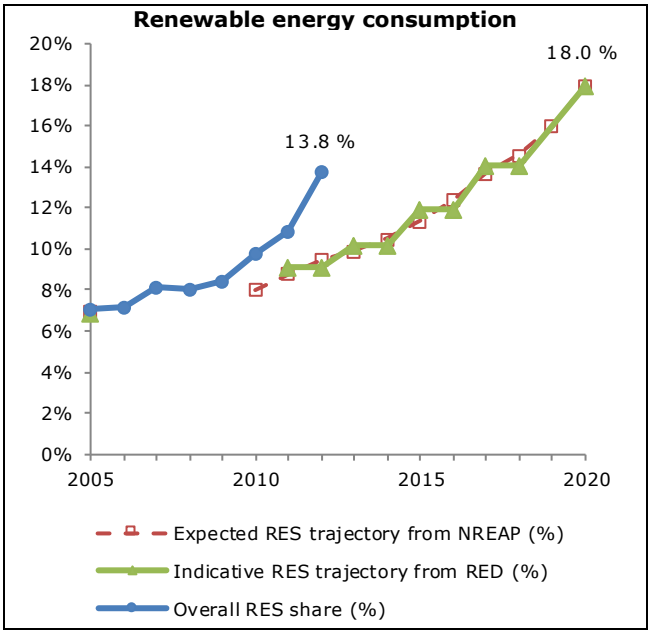
Over the period 2005–2012, primary and final energy consumption decreased at a much faster pace than is necessary to achieve the 2020 targets. The economic crisis had a significant impact on this development leading to large energy savings particularly in industry and transport sectors (a decrease by 30 % and 22 % respectively), while energy consumption in the residential sector changed much less. As the Greek economy slowly picks up, improvements in energy efficiency will be necessary. Particular attention could be necessary to limit energy consumption in the energy sector, where own consumption increased by 30 % between 2005 and 2012.

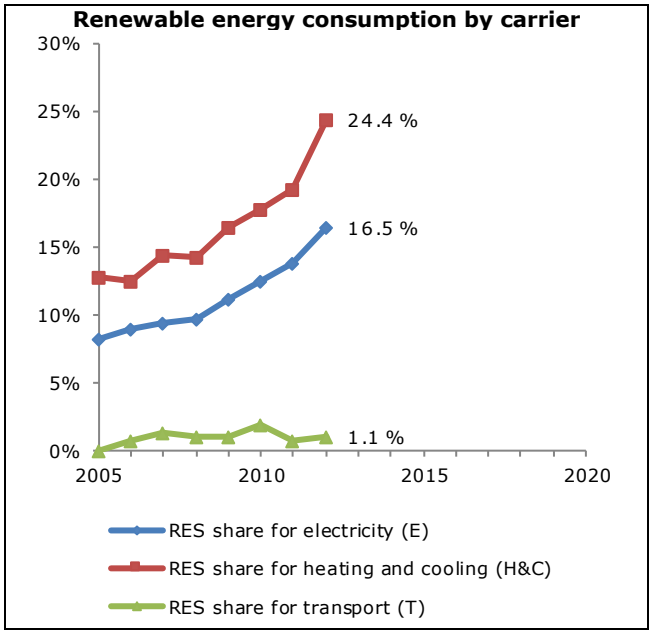

GHG trends and projections
Mt CO2 equivalent
160
140
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
70
60
50
40
30
20
10
0
-10
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
35
30
25
20
15
10
5
0
2005
2010
2015
2020
27.1
27.1
17.1
20.5
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
20
18
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
20%
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
18.0 %
13.8 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
24.4 %
16.5 %
1.1 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Greece still receives direct financial aid through the European rescue facility and the associated second economic adjustment programme strongly influences policymaking. Green growth elements are only included to a limited extent in this programme and since the country remains in a state of financial stress, policy measures need to be designed in a very cost-efficient manner. The persistently high unemployment means that policymakers also need to be very aware of costs that are passed on to consumers. However, a specific opportunity presents itself in the form of clean technology investments, which can lead to economic development. Specifically, decentralised renewable energy deployment and energy efficiency measures in buildings can correlate with local economic activity and employment. In 2012, more than 33 000 jobs and more than EUR 2.7 billion of turnover were generated by the renewable energy sector alone, without considering supplying industries and energy efficiency (EurObserv'ER, 2012). Expanded energy efficiency measures could at the same time be the key to reduced energy poverty and reduced costs in industry. In addition, the successful implementation of measures listed in the National Renewable Energy and Energy Efficiency Action Plans is vital so that Greece can meet its greenhouse gas (GHG) emission target.

Climate and energy strategies
Greece has introduced climate policy instruments with a particular focus on energy and energy efficiency. Following the Energy Roadmap 2050, reducing dependence on imported energy, maximising the penetration of renewables, achieving a significant reduction in emissions of carbon dioxide (CO_2), reinforcing energy efficiency in building, industry and transport, and the protection of final consumers are the main pillars of long-term national energy planning. The introduction of natural gas into the energy mix, as well as the expansion of grid connections to the currently isolated islands and to neighbouring states are current major priorities of national energy policy. Greece has also been focusing on creating a sustainable financing structure for renewables, given the deficits in the funding mechanism. Further important reform targets include the privatisation of the electricity sector, adjustments in electricity pricing and the adoption of smart meter technology. However, civil society organisations caution that the economic downturn and the introduction of the economic adjustment programme have reduced policymakers' attention towards environmental topics (Ekathimerini, 2012).

Renewable energy
With the introduction of Law 3851/2010 the Greek government increased its national renewables target for 2020 of 18 % to 20 % participation of renewables in gross final energy consumption, composing of 40 % participation of renewable energy sources in electricity production, 20 % in heating and cooling, and 10 % in transport. However, the share of renewables in total energy consumption has been among the lowest in the EU. The main support system for renewable electricity is a feed-in tariff (FIT) scheme. Until recently, the FITs in Greece were among the most generous in the EU (MEEC, 2010). This led to a steep increase of installed capacity, especially in photovoltaics, which increased from 624 MW in 2011 to 2 579 MW in 2013 (HELAPCO, 2014). On the other hand, this caused a significant deficit in the Renewable Energy Special Account, the funding instrument basically fed by the Special Levy for the Reduction of GHGs paid by electricity consumers. Obligations under the economic adjustment programme have led the Greek government to reduce FIT rates and to increase the Special Levy to nullify the Special Account deficit.
Renewables in heating and cooling are supported through tax reliefs granted on renewable boiler installation costs or replacement costs of old boilers with renewable boilers. The programme for energy savings in private buildings (Εξοικονομώ κατ'οικον) supports measures to increase the energy performance of buildings by providing financial means for installation costs of renewable heating facilities through subsidies and interest-free loans. The share of both instruments in total investment costs depends on family income.

Energy efficiency
Although the Energy Roadmap 2050 foresees significant energy efficiency improvements, Greece has no long-term energy efficiency strategy outlining specific targets. Energy **taxation** is rather high with the level of excise duties being above the EU average. There are exemptions in place for coal and coke used for chemical reduction and in electrolytic metallurgical processes. Greece has no CO_2 tax. A legislative framework is in force for the promotion of **cogeneration** and district heating in industry, residential buildings and the tertiary sector. In the **building sector**, minimum performance standards and certification have been introduced for new or renovated buildings. The Building the Future programme aims to upgrade the energy performance of residential and industry buildings by implementing modern energy efficiency technologies. Within this framework, policy instruments, such as white certificates, voluntary agreements with the industrial and commercial sectors, and contracts of guaranteed performance are planned to be introduced. The programme for energy savings in residential buildings (Εξοικονομώ κατ'οίκον) provides funding, granting interest-free loans and subsidies for the installation of renewables and energy-savings measures. The programme foreseaw a budget of EUR 396 million and due to its success it is expected to continue in the next programmatic period 2014–2020 with a substantially augmented budget.
Environmental organisations criticise a lack of coherence in the current policy framework. It is estimated that during the period 2012–2014 the Greek government will still spend almost EUR 1.20 in heating oil subsidies for each euro spent on energy efficiency (Greenpeace, 2013).

Transport
As the economic adjustment programme primarily encourages transport price reductions and growth of the tourism sector, including maritime transport and aviation (European Commission, 2012), Greece's transport

policy is currently concerned with the liberalisation of the transport market. However, emissions from transport decreased in the last years and average emissions for newly registered cars are the fourth lowest in the EU (Eurostat, 2013). Measures to incentivise efficient driving and the purchase of efficient cars include a registration tax based on value, age and cylinder capacity, as well as an ownership tax based on CO_2 emissions for passenger cars and on weight for most commercial vehicles. Petrol is taxed well above EU average, while diesel is taxed well below EU average. The Greek government promotes the use of biofuels through a biofuels quota and an exemption from the excise tax.
Modal shift is supported through different measures that are under development, including the expansion of metro lines and bus lanes. Moreover, the bus fleet is being renewed and railways are being electrified, aiming at increasing energy efficiency.

Agriculture
The Rural Development Plan for Greece, co-funded by the EU, imposes the strategic objectives of maintaining and improving competitiveness, environmental protection and sustainable management, as well as improvement of quality of life in rural areas and the development of local possibilities for employment and diversification of rural economies. It includes measures to increase organic farming, reduce land use and decrease the use of synthetic fertilisers. Actions such as 'Crop rotation with rain-fed crops in tobacco producing regions' support former tobacco producers using irrigated farming to implement dryland farming and cultivate rain-fed crops as part of their cultivation switching to irrigated farming. The aim of the action is to reduce water consumption, restrict chemical compounds use and abate CO_2 emissions.

Waste
As a result of the National Waste Management Plan, nearly all municipal waste is disposed in sanitary landfills. The Plan's main objectives are the gradual closure of all uncontrolled waste disposal sites, the reduction of waste generation rates, the recovery and reuse of the wastes, including energy recovery, and the reduction of biodegradable wastes going to landfills. The share of recycled solid waste increased from 8 % in 2000 to 18 % in 2011. The four largest SWDS, managing some 90 % of waste disposed to SWDS, operate biogas recovery and flaring installations. Also, the number of wastewater treatment plants has been increased considerably, serving 91 % of the population living in agglomerations with more than 2 000 inhabitants in 2011 (MEEC, 2014).

Land use, land-use change and forestry
Rural development actions and further financing mechanisms aim at forest conservation, recovery of degraded forests and forest fire prevention.

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Key climate- and energy-related data — Hungary

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	78.4	66.0	62.0	59.7	4 544.2
GHG per capita (t CO_2-eq./cap.)	7.8	6.6	6.2	6.0	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	548	393	368	348	350
Share of GHG emissions in total EU-28 emissions (%)	1.5 %	1.4 %	1.4 %	1.3 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	26.2	22.5	21.3	19.1	1 848.6
Share of EU ETS emissions in total emissions (%)	33.4 %	34.0 %	34.3 %	32.1 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 13.5 %	– 10.0 %	– 35.1 %	n.a.	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	9.1 %	13.8 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	50.4	43.1	40.3	40.6	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(4.5 %)	(8.6 %)	9.1 %	9.6 %	14.1 %
Share of renewable energy for electricity (%)	4.4 %	7.1 %	6.4 %	6.1 %	23.5 %
Share of renewable energy for heating and cooling (%)	6.0 %	11.1 %	12.3 %	13.6 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.4 %)	(4.7 %)	5.0 %	4.6 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	25.4	23.8	23.1	21.7	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	2.5	2.4	2.3	2.2	3.1
Final energy consumption (Mtoe)	18.2	16.6	16.2	14.8	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.8	1.7	1.6	1.5	2.2
Efficiency of conventional thermal electricity and heat production (%)	53.7 %	53.4 %	53.8 %	54.4 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.59	1.45	1.49	n.a.	1.42
Space heating and cooling (toe/dwelling)	1.03	0.97	0.99	n.a.	0.96
Water heating (toe/dwelling)	0.30	0.26	0.26	n.a.	0.18
Cooking (toe/dwelling)	0.12	0.08	0.09	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.14	0.15	0.15	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 4.8 %	2020 ESD target (% vs base year)	+ 10.0 %
2013 ESD emissions (% vs base year)	– 20.7 %	2020 ESD projections WEM (% vs base year)	– 16.5 %
		2020 ESD projections WAM (% vs base year)	– 21.4 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

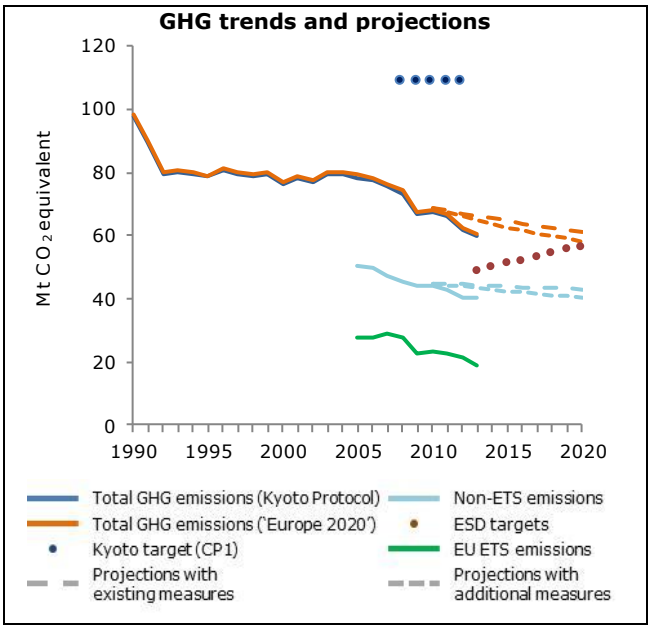
2012 RES share in gross final energy consumption (%)	9.6 %	2011–2012 indicative share from RES Directive (%)	6.0 %
2020 RES target	13.0 %	2012 expected share from NREAP (%)	7.4 %

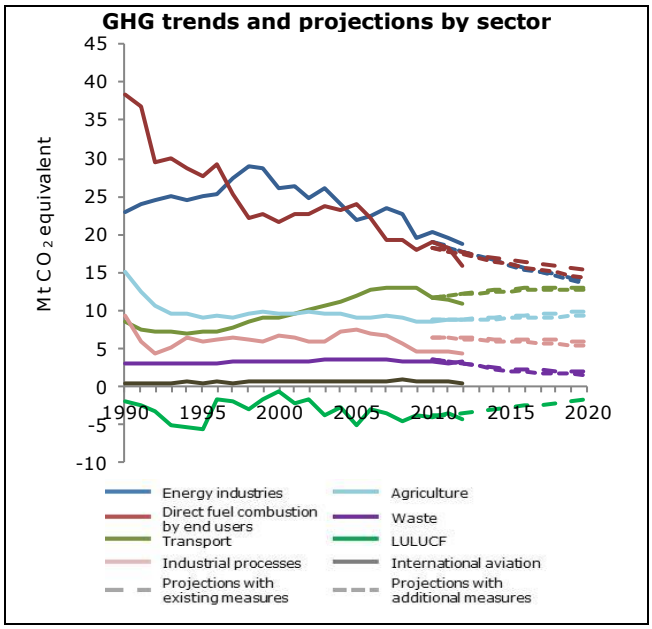
The average share of renewable sources in gross final energy consumption for 2011–2012 was 9.3% (1.5 Mtoe), which is higher than the indicative RED target for 2011–2012 (6.0%). At the same time, the share of renewables in 2012 (9.6 %) is higher than the expected 2012 NREAP target (7.4 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 8.3%. In order to reach its 2020 NREAP target, Hungary needs an average annual growth rate of 8.8% in the run-up to 2020. In absolute terms, this is equivalent to 2.3 times its cumulative effort so far.

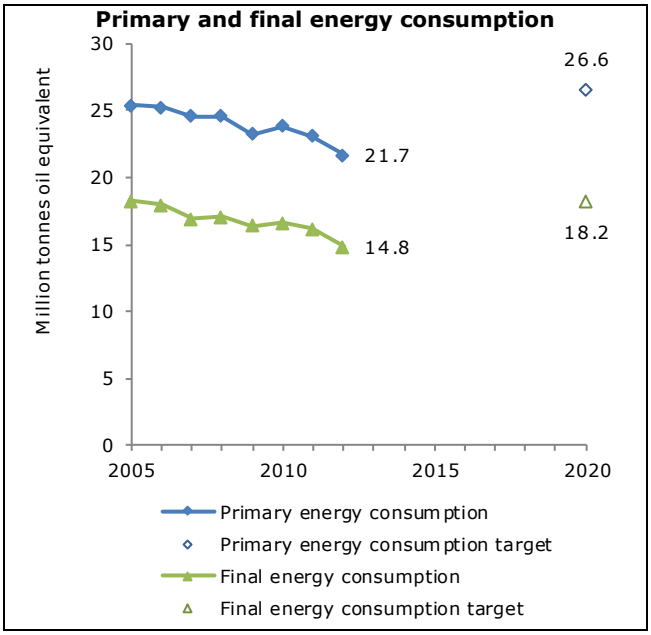
Progress towards energy efficiency targets

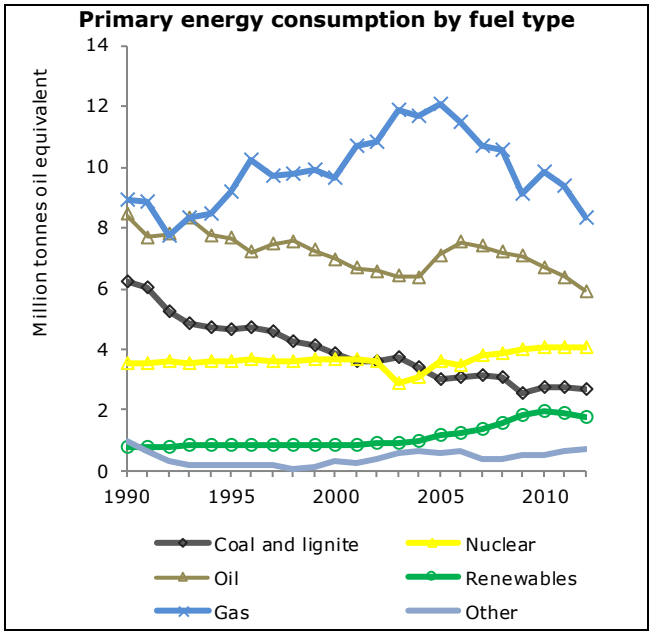
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 2.3 %	2005–2012 average annual change	– 2.9 %
2012–2020 average annual change to target	+ 2.6 %	2012–2020 average annual change to target	+ 2.6 %

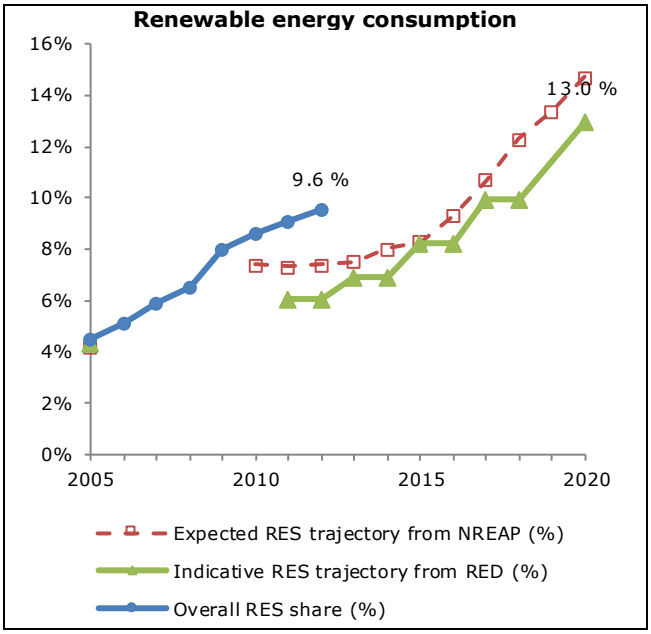
Primary and final energy consumption decreased significantly over the period 2005–2012, particularly between 2011 and 2012. Alongside the effects of the economic crisis, efficiency improvements also contributed to this trend, for example through reduced distribution losses. Hungary has a positive target in primary energy and a reduction target in final energy consumption, compared to 2005 respectively. It can therefore focus on limiting its energy consumption as the economy picks up again. Particular attention could be necessary to improve efficiency in energy conversion to produce electricity, including by autoproducers.

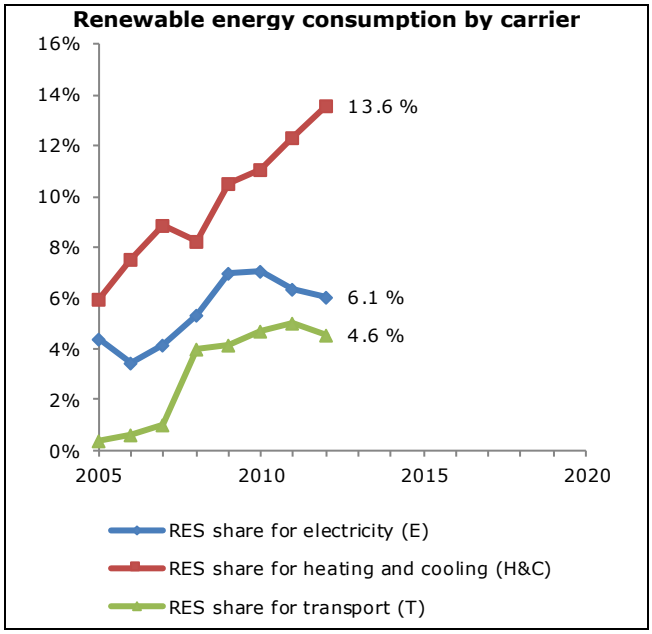

GHG trends and projections
Mt CO2 equivalent
120
100
80
60
40
20
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
45
40
35
30
25
20
15
10
5
0
-5
-10
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
30
25
20
15
10
5
0
2005
2010
2015
2020
26.6
21.7
18.2
14.8
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
9.6 %
13.0 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
13.6 %
6.1 %
4.6 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
The energy intensity of Hungary's economy is well above the EU average, in particular due to the rising energy intensity of households. From 2005 to 2011 the increase in household energy intensity was the highest in the EU. Despite an extensive number of subsidy programmes aimed at improving energy efficiency in buildings, the number of renovations remains low because funds are often available only at short notice for short periods of time, limiting investment stability. For example, a programme offering grants to energy efficiency measures in multi-storey dwellings was stopped after only one day due to the enormous demand for this subsidy programme (Ministry of National Development, 2013c). Considering the significant potential for energy savings in the residential sector, pursuing a more substantial policy in this area is a significant opportunity for Hungary to reduce energy imports, and create jobs through increased investment in building renovations and other energy efficiency improvements.
Average emissions for newly registered cars were the 4th highest in the EU in 2011, and emissions in the transport sector have risen nearly 37 % between 1990 and 2011. Incentivising the purchasing of efficient vehicles, more efficient driving and shifting to public transport, for example through increasing environmental taxation in the transport sector and making public transport more attractive, would lower transport energy consumption and related greenhouse gas (GHG) emissions as well as air pollution.

Climate and energy strategies
A National Climate Change Strategy 2008–2025 was adopted in 2008 and a draft revision finalised in 2013 is open for public consultation until November 2014. The Strategy focuses on the expected effects of climate change on Hungary and elaborates on mitigation and adaption measures, including a GHG emission reduction target of 16–25 % by 2025 (compared to 1991 levels). The Strategy includes the Hungarian Decarbonisation Schedule examining key sectors for reducing Hungary's carbon dioxide (CO_2) emissions. Furthermore, the Strategy encompasses an Awareness Raising Action Plan aiming to raise public support for energy efficiency measures and the use of renewable energy sources (RES). A National Energy Strategy was adopted in 2011 and aims at security of supply, increasing competitiveness and sustainability. Hungary aims to reduce primary energy consumption to 1 150 PJ/year, limit growth in electricity consumption to 1.5 % per annum, and achieve a share of 20 % renewables in primary energy consumption by 2030.
In addition, the New Széchenyi Plan, an economic development programme implemented in 2011, provides financial support for the strategic goals. Moreover, it serves as an overall framework policy for all other strategies related to energy, transport and energy efficiency.

Renewable energy
Renewables are growing rapidly as a share of both final energy consumption and electricity. Electricity from renewables is mainly supported through a feed-in tariff (FIT). All renewable technologies above 50 kW are eligible. The current FIT (§ 11 (3) Act No LXXXVI of 2007) started operation on 1 January 2008. Biomass currently accounts for the largest share, ahead of wind and solar. A unique aspect of Hungary's FIT is that the tariffs vary by time of day and day of the week depending on demand; they are higher during peak hours. This system should help to make generators sensitive to electricity demand, providing a market incentive to optimise power generation. Reforms to the FIT were announced in 2011; however, there have been no reforms of the FIT system to this date. A net-metering system applies for household-sized renewables up to an installed capacity of 50 kW. Additional support is provided through restrictions on electricity imports to the benefit of renewables. Subsidies are in place for pilot projects, renewables in buildings of ecclesiastic legal entities and solar installations on public buildings; however, financial support is frequently stopped at short notice and funds are often quickly exhausted.
A subsidy for renewable heat is provided for pilot projects. Additional certification programmes for renewable installations and infrastructure were provided, including within the Framework of the Environmental and Energy Operational Programme. However, current funds are exhausted since the beginning of 2013. A call for additional funding from the European Environment Agency (EEA) and Norway grants financial mechanism to replace existing district heating installations with geothermal energy was also available for several months in early 2014. Moreover, Decree No 7/2006 (V.24.) makes a recommendation to consider the use of RES in newly built buildings and buildings undergoing renovation or extensions.

Energy efficiency
Energy **taxation** is rather low with the level of excise duties being below the EU average. Prices for electricity, gas and district heating are regulated by the state, a practice against which the European Commission has announced legal action. The Hungarian government has pursued a policy of reducing various charges and levies, making energy prices more affordable to reduce energy poverty. Prices for electricity, natural gas and district heating were reduced by more than 20 % in 2013, and additional price reductions were announced in January 2014.
A FIT for electricity from **combined heat and power** stations was halted in August 2011.
In **industry**, large consumers must report their energy consumption, and a voluntary agreement with industry to implement energy audits is planned (EEW, 2013).
Hungary has a long-term National Strategy for Energy Efficiency in **Buildings** since 2014 that provides the conceptual framework for upgrading Hungarian buildings to be more energy efficient, and for constructing new energy-efficient buildings. According to the Ministry of Rural Development, energy efficiency improvements are advisable for approximately 2 million buildings. Hungary has minimum energy performance standards for new and modernised buildings and performance certification has been introduced. In recent years, Hungary has set

up numerous subsidy programmes aimed at improving the energy efficiency of buildings, mainly financed from EU funds, revenues made by selling surplus Kyoto Protocol assigned amount units, and grants under the financial mechanism of the EEA and Norway. Support is provided for energy efficiency measures in traditionally built homes, multi-storey residential buildings, public sector buildings and businesses. However, these subsidy programmes are usually available at short notice and only for a short period.

Transport
Hungary is developing a National Transport Strategy that sets long-term goals for the years 2020, 2030 and 2050 with an action plan for 2014–2020. Measures incentivising the purchasing of efficient cars include a registration tax based on EURO emission standards as well as engine capacity; however, it is depreciated for second-hand cars. The ownership tax for passenger and company cars depends on the engine capacity and the number of years since the production year (ACEA, 2012). Tax rates for both petrol and diesel are below the EU average, but both are taxed at almost the same rate (European Commission, 2013). However, Hungary also introduced an e-toll system in 2013 (Governmental Decree No 209/2013) that applies to heavy vehicles of more than 3.5 t. The Ministry of National Development expects to generate HUF 150 billion (approximately EUR 508 million) annually with the new system compared to the former road tariff system (Ministry of National Development, 2013b). Biofuels and hydrogen are promoted through a biofuel quota of 4.9 % for both petrol and diesel, as well as a reimbursement of excise duties on biofuels in the case of vehicles used in the mining industry and in water management not driving in public traffic.
Modal-shift and increased railway use is promoted through modernisation of trains, railway stations and infrastructure, as well as reduced railway prices on regional train connections. Moreover, timetables and routes for intercity buses are being optimised. Financial support is provided to purchase new public transport buses with engines using compressed natural gas.

Agriculture
GHG-related actions of the New Hungary Rural Development Strategic Plan (2007–2013) are the increase of energy crop production (+ 4 %) and a reduction of energy intensity of agriculture (– 2.5 TJ/billion HUF). Farmers are required to use practices that limit nitrogen fertiliser use to 50 kg/ha and reduce the loss of soil carbon per hectare to 2 tonnes per hectare and year. The New Nitrate Action Programme identifies nitrate-sensitive areas and provides general rules of protection. Old manure management systems with deep open lagoons are also being replaced and manure transport at biogas plants improved. The National Action Plan for Developing Organic Farming 2014–2020 aims at bringing in line the intensification of Hungarian agriculture and increasing Hungarian livestock. This includes also an increase of organic farming as well as of the use of organic products in canteens to 30 % until 2020.

Waste
Waste management policy is based on the 2012 Act on Waste. The main goals are the reduction of landfilling and increasing reuse and recycling. Hungary sets fees on landfilling according to different sources of waste. Moreover, a campaign has been launched to reduce municipal landfilling from 70 % today to 10 % in 2020. To support incineration, electricity providers are required to purchase power generated from waste at subsidised prices. An environmental tax on environment-damaging products, calculated on the basis of product weight and differentiated by product, applies to persons or legal entities that introduce or process the listed product. The Ministry of Rural Development claims that the number of small plastic bags decreased from more than 300 million to less than 200 million from 2012 to 2013 as a result of this tax. Additionally, legislation is currently being developed to introduce a refund system for packaging waste; in 2015, the introduction of improved waste separation measures aimed at increasing recycling and incineration rates, as well as compulsory door-to-door separate household waste collection, is foreseen.

Land use, land-use change and forestry
The National Forest Programme 2006–2015 sets the objective of at least maintaining the current area covered by forests. It also encourages the use of wood as an environmentally friendly raw material, while managing forests sustainably. The National Agri-Environmental Programme also aims to increase the territorial proportion of semi-natural forest management through afforestation and reforestation measures. In 2013, HUF 700 million (approximately EUR 2.3 million) of financial support was assigned to forest owners in Natura 2000 sites, on which forestry use is restricted, depending on the forest's natural value, the forest species and the trees' ages.

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Odyssee, 2012, 'Country Profiles — Energy efficiency trends and policies profiles' and 'National Reports — Energy efficiency trends and policies' (http://www.odyssee-indicators.org/publications/country_profiles.php) and (http://www.odyssee-indicators.org/publications/national_reports.php) accessed 7 October 2014.

Key climate- and energy-related data — Ireland

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	69.7	57.7	58.5	56.6	4 544.2
GHG per capita (t CO_2-eq./cap.)	16.9	12.6	12.8	12.3	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	517	391	388	374	350
Share of GHG emissions in total EU-28 emissions (%)	1.3 %	1.3 %	1.3 %	1.3 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	22.4	15.8	16.9	15.7	1 848.6
Share of EU ETS emissions in total emissions (%)	32 %	27 %	29 %	28 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	+ 16.7 %	– 27.5 %	– 22.3 %	– 1.7 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	12.4 %	15.0 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	46.9	41.6	41.3	40.9	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			6.6 %	7.2 %	14.1 %
() = including all biofuels consumed in transport	(2.8 %)	(5.6 %)			
Share of renewable energy for electricity (%)	7.2 %	14.9 %	17.6 %	19.6 %	23.5 %
Share of renewable energy for heating and cooling (%)	3.5 %	4.3 %	4.9 %	5.1 %	15.6 %
Share of renewable energy for transport (%)			3.9 %	4.1 %	5.1 %
() = including all biofuels consumed (%)	(0.0 %)	(2.4 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	14.7	14.9	13.7	13.6	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.6	3.3	3.0	3.0	3.1
Final energy consumption (Mtoe)	12.6	11.9	11.0	10.7	1 104.5
Final energy consumption per capita (Mtoe/cap.)	3.1	2.6	2.4	2.3	2.2
Efficiency of conventional thermal electricity and heat production (%)	43.2 %	47.0 %	48.0 %	46.7 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	2.12	1.87	1.75	1.70	1.42
Space heating and cooling (toe/dwelling)	1.48	1.27	1.15	1.13	0.96
Water heating (toe/dwelling)	0.34	0.30	0.28	0.27	0.18
Cooking (toe/dwelling)	0.08	0.08	0.08	0.08	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.23	0.23	0.24	0.22	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 3.7 %	2020 ESD target (% vs base year)	– 20.0 %
2013 ESD emissions (% vs base year)	– 11.6 %	2020 ESD projections WEM (% vs base year)	– 3.1 %
		2020 ESD projections WAM (% vs base year)	– 10.0 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. However, projections indicate that 2020 ESD emissions are expected to be above the 2020 ESD target, despite the implementation of measures planned until 2013.

Progress towards renewable energy targets

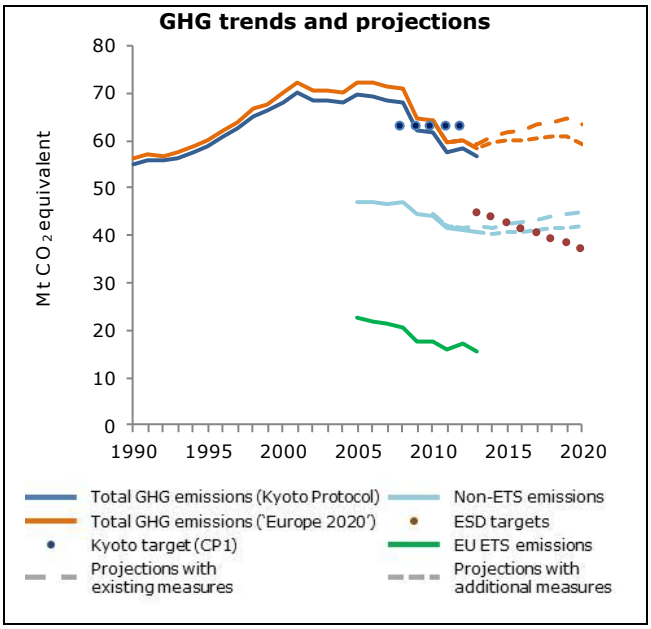
2012 RES share in gross final energy consumption (%)	7.2 %	2011–2012 indicative share from RES Directive (%)	5.7 %
2020 RES target	16.0 %	2012 expected share from NREAP (%)	7.6 %

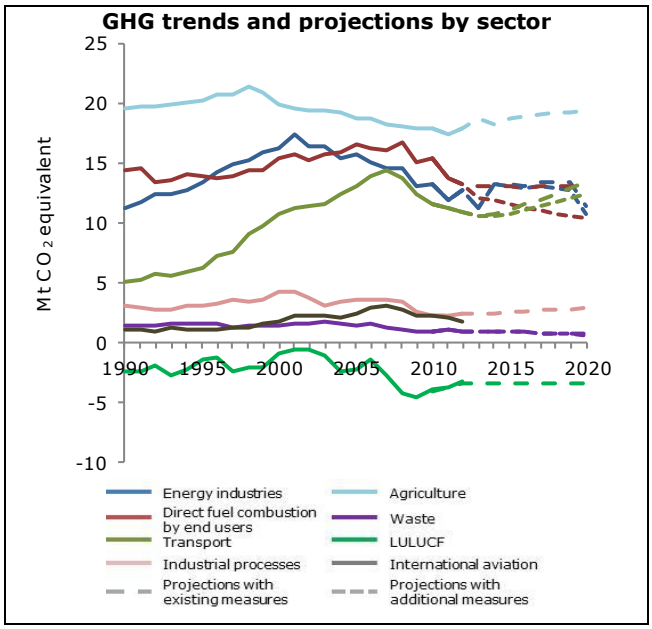
The average share of renewable sources in gross final energy consumption for 2011–2012 was 6.9% (762 ktoe), which is higher than the indicative RED target for 2011–2012 (5.7%). At the same time, the share of renewables in 2012 (7.2 %) is lower than the expected 2012 NREAP target (7.6 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 11.7%. In order to reach its 2020 NREAP target, Ireland needs an average annual growth rate of 14.2% in the run-up to 2020. In absolute terms, this is equivalent to 3.5 times its cumulative effort so far.

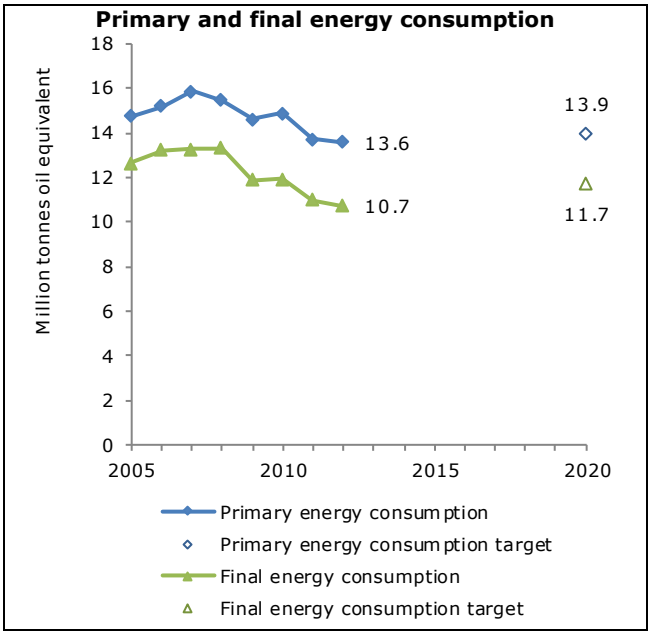
Progress towards energy efficiency targets

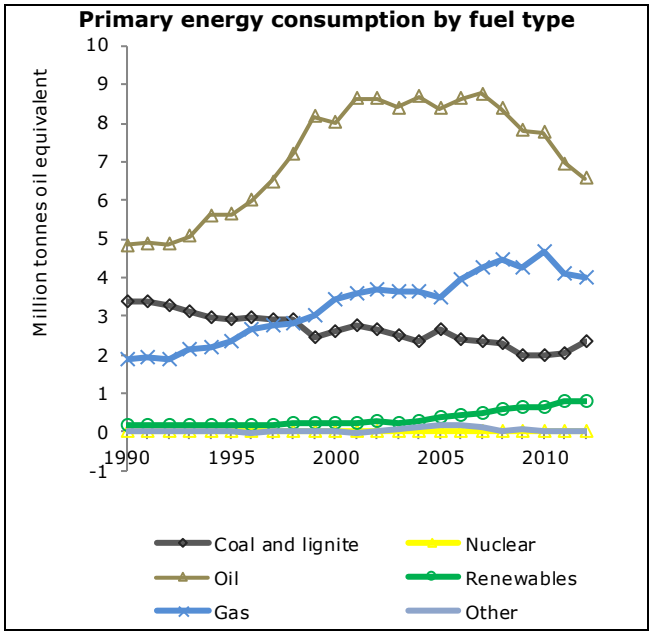
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-1.2 %	2005–2012 average annual change	-2.3 %
2012–2020 average annual change to target	0.3 %	2012–2020 average annual change to target	1.1 %

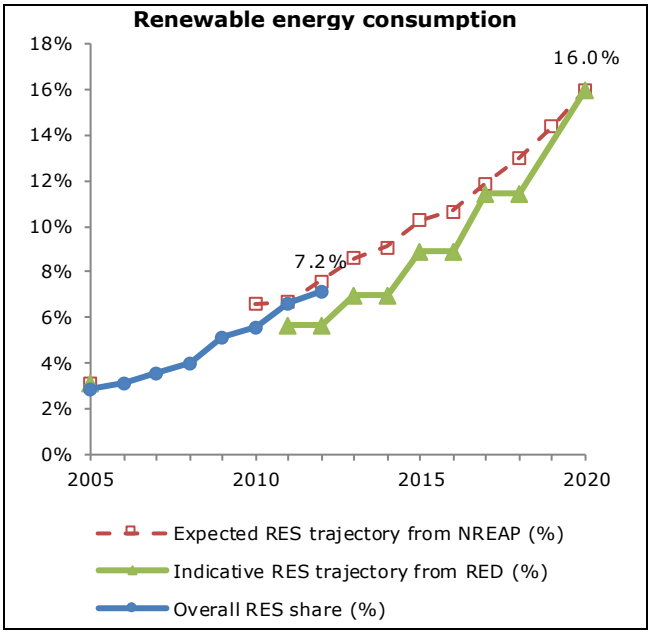
During the period 2005–2012, primary and final energy consumption decreased at a faster pace than is necessary to meet the 2020 targets. Alongside the effects of the economic crisis, energy efficiency improvements also contributed to this result, for example in the buildings and industry sectors. Because of the recent increase in coal consumption, facilitated by low international prices, and the low efficiency of oil-based power plants, reducing losses in transformation efficiency for electricity production could contribute to further reducing or stabilising primary energy consumption, as the economy picks up again.

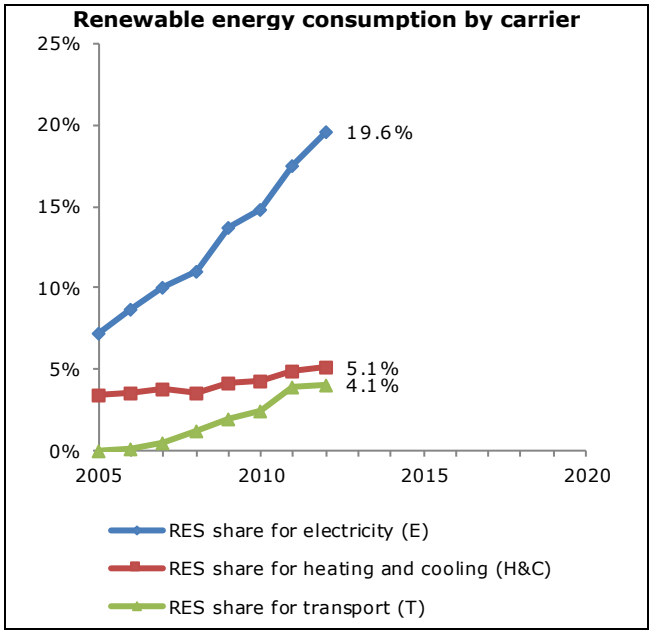

GHG trends and projections
Mt CO2 equivalent
80
70
60
50
40
30
20
10
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
25
20
15
10
5
0
-5
-10
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
18
16
14
12
10
8
6
4
2
0
2005
2010
2015
2020
13.6
10.7
13.9
11.7
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
10
9
8
7
6
5
4
3
2
1
0
-1
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
16.0%
7.2%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
19.6%
5.1%
4.1%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Ireland's energy dependence remains a key challenge for the country. Mainly due to high oil and natural gas imports and a lack of sufficient domestic sources, for example renewable energy, Ireland is among the five most vulnerable countries in the EU in terms of security of supply (European Commission, 2013). It spends around EUR 6.5 billion per year on imported fossil fuels. Increasing the share of renewable energy sources (RES) is a great opportunity to reduce Ireland's energy dependence and fuel import expenses while at the same time reducing greenhouse gas (GHG) emissions. In the past 5 years, renewable energy has not only reduced carbon dioxide (CO_2) emissions by 12 million tonnes but also saved over EUR 1 billion in fossil fuel imports during this period (SEAI, 2014). Moreover, recent analyses highlight the importance of renewable energy to the Irish economy and the potential for green jobs, showing that the wind sector alone could create between 8 000 and 35 000 new jobs depending on the capacity additions, which range from 400 MW to 12 GW, respectively. In addition, improving the energy efficiency of the economy could reduce the need for energy imports, reduce GHG emissions and also support jobs, for example through investments in building insulation measures. The Better Energy Programme, for example, is expected to lead to 3 000 new jobs in addition to those it has already created (SEAI, 2011, 2013).

Climate and energy strategies
In April 2014, Ireland presented its new National Policy Position on Climate Action and Low-Carbon Development and the final general scheme of the Climate Action and Low-Carbon Development Bill. The two instruments focus on balancing environmental, social and economic challenges. The National Policy Position has the aim of bringing clarity and certainty to the national low-carbon transition objective for 2050 to facilitate planning and investment by Irish business. It should also attract potential new national and international investors. Furthermore, four key sectors (electricity generation, environment, transport and, above all, agriculture) have been identified as particularly important. The National Policy Position has set out different targets and aims, including the target of achieving an aggregate reduction in CO_2 emissions of at least 80 % (compared to 1990 levels) by 2050 for electricity generation, built environment and the transport sector (NPP Ireland, 2014).
Ireland's energy policy priorities are presented in the Government White Paper on energy of 2007, which will be replaced by a new green paper in 2014. The 2007 White Paper contains a number of guiding principles, policies and actions to be implemented in the energy sector by 2020, and is supplemented by further policy documents of the Department of Communications, Energy and Natural Resources that focus on energy efficiency and renewable energy in particular (UNFCCC, 2013).

Renewable energy
The main support mechanism for renewable electricity is the Renewable Energy Feed-in Tariff (REFIT), which is subdivided into three schemes (REFIT 1, 2 and 3). REFIT has replaced the Alternative Energy Requirement Programme, a tender scheme to support renewable electricity generation so as to provide certainty to renewable electricity generators. It is funded by the Public Service Obligation, which is paid for by all electricity consumers. Amendments to all schemes were made in 2013. The REFIT 1 and 2 schemes cover small wind (< 5 MW), large wind (> 5 MW), hydroelectricity and biomass/landfill gas. REFIT 3 was introduced in February 2012 as the first REFIT scheme dedicated solely to biomass technologies. It aims to support the generation of bioenergy from anaerobic digestion, biomass cogeneration and co-firing of biomass with peat (UNFCCC, 2013).
Renewables in heating and cooling are supported by grants to promote investment into renewable heat, tax regulations to encourage investments that increase the use of RES and building obligations that ensure that new buildings meet minimum standards for integrating RES. Homeowners can receive a EUR 800 grant for the installation of solar thermal installations under the Better Energy Homes scheme. A tax return of 100 % of the purchase value of certain energy-efficient equipment is given to Irish companies under the Accelerated Capital Allowance scheme (RES Legal).

Energy efficiency
Ireland does not have a long-term strategy outlining energy efficiency targets beyond 2020. Ireland has, however, introduced ambitious policies to increase energy efficiency and a National Energy Efficiency Fund for investments in energy efficiency.
Energy **taxation** is relatively high with the level of excise duties being above the EU average. In addition, there is a carbon tax with rates of EUR 20 per tonne of CO_2 since May 2014. There are excise duty exemptions for businesses holding a GHG emissions permit, and for oil and coal used for chemical reduction or in electrolytic or metallurgical processes. The Natural Gas Carbon Tax has been amended in 2013 to include solid fuels such as peat and coal. Reduced VAT rates of 13.5 % instead of the standard 21 % rate apply to natural gas, electricity, district heating, firewood and heating oil.
Ireland has introduced an **obligation scheme to energy suppliers** to meet its energy saving target under the Energy Efficiency Directive (according to Art. 7). The Energy Efficiency Obligation Scheme was introduced in early 2014. Energy suppliers receive Energy Efficiency Notices that analyse how their energy efficiency savings target can be met so as to avoid penalties. Originally, the scheme was initiated as a voluntary scheme. There are no specific measures to support **combined heat and power**.
Regarding the **industry** sector, a number of programmes promote energy efficiency in businesses and networks are established for small and medium-sized enterprises to provide advice, mentoring and training, and to share best practices. The Energy in Business programme promotes structured energy management and

supports energy efficiency efforts in all business sectors. The Energy Agreements Programme and the Large Industry Energy Network support larger industrial sites (UNFCCC, 2013).
In the **building sector**, the Building Regulations set minimum energy performance requirements for new buildings. Ultimately, the aim is to achieve a Nearly Zero Energy Building framework for dwellings by 2015. The Building Energy Rating scheme has been established to assess the energy performance of buildings. The Quality Housing for Sustainable Communities guidelines set out requirements for the design of energy-efficient housing developments. The Building Regulations also establish certain minimum energy performance requirements for existing buildings. In March 2014, Ireland published the 'Code of Practice for the Energy Efficient Retrofit of Dwellings' to further improve the quality standards in the retrofit of buildings (NSAI, 2014; UNFCCC, 2013). Financial support is provided through different programmes: the Better Energy Homes scheme offers grants for energy-efficient renovations, and the Better Energy Warmer Homes scheme finances energy efficiency improvements in the homes of elderly and vulnerable people.

Transport
Ireland promotes the purchasing of less carbon-intensive cars through a vehicle registration **tax** based on value and CO_2 emissions. Since its introduction in 2008, the average emissions of new cars have constantly decreased and new cars are approximately 23 % more energy efficient than the average new car before 2008 (UNFCCC, 2013). There is a vehicle ownership tax in place that is also based on CO_2 emissions in the case of passenger cars and weight in the case of lorries. Diesel taxes are above the EU average while petrol taxes are only around the EU average.
Ireland has established a quota system for **renewable energies** in the transport sector: the biofuel obligation from 2010 aims at increasing the share of biofuels from 4 % to 6 % from 1 January 2013 onwards. By 2020, the share of renewable energies used in the transport sector should increase to 10 %.
Ireland is working on the improvement of its public transport system, including **rail transport**. In order to improve the level, accessibility and quality of rail services, the Minister for Transport, Tourism & Sport aims to reorganise Irish Rail. In addition, investments in the public transport system included expanding the tram service in Dublin and improving the public bus system. Tax incentives for the purchase of bicycles for commuting as well as tax relief schemes for employers or employees choosing public transport are in place. Furthermore, Ireland has introduced measures such as the Dublin Bikes bicycle sharing scheme to promote the use of bicycles in Dublin, Cork, Galway and Limerick. A Vehicle Pilot Project for the introduction of a charging infrastructure for electric vehicles has recently been approved by the Irish Commission for Energy Regulation.

Fluorinated gases (F-gases)
Ireland's existing laws are mainly based on containment provisions. The country has, however, adopted new legislation that will come into force in 2015 and which will include the phasing down of hydrofluorocarbons, a service and maintenance ban using refrigerants with a high global warming potential, and an introduction of market bans on hydrofluorocarbons of certain products and equipment (UNFCCC, 2013).

Agriculture
In Ireland, approximately 65 % of the total land area is used for agriculture (UNFCCC, 2013). Given that the agricultural sector is the largest single contributor to GHG emissions, the recently published National Policy Position on Climate Action and Low-Carbon Development has highlighted this problem and emphasised that National Low-Carbon Roadmaps will be developed in an iterative process also in the agricultural sector. This should include an approach to carbon neutrality for agriculture, which does not compromise capacity for sustainable food production. Ensuring a coherent and cost-effective approach to the twin challenge of sustainable food production and climate change in the agricultural sector is noted as a particularly important issue for the development of climate policy in Ireland (NPP Ireland, 2014).

Waste
Ireland uses a number of regulatory and market-based instruments to achieve more sustainable waste management practices, including increases in the landfill levy, source-separated collection of biowaste, and the pre-treatment and restriction of particular waste streams to landfill. The National Waste Prevention Programme was introduced in 2004 to prevent waste generation in business, households, hospitals, retail, packaging and local authorities. In 2012, Ireland published its Waste Management Policy that aims to reduce Ireland's dependence on landfill for the treatment of municipal waste. Furthermore, the regulatory impact analysis on household waste collection has suggested strengthening the regulatory regime of the current waste collection market structure, for example by introducing separated waste collections. A review of the current system will be carried out in 2016 (EPA, 2014).

Land use, land-use change and forestry
About 10.5 % of Ireland's total land area is used for forestry. In addition to agriculture, the National Policy Position on Climate Action and Low-Carbon Development also addresses land use and forestry and an approach to carbon neutrality in these sectors. They shall equally be considered in the mentioned roadmapping process. Ireland has adopted an afforestation programme that plays an important role in mitigating climate change, as a land-based sink for CO_2, and as a source of renewable raw materials for fuel and wood products (UNFCCC, 2013). The Afforestation Grant and Premium Scheme provides grants and annual premiums for new afforestation projects. The grants are available to cover the costs for planting the trees while annual forest premiums are available to compensate farmers and non-farmers for the loss of income if used for other activities (TEAGASC, 2014).

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Key climate- and energy-related data — Italy

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	574.3	486.6	460.1	438.0	4 544.2
GHG per capita (t CO_2-eq./cap.)	9.9	8.2	7.7	7.3	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	415	315	295	284	350
Share of GHG emissions in total EU-28 emissions (%)	11.1 %	10.6 %	10.1 %	9.8 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	226.0	190.0	179.1	164.4	1 848.6
Share of EU ETS emissions in total emissions (%)	39 %	39 %	39 %	38 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	+ 4.6 %	– 2.7 %	– 7.1 %	– 11.6 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	10.3 %	26.1 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	330.5	284.7	269.2	271.4	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(5.9 %)	(10.6 %)	12.3 %	13.5 %	14.1 %
Share of renewable energy for electricity (%)	16.4 %	20.2 %	23.7 %	27.6 %	23.5 %
Share of renewable energy for heating and cooling (%)	4.7 %	10.7 %	12.5 %	12.8 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.8 %)	(4.6 %)	4.7 %	5.8 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	178.9	165.2	162.8	155.3	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.1	2.8	2.7	2.6	3.1
Final energy consumption (Mtoe)	134.5	124.8	122.1	119.0	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.3	2.1	2.1	2.0	2.2
Efficiency of conventional thermal electricity and heat production (%)	45.5 %	46.7 %	46.7 %	46.6 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.14	1.11	1.19	1.21	1.42
Space heating and cooling (toe/dwelling)	0.80	0.78	0.86	0.87	0.96
Water heating (toe/dwelling)	0.11	0.10	0.10	0.10	0.18
Cooking (toe/dwelling)	0.07	0.07	0.07	0.07	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.17	0.16	0.16	0.16	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 8.9 %	2020 ESD target (% vs base year)	– 13.0 %
2013 ESD emissions (% vs base year)	– 17.8 %	2020 ESD projections WEM (% vs base year)	– 9.5 %
		2020 ESD projections WAM (% vs base year)	– 18.5 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, only if measures planned until 2013 are fully implemented.

Progress towards renewable energy targets

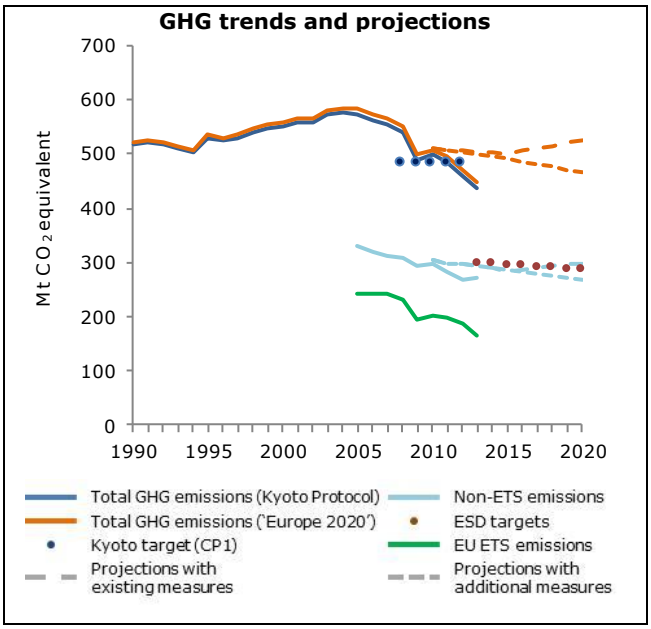
2012 RES share in gross final energy consumption (%)	13.5 %	2011–2012 indicative share from RES Directive (%)	7.6 %
2020 RES target	17.0 %	2012 expected share from NREAP (%)	9.2 %

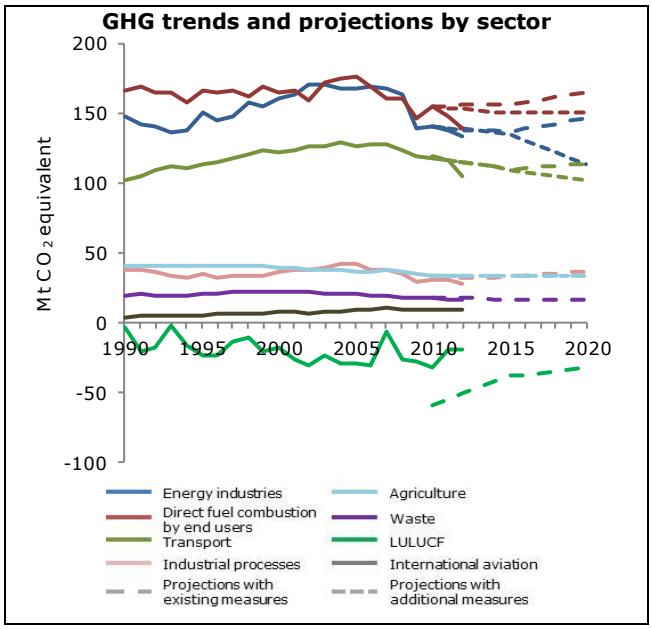
The average share of renewable sources in gross final energy consumption for 2011–2012 was 12.9% (16.2 Mtoe), which is higher than the indicative RED target for 2011–2012 (7.6%). At the same time, the share of renewables in 2012 (13.5 %) is higher than the expected 2012 NREAP target (9.2 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 11.3%. In order to reach its 2020 NREAP target, Italy needs an average annual growth rate of 3.2% in the run-up to 2020. In absolute terms, this is equivalent to 0.5 time its cumulative effort so far.

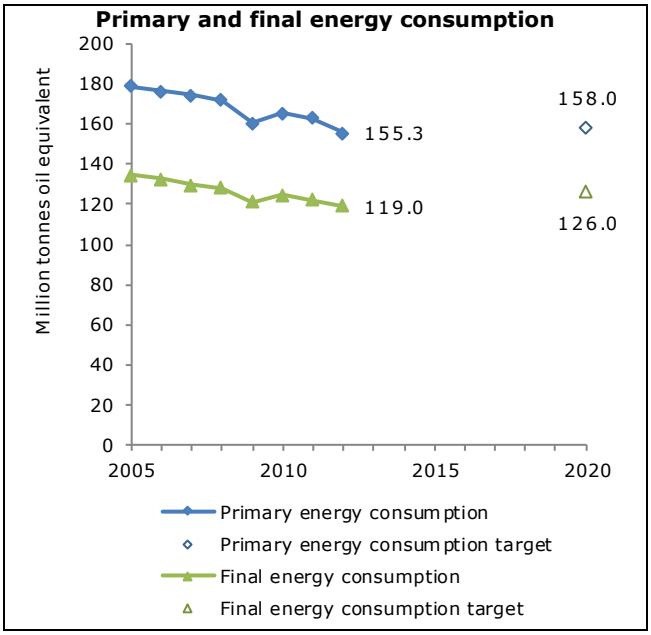
Progress towards energy efficiency targets

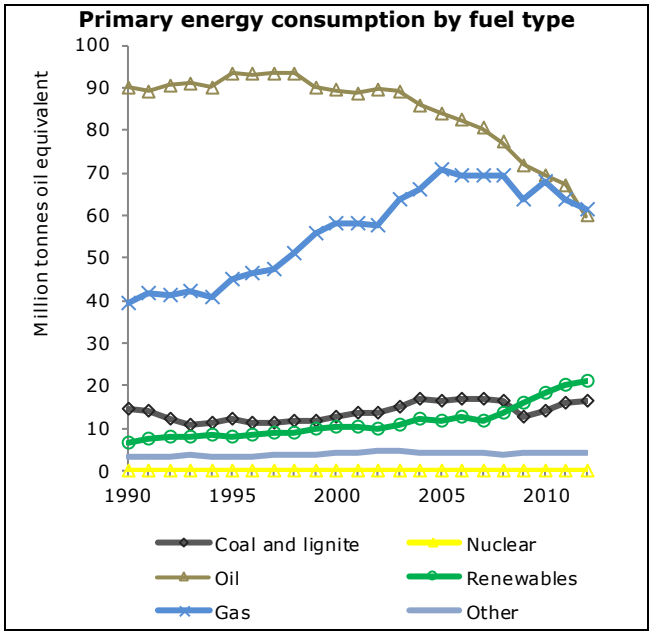
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-2.0 %	2005–2012 average annual change	-1.7 %
2012–2020 average annual change to target	0.2 %	2012–2020 average annual change to target	0.7 %

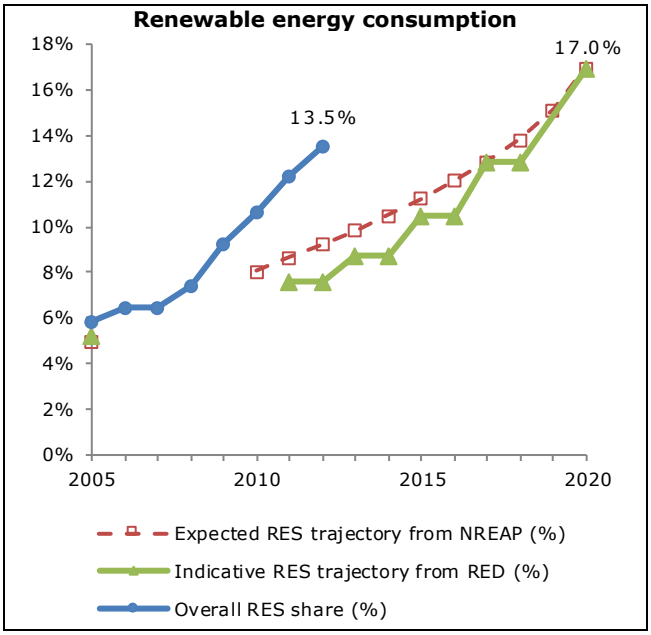
Primary and final energy consumption decreased at a faster pace than is necessary to achieve the 2020 targets. The decrease was a combined result of energy efficiency policies (in particular the introduction of a white certificate scheme) and the effects of the economic crisis (resulting in a decrease in activity). Italy can therefore focus on limiting its energy consumption. Reducing distribution losses, which have increased by 7.3 % since 2008, and improving efficiency in electricity generation, where the consumption of solid fuels increased by 25 % since 2009, could contribute to further reducing primary energy consumption. In addition, the residential sector is the only sector where energy consumption actually increased since 2007, in stark contrast with the industry and transport sectors which experienced a significant reduction.

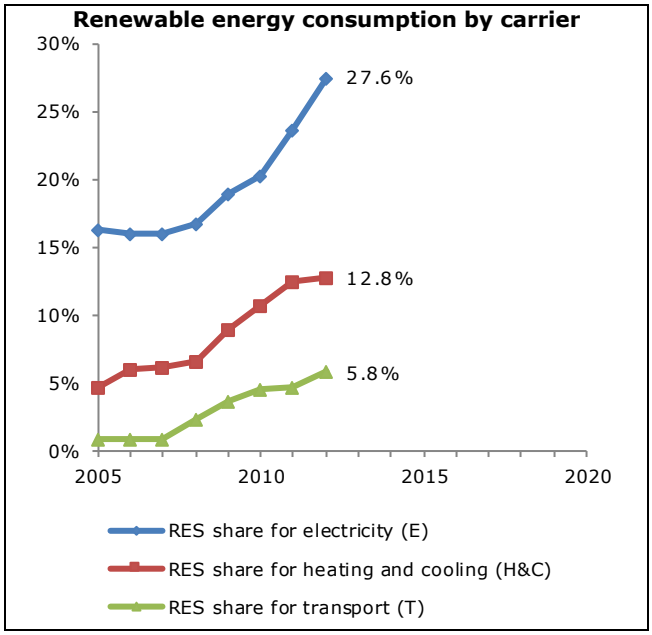

GHG trends and projections
Mt CO2 equivalent
700
600
500
400
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
200
150
100
50
0
-50
-100
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
200
180
160
140
120
100
80
60
40
20
0
2005
2010
2015
2020
155.3
119.0
158.0
126.0
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
100
90
80
70
60
50
40
30
20
10
0
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
13.5%
17.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
27.6%
12.8%
5.8%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Italy is projected to not meet its 2020 emission reduction target with existing measures (EEA, 2013). Recently introduced strategies and support measures, including the National Energy Strategy, aim to tackle this deficit and bring Italy on course to surpass the 2020 goal, while at the same time developing Italy's green economy sectors and creating green jobs. A major challenge regarding non-Emissions Trading System (ETS) emissions is the inclusion of environmental externalities into existing environmental taxation, as was emphasised by the Organisation for Economic Co-operation and Development (OECD) (OECD, 2013). Italy has a quite structured range of environmental taxes related to energy, fuels, transport and polluting activities (e.g. emissions of sulphur dioxide). However, existing environmental taxes do not sufficiently reflect environmental externalities to result in significant emission reductions. For example, none of the vehicle taxes take carbon dioxide (CO_2) emissions into account. Also, excise duties on fuels vary greatly and do not entirely reflect the corresponding fuel's carbon impact. A restructuring of energy and fuel taxes to provide a consistent carbon price across all fuel types could tackle transport greenhouse gas (GHG) emissions, which currently make up 24 % of total emissions and increase energy-efficient end-use. In addition, it would help shifting taxation towards environmental taxes, as recommended by the European Commission (COM, 2013).

Climate and energy strategies
Renewable energy and the promotion of energy efficiency are a clear policy priority. The primary development in this area is currently Italy's new National Energy Strategy, which was approved in March 2013. It includes various targets, such as energy cost reduction (prices and volumes) through investment in renewables and energy efficiency, reaching and surpassing all European climate change and energy goals, a higher security of supply (reduction from 84 % to 62 % of energy dependence), as well as industrial development of the energy sector, including job creation. A competitive gas market and extended interconnections with the EU electricity market are further aims of the strategy.

Renewable energy
In Italy, support schemes for renewable electricity are mainly managed by the state-owned Manager of Electricity Services (Gestore dei Servizi Energetici (GSE)). A range of mechanisms to support renewable electricity are in place. Various feed-in tariffs (FITs), premium tariffs and a tendering scheme coexist as alternatives and complementaries promoting wind power, geothermal energy, biogas and biomass, as well as hydropower and concentrated solar power. Depending on the source and the size of the renewables plant, operators may be obliged to opt for a certain system or may choose between the available ones. Besides this, there are tax regulations in place reducing real estate tax (all technologies) and value-added tax (wind and solar electricity). Under certain conditions, electricity producers can also make use of net-metering. In addition to these national incentives, there are also a number of regional programmes available. However, Italy is currently reviewing the amount of incentives granted. The recent changes of the FIT Ritiro Dedicato in January 2014 abolish the guaranteed minimum price granted to renewable producers, leaving only the option to sell at market price. The cut also affects existing installations, which have to choose between two system exit strategies. Furthermore, after the introduction of a legal framework for self-consumption systems up to 20 MW, there is an ongoing debate regarding the contribution of self-consumers to grid access fees. Photovoltaic (PV) systems are currently only promoted through tax reductions in real estate tax and value-added tax, as well as through tax deduction of expenses as part of energy efficiency measures in buildings.
There are also various support mechanisms for renewable heating and cooling in place. The Thermal Account gives subsidies for the installation of small renewable heating sources, with the amount varying depending on the type, source, capacity and location of the installation. Moreover, subsidised loans with an interest rate of 0.5 % are available supporting biomass, biogas, geothermal and solar thermal plants. The overall budget for 2014 amounts to EUR 200 million, and the available loan amount depends on the nature of the subject, the plant size and technology. In addition, tax deductions of up to 65 % for expenses related to energetic requalification of buildings and installation of renewable technologies are in place. Reductions of the real estate tax also apply to buildings equipped with renewables for heating.

Energy networks
The EU Commission recommended to Italy to upgrade infrastructure capacity with a focus on energy interconnections (COM, 2013). In July 2013, it was reported that the European Investment Bank (EIB) will support the development of the national grid in southern Italy for the period 2012–2016 with EUR 570 million. The focus of this financial support will be the development of the grid in Campania, Puglia, Sicily and Calabria (EIB, 2013).

Energy efficiency
The National Energy Strategy lists various measures to achieve the energy efficiency target, most of them aiming at strengthening and enforcing existing instruments such as the white certificate scheme and the prolongation of tax deductions for energy efficiency works in buildings. Energy **taxation** is rather high with the level of excise duties being well above EU average. However, there are excise duty exemptions, for example reduced rates on liquefied petroleum gas used for heating in mountain regions and progressive duty rates on electricity with lowest rates for energy-intensive businesses. Italy has no CO_2 tax in place.
The principal instrument to promote energy efficiency in the energy services sector is a **white certificate system**. The certificates represent reductions of energy consumptions obtained through energy efficiency

projects. Energy services companies need to obtain a certain number of white certificates depending on the amount of energy sold.
Cogeneration of electricity and heat is supported by various incentive schemes rewarding the production of heat or electricity.
In the **building** sector, minimum energy performance standards for new and modernised buildings have been introduced and energy performance certificates are mandatory. In 2013, tax incentives for energy efficiency measures were introduced so that certain energy refurbishment measures can now count on a tax deduction of up to 65 % of expenses related to the refurbishment of existing buildings, renovations aimed at increasing energy efficiency and installation of renewable technologies (50 % in the case of the installation of PV panels). After its successful uptake the incentive was prolonged until 2016, with the deduction level declining to 50 % in 2015 and 36 % in 2016. Moreover, the Thermal Account provides subsidies to cover a part of the investment costs for building renovation, exchange of heating systems and the production of thermal energy.

Transport
In Italy, the vehicle registration tax is based on engine capacity and has varying rates between the provinces. An ownership tax applies to passenger cars, which is based on horsepower, and to heavy-goods vehicles, which is based on weight. Both diesel and petrol are taxed above EU average. A quota system is in place to support renewables in transport. Moreover, the Ministry of Economic Development provides lump sum financial support for the purchase of cars powered by natural gas, electricity and hybrid engines, based on CO_2 emission levels. In 2013 and 2014, incentives of 20 % of the purchase price of the vehicle are provided with a maximum amount of EUR 3 000 to 5 000. This subsidy is lowered to 15 % of the price and a maximum of EUR 1 800 to 3 500 in 2015. The total available budget until 2015 is EUR 120 million: EUR 40 million in 2013, EUR 35 million in 2014 and EUR 45 million in 2015.
In addition, policy measures focus on the shift from private to public transport, as well as a shift of freight road transport to sea and rail. In 2013, a Memorandum of Understanding on sustainable mobility was signed by the Ministry of Environment, the logistics company Auta Marocchi and the rail transport company Trenitalia. It establishes the target to increase rail freight transport from the current 6 % to 24 % of total transport by shifting road transportation of goods to rail transportation.

Agriculture
Following the reform of the Common Agricultural Policy (CAP), financial support has been decoupled from production, and criteria for rural development and environmental considerations are now included. Italy concentrates on two main policies in the agricultural sector: firstly, the rationalisation of nitrogen fertiliser usage, and secondly, the recovery of biogas from the animal storage system. In 2011, methane from biogas recovery has contributed to reducing methane emissions from manure management by 36 % (IMELS, 2013).

Waste
Italy's main policy goals are compliance with the separate collection targets and the reduction of biodegradable waste disposed into landfills, both resulting from the transposition of the European Landfill Directive into national law. Separate collection has been increasing over the last years. In 2011, 31.3 % of municipal solid waste was subject to separate collection, compared to 25.8 % in 2006 and 7.2 % in 1996. This was also supported by policies supporting alternative waste treatments, such as incineration with energy recovery, mechanical biological treatment and composting. A further measure is to only dispose bio-stabilised waste into landfills, which encourages the anaerobic digestion of municipal solid waste also in co-digestion with other types of waste such as sludge from municipal wastewater treatment plants and animal waste and also increases energy recovery from biogas production (IMELS, 2013).

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Key climate- and energy-related data — Latvia

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	11.1	11.1	11.0	10.9	4 544.2
GHG per capita (t CO_2-eq./cap.)	4.9	5.4	5.4	5.4	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	444	360	330	313	350
Share of GHG emissions in total EU-28 emissions (%)	0.2 %	0.2 %	0.2 %	0.2 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	2.9	2.9	2.7	2.6	1 848.6
Share of EU ETS emissions in total emissions (%)	25.8 %	26.2 %	25.0 %	24.2 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 29.9 %	– 36.7 %	– 45.1 %	– 50.4 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	2.6 %	27.1 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	8.2	8.2	8.2	8.3	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			33.5 %	35.8 %	14.1 %
() = including all biofuels consumed in transport	(32.3 %)	(32.5 %)			
Share of renewable energy for electricity (%)	43.0 %	42.1 %	44.7 %	44.9 %	23.5 %
Share of renewable energy for heating and cooling (%)	42.7 %	43.8 %	44.8 %	47.4 %	15.6 %
Share of renewable energy for transport (%)			3.2 %	3.1 %	5.1 %
() = including all biofuels consumed (%)	(1.3 %)	(3.3 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	4.5	4.7	4.3	4.4	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	2.0	2.2	2.1	2.2	3.1
Final energy consumption (Mtoe)	4.0	4.3	3.9	4.0	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.8	2.0	1.9	2.0	2.2
Efficiency of conventional thermal electricity and heat production (%)	83.3 %	82.8 %	82.3 %	81.9 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.69	1.69	1.72	1.68	1.42
Space heating and cooling (toe/dwelling)	1.21	1.15	1.13	1.15	0.96
Water heating (toe/dwelling)	0.27	0.30	0.33	0.29	0.18
Cooking (toe/dwelling)	0.11	0.11	0.12	0.11	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.10	0.13	0.14	0.13	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 9.5 %	2020 ESD target (% vs base year)	+ 17.0 %
2013 ESD emissions (% vs base year)	+ 1.0 %	2020 ESD projections WEM (% vs base year)	+ 18.5 %
		2020 ESD projections WAM (% vs base year)	+ 14.8 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, only if measures planned until 2013 are fully implemented.

Progress towards renewable energy targets

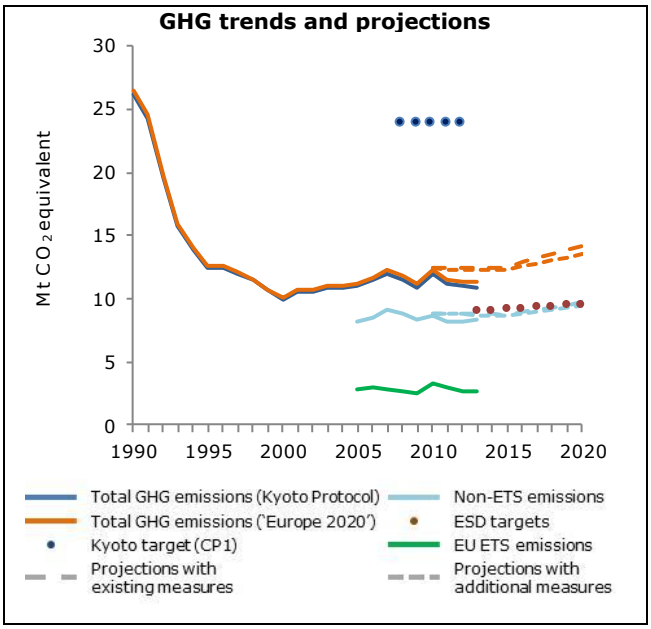
2012 RES share in gross final energy consumption (%)	35.8 %	2011–2012 indicative share from RES Directive (%)	34.1 %
2020 RES target	40.0 %	2012 expected share from NREAP (%)	34.3 %

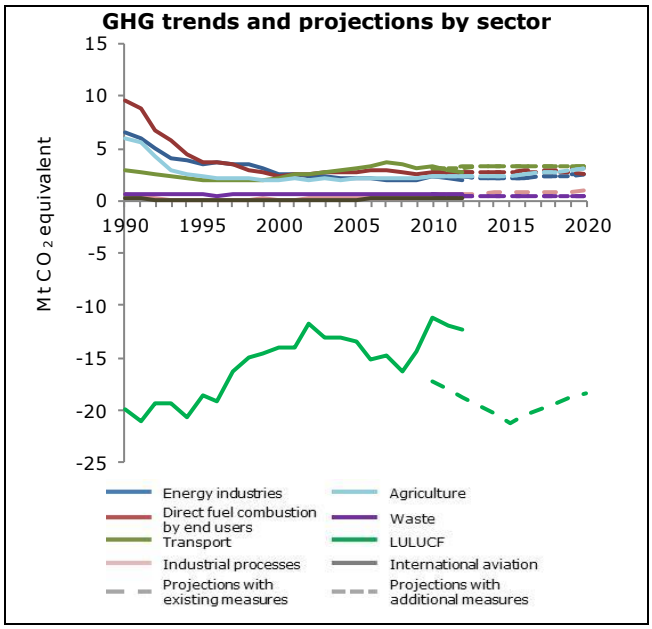
The average share of renewable sources in gross final energy consumption for 2011–2012 was 34.7% (1.4 Mtoe), which is higher than the indicative RED target for 2011–2012 (34.1%). At the same time, the share of renewables in 2012 (35.8 %) is higher than the expected 2012 NREAP target (34.3 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 1.3%. In order to reach its 2020 NREAP target, Latvia needs an average annual growth rate of 3.0% in the run-up to 2020. In absolute terms, this is equivalent to 3.1 times its cumulative effort so far.

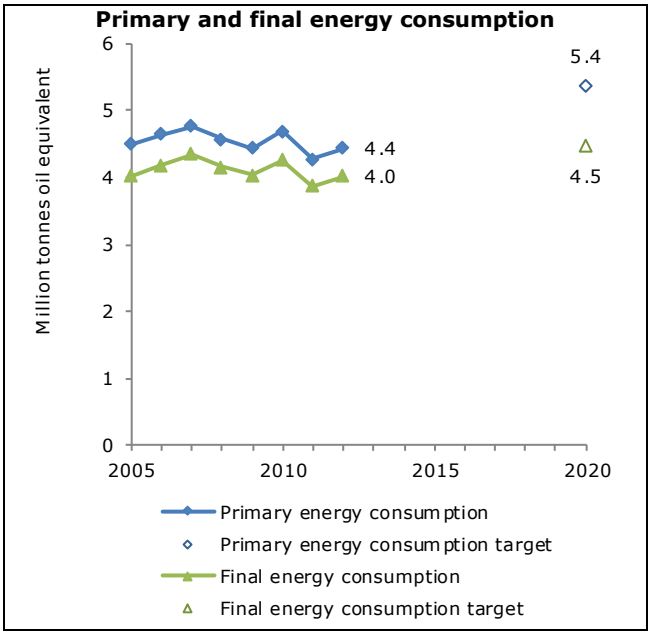
Progress towards energy efficiency targets

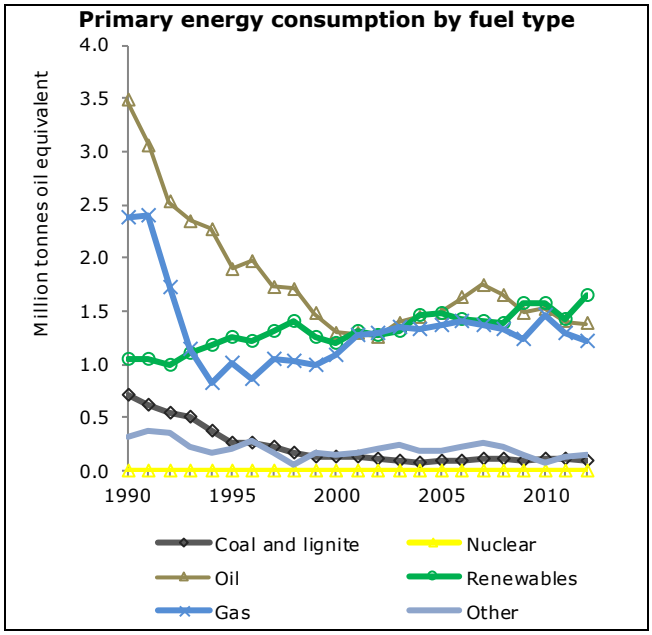
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 0.2 %	2005–2012 average annual change	+ 0.0 %
2012–2020 average annual change to target	+ 2.4 %	2012–2020 average annual change to target	+ 1.3 %

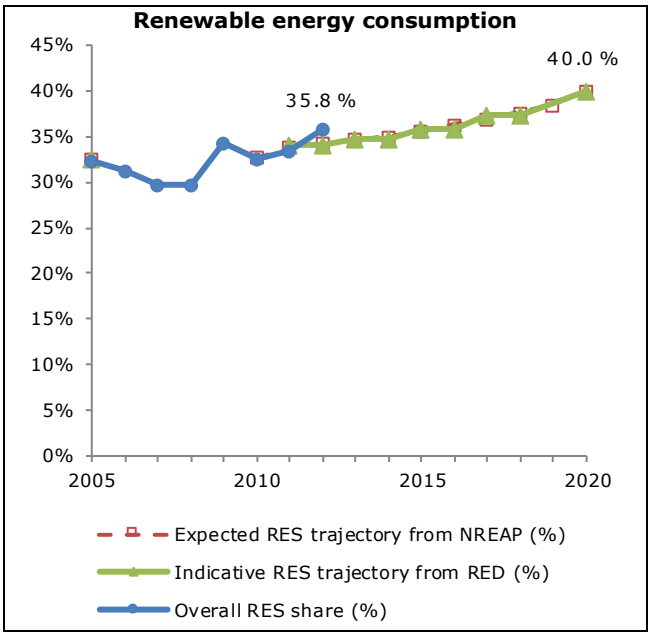
Between 2005 and 2012, primary energy consumption decreased and final energy consumption remained stable. Addressing the increase consumption from the energy sector, observed since 2007, could contribute to further reducing or stabilising primary energy consumption.

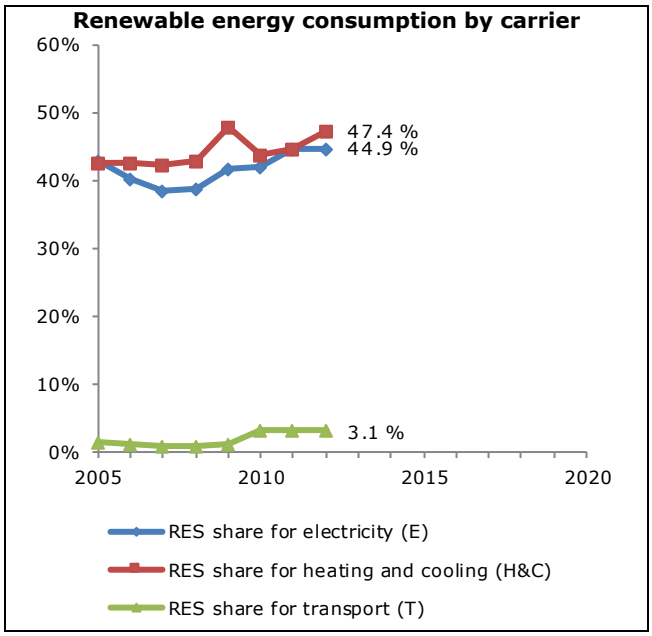

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
5.4
4.4
4.0
4.5
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
40.0 %
35.8 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
47.4 %
44.9 %
3.1 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
A key concern in Latvia is security of its energy supply: the country continues to be highly dependent on energy imports such as Russian natural gas and it remains isolated from EU energy networks. Measures adopted to improve cooperation between the three Baltic countries and projects of regional scope constitute economically viable solutions for the regional energy market. Shifting to domestic renewable energy sources (RES) and an increase of energy efficiency in end-use to reduce overall energy consumption provide great opportunities to contribute to Latvia's energy supply security. Latvia assumes in its Energy Strategy 2030 that such approaches will have a positive impact on the overall Latvian economy, energy companies and energy consumers.
Latvia is one of the most energy-intensive Member States due to the high energy intensity of industry, transport and households. For example, the housing stock consumes 40–60 % more energy than necessary (EEO, 2013). Increasing the efficiency in energy end-use would help to increase energy security while at the same time improving the competitiveness of industry and providing opportunities for skilled workers in construction, plumbing and heating, insulation specialists and manufacturers as well as installers of energy-efficient products and appliances. This would increase the share of green jobs in Latvia, which currently amounts to less than 1 % of total employment (Green Jobs, 2012; EEO, 2013).
In the transport sector, emissions steadily decreased between 1990 and 2011. However, since 2005 the overall trend is negative and emissions have slightly increased. With one fourth of all of Latvia's emissions, the transport sector is the main greenhouse gas (GHG) contributor. The purchase of more efficient vehicles and more efficient driving is incentivised through an ownership tax based on the maximum gross weight for passenger cars and commercial vehicles. Shifting taxation to fuel consumption and greater investments in the public transport system would also help to reduce inefficient individual motorised mobility, thus also reducing transport emissions and air pollution. Furthermore, adopted measures making public transport services more attractive contribute to reducing emissions from transport and improve the cityscape.

Climate and energy strategies
Latvia has not yet implemented a comprehensive climate change strategy. However, a detailed energy policy framework covering the period from 2014 to 2020 is currently being developed by the Ministry of Economics. Latvia published an Energy Strategy 2030 in 2013. The Strategy outlines measures to ensure energy supply, competitiveness, energy efficiency and the use of renewable energy. Furthermore, Latvia has adopted an Energy Law and regulations regarding the production of electricity using renewable sources. Latvia has also set out its energy targets in Energy Development Guidelines 2007–2016 aiming to provide short-term strategies for the efficient distribution and use of energy. Addressed issues include the security of energy supply, diversifying energy sources and increasing the share of electricity from RES (IEA, 2013).
In March 2014, the government of Latvia approved amendments to the Electricity Market Law that postponed the planned opening of the end-user electricity market mainly because of concerns about possible resulting electricity price increases. Studies on the potential price increases and mitigation options are underway to support the decision process.

Renewable energy
Renewable energy plays an important role in Latvia with the most important sources being biomass for heat generation and hydropower in the electricity sector. The main renewable electricity support scheme, a feed-in tariff, is currently being revised. The amendments should create more transparency regarding subsidised energy production and reduce the risk of price increases for consumers. In addition, a new tax for companies receiving financial support for renewable electricity generation or combined heat and power plants has been introduced in January 2014. The tax rate for energy produced from natural gas is 15 % and a tax rate for energy produced from renewable sources is 10 %, while the rate applied to central heating systems is 5 %. The tax is a temporary one and is scheduled to be in place until 2018.
Latvia has introduced different tax benefits for heating and cooling from RES. Companies supplying biomass and biogas have to pay a reduced VAT rate. Biogas that is supplied to end users is taxable with the excise tax rate being reduced if the biogas is used for heating.

Energy networks
The European Commission recommended that Latvia should improve its cross-border interconnections to increase security of supply (European Commission). Two electricity interconnection projects and one underground storage facility modernisation and expansion project are to be developed, and the first stage of the projects were submitted to the European Commission's Connecting Europe Facility to get co-financing.

Energy efficiency
The promotion of energy efficiency is one of the priorities of Latvia. The overall budget for energy efficiency activities until 2015 is planned to amount to approximately EUR 500 million in total. The Energy Strategy 2030 highlights the importance of improving energy efficiency and focuses on, for example, the need to establish cost-efficient classes of mandatory construction standards for thermal efficiency of new and renovated buildings, as well as voluntary classes, including zero-consumption buildings, the need to promote the introduction of smart meters and the need to define rigid requirements for district heat supply systems. In addition, Latvia plans to develop a long-term energy efficiency strategy in 2014 and a detailed action plan for 2014–2016.

Energy **taxation** is among the lowest in the EU with exemptions applying to, for example, electricity used by households. The tax on liquid petroleum gas was increased in 2014. A reduced VAT rate of 12 % applies to district heating.
Latvia plans to introduce **obligations for energy market operators** and to support **combined heat and power**. The energy intensity of the **industrial sector** has decreased in recent years but is still above EU average. There are voluntary agreements with enterprises requiring energy audits, implementation of identified cost-efficient measures, obligations for action plans and information gathering. Certain non-fossil energy projects at industrial facilities are subsidised. Support such as biomass heating technologies, cogeneration stations, photovoltaic systems and solar water heating systems is provided to industrial buildings to switch from technologies using fossil energy to RES. This measure also supports reconstruction or renovation measures that increase the facility's energy efficiency via more effective heat storage systems, lighting, and electricity management and control.
In the **building** sector, the Ministry of Economics has introduced the Building Energy Certification Rules in 2013 in accordance with the new Law on Energy Performance of Buildings, which establishes minimum energy performance requirements and certification for energy, heating and air conditioning. Latvia supports activities aimed at increasing energy efficiency in buildings through the Complex Solutions for Greenhouse Gas Emissions Reduction programme. Other schemes to support energy efficiency in buildings are the programmes Improvement of heat insulation of residential buildings and Improvement of heat insulation of social residential buildings.

Transport
Latvia incentivises the purchasing of more efficient vehicles and more efficient driving modes through an ownership tax based on the maximum gross weight for passenger cars and commercial vehicles. In order to minimise the differences between the rates of excise duties on fuels, the excise duty on liquid petroleum gas has been increased from EUR 128 per 1 000 kg to EUR 160 per 1 000 kg in January 2014. The additional revenues are meant to be used for energy efficiency and infrastructural measures. A registration tax applies to passenger cars and motorcycles and is based on carbon dioxide (CO_2) emissions. An additional natural resource tax is levied on every vehicle. However, taxes on transport fuels are well below EU average.
In order to increase the share of renewables in the transport sector, Latvia has implemented Regulation No. 648. It introduces a quota — i.e. a mandatory share of biodiesel to petrol and diesel. In 2014, the share of biodiesel is set at 6.5–7 %.
To support e-mobility, Latvia's Ministry of Environmental Protection and Regional Development extended the tender of the subsidy programme Climate Change Financial Instrument until 8 April 2014. The tender aimed to support electric vehicles and the charging infrastructure in Latvia. The overall budget of the programme is around EUR 5 million and the grants awarded to projects range between EUR 18 500 and 550 000
In 2013, the government decided that approximately EUR 10 million will be allocated to improve the bus, tram and trolleybus system to make the public transport system more attractive.

Agriculture
Latvia intends to support agricultural measures that preserve the environment and reduce GHG emissions from agricultural activities as part of its National Development Plan for 2014–2020. It aims to increase the area for agricultural purposes, increase productivity to achieve EU average outputs, and increase the share of land used for organic farming to more than 15 % by 2030 (EEA, 2013). Furthermore, it includes a variety of measures contributing to GHG emission reductions such as modernisation of agricultural holdings and a number of agro-environmental sub-programmes (UNFCCC, 2013). Latvia has also adopted the regulation Regarding Protection of Water and Soil from Pollution with Nitrates Caused by Agricultural Activity (2011) that determines the requirements and restrictions for the use and land application of different types of fertilisers, as well as the regulation Special Environmental Requirements for Performance of Polluting Activities in Animal Housing that prescribes environmental requirements for manure management in animal housing (UNFCCC, 2013).

Waste
Latvia has published the Latvian National Waste Management Plan for the period 2013–2020 in March 2013, which mainly aims at promoting recycling of municipal waste. In this context, Latvia also announced the introduction of a mandatory deposit system in 2015. The system will apply to beverages with reusable and disposable packaging made of glass, plastic and metal. The new system entails obligations for packagers, merchants and packaging reception centres (Cabinet of the Ministers, 2013). In addition, Latvia wants to establish a modernised waste management system.

Land use, land-use change and forestry
Regarding land use, land-use change and forestry (LULUCF), Latvia is implementing measures to renovate and expand forest drainage systems and to promote forest regeneration and afforestation (EEA, 2013). In 2011, CO_2 removals from LULUCF decreased by 22.8 % in comparison to 1990. Forest lands account for 93.7 % of the total CO_2 removal. No support is available for purposeful forest regeneration (except regeneration of degraded forest stands), which is among the most visible measures to improve national GHG balances in the LULUCF sector.

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Key climate- and energy-related data — Lithuania

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	23.3	21.7	21.6	20.4	4 544.2
GHG per capita (t CO_2-eq./cap.)	6.9	7.1	7.2	6.9	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	573	423	396	359	350
Share of GHG emissions in total EU-28 emissions (%)	0.5 %	0.5 %	0.5 %	0.5 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	6.6	5.6	5.7	7.5	1 848.6
Share of EU ETS emissions in total emissions (%)	28.3 %	25.9 %	26.4 %	36.6 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 51.1 %	– 36.9 %	– 47.3 %	n.a.	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	27.1 %	43.3 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	12.4	11.8	11.6	12.9	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			20.2 %	21.7 %	14.1 %
() = including all biofuels consumed in transport	(17.0 %)	(19.8 %)			
Share of renewable energy for electricity (%)	3.8 %	7.4 %	9.0 %	10.9 %	23.5 %
Share of renewable energy for heating and cooling (%)	30.1 %	33.2 %	33.7 %	35.5 %	15.6 %
Share of renewable energy for transport (%)			3.7 %	4.8 %	5.1 %
() = including all biofuels consumed (%)	(0.5 %)	(3.6 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	7.9	6.1	5.8	5.9	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	2.4	1.9	1.9	1.9	3.1
Final energy consumption (Mtoe)	4.6	4.8	4.7	4.8	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.4	1.5	1.5	1.6	2.2
Efficiency of conventional thermal electricity and heat production (%)	81.3 %	82.9 %	91.7 %	90.1 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.12	1.23	1.19	1.22	1.42
Space heating and cooling (toe/dwelling)	0.82	0.87	0.84	0.87	0.96
Water heating (toe/dwelling)	0.08	0.08	0.09	0.09	0.18
Cooking (toe/dwelling)	0.11	0.12	0.12	0.12	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.12	0.15	0.14	0.14	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 3.8 %	2020 ESD target (% vs base year)	+ 15.0 %
2013 ESD emissions (% vs base year)	– 4.3 %	2020 ESD projections WEM (% vs base year)	+ 16.9 %
		2020 ESD projections WAM (% vs base year)	+ 1.6 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, only if measures planned until 2013 are fully implemented.

Progress towards renewable energy targets

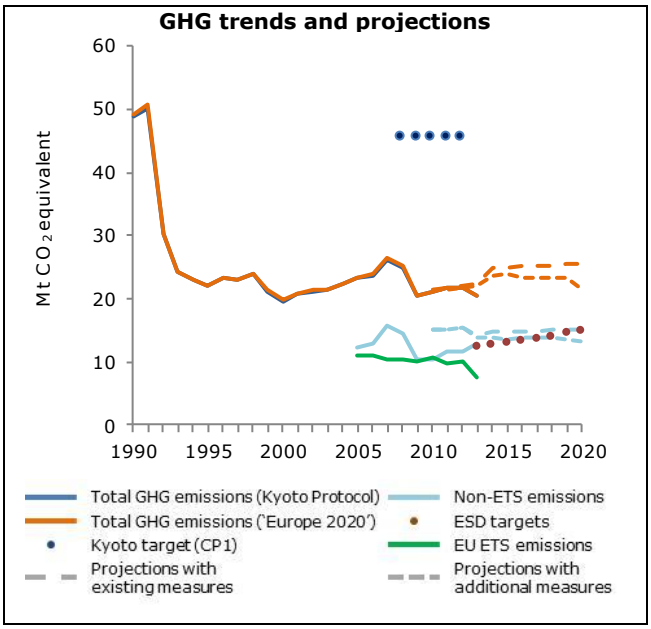
2012 RES share in gross final energy consumption (%)	21.7 %	2011–2012 indicative share from RES Directive (%)	16.6 %
2020 RES target	23.0 %	2012 expected share from NREAP (%)	18.0 %

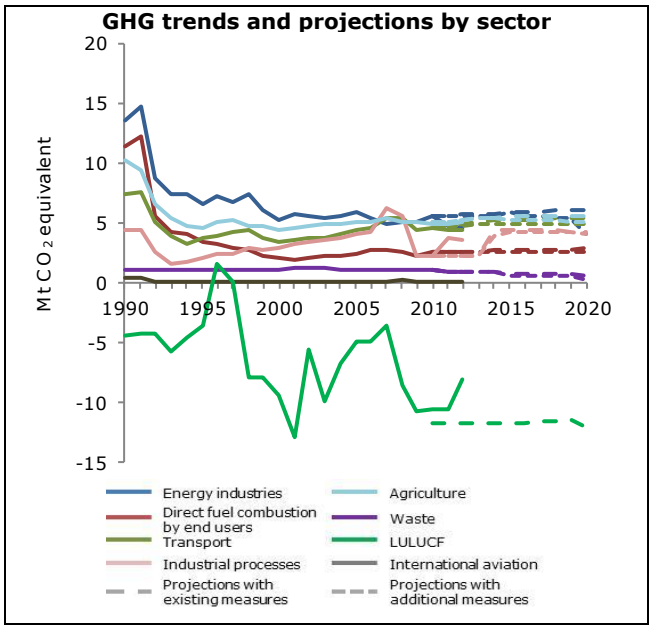
The average share of renewable sources in gross final energy consumption for 2011–2012 was 21.0% (1.1 Mtoe), which is higher than the indicative RED target for 2011–2012 (16.6%). At the same time, the share of renewables in 2012 (21.7 %) is higher than the expected 2012 NREAP target (18.0 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 3.8%. In order to reach its 2020 NREAP target, Lithuania needs an average annual growth rate of 3.7% in the run-up to 2020. In absolute terms, this is equivalent to 1.5 time its cumulative effort so far.

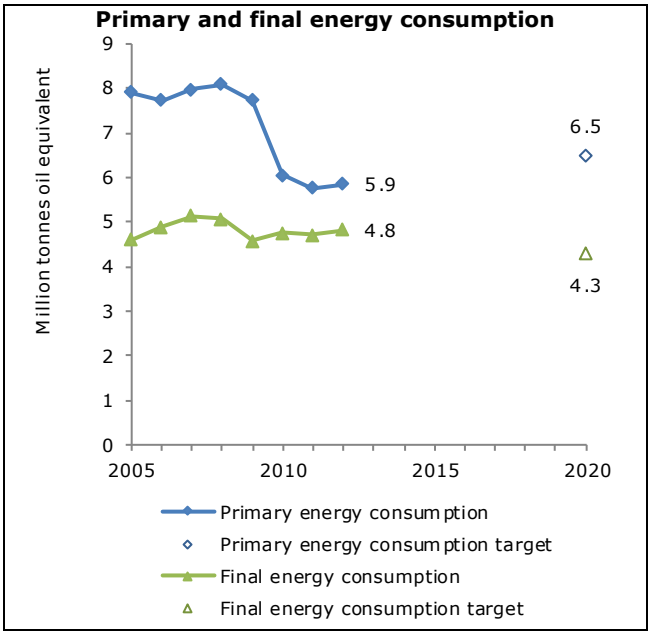
Progress towards energy efficiency targets

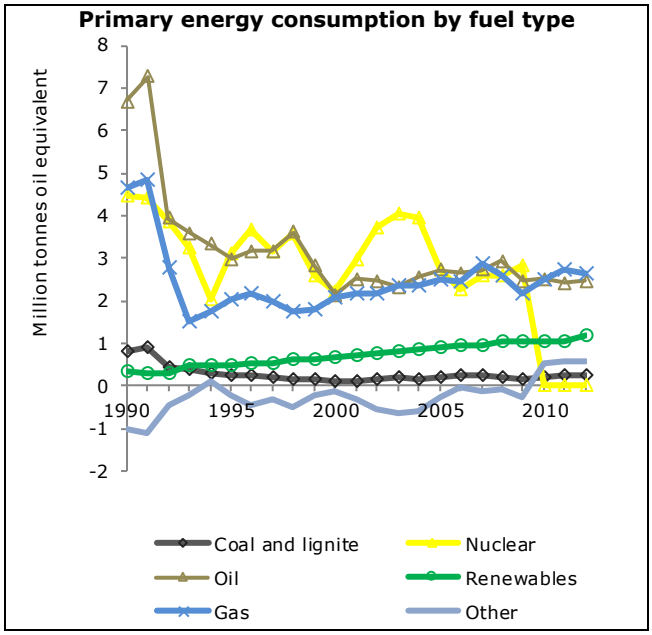
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 4.2 %	2005–2012 average annual change	+ 0.7 %
2012–2020 average annual change to target	+ 1.3 %	2012–2020 average annual change to target	– 1.5 %

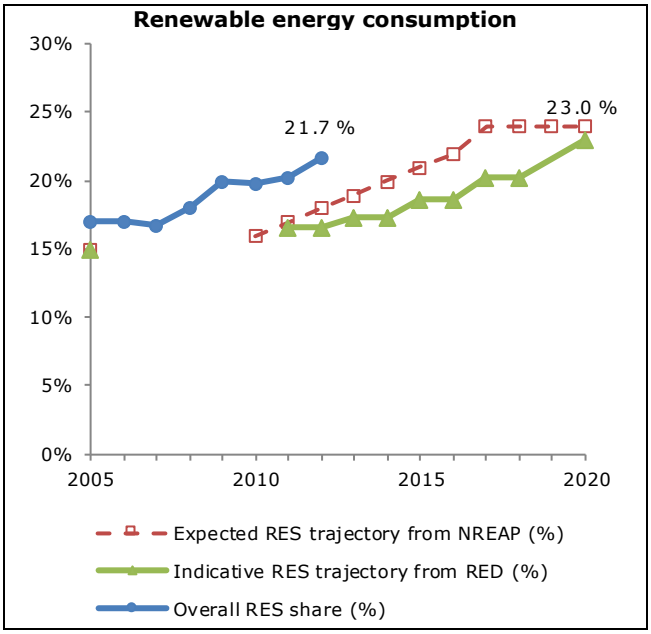
During the period 2005–2012, primary energy consumption decrased at a faster pace than is necessary to meet the 2020 target. This decrease was due to structural changes, which brought about significant reductions in the energy sector's consumption as well as distribution losses. However, final energy consumption increased instead during this period. Further efforts to reduce energy consumption, particularly in the industry and residential sectors, could contribute to helping Lithuania achieve its target on final energy consumption.

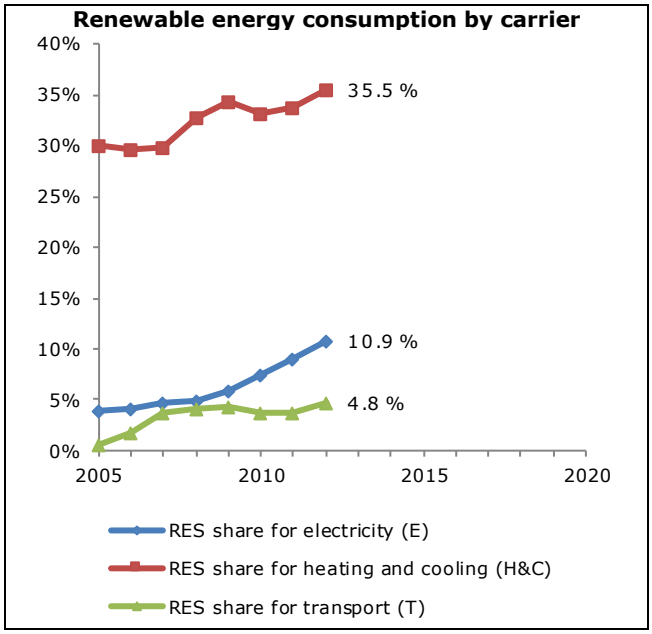

GHG trends and projections
Mt CO2 equivalent
60
50
40
30
20
10
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
20
15
10
5
0
-5
-10
-15
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
9
8
7
6
5
4
3
2
1
0
2005
2010
2015
2020
6.5
5.9
4.8
4.3
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
8
7
6
5
4
3
2
1
0
-1
-2
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
21.7 %
23.0 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
40%
35%
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
35.5 %
10.9 %
4.8 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Lithuania is highly dependent on energy imports and, thus, has set up plans to reduce the dependence on energy imports, especially from Russia. Policies in place address the power grid and the building of a new liquefied gas terminal. Through the promotion of renewable energies, energy dependence on any energy imports could be further reduced, local jobs and revenues could be created, and air quality benefits could be generated.
Another challenge is energy efficiency in residential buildings. Lithuania has established refurbishment policies and a funding scheme to address this problem. However, due to limited state and private funds the share of refurbishment projects is currently small compared to the large number of buildings requiring modernisation. Nonetheless, the savings potential (for example, for heat) is high (as high as 50 %), especially in multi-family buildings. A broader refurbishment programme would represent a significant opportunity for the construction sector and associated jobs through increased investments.
The transport sector also remains a challenge for Lithuania. Transport fuel taxes, for example, are amongst the lowest in the EU. The impact of existing policies attempting to tackle the high share of emissions from the transport sector is limited. While it has so far not been possible to reach consensus on the introduction of vehicle taxation it can be argued that such an introduction would be beneficial in many ways, including the generating of financial revenues to be used for greater investments in transport infrastructure.

Climate and energy strategies
In 2012, Lithuania adopted a Strategy on Climate Change Management Policy for 2013–2050 (Seimas, 2012). It sets out mitigation and adaptation targets to be met in the short, medium and long terms. By 2050, Lithuania will ensure its economic sectors adapt to climate change, reduce emissions, shift to a low-carbon competitive economy, introduce eco-innovative technologies, and improve the energy production efficiency and use, and use of renewable energy sources (RES) in all economic sectors. Specific measures are outlined in an accompanying Action Plan to implement policies and achieve the climate change goals. It aims to develop eco-innovative technologies and increase energy-efficient production and consumption. The National Energy Independence Strategy's main goal is Lithuania's energy independence before 2020. The Strategy is to produce electricity in combined heat and power (CHP) plants and resort to RES. It also addresses building the new Visaginas Nuclear Power Plant (VNPP) after the shut-down of the only nuclear power station in the country in 2009. In a non-binding referendum in October 2012, most voters (64.77 %) voted against the construction of the VNPP (Lyrtas, 2013a). Lithuanian political parties have nonetheless expressed their commitment to the construction of the VNPP.

Renewable energy
Renewable energies already play an important role in Lithuania's energy supply. The National Renewable Energy Development Programme for 2014–2020 is planned to be approved by the end of 2014 after a strategic impact assessment report is completed. The mentioned Programme will in principle determine national renewable energy consumption targets in electricity, heat and transport sectors as well as establish measures for their achievement.
The main support mechanism for renewable electricity generation is a feed-in tariff (FIT) established in the Law on Energy from Renewable Sources (2011). The Law has been amended several times in 2013, mainly with the aim to balance the development of RES in order to avoid increasing electricity prices to final energy consumers (public interest protection). The amendments included that the tariffs are reviewed each quarter allowing the National Control Commission for Prices and Energy to respond to the rapidly changing prices of technology and equipment. According to the Ministry of Energy, in the period of 2012 (I) to 2013 (IV), the average reduction of FIT rates for renewable energy technologies amounted to 23–25 %.
The government approved the Draft National Heating Sector Development Programme for 2014–2021 in April 2014. It is meant to increase the installed capacity of biomass heating systems and provides support through the EU Structural Funds. Furthermore, the Lithuanian Environmental Investment Fund (LEIF) subsidises investment projects aiming to mitigate as well as adapt to climate change in the long-term perspective, which also covers the shift from fossil fuels to RES in electricity and heating sectors.

Energy networks
Lithuania has made significant progress in constructing interconnections of its power grid and natural gas infrastructure with neighbouring countries (Litgrid, 2013). In February 2014, the National Control Commission for Prices and Energy announced the approval of the Lithuanian electricity transmission network development plan for 2013–2022. It addresses funding for the Lithuania–Sweden power interconnection, the capacity integration of the VNPP, the construction of the power link with Poland and the preparation of the network for synchronous operation with the European Continental Network. Further studies will be carried out to identify the maximum number of power plants using renewable energy able to be connected to the existing transmission network.
In addition, the Gas Interconnection Poland–Lithuania is being implemented to integrate Lithuania into the EU gas market. Currently, an Environmental Impact Assessment is being carried out. The engineering design and construction period will follow from 2015–2018.

Energy efficiency
Lithuania has made significant progress with regards to energy efficiency. A draft of the Law on Energy Efficiency is planned to create an Energy Efficiency Obligation. Energy **taxation** is below EU average and there

are quite a few exemptions, for example for electricity, coal and coke used by households and charitable organisations, and for natural gas used as motor fuel in local regular buses.
Lithuania aims to increase the amount of electricity produced from **combined heat and power** during the heating season by 35 % by 2025. By 2020, Lithuania intends to meet the target of 75 % of heat provided in heating systems from CHP plants.
In the context of energy efficiency measures in the **industrial** sector, the Energy Efficiency Action Plan (Energy Efficiency Action Plan, 2014) that sets out relevant measures is an important step to promote energy efficiency. Furthermore, the government has adopted voluntary agreements with the industry sector to improve energy efficiency (EEA, 2013). Energy consumption audits are financed by the state, committing companies to introduce efficiency measures.
In the **building** sector, the Lithuanian Housing Strategy aims to renovate and modernise existing buildings to reduce thermal energy consumption by up to 30 % by 2020. Minimum energy performance standards for new and modernised buildings and energy performance certificates have been introduced. An important step was to also amend the Law on State Support for the Acquisition or Rent of Housing and for the Renovation of Multifamily Buildings (Grynas, 2013). Amendments introduced a new financing model for renovation to accelerate Lithuania's building refurbishment process. Furthermore, the LEIF provides multiple grants to projects resulting in improved energy efficiency in buildings. The Ministry of Environment and the Ministry of Energy are currently drafting a new Public Building Energy Efficiency Programme. In addition, the Law on Energy (2002) includes minimum efficiency requirements for electrical appliances, boilers and heat generators.

Transport
Lithuania has adopted a National Communication Development Programme 2014–2022. It addresses sustainable development of the transport and communications system, efficient management of public resources and the increase in the competitiveness of the sector. Regarding **taxation**, there is no registration tax; ownership tax is only for commercial vehicles, based on weight. Attempts to reach consensus on taxing private cars have so far not been successful (Lyrtas, 2013b). In addition, the Law on Pollution Tax sets out extensive tax exemptions for commercial vehicles, including for example if they have installed exhaust gas neutralisation systems, or if the vehicle uses biofuels that meet established standards. In terms of renewables, Lithuania aims to increase biofuel consumption in the sector to 15 % by 2025 (EEA, 2013). A mandatory blending in of biofuels in mineral fuels and an excise tax relief for biofuels are currently being implemented.
Furthermore, Lithuania is investing in the **rail transport system**. In February 2014, Estonia, Latvia and Lithuania agreed that Vilnius will be connected to the rail gauge Rail Baltica. The Baltic States are also negotiating the establishment of a joint venture to implement the Rail Baltica II project. Eighty-five per cent of the project will be financed by the EU. The planned railway line will connect Helsinki, Tallinn, Riga, Vilnius and Warsaw and Berlin. In June 2014, the Rail Baltica task force reached agreement on the joint venture, which will be responsible for implementing the second part of the Rail Baltica project (MoT, 2014). Further investments are made to promote the environmental friendliness of the public transport system. Buses meeting the Euro 5 and Enhanced Environmentally Friendly Vehicle (EEV) emission requirements have been bought and further purchases are planned for 2014.

Agriculture
The National Strategy for Climate Change Management Policy addresses key emission reduction activities in the agricultural sector. The Strategy aims to promote organic farming practices and the management of meadowlands no longer in production, and intends to reduce methane emissions through manure management systems at animal facilities and to introduce measures to reduce greenhouse gas (GHG) emissions from nitrogen-based fertiliser. Important measures taken to reduce the loss of nutrients during agriculture activities are Order No. D1-367/3D-342 of 14 July 2005 on environmental requirements for manure management, and a programme for minimisation of water pollution caused by agriculture activities.

Waste
The Lithuanian Ministry of Environment has established a number of measures in the context of waste, including legislative measures to implement the waste management requirements of the European Union (MoE, 2013a, 2013b, 2013c). The Waste Management Plan for 2014–2020 aims to achieve that at least 50 % of municipal waste is recycled. The Law on Waste Management's aim is to encourage individuals and businesses to sort the waste they produce.
Recently, the Packaging and Packaging Waste Management Law was amended to introduce a mandatory deposit system for cans and polyethylene terephthalate (PET) bottles in Lithuania beginning in February 2016.

Land use, land-use change and forestry
In Lithuania the most important instrument for forest protection and afforestation is the Forestry Law (No I-671). It regulates the legal conditions to improve the preservation of forest in case of land-use change. The National Forest Sector Development Programme for 2012–2020 addresses the afforestation of low-fertility soils. Lithuania also aims to increase the national forest area by 3 % by 2020. The annual felling rate for state-owned forests was, however, increased to 6 % for the period 2014–2018 compared to 2009–2013.
The government recently adopted legislative amendments to address illegal logging in state forests, for example through increased fines (MoE, 2013d). From now on, compensation rates will be calculated based on the 'Methodology for calculating compensation for environmental damage caused by illegal activity committed by natural and legal persons' (Order No. D1-249). In addition, forest officers gain the authority to inspect transported timber goods. According to data from the State Forest Service, illegal logging has already decreased by more than 80 % over the last decade.

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MoE, 2013a, 'Atliekų problemos žinomos ir sprendžiamos' (Waste problems are known and are being solved), Ministry of Environment (http://www.am.lt/VI/index.php#a/13539) accessed 8 October 2014.

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MoE, 2013c, 'Visuomenei pristatomas Valstybinio atliekų tvarkymo 2014-2020 m. plano projektas' ('The National Waste Management Plan for 2014-2020 is presented for public consultation'), Ministry of Environment (http://www.am.lt/VI/article.php3?article_id=13745) accessed 8 October 2014.

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Key climate- and energy-related data — Luxembourg

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	13.1	12.1	11.8	11.4	4 544.2
GHG per capita (t CO_2-eq./cap.)	28.4	23.7	22.6	21.3	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	493	350	332	311	350
Share of GHG emissions in total EU-28 emissions (%)	0.3 %	0.3 %	0.3 %	0.3 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	2.6	2.1	2.0	1.8	1 848.6
Share of EU ETS emissions in total emissions (%)	19.9 %	16.9 %	16.8 %	16.2 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 19.4 %	– 17.5 %	– 20.0 %	– 29.5 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	11.8 %	12.9 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	10.2	9.8	9.6	9.6	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			2.9 %	3.1 %	14.1 %
() = including all biofuels consumed in transport	(1.4 %)	(2.9 %)			
Share of renewable energy for electricity (%)	3.2 %	3.8 %	4.1 %	4.6 %	23.5 %
Share of renewable energy for heating and cooling (%)	3.6 %	4.8 %	4.8 %	5.0 %	15.6 %
Share of renewable energy for transport (%)			2.1 %	2.2 %	5.1 %
() = including all biofuels consumed (%)	(0.1 %)	(2.0 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	4.8	4.6	4.5	4.4	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	10.3	9.2	8.9	8.4	3.1
Final energy consumption (Mtoe)	4.5	4.3	4.3	4.2	1 104.5
Final energy consumption per capita (Mtoe/cap.)	9.7	8.6	8.4	8.0	2.2
Efficiency of conventional thermal electricity and heat production (%)	n.a.	n.a.	n.a.	n.a.	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	2.99	2.81	2.46	n.a.	1.42
Space heating and cooling (toe/dwelling)	n.a.	n.a.	n.a.	n.a.	0.96
Water heating (toe/dwelling)	n.a.	n.a.	n.a.	n.a.	0.18
Cooking (toe/dwelling)	n.a.	n.a.	n.a.	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	n.a.	n.a.	n.a.	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 6.3 %	2020 ESD target (% vs base year)	– 20.0 %
2013 ESD emissions (% vs base year)	– 5.2 %	2020 ESD projections WEM (% vs base year)	+ 3.0 %
		2020 ESD projections WAM (% vs base year)	– 4.1 %

Based on approximated emission estimates for 2013 by EEA, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be above the annual ESD target in 2013. However, according to recent national proxy estimates, the 2013 ESD target could actually be met. Projections indicate that 2020 ESD emissions are expected to be well above the 2020 ESD target, despite the implementation of measures planned until 2013.

Progress towards renewable energy targets

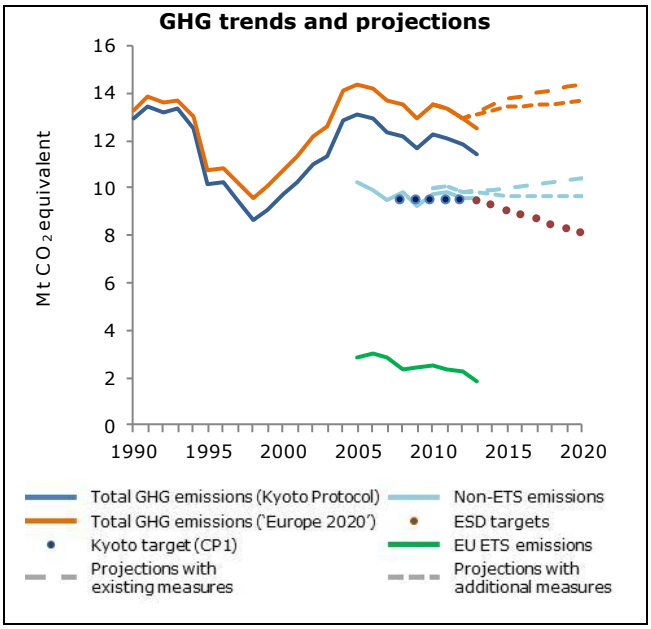
2012 RES share in gross final energy consumption (%)	3.1 %	2011–2012 indicative share from RES Directive (%)	2.9 %
2020 RES target	11.0 %	2012 expected share from NREAP (%)	2.9 %

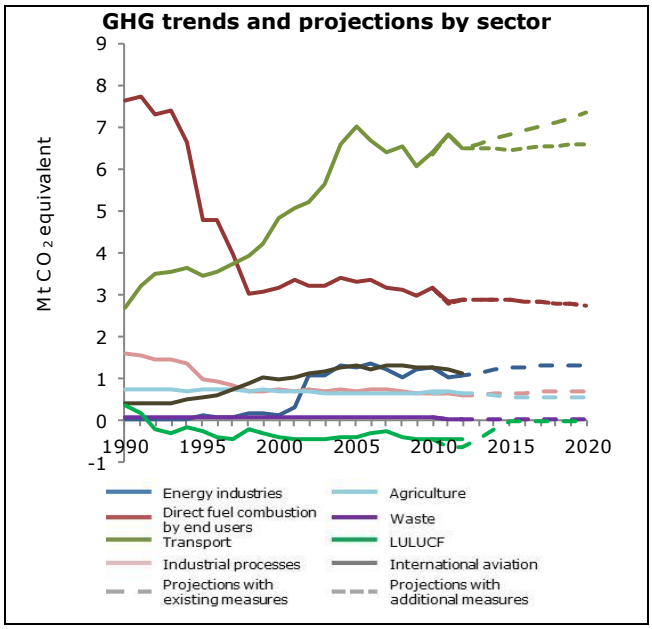
The average share of renewable sources in gross final energy consumption for 2011–2012 was 3.0% (124 ktoe), which is higher than the indicative RED target for 2011–2012 (2.9%). At the same time, the share of renewables in 2012 (3.1 %) is higher than the expected 2012 NREAP target (2.9 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 11.3%. In order to reach its 2020 NREAP target, Luxembourg needs an average annual growth rate of 15.0% in the run-up to 2020. In absolute terms, this is equivalent to 3.9 times its cumulative effort so far.

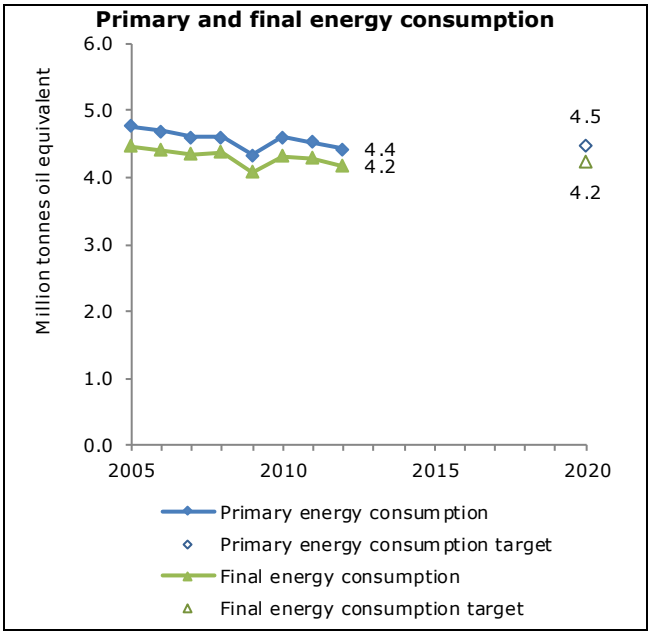
Progress towards energy efficiency targets

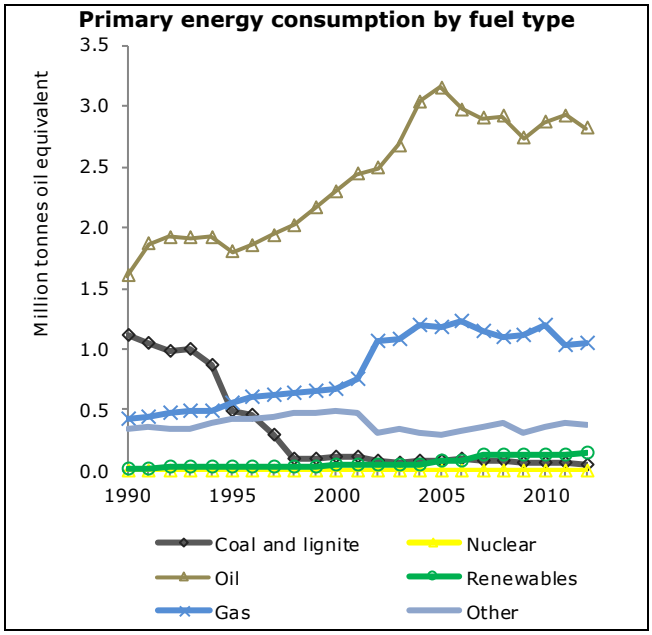
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 1.1 %	2005–2012 average annual change	– 1.0 %
2012–2020 average annual change to target	+ 0.2 %	2012–2020 average annual change to target	+ 0.2 %

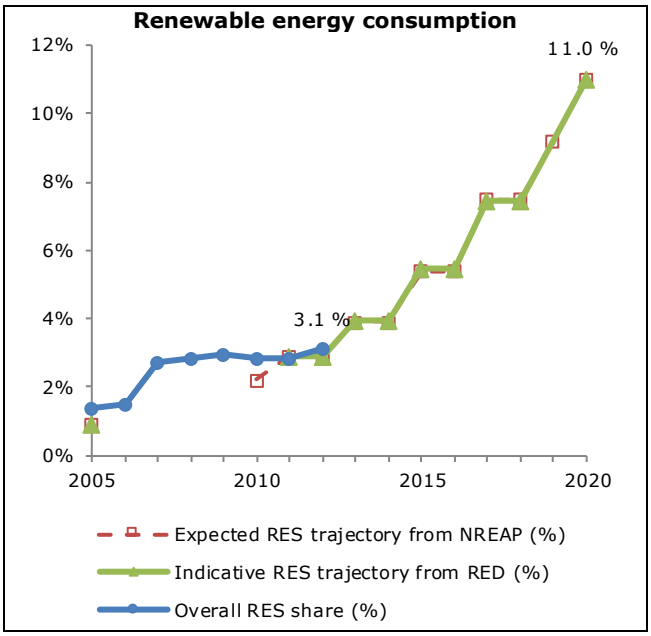
Between 2005 and 2012, primary and final energy consumption decreased at a faster pace than is necessary to meet the 2020 targets. This was due to energy efficiency improvements (for example, the replacement of coal by electricity in the steel industry, coupled with an increased share of natural gas in electricity production), as well as a reduction in activity, to some extent. Therefore Luxembourg could focus on stabilising its energy consumption.

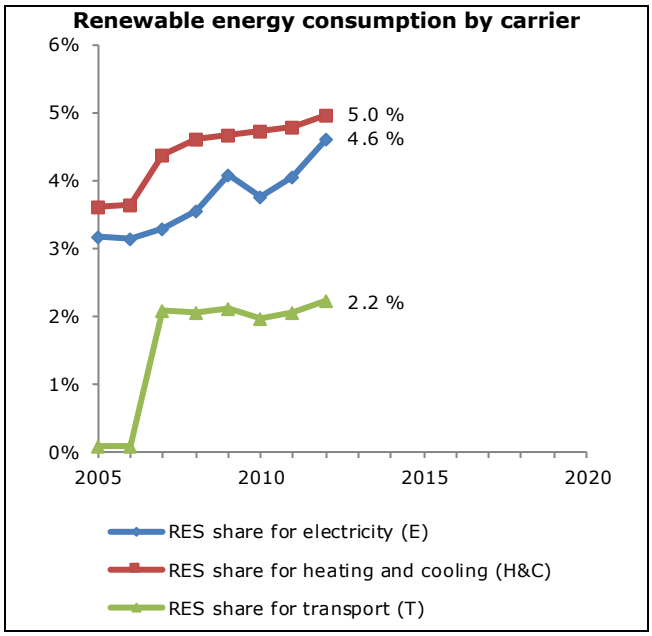

GHG trends and projections
Mt CO2 equivalent
16
14
12
10
8
6
4
2
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
9
8
7
6
5
4
3
2
1
0
-1
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2005
2010
2015
2020
4.4
4.2
4.5
4.2
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
11.0 %
3.1 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
6%
5%
4%
3%
2%
1%
0%
2005
2010
2015
2020
5.0 %
4.6 %
2.2 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Luxembourg is projected to miss its 2020 target for non-Emissions Trading System (ETS) greenhouse gas (GHG) emissions by a significant margin if no additional measures are taken. Emissions dropped until 1998 but have risen back to 1990 levels, which can mainly be ascribed to an increase in fuel use in the transport sector. However, a 2008 study indicated that Luxembourg could reduce its energy consumption by up to 72 % by 2050 compared to a business-as-usual scenario, if the country eliminated fuel tourism and implemented energy efficiency measures in all sectors (Ecofys, 2008). More than half of Luxembourg's emissions stem from transport, 70 % of which are connected to fuel export. The main reason for this phenomenon is Luxembourg's geographical position as a transit country and, more importantly, fuel taxes that are well below those of neighbouring Member States, especially as regards diesel. The recognition in the new Climate Action Plan of fuel export as a key challenge is a step forward, but the Plan only establishes a no-growth objective and no reduction of fuel export. However, emissions from domestic transport have also grown, and average emissions from newly registered cars are high. Addressing these emission sources both from domestic fuel consumption as well as fuel export could help Luxembourg to even overachieve its 2020 GHG target. Promoting alternative means of transportation would also help to solve the increasing congestion problem on Luxembourg's roads. Luxembourg's Strategy for Sustainable Mobility and the new Climate Action Plan already outline a number of possible measures, but they largely remain vague and clear timelines for their implementation are missing. Particularly, better spatial planning plays a key role in this respect, given that there is a growing spatial separation between workplace and housing in Luxembourg.
Energy efficiency in the residential sector presents another challenge given that Luxembourg's households have the highest energy consumption per dwelling in the EU, partly due to large living space per capita. Projections show that Luxembourg's population will continue to grow, and so will demand for housing. Refurbishing existing buildings to make them more energy efficient, and constructing highly efficient buildings, could reduce household spending on heating. In particular, investments in refurbishment can also spur local job creation.

Climate and energy strategies
In 2013, Luxembourg published its second National Climate Action Plan, which contains 51 measures aiming to reduce GHG emissions in Luxembourg by 20 % until 2020. The government announced a focus on energy efficiency measures and the 'strategic potential' of the use of flexible mechanisms and changes in fuel export, recognising that reducing fuel exports by 60 % could close the emissions gap. However, no specific measures on fuel exports are provided, partly because Luxembourg fears tax revenue losses. Rather, the proposed measures target 'domestic' emission reduction potentials in six priority areas, namely renewable energy, energy efficiency, electric mobility, restructuration of the tax system, financial instruments that from a social point of view are more efficient and fair, and improvements on information and communication. In the framework of the Climate Pact, the state government provides financial and technical support to exemplary municipalities.

Renewable energy
Luxembourg has the second lowest share of renewables in overall energy consumption in the EU, and is still far from meeting its 11 % target for 2020. The main instrument for the promotion of renewable electricity is a feed-in tariff (FIT) system, with tariffs guaranteed for a period of 15 years. The FIT rates depend on the technology and the size of the plant. Except for geothermal energy, all renewable electricity-generation technologies are eligible (Règlement Grand Ducal du 8 février 2008). Following an amendment, FITs for hydropower, wind energy, biogas and biomass were increased by 11 to 31 % while FITs for new photovoltaic (PV) installations decreased by 9 % from 2014 onwards. The new tariffs were presented to the European Commission by the government in July 2013 but are still not approved as of May 2014 (europaforum.lu, 2014). Additionally, a number of subsidies are available for investments in renewable electricity generation, for example for PV installations with a maximum capacity of up to 30 kWp, for companies or for municipalities (RES Legal). Also, sales of electricity generated by PV with a capacity up to 4 kW are exempt from the income tax, as the sale of PV electricity from these installations is not deemed a commercial activity.
For renewable heating, which accounts for only 5 % of heat generation, there are a number of subsidy schemes available, for example for aerothermal and geothermal heat pumps as well as renewable energy plants generating heat from solar thermal energy or various types of biomass (RES Legal). The Climate Action Plan of May 2013 envisages for 2014 information campaigns on renewable energies targeting small and medium-size companies as well as companies of the industrial sector, and a more targeted support scheme for the use of biomass in the form of wood, green waste, agricultural waste and sewage sludge, for example through the introduction of a FIT for renewable heat from these sources.

Energy efficiency
The second National Action Plan for the reduction of CO_2 emissions contains a number of proposed measures, mainly targeting energy efficiency in residential buildings.
Taxes on energy products are below EU average, a fact that is even aggravated by the generally low VAT rate. Luxembourg also grants a number of tax and VAT exemptions and reductions, for example for electricity used in metallurgical processes.
Cogeneration of electricity and heat is supported under the FIT system for renewable electricity.
As regards **industry**, structural changes in the iron and steel industry, which are Luxembourg's most important industrial branches, have decreased energy consumption, but the industry remains one of the most energy intensive in the EU. Voluntary agreements with industry are in place in order to improve the energy efficiency

of single industrial companies by 1 % per year. The government committed in the Climate Action Plan to monitor these agreements more closely but apart from that the industrial sector does not seem to be in the focus of the plan.
For residential **buildings**, the government recently adopted a regulation setting the target of 'nearly zero energy' requirements from 2019 onwards. As a follow-up measure to the Climate Action Plan, Luxembourg presented a Sectoral Master Plan for Housing offering a new aid scheme for energy savings and the use of renewable energy of residential buildings from 2013 to 2015 (MDDI, 2014b). The Action Plan also lays out that all new buildings should meet the requirements of the low-energy building standards 'as soon as possible'. A Grand-Ducal regulation setting deadlines for the compliance of new buildings to 'nearly zero energy' standards is currently in preparation. For public buildings, monitoring of energy consumption will be improved by means of a database compiling information on the energy consumption of public buildings and connected to a smart-metering system.

Transport
Transport is the most challenging sector with regard to GHG emissions. The second Climate Action Plan, which gives priority to the improvement of public transport networks, improved spatial planning, the promotion of soft mobility and the promotion of electric mobility, addresses these challenges only partly.
Transport taxation is limited in Luxembourg. There is no registration tax. The ownership tax is based on CO_2 emissions only, or engine capacity for older cars (ACEA, 2012). Taxes on transport fuels are among the lowest in the EU, and fuel export to neighbouring countries is a significant revenue source for Luxembourg. The Action Plan envisages restructuring the transportation tax system, possibly including a revision of the vehicle tax, a reform of the company cars taxation and the gradual adjustment of tax rates on transport fuels (GovLux, 2013a). However, the National Action Plan does not formulate concrete implementing measures but only commits to examine possible actions in the medium term.
Biofuels make up 2 % of transport fuels but are exclusively imported. They are promoted via a quota system.
For electric mobility, the National Action Plan sets the target of approximately 10 % of the Luxembourg fleet to be constituted of electric cars by 2020 (corresponding to about 40 000 cars). Additionally, about 850 charging stations for electric cars should be installed by 2020. However, the Car-e bonus for electric cars is discontinued from 1 January 2015 as the government wants to focus on the e-mobility in public transport rather than for private vehicles.
The 2013 Global Strategy for Sustainable Mobility (MoDu) of the Grand Duchy of Luxembourg (MDDI, 2014a) envisages increasing the modal share of the country's daily commuting for soft mobility from 13 % to 25 %, and the share of public transport from 14.5 % to 25 % by 2020 (GovLux, 2013b; Luxemburger Wort, 2013). For this purpose, the MoDu Strategy foresees the development of the rail network so as to become the main public transport at national level, and the promotion of cross-border mobility schemes. As part of the strategy, Luxembourg also presented in July 2013 a draft law aiming at developing an 'effective and consistent cycling network for soft mobility'. As of May 2014, however, no information was available as to the further legislative process of this law. The projects of the MoDu Strategy should be implemented in three steps, namely by 2020, by 2030 and after 2030.

Agriculture
Agriculture only accounts for a very small share of emissions in Luxembourg. The second Climate Action Plan includes measures on agrofuels but notes that further work is required to identify and realise additional emission-saving potentials in agriculture and forestry. Moreover, it foresees the development and implementation of a legislative framework for the promotion of agroforestry in 2014.

Waste
The 2010 national waste management plan established the principle of full-cost pricing of every stage of waste management. In March 2012, a new framework law regulating waste management in Luxembourg was published. According to the law, the Administration of Environment of the Ministry of Sustainable Development should develop a new national waste management plan replacing the one from 2010. The law also provides for the introduction of municipal taxes on waste to help cover the costs incurred by the municipalities for waste management. A tax on household waste should also be introduced depending on the weight and volume of waste produced. However, so far, implementing acts have only been published for electronic waste.

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Key climate- and energy-related data — Malta

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	3.0	3.0	3.1	2.7	4 544.2
GHG per capita (t CO_2-eq./cap.)	7.4	7.3	7.5	6.4	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	409	336	340	285	350
Share of GHG emissions in total EU-28 emissions (%)	0.1 %	0.1 %	0.1 %	0.1 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	2.0	1.9	2.1	1.7	1 848.6
Share of EU ETS emissions in total emissions (%)	66.2 %	63.8 %	65.4 %	62.6 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 5.5 %	– 10.9 %	– 4.9 %	+ 50.3 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	n.a.	0.0 %	52.2 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	1.0	1.1	1.1	1.0	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(0.3 %)	(0.4 %)	0.7 %	1.4 %	14.1 %
Share of renewable energy for electricity (%)	0.0 %	0.1 %	0.6 %	1.1 %	23.5 %
Share of renewable energy for heating and cooling (%)	4.7 %	4.3 %	7.8 %	13.0 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(0.0 %)	(0.0 %)	0.0 %	1.0 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	1.0	0.9	0.9	0.8	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	2.4	2.3	2.2	2.0	3.1
Final energy consumption (Mtoe)	0.4	0.5	0.5	0.5	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.0	1.1	1.1	1.1	2.2
Efficiency of conventional thermal electricity and heat production (%)	26.4 %	31.4 %	31.0 %	30.4 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	0.54	0.54	0.52	n.a.	1.42
Space heating and cooling (toe/dwelling)	0.16	0.17	0.19	n.a.	0.96
Water heating (toe/dwelling)	0.09	0.09	0.10	n.a.	0.18
Cooking (toe/dwelling)	0.08	0.07	0.09	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.26	0.23	0.20	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)			
2013 ESD target (% vs base year)	+ 6.1 %	2020 ESD target (% vs base year)	+ 5.0 %
2013 ESD emissions (% vs base year)	– 3.8 %	2020 ESD projections WEM (% vs base year)	+ 4.0 %
		2020 ESD projections WAM (% vs base year)	+ 2.0 %

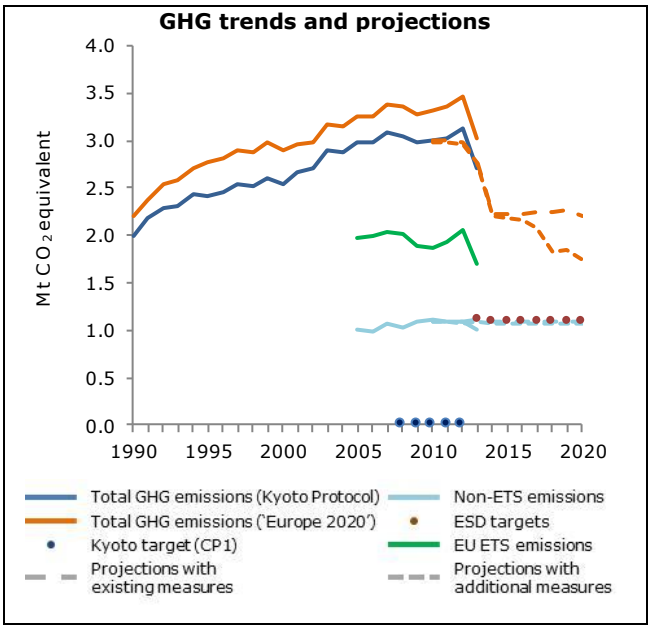
Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

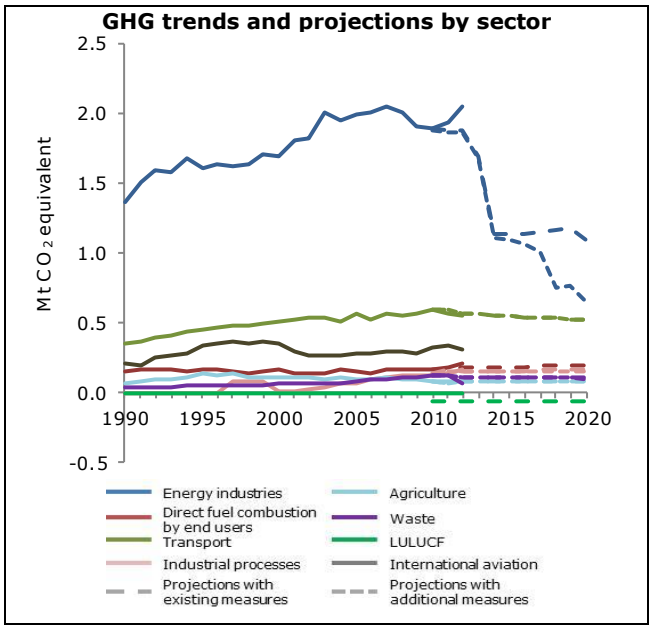
Progress towards renewable energy targets			
2012 RES share in gross final energy consumption (%)	1.4 %	2011–2012 indicative share from RES Directive (%)	2.0 %
2020 RES target	10.0 %	2012 expected share from NREAP (%)	2.6 %

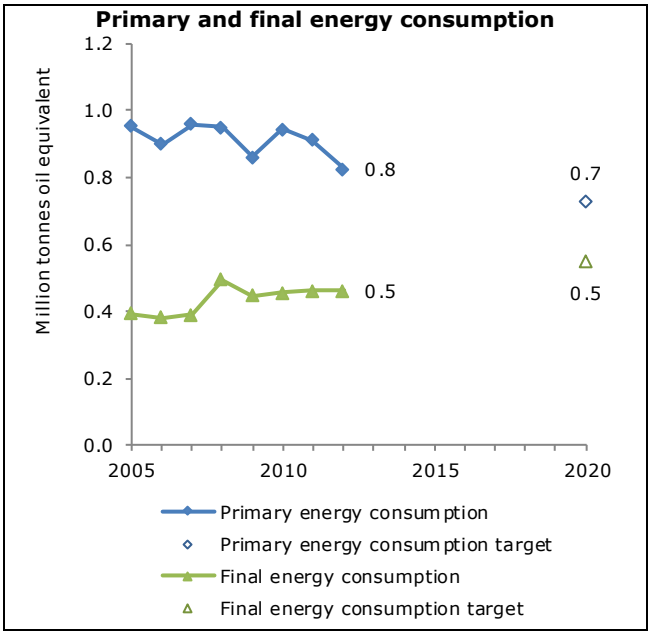
The average share of renewable sources in gross final energy consumption for 2011–2012 was 1.1% (4 ktoe), which is lower than the indicative RED target for 2011–2012 (2.0%). At the same time, the share of renewables in 2012
(1.4 %) is lower than the expected 2012 NREAP target (2.6 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 23.4%. In order to reach its 2020 NREAP target, Malta needs an average annual growth rate of 35.5% in the run-up to 2020. In absolute terms, this is equivalent to 13.4 times its cumulative effort so far.

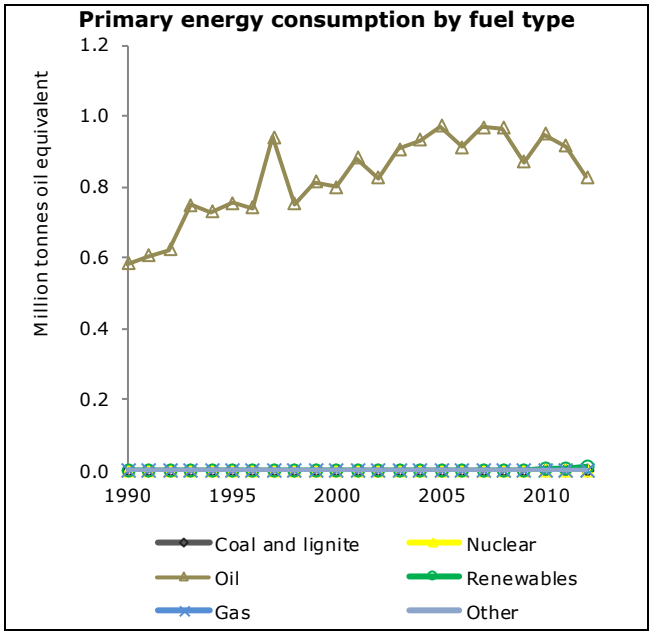
Progress towards energy efficiency targets			
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 2.0 %	2005–2012 average annual change	+ 2.4 %
2012–2020 average annual change to target	– 1.6 %	2012–2020 average annual change to target	+ 2.2 %

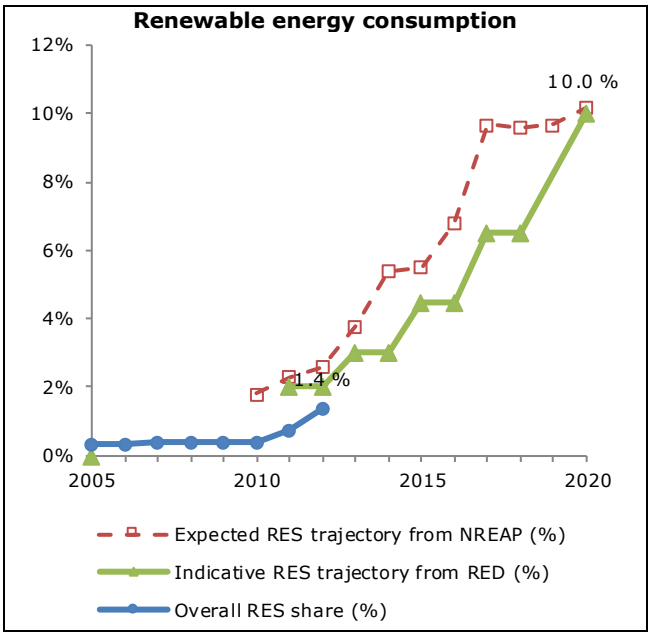
Between 2005 and 2012, primary energy consumption decreased at a faster pace than is necessary to meet the 2020 reduction target on primary energy consumption, however final energy consumption grew at a faster pace than is necessary to achieve the 2020 positive target on final energy consumption, in particular in the transport and industry sectors. In 2014, Malta reduced its target for final consumption compared to the one announced in 2013. Energy efficiency improvements, in particular in the vehicle fleet and in the industry sector, could contribute to achieving this target.

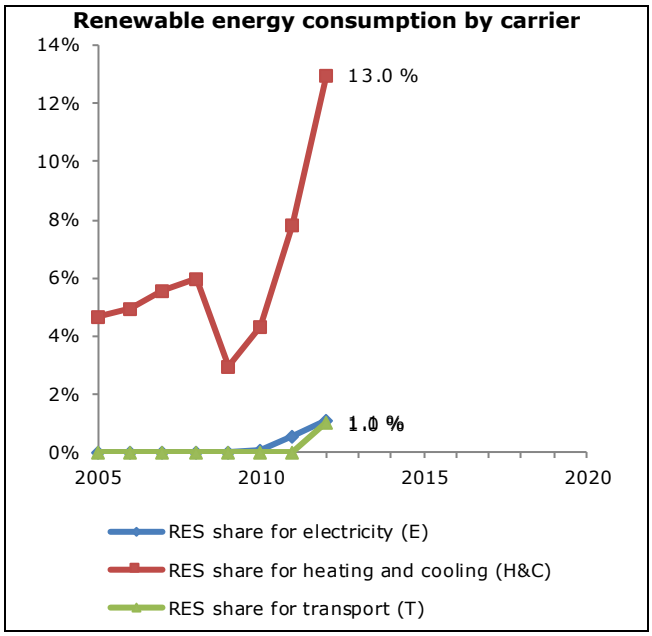

GHG trends and projections
Mt CO2 equivalent
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2005
2010
2015
2020
0.8
0.5
0.7
0.5
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
10.0 %
1.4 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
13.0 %
1.0 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
As an island, Malta depends almost entirely on fuel imports for its energy supply, and the cost of these is rising. The spending on fuel/lubricants imports increased from about EUR 300 million in 2005 to more than EUR 2 700 million in 2012 (NSO, 2013a), contributing to a negative trade balance. Currently, around 60 % of these imports are consumed in the transport sector ([5]). Transport is not only responsible for the majority of fuel imports but also the second largest emitter, following electricity generation. From 1990 to 2011, emissions from transport doubled, mainly as a result of an increasing number of vehicles and longer distances travelled. Thus, transport entails significant potential to tackle energy imports and energy dependence and at the same time reduce greenhouse gas (GHG) emissions.
The majority of the residual of fuel imports (after deduction of transport fuels) is used for the two oil-based power plants currently covering the bulk of electricity provision in Malta. The grid interconnection to Sicily has the potential to reduce dependence on oil imports and to lower GHG emissions, since it will enable the import of electricity with a higher share of lower-carbon energy sources. Additionally, the extended exploitation of local renewable energy sources (such as through photovoltaic (PV) systems) could reduce energy imports and the related expenditure, leading to an improvement of the trade balance. Moreover, it could reduce GHG intensity of energy supply significantly. However, so far domestic renewable energy potentials are almost not being utilised and the achievement of the Maltese renewable targets for 2020 is at risk.

Climate and energy strategies
In 2009, the National Strategy for Policy and Abatement Measures relating to the reduction of GHG emissions was introduced to implement the national 2020 climate and energy targets and articulate actions to be adopted relating to climate change mitigation as well as adaptation. Moreover, the Strategy prioritises actions on the basis of financial cost and economic impact, feasibility and environmental impact. The 2012 Energy Policy for Malta is based on the objectives of security of supply, competitively priced energy services and environmental responsibility. These objectives are addressed through policies targeting energy efficiency and affordability, security of supply, diversification, flexibility and sustainability. A main focus is the reduction of energy dependence from oil imports and of emissions from energy generation. The Pre Budget Document for 2013 generally states that the government will make efforts to develop a plan for green jobs and provide training for young people to be qualified to work in environment-related sectors (Government of Malta, 2013).

Renewable energy
Malta rather lags behind regarding the development of renewable energy in comparison to the other Member States and major actions are required to reach the 2020 goal of 10 %. Renewable electricity is promoted through a feed-in tariff for domestic PV installations, as well as grants covering 50 % of investment costs and up to EUR 2 500 for domestic PV installations. Offshore wind energy was planned to make up 5.5 % of energy consumption by 2020 but the government withdrew from this plan due to environmental concerns and high investment costs. Instead, it is planned to have a larger number of small installations of technologies that are already available in Malta, such as PV, solar water heaters and micro wind (EC, 2013a).
Renewables in heating and cooling are supported through grants for solar water heating systems for domestic use, covering 40 % of the total costs up to EUR 400. Additionally, in 2014 the European Regional Development Fund (ERDF) will allocate EUR 25 million to the promotion of 14 projects for clean energy use.

Energy networks
The Maltese electricity grid will be connected to Sicily with project costs of approximately EUR 183 million, partially funded by the European Energy Programme for Recovery. The implementation of the project has the potential to lower Malta's GHG emissions, since it would enable Malta to import electricity instead of generating it through its own oil-based power stations. Moreover, the interconnection will improve security of supply through a diversification of energy imports. The interconnector is expected to be commissioned towards the end of 2014 (Enemalta, 2014).

Energy efficiency
So far, there is no long-term strategy addressing energy efficiency, but a project conducting studies for the National Energy Efficiency Action Plan will be running throughout 2014 and will inform the transposition of the Energy Efficiency Directive in Malta. Energy **taxation** is rather high with the level of excise duties being well above the EU average. There are exemptions for gas and oil for maritime commercial activities.
Energy market operators are required to provide energy audits and information on energy intensity. Energy efficiency improvements in **industry** and for small and medium-sized enterprises are supported through investment support, as well as through energy audits.
In the **building sector**, minimum energy performance standards have been introduced; energy performance certificates are mandatory but not common so far. For residential buildings, a subsidy scheme for building envelope improvement supports roof thermal insulation and double glazing by providing grants on investment costs of 15.3 % of total costs and a maximum amount of EUR 1 000. Besides financial support, Maltese households will be given the opportunity to receive an energy audit. Moreover, automatic meter management systems with smart electricity meters have been implemented, in order to improve demand management of

([5]) Own calculations based on energy consumption given in Eurostat (2013, tsdpc320), and under the assumption that about 100 % of energy consumed in Malta is coming from imported fuels (Eurostat, 2013, tsdcc320: Gross inland energy consumption, by fuel; and EC, 2013b).

consumers. In addition, various pilot projects regarding energy efficiency in schools or an exchange of street lights with LEDs are funded by the Maltese government and co-funded by EU funds (MFIN, 2013).

Transport

In Malta, a major issue is the increasing number of private cars, which offset the achieved efficiency increases (average emissions for newly registered cars are the 5th lowest in the EU) (Eurostat, 2013): for 2012, 748 vehicles per 1 000 total inhabitants were estimated (NSO, 2013b), which is one of the highest figures in the European Union (Eurostat, 2014; World Bank, 2014). Incentives for efficient driving and the purchase of efficient cars include the registration tax, which is based on value, carbon dioxide (CO_2) emissions, EURO standard, fuel type and length for passenger cars or weight, and EURO standard for heavy goods vehicles. The ownership tax is based on fuel type and particulate matter, as well as on CO_2 emissions for passenger cars, and on number of axles and weight for lorries, respectively. The ownership tax increases after 5 years (ACEA, 2012). A Scrapping Scheme was launched in 2014 offering every person who replaces a 10-year-old or an older M1 passenger vehicle and registers a new M1 passenger vehicle with a CO_2 emissions value of less than 150 g/km a one-time grant of between EUR 500 and 900. The budget of EUR 300 000 for 2014 was increased in April 2014 by another EUR 200 000 but is since May 2014 exhausted. Altogether 656 vehicles have benefited from the scheme (Transport Malta, 2014).

Diesel and petrol are taxed around EU average (European Commission, 2013). Renewables are promoted through the Substitution Obligation stipulating a blending quota for importers/wholesalers of fuel, rising from 1.5 % based on energy content in 2011 to 10 % by 2020 (MRA, 2010). The MODUS programme, introduced in 2011, includes several measures aiming to shift the mode of land transportation to reach a higher share of public transport such as an upgrade of the national bus system, including more routes, more frequent service and also night services. In addition, new bus terminals, vehicles and information services are planned. A new parking management, regulating parking opportunities and car access restrictions, as well as infrastructure improvements for pedestrians and cyclists are also planned.

Agriculture

Climate effects of and on agriculture are addressed in the National Strategy for Climate Change and Adaptation, published in May 2012. The Strategy outlines different action plans and policies concerning agriculture. Among others, they aim at securing synergies between mitigation and adaptation strategies and vitalising agricultural activity. Furthermore, the Strategy points out the importance of information and advisory support on climate-related matters to farmers and works with the rural community to encourage them to adopt sound land management practices essential for soil conservation. The 2011 Nitrates Action Programme aims to reduce nitrates pollution of water bodies, air and soil by nitrates, and imposes stringent requirements on manure management from livestock (storage and disposal) and control of fertiliser use. It also requires the users of organic and/or inorganic fertilisers to register at the responsible authority. It is accompanied by the InfoNitrates campaign to inform and train farmers to comply with the EU Nitrates Directive and the Nitrates Action Plan.

Waste

Malta mainly aims to reduce the waste going to landfills, for example through higher recycling rates, as well as to reduce emissions from landfill sites: since 2008, landfill gas extraction with combustion of extracted methane has been introduced together with rehabilitative works to improve stability and prepare the site for eventual alternative uses in the future. Old landfills have been replaced with new engineered ones featuring waste mass caps and gas extraction for flaring or energy generation. Biological waste is separated for biogas generation in a cogeneration plant at Sant'Antnin Waste Treatment Plant in the island's south. Similar plans exist for other regions (UNFCCC). Additionally, three wastewater treatment plants were constructed, upgrading the national wastewater infrastructure.

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Key climate- and energy-related data — the Netherlands

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	209.4	195.1	191.7	191.9	4 544.2
GHG per capita (t CO_2-eq./cap.)	12.8	11.7	11.5	11.4	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	437	360	352	352	350
Share of GHG emissions in total EU-28 emissions (%)	4.0 %	4.2 %	4.2 %	4.3 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	80.4	80.0	76.4	86.8	1 848.6
Share of EU ETS emissions in total emissions (%)	38.4 %	41.0 %	39.9 %	45.2 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 7.1 %	– 13.9 %	– 16.0 %	+ 3.5 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	4.4 %	26.6 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	123.0	113.2	113.3	105.1	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			4.3 %	4.5 %	14.1 %
() = including all biofuels consumed in transport	(2.3 %)	(3.7 %)			
Share of renewable energy for electricity (%)	6.3 %	9.7 %	9.8 %	10.5 %	23.5 %
Share of renewable energy for heating and cooling (%)	2.0 %	2.7 %	3.3 %	3.4 %	15.6 %
Share of renewable energy for transport (%)			4.6 %	5.0 %	5.1 %
() = including all biofuels consumed (%)	(0.2 %)	(3.1 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	68.5	71.1	66.3	67.1	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	4.2	4.3	4.0	4.0	3.1
Final energy consumption (Mtoe)	51.7	53.9	50.7	51.1	1 104.5
Final energy consumption per capita (Mtoe/cap.)	3.2	3.3	3.0	3.1	2.2
Efficiency of conventional thermal electricity and heat production (%)	60.2 %	58.7 %	60.2 %	58.5 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.58	1.48	1.50	1.45	1.42
Space heating and cooling (toe/dwelling)	1.06	1.00	1.01	0.98	0.96
Water heating (toe/dwelling)	0.23	0.21	0.21	0.21	0.18
Cooking (toe/dwelling)	0.04	0.04	0.04	0.04	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.25	0.24	0.24	0.23	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 3.5 %	2020 ESD target (% vs base year)	– 16.0 %
2013 ESD emissions (% vs base year)	– 15.3 %	2020 ESD projections WEM (% vs base year)	– 15.2 %
		2020 ESD projections WAM (% vs base year)	– 18.8 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, only if measures planned until 2013 are fully implemented.

Progress towards renewable energy targets

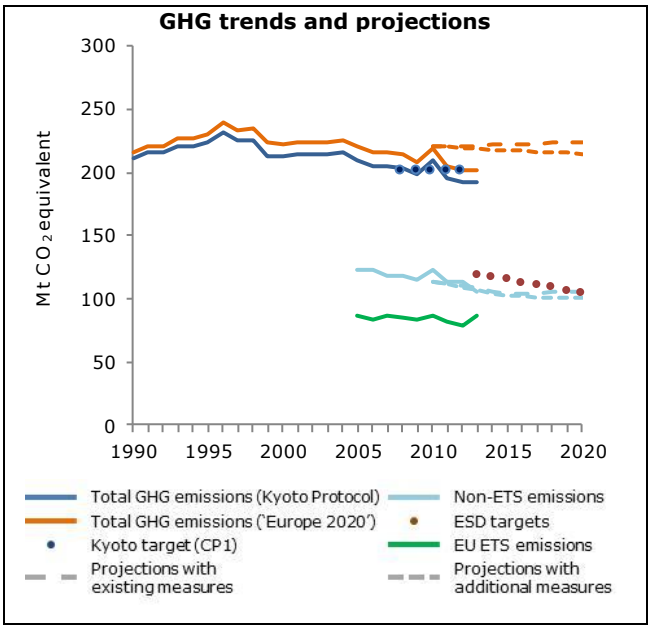
2012 RES share in gross final energy consumption (%)	4.5 %	2011–2012 indicative share from RES Directive (%)	4.7 %
2020 RES target	14.0 %	2012 expected share from NREAP (%)	5.6 %

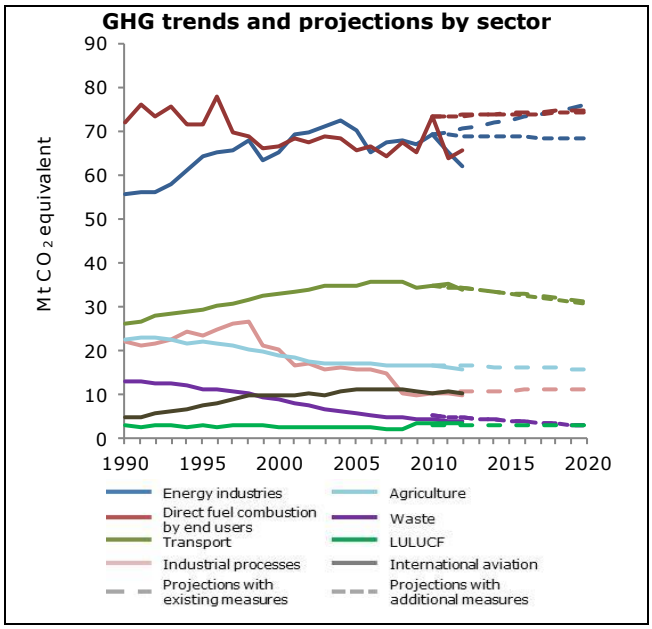
The average share of renewable sources in gross final energy consumption for 2011–2012 was 4.4% (2.3 Mtoe), which is lower than the indicative RED target for 2011–2012 (4.7%). At the same time, the share of renewables in 2012 (4.5 %) is lower than the expected 2012 NREAP target (5.6 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 11.5%. In order to reach its 2020 NREAP target, Netherlands needs an average annual growth rate of 15.4% in the run-up to 2020. In absolute terms, this is equivalent to 4.0 times its cumulative effort so far.

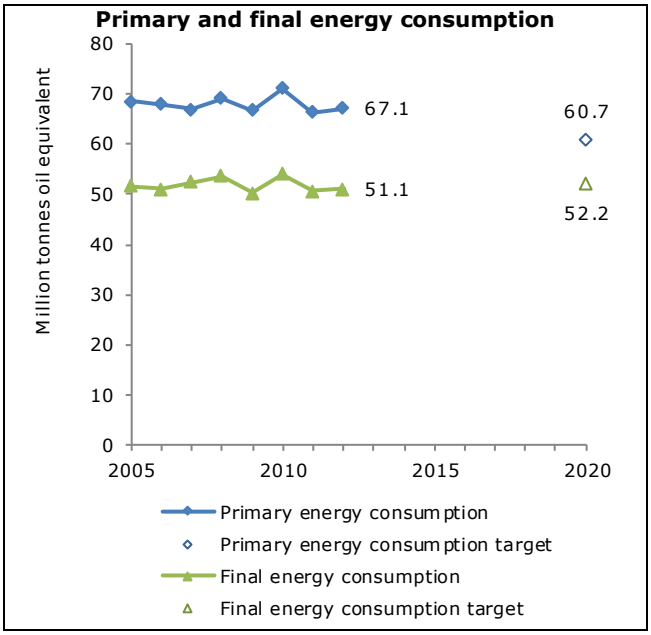
Progress towards energy efficiency targets

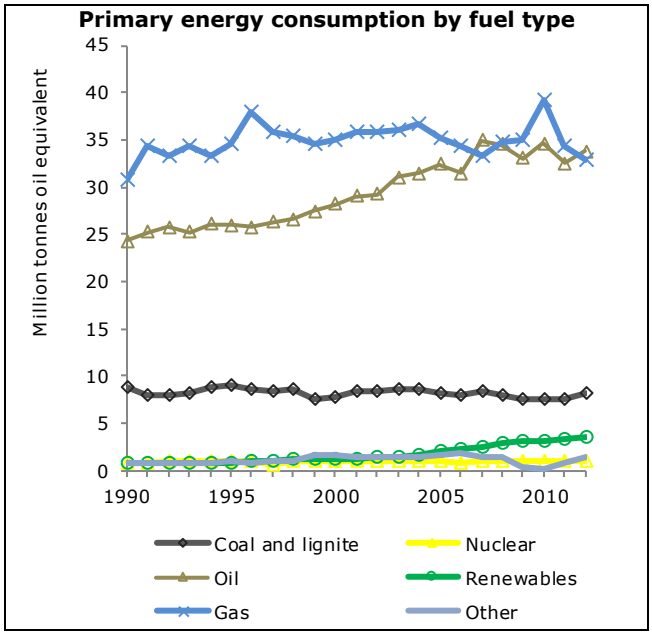
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 0.3 %	2005–2012 average annual change	– 0.1 %
2012–2020 average annual change to target	– 1.2 %	2012–2020 average annual change to target	+ 0.3 %

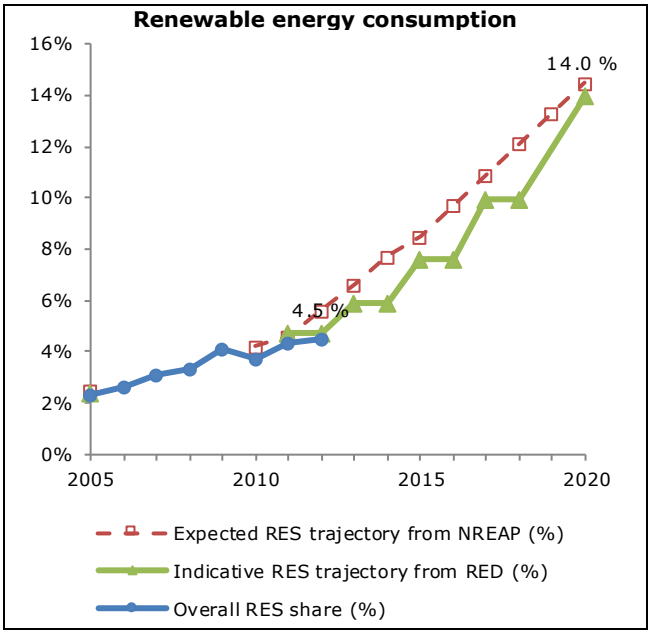
Between 2005 and 2012, final energy consumption decreased while the 2020 target is actually positive compared to 2005. However, primary energy consumption did not decrease at a sufficient pace to put the Netherlands on track to meet its 2020 reduction target for primary energy consumption. Further improvements in conversion efficiency in the energy sector, where the consumption has been increasing since 2008, could contribute to reducing further primary energy consumption. Concerning final energy consumption, the Netherlands can focus on stabilizing energy consumption in end-use sectors, in particular in the industry and the residential sectors.

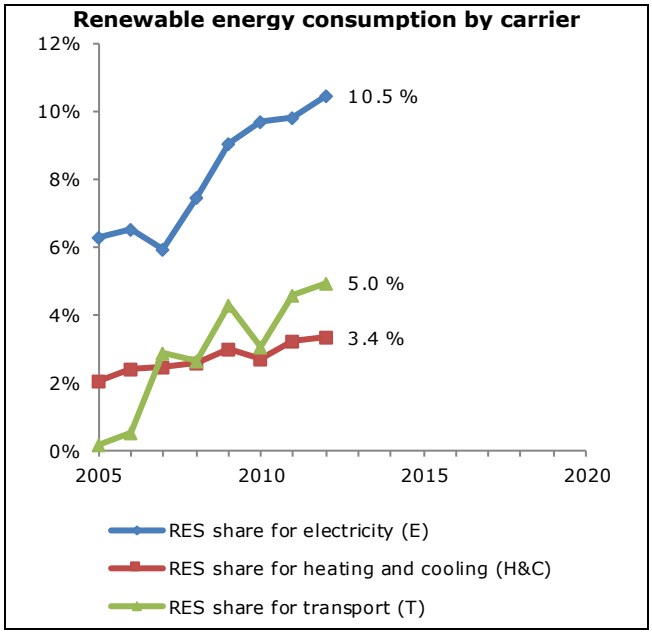

GHG trends and projections
Mt CO2 equivalent
300
250
200
150
100
50
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
90
80
70
60
50
40
30
20
10
0
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
80
70
60
50
40
30
20
10
0
2005
2010
2015
2020
67.1
51.1
60.7
52.2
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
45
40
35
30
25
20
15
10
5
0
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
14.0 %
4.5 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
10.5 %
5.0 %
3.4 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
The Netherlands has been actively developing mitigation and adaptation policies. However, progress on two of the main pillars for greenhouse gas (GHG) emission reductions, renewable energies and energy efficiency, is currently not sufficient. There is a significant gap between the current renewable energy share in total energy consumption and the 2020 target, and also estimations of final energy savings based on current measures show that the 2020 energy-savings target laid out in the Energy Agreement for Sustainable Growth could be missed by more than 40 % (PBL, 2013).
For renewables, the main support scheme SDE+ has been criticised for not having enough budget to trigger a sufficient level of investment for the Netherlands to comply with its 2020 goal (SER, 2013). Furthermore, the policy architecture of the SDE+ was assessed as favouring large investors and technologies with already low electricity production costs, and thus not supporting further innovation (Tonneyck, 2013). Simplified access for small investors to the promotion scheme could help spur the necessary investments. Moreover, the dedicated promotion of currently higher cost technologies could help trigger innovation and Dutch industry could profit from gaining know-how and market share in prospectively successful sustainable energy technologies.
Regarding energy efficiency, a long-term strategy and further investments could improve the Netherlands' performance towards its 2020 energy-savings target and create further employment and turnover in green industries. A study by Energie-Nederland, and Netbeheer Nederland, released in October 2013, estimated that the energy transition and related innovation could trigger 20 000 new jobs by 2017 (ECN, 2013).

Climate and energy strategies
The Sustainability Agenda was published in 2011 aiming at the transformation towards a green economy and advocates green growth through international agreements, smart and efficient regulations, and improved financial incentives. The Sustainability Agenda builds on the international Climate Agenda, the National Roadmap Climate 2050 and the Local Climate Agenda 2011. It defines the priority areas, such as: resources and product chains, sustainable water and land use, food, climate and energy, and mobility. With the implementation of this Agenda, the Cabinet of Ministers hopes to increase the competitiveness of the Dutch economy by reducing its dependence on fossil energy sources and environmental harm.
For the energy sector, the centrepiece is the Energy Agreement for Sustainable Growth that has been published in September 2013. It includes: an annual savings target of 1.5 % in final energy consumption, totalling 100 PJ of energy savings by 2020; a targeted share of renewable energy of 14 % in 2020 and 16 % in 2023; and the creation of at least 15 000 jobs. Already in 2012, employment in the sustainable sector reached 10 000 jobs with revenue of EUR 3.3 billion per year (Dutch Government, 2013).

Renewable energy
The self-defined target to increase the share of renewable energies in final energy consumption to 16 % (+ 2 % from the EU target) has been revised in the summer of 2013 and pushed back to 2023 due to insufficient progress. The main support scheme for renewable electricity and heat, especially in large-scale applications, is a premium tariff with a quasi-tendering process, called SDE+. Under the SDE+ energy producers compete against each other for funding in six steps on a 'first come, first serve' basis. The budget for the support of renewable energy in electricity and heat production in SDE+ will amount to EUR 3.5 billion in 2014, an amount that is still criticised of being too low to reach the 2020 goal (SER, 2013). Furthermore, it has been criticised that the current scheme favours technologies that already produce at a low price. Accordingly, new technologies, being relatively expensive, lack sufficient support and thus the chance for further cost reductions (Tonneyck, 2013).
Next to the SDE+, photovoltaic installations can qualify for subsidies under the Spring Agreement, with a maximum investment subsidy of EUR 650. Moreover, for enterprises investing in renewable electricity and heat, the Energy Investment Allowance (EIA) offers a tax deduction of up to 41.5 % of the investment costs for renewable energy and energy savings, which has been estimated to lead to a reduction of investment costs by 10 %. This instrument can also be used by energy cooperatives as an investment support.
Furthermore, renewables in heating and cooling can qualify for subsidised loans providing an interest rate reduction of 1 %.

Energy efficiency
There is no specific long-term energy efficiency strategy, but the Energy Agreement for Sustainable Growth includes an annual savings target of 1.5 % in final energy consumption, totalling 100 PJ of energy savings by 2020.
Energy **taxation** is rather high with the level of excise duties being above the EU average. There are exemptions for energy-intensive businesses if the consumer has agreed to obligations for improving energy efficiency, as well as for electricity used for chemical reduction and in electrolytic and metallurgical processes. The Netherlands has no carbon dioxide (CO_2) tax in place.
Cogeneration of electricity and heat is fostered by lowering investment costs. The government's Long-Term Agreements, voluntary agreements with non-Emissions Trading System (ETS) large and medium-sized companies and institutions in industry, agriculture and the service sector, covering the period from 2001 to 2020, aim at improving energy efficiency by 30 % between 2005 and 2020. In return for the introduction of energy-saving plans (energy management and saving projects), the government agrees not to impose additional specific national measures aimed at energy conservation or CO_2 emission reductions on the involved companies. In addition, industrial companies acting under these covenants are largely exempt from energy and

carbon taxes and the energy efficiency component of the EIA supports industrial process improvements as well as building renovation for enterprises through tax deductions.
In the **building** sector, minimum energy performance standards and performance certificates have been introduced. Energy efficiency measures in buildings, such as floor, roof and wall cavity insulation, as well as double glazing are eligible for a reduced value-added tax rate of 6 %. Since January 2014, a fund of EUR 300 million is directed towards landlords, owners and tenants to finance energy-saving technology and measures with the help of low-interest loans with a 12-year payback period (Dutch Government, 2014). The fund is co-financed by private parties: EUR 225 million was contributed by Rabobank and ASN Bank, and EUR 75 million was added from the state. Furthermore, under the support programme More with Less, the government signed voluntary agreements with key players within housing, energy and construction to reduce energy consumption in existing buildings. The programme is planned to reduce barriers for owners to stimulate investment in savings measures, for example through customised advice on subsidies, costs and savings.

Transport
Vehicle **taxes** in the Netherlands are partly based on CO_2 emissions: the registration tax that is levied on passenger cars and motorcycles is based on the price of the vehicle, its CO_2 emissions, and a lump sum differentiating between diesel and petrol cars. An ownership tax for passenger cars is based on deadweight and fuel, but varies between the provinces. For buses, coaches and commercial vehicles, the tax is based on weight only. The Netherlands levies a time-based road toll for commercial vehicles with a weight of over 12 t. Diesel and petrol are taxed above EU average.
Fuel suppliers are obliged to blend transport fuels with a share of sustainable **biofuels**, from 4.25 % in 2011 to 5.5 % in 2014. Contributions made by biofuels produced from wastes, residues, non-food cellulosic material and lignocellulosic material are counted twice, which results in a relatively large share of biodiesel from used cooking oil, for example. Tax deductions similar to the EIA scheme exist for investments in biofuel and hydrogen production facilities. The Action Plan Electric Mobility supports the purchase of electric vehicles if CO_2 emissions are lower than 50 grams per kilometre. The overall policy aim is to achieve 15 000 to 20 000 electric cars in 2015 and 1 million by 2025.
No measures promoting **modal shift** are reported, but in general, transport networks for bicycles as well as the public transport system are considered to be well developed.

Fluorinated gases (F-gases)
The Netherlands aims to reduce nitrous oxide gas emissions through the EU ETS. The government realised an opt-in for nitrous dioxide from industrial processes into the ETS. Furthermore, hydrofluorocarbons shall further be reduced by promoting afterburner systems.

Agriculture
The Covenant Clean and Efficient Agrosectors contains concrete actions to reduce CO_2 emissions by 3.5 to 4.5 Mt per year until 2020 for the sectors of agriculture, horticultural field crops and livestock. Facilitated by research and innovation programmes, as well as by the financial support, companies in the field of greenhouse horticulture are stimulated to exchange best practices and expertise and innovation in the field of innovative energy systems, energy efficiency and the use of renewable energies. Here, the Market Introduction of Energy Innovation (MEI) programme offers a 40 % subsidy for investments in innovative energy systems contributing to a reduction of CO_2 emissions and energy consumption. The Investment Subsidy in Energy Savings (IRE) programme offers an investment subsidy of up to 25 % of eligible investment costs. For 2013, the budget for MEI is EUR 9 million and for IRE it is EUR 2.225 million.

Waste
The Netherlands' policy on waste management focuses firstly on prevention, secondly on reuse and thirdly on incineration with energy recovery. As a result, the amount of landfilled waste has been reduced substantially. Between 1990 and 2012 the rate of waste reuse (including recycling and the use of waste for energy production) increased from an already high level of 60 % to almost 88 % of the total amount. The majority of the residual comes from residential waste, followed by office waste. Most industrial waste, almost all demolition waste, almost all agricultural waste and almost all waste from coal-fired power plants are being fully recycled (I&M, 2013). Additionally, on 22 November 2013 the national Chain Agreement for Recycled Plastic was signed. The main aim of the Agreement is to close the plastic recycling loop and get rid of visible waste in waters within the upcoming 2 years.

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Key climate- and energy-related data — Poland

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	398.8	405.7	399.3	396.0	4 544.2
GHG per capita (t CO_2-eq./cap.)	10.4	10.5	10.4	10.3	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	907	644	605	587	350
Share of GHG emissions in total EU-28 emissions (%)	7.7 %	8.8 %	8.8 %	8.9 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	203.1	203.0	196.6	205.7	1 848.6
Share of EU ETS emissions in total emissions (%)	51 %	50 %	49 %	52 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 14.5 %	– 2.0 %	– 7.7 %	n.a.	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	12.2 %	20.3 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	179.6	191.5	191.5	190.2	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(7.0 %)	(9.3 %)	10.4 %	11.0 %	14.1 %
Share of renewable energy for electricity (%)	2.6 %	6.6 %	8.2 %	10.7 %	23.5 %
Share of renewable energy for heating and cooling (%)	10.4 %	11.9 %	13.4 %	13.7 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(1.0 %)	(6.3 %)	6.5 %	6.1 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	88.0	96.0	96.3	93.3	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	2.3	2.5	2.5	2.4	3.1
Final energy consumption (Mtoe)	58.3	66.3	63.9	63.6	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.5	1.7	1.7	1.7	2.2
Efficiency of conventional thermal electricity and heat production (%)	47.4 %	47.1 %	46.0 %	46.7 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.47	1.47	1.51	1.48	1.42
Space heating and cooling (toe/dwelling)	1.01	1.02	1.03	1.04	0.96
Water heating (toe/dwelling)	n.a.	n.a.	n.a.	n.a.	0.18
Cooking (toe/dwelling)	n.a.	n.a.	n.a.	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	n.a.	n.a.	n.a.	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 9.1 %	2020 ESD target (% vs base year)	+ 14.0 %
2013 ESD emissions (% vs base year)	+ 11.5 %	2020 ESD projections WEM (% vs base year)	+ 4.1 %
		2020 ESD projections WAM (% vs base year)	+ 4.1 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be above the annual ESD target in 2013. Projections indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

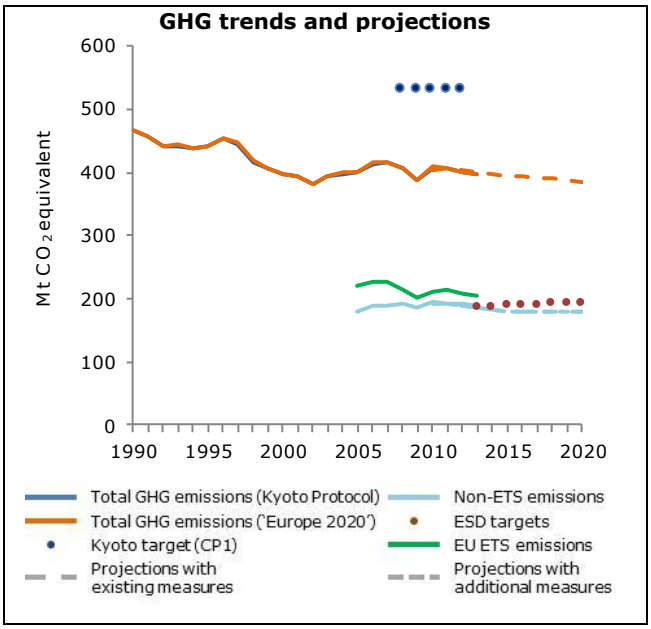
2012 RES share in gross final energy consumption (%)	11.0 %	2011–2012 indicative share from RES Directive (%)	8.8 %
2020 RES target	15.0 %	2012 expected share from NREAP (%)	10.6 %

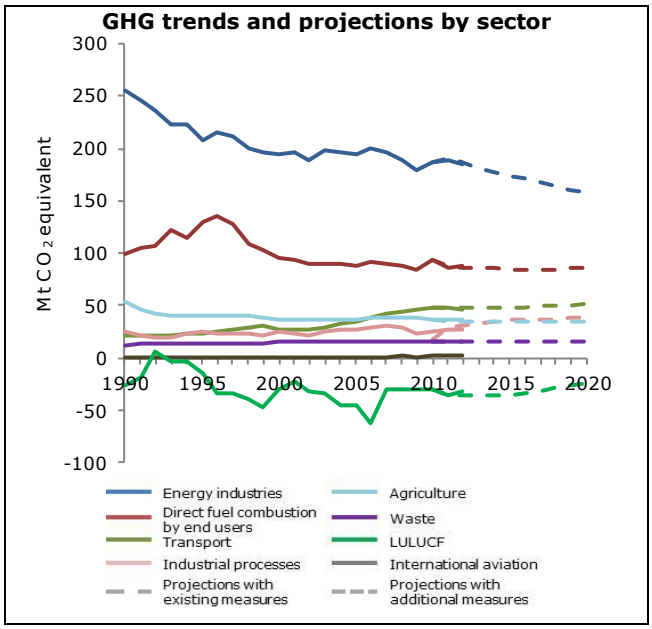
The average share of renewable sources in gross final energy consumption for 2011–2012 was 10.7% (7.2 Mtoe), which is higher than the indicative RED target for 2011–2012 (8.8%). At the same time, the share of renewables in 2012 (11.0 %) is higher than the expected 2012 NREAP target (10.6 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 8.4%. In order to reach its 2020 NREAP target, Poland needs an average annual growth rate of 4.8% in the run-up to 2020. In absolute terms, this is equivalent to 1.1 time its cumulative effort so far.

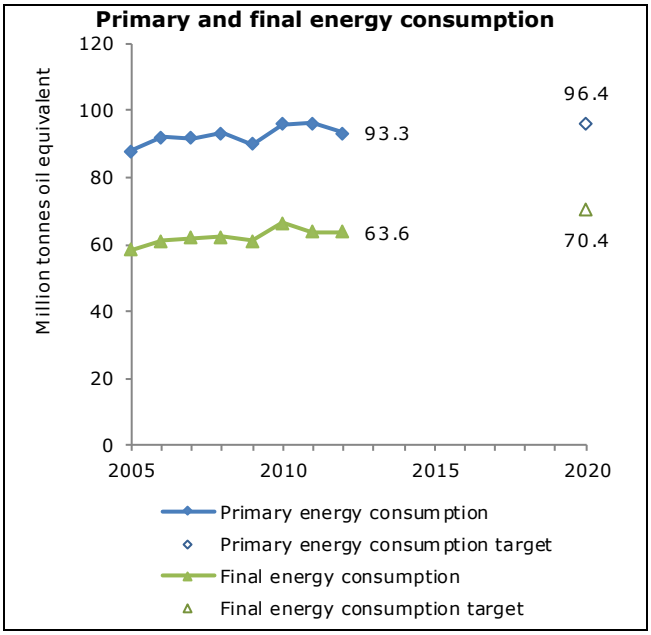
Progress towards energy efficiency targets

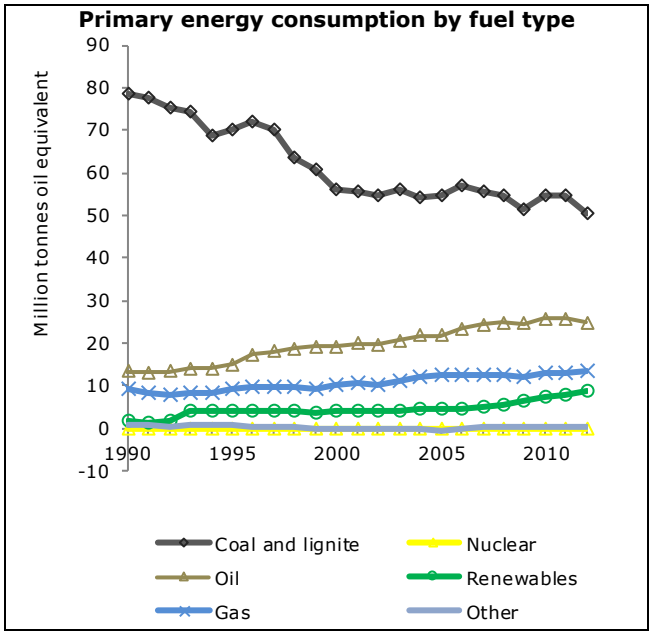
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	0.8 %	2005–2012 average annual change	1.3 %
2012–2020 average annual change to target	0.4 %	2012–2020 average annual change to target	1.3 %

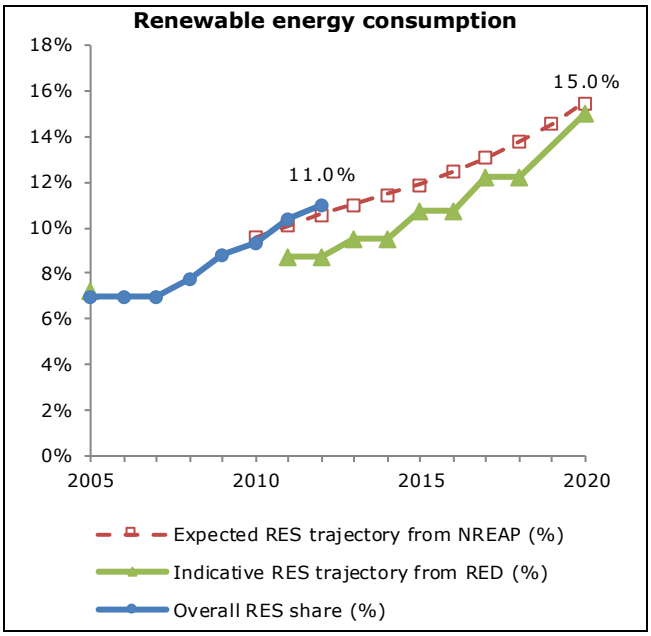
Between 2005 and 2012, primary energy consumption grew at a faster pace than is 'allowed' to achieve the 2020 target. Tackling distribution losses (which grew by 46 % between 2008 and 2012) , could contribute to further limiting the increase in primary energy consumption. The average increase in final energy is close to the linear target path. Particular attention could therefore be paid in limiting energy use in the transport and the residential sectors.

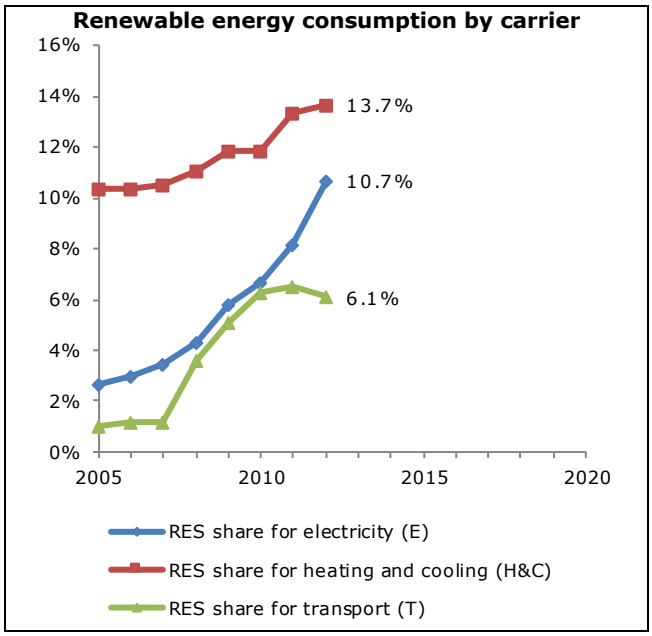

GHG trends and projections
Mt CO2 equivalent
600
500
400
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
300
250
200
150
100
50
0
-50
-100
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
120
100
80
60
40
20
0
2005
2010
2015
2020
93.3
63.6
96.4
70.4
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
90
80
70
60
50
40
30
20
10
0
-10
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
15.0%
11.0%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
13.7%
10.7%
6.1%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
The Polish economy is very energy intensive and ranks seventh from the bottom among EU Member States. Poland aims at increasing efficiency in energy generation and is currently renewing its aged (mainly coal-fired) power plants (60 % older than 30 years); 18 GW of additional generating capacity are being planned or built. This will mainly be coal and gas plants, with renewables playing an insignificant role, also because the support system delivers few investment incentives. The dependence on coal results in rather high greenhouse gas (GHG) emissions from electricity generation, which need to be reduced substantially by 2050. Shifting to renewables would also help to reduce dependence on energy imports from Russia — a priority of Polish energy policy — and generate local employment and revenues. In addition, large energy savings could be realised in the building sector, where energy for heating could be reduced by more than 80 % (3CSEP, 2012). The socio-economic benefits of a large building renovation programme realising these reductions is expected to result in an additional 250 000 jobs by 2020, substantial improvements in air quality, and reduction of energy poverty and energy dependency.
In the transport sector, emissions have grown considerably over the last decade, energy intensity has increased besides a general downward trend in the EU, and newly registered vehicles are less emission-efficient than the EU average. Taxation on the transport sector is rather limited in Poland, having the lowest vehicle ownership tax in the EU, with private cars being an exception; overall taxation of fuels is very low, creating only a minor incentive to use fuel-efficient cars. Higher taxes on fuels and emissions-based vehicle ownership taxation could on the one hand tackle transport GHG emissions and on the other help to shift taxation from labour to consumption. By 2025, the health and environmental benefits from an environmental tax reform could amount to 0.55 % of gross domestic product in Poland (Hogg et al., 2014).

Climate and energy strategies
Poland is one of a few countries that refer to sustainable development in their constitutions (Art. 5) and low-carbon and efficient development is mentioned in the Medium-Term (up to 2020) and the Long-Term National Development Strategy 2030. The second document specifically recognises the need for an improvement of environmental conditions and eliminating the risks of climate change. However, the 'Polish Climate Policy Strategies until 2020', published in 2003, has little relevance to the current policy situation since it has not been updated; however, Poland has joined the European Union and new EU directives were developed in the meantime.
Polish energy policy focuses on a secure, affordable and diversified energy supply as outlined in the 'Polish Energy Policy until 2030' published in 2009 or in the recently published Strategy for Energy Security and the Environment up to 2020. Security of fuels and energy supplies is a priority of national energy policy and one of the reasons for the Polish government's strong support for its coal industry, new nuclear power plants and exploration of shale gas resources.

Renewable energy
Renewable energies play a minor role in Poland both in electricity and heat generation. The main support mechanism — besides an exemption from the consumption tax levied on the sale of electricity to end users and their consumption — is a quota system (the principle of non-discrimination applies to grid access and transmission of renewable electricity has priority). The system obliges energy companies selling electricity to final consumers to obtain a certain number of 'green certificates' from renewable electricity producers. However, oversupply of certificates mainly caused by power plants co-firing biomass and faster growth (than expected in the National Renewable Energy Action Plan (NREAP)) of wind power capacities resulted in lower prices and thus lower incentives to invest into new renewable capacities. Nevertheless, strong growth of new installations was observed in 2013 — 1 095 MW (mainly wind units). A new draft presented in November 2013 envisions a support scheme based on tendering. The tendering scheme will be divided in two categories, depending on the capacity of the plant (40 kW to 1 MW and > 1 MW). The winner of the tender is the entity that pledges to deliver a specified quantity of electricity at the lowest price. This price represents the guaranteed feed-in tariff (for installation 40 kW to 0.5 MW) or feed-in premium (for installation > 0.5 MW) for 15 years. The operators of existing installations (except of biomass with over 50 MW and plants co-firing biomass) would be able to choose if they want to receive support in form of the green certificates (as currently) or through the new tendering scheme (special auctions will be organised for existing units) (MG, 2013a).
Renewables in heating and cooling are supported through a number of subsidy schemes. The National Fund for Environmental Protection and Water Management (NFOSiGW) provides: grants equal to 45 % of a loan for the purchase and installation of solar thermal heating systems on residential buildings; soft loans for 30–75 % of the total investment costs for commercial entities depending on the type of technology; and grants (20–40 % of investment cost) and soft loans (covering 100 % of investment costs) for municipalities willing to invest in micro installations for renewable electricity and combined heat and power generation.
Under the Thermo-Modernisation scheme the state-owned bank Gospodarstwa Krajowego provides grants equal to 20 % of a loan for refurbishment work, including the installation of renewable heating systems.

Energy networks
The European Commission recommended to 'speed up and extend the development of the electricity grid […]' (COM, 2013). The legislative proposals on transmission corridors regulating linear investments in the transmission of, inter alia, electricity and natural gas are being prepared. The proposals aim to further simplify procedures and help settle existing conflicts related to transmission. In addition, the European Commission confirmed in February 2014 the award of more than PLN 120 million (approximately EUR 28.9 million) from the

Infrastructure and Environment Programme for the construction of the power station Siedlce Ujrzanów and power lines Miłosna to Siedlce Ujrzanów. The project is part of the grid interconnection activities between Lithuania and Poland aiming at closing the so-called Baltic ring.

Energy efficiency
Poland has no long-term energy efficiency strategy outlining specific targets, although improving energy efficiency is the first priority of Poland's Energy Policy until 2030, with two specific aims: to make efforts to achieve development of Polish economy without increasing primary energy demand, and to decrease the energy intensity of Polish economy to the EU-15 level (in 2005). Energy **taxation** is rather low with the level of excise duties being below the EU average. In addition, there are exemptions for energy-intensive businesses using coal for heating and for coal-using companies covered under the EU Emissions Trading System (ETS). Poland has no carbon dioxide (CO_2) tax. The indicative target included in the Energy Efficiency Act is to achieve energy savings representing 9 % of the annual final energy consumtion from the period 2001–2005 by 2016. The energy efficiency target for 2016 is equal to 4.5 Mtoe in the sectors not covered by the EU-ETS.
The main instrument to support energy efficiency is an **obligation** imposed on energy entities in a form of a 'white certificates' scheme. The certificates are granted for energy-efficient investments, such as modernisation of local heating grids and heat sources, buildings, lighting, household appliances, as well as energy recovery and modernisation of industrial devices and installations. Companies selling electricity, natural gas and heat to final consumers are obliged to obtain a certain number of white certificates depending on the energy sold to final consumers.
The quota system for renewable energy is very similar to the quota system which promotes the use of **combined heat and power**. 'Red and yellow certificates' are issued for electricity produced from cogeneration depending on the capacity and fuel. There are specific minimum quotas for green, red and yellow certificates.
Energy efficiency in **industry** is promoted through financial incentives for energy auditing and the implementation of energy management systems. The NFOSiGW will allocate more than PLN 340 million (approximately EUR 81.6 million) in the form of grants and loans to energy-intensive enterprises for increasing energy efficiency, performing energy auditing and using industrial waste for energy generation (including sewage sludge) (Ministerstwo Środowiska, 2014).
In the **building sector**, a national action plan aimed at increasing the number of nearly-zero–energy buildings is under development. More stringent rules for minimum energy performance standards for new buildings and those undergoing major renovation are in force since January 2014. In addition, on 29 August 2014 a new law on energy building performance was adopted by the Parliament, which introduces the obligation to receive Energy Performance Certificates for new buildings sold or rented. Financial support is mainly provided by the NFOSiGW, which offers grants and low-interest loans for investments in energy efficiency. The overall budget from 2013–2018 amounts to PLN 300 million (approximately EUR 71.72 million) and should lead to energy savings of 93 500 MWh per year and avoided CO_2 emissions of 32 300 tonnes per year (NFOSiGW, 2013).

Transport
Incentives for efficient driving and the purchasing of efficient cars are rather limited in Poland. There is no registration tax and no ownership tax applies to private cars. A local tax applies only to commercial vehicles depending on weight and number of axles. Taxes on diesel and petrol are well below the EU average. The main measures related to the reduction of GHG emissions in transport include support for biofuels and lower-carbon fuels, such as natural gas. This includes tax relief for liquid petroleum gas and biocomponents and promotional prices of gaseous fuels as well as the obligation to increase the share of biocomponents in transport fuels. In addition, the Council of Ministers also adopted a draft bill amending the Law on the system for monitoring and controlling the quality of fuels, which introduces a 6 % reduction target for GHG emissions from fuel and electricity consumed in transport by 2020 compared to 2010. Entities selling or using liquid fuels or electricity used in vehicles have to submit monitoring reports showing they comply with the obligation (MG, 2013b).
In the rail transport sector, the government works at implementing a more efficient and safe rail traffic management system and invests in the modernisation of rail vehicles and infrastructure and electrification of systems.
Policies to increase the share of public transport are currently limited to attempts to raise public awareness (e.g. through one-off, high-profile events such as European Car Free Day or Day of Public Transport) and increasing attractiveness, for example through integrated tickets on designated routes, tickets zone, park and ride, and promotions such as family rides during summer and winter holidays and free transportation of bikes during spring and summer.

Agriculture
Existing measures include a limitation on natural fertiliser use, promotion of organic farming and the ordinance regulating agri-environmental measures that was amended on 12 March 2012. Farmers who voluntarily commit to environmental objectives, including ecosystem preservation, promotion of sustainable management, water conservation and protection of endangered local breeds of livestock and local crop varieties, can apply for funding. In addition, the use of biomass waste, slurry and manure for energy generation is promoted. In particular, the Council of Ministers decided on the 'directions of development of agricultural biogas plants in Poland'. The objective is to have at least one biogas plant in each town by 2020 that should be facilitated by optimising legal and administrative proceedings and using co-financing options from national and EU funds.

Waste
The National Waste Management Plan outlines the objectives for integrated waste management. The Act on Waste includes general waste management rules and rules on organic wastes going to landfills (transposing the EU Directive on landfilling). As partner of the Global Methane Initiative, Poland implements projects to reduce methane emissions from landfills. On 1 July 2013, the law on waste management entered into force, defining amongst others the responsibility for waste collection and segregation at the municipal level (MOS, 2013). For

specific wastes, there are additional acts such as the act on the recycling of end-of-life vehicles, and the act on electrical and electronic equipment.

Land use, land-use change and forestry
In Poland, the Rural Development Programme and the Act on Forests and related national programme to increase forest cover (KPZL) outline forest protection, afforestation and use for increasing carbon sequestration and the production of woody biomass. By 2020, forest cover should increase to 30 % and by 2050 to 33 % based on the afforestation of non-agricultural and agricultural land.

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Key climate- and energy-related data — Portugal

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	87.7	69.3	68.8	67.0	4 544.2
GHG per capita (t CO_2-eq./cap.)	8.4	6.6	6.5	6.4	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	465	338	335	329	350
Share of GHG emissions in total EU-28 emissions (%)	1.7 %	1.5 %	1.5 %	1.5 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	36.4	25.0	25.2	24.6	1 848.6
Share of EU ETS emissions in total emissions (%)	41.5 %	36.1 %	36.7 %	36.8 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 1.3 %	– 24.2 %	– 23.4 %	– 19.0 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	12.0 %	26.1 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	49.5	43.4	42.6	42.0	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			24.5 %	24.6 %	14.1 %
() = including all biofuels consumed in transport	(19.5 %)	(24.2 %)			
Share of renewable energy for electricity (%)	27.7 %	40.7 %	45.9 %	47.6 %	23.5 %
Share of renewable energy for heating and cooling (%)	31.8 %	33.7 %	35.0 %	33.0 %	15.6 %
Share of renewable energy for transport (%)			0.4 %	0.4 %	5.1 %
() = including all biofuels consumed (%)	(0.2 %)	(5.6 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	24.9	22.6	21.9	20.9	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	2.4	2.1	2.1	2.0	3.1
Final energy consumption (Mtoe)	19.0	18.1	17.3	16.2	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.8	1.7	1.6	1.5	2.2
Efficiency of conventional thermal electricity and heat production (%)	47.3 %	50.6 %	49.6 %	48.2 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	0.80	0.83	0.72	n.a.	1.42
Space heating and cooling (toe/dwelling)	0.18	0.21	0.14	n.a.	0.96
Water heating (toe/dwelling)	0.15	0.14	0.14	n.a.	0.18
Cooking (toe/dwelling)	0.34	0.33	0.29	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.13	0.14	0.15	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 2.8 %	2020 ESD target (% vs base year)	+ 1.0 %
2013 ESD emissions (% vs base year)	– 12.4 %	2020 ESD projections WEM (% vs base year)	– 30.7 %
		2020 ESD projections WAM (% vs base year)	n.a.

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

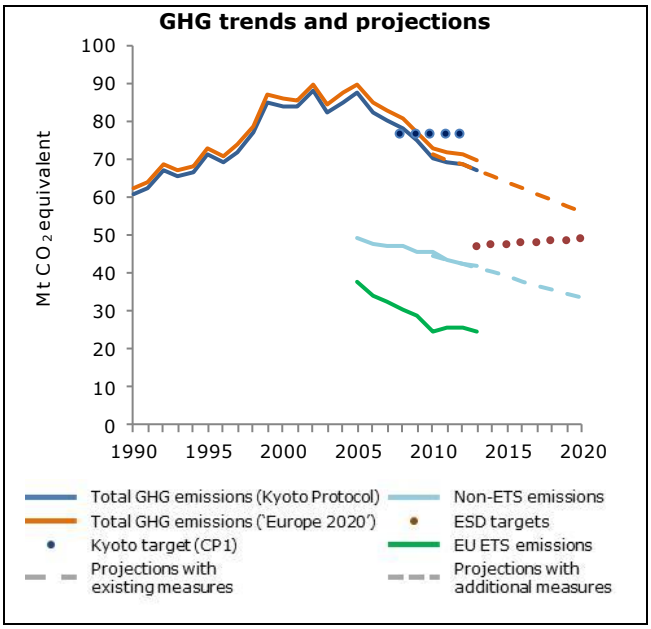
2012 RES share in gross final energy consumption (%)	24.6 %	2011–2012 indicative share from RES Directive (%)	22.6 %
2020 RES target	31.0 %	2012 expected share from NREAP (%)	26.9 %

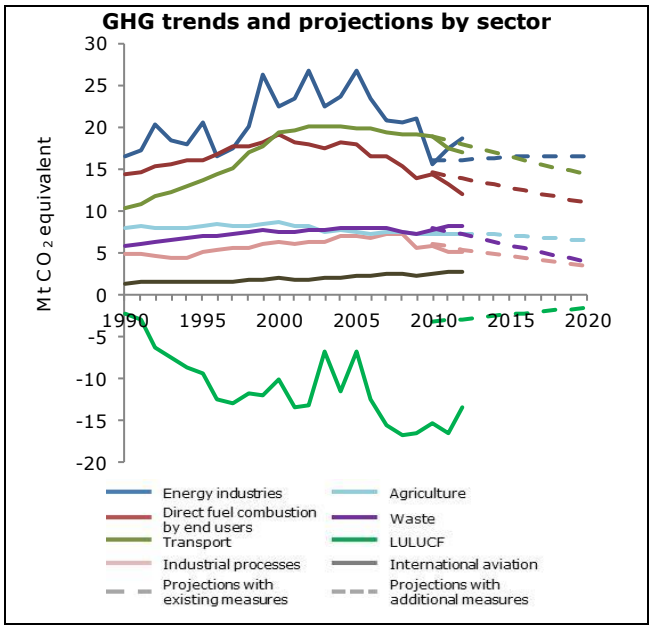
The average share of renewable sources in gross final energy consumption for 2011–2012 was 24.6% (4.2 Mtoe), which is higher than the indicative RED target for 2011–2012 (22.6%). At the same time, the share of renewables in 2012 (24.6 %) is lower than the expected 2012 NREAP target (26.9 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 1.0%. In order to reach its 2020 NREAP target, Portugal needs an average annual growth rate of 5.1% in the run-up to 2020. In absolute terms, this is equivalent to 7.3 times its cumulative effort so far.

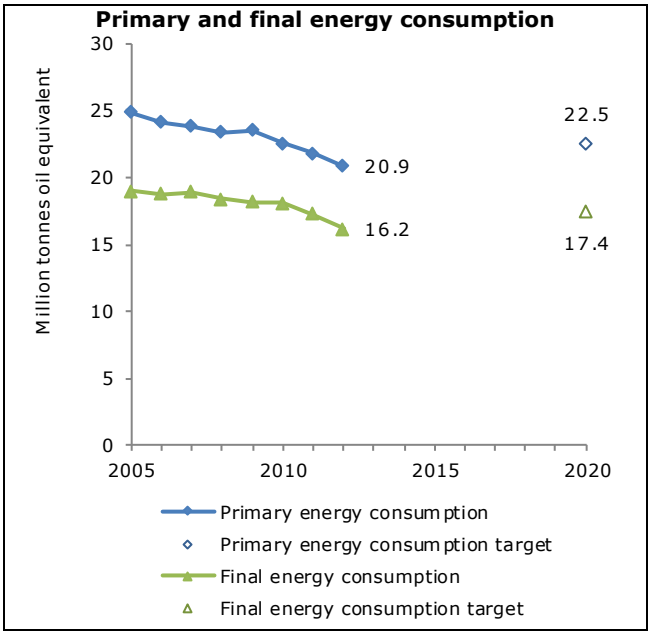
Progress towards energy efficiency targets

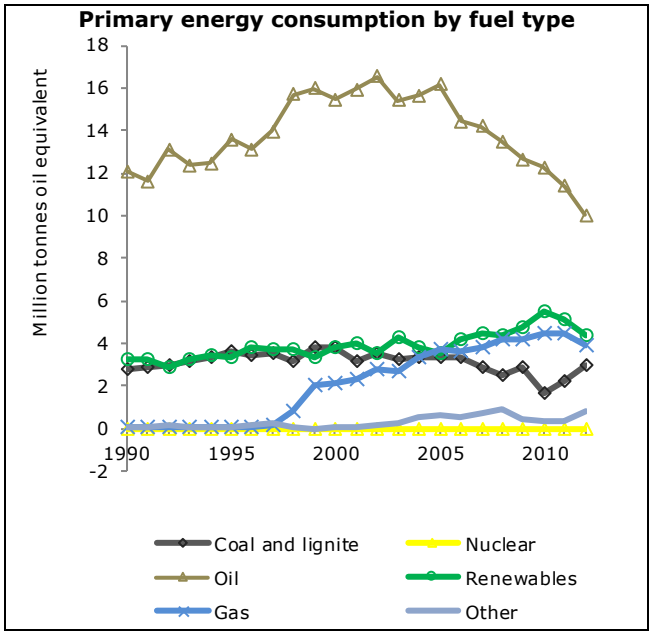
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 2.5 %	2005–2012 average annual change	– 2.3 %
2012–2020 average annual change to target	+ 0.9 %	2012–2020 average annual change to target	+ 0.9 %

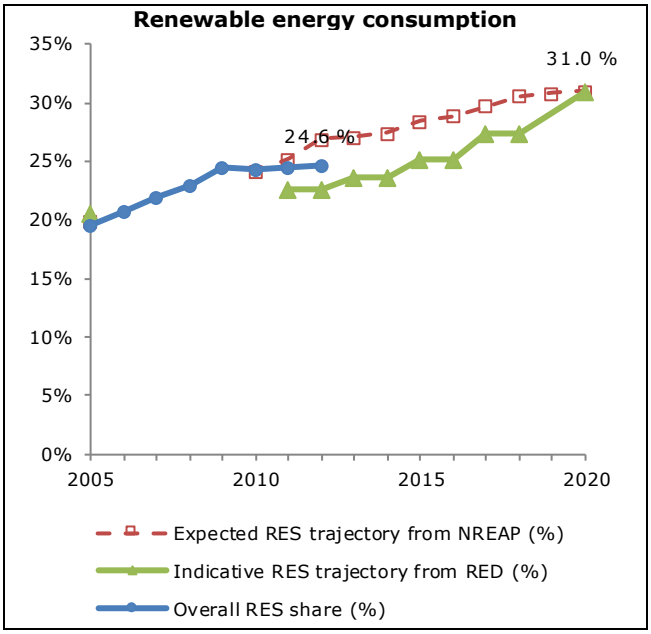
Between 2005 and 2012, primary and final energy consumption decreased at faster paces than is necessary to meet the 2020 targets. Despite the important role played by the economic crisis in this result, energy efficiency policies also contributed to these decreases. For example, the measures addressing for the building sector contributed to the reductions in energy consumption in the recent years. Portugal can focus on stabilising its energy consumption. Reducing distribution losses (which increased by 9.3 % between 2005 and 2012) and improving conversion efficiency (consumption of solid fuels increased by 77 % since 2010) could contribute to further reducing primary energy consumption.

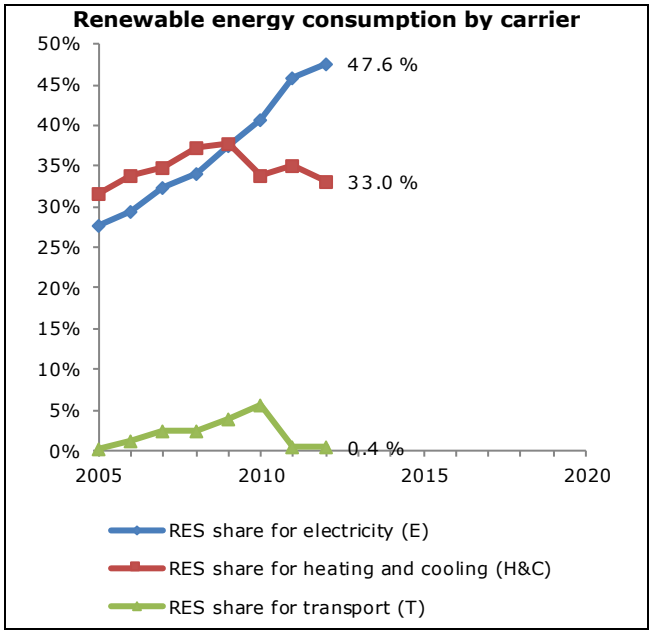

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
20.9
16.2
22.5
17.4
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
31.0 %
24.6 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
47.6 %
33.0 %
0.4 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Portugal's economic situation remains a challenge also for climate and energy-related matters. With regard to progress in implementing climate and energy policies, Portugal has experienced some delays. The review of the National Programme for Climate Change (PNAC) for the period 2013–2020 is still being developed. Changes to the renewable energy source's (RES) regulatory framework have destabilised the investment environment. The renewable energy and energy efficiency sectors still entail potential opportunities. Studies found that a low-carbon pathway could create a large number of additional green jobs. Portugal's National Energy Strategy for 2020 (ENE 2020), for example, which promotes RES and energy efficiency among other things, could create more than 120 000 additional jobs (OECD, 2012) while measures set out in Portugal's National Action Plan for Renewable Energy (PNAER) 2020 could lead to approximately 70 000 additional jobs (RCM 20/2013).
The Portuguese transport sector continues to be a challenging issue given that the sector is the single largest contributor to greenhouse gas (GHG) emissions in the country. While some attempts have been made to tackle emissions and progress has been made in some respects, Portugal has so far not implemented a comprehensive strategy addressing the issue. Higher taxes on fuels could tackle transport GHG emissions and at the same time help to shift taxation from labour to consumption.

Climate and energy strategies
Portugal has a number of major climate and energy strategies in place, such as the National Low Carbon Roadmap 2050 (APA, 2012), the PNAC, which still needs to be reviewed, and the Sectoral Low Carbon Plans. Portugal's main focus is on developing a low-carbon economy, increasing energy efficiency, liberalising energy markets to make them more competitive, improving the quality of public transport, reducing the dependence on fossil fuels by diversifying primary energy sources and meeting its GHG reduction targets (Governo de Portugal, 2011). Furthermore, Portugal has implemented the ENE 2020, which aims to increase electricity from RES.

Renewable energy
In Portugal, renewables play an important role, in particular in the electricity sector. Due to the increased renewable energy capacity, Portugal yielded savings amounting to approximately EUR 846 million through a EUR 806 million saving on imports of fossil fuels (natural gas and coal) and a EUR 40 million saving in CO_2 emission allowances.
Portugal's PNAER 2020 has been reviewed in 2013. One focus of the revision was to create additional jobs. The main support measure for renewable electricity has been a feed-in tariff (FIT). The system is, however, under review and might be changed to a market regime. Since 2013, there is also an alternative remuneration regime for wind farms. In addition, Portugal has programmes aiming at replacing the use of coal through biomass combustion in thermal power plants and aiming to improve the capacity of wind farms to reduce GHG emissions.
Renewable heating is indirectly supported through the micro generation regime as electricity producers have to install 2 m^2 of solar thermal panels in order to receive the FIT.

Energy networks
The export of renewable electricity to countries outside the Iberian market is vital for the country. Therefore, Portugal is planning to increase the interconnection capacity with Spain by installing two lines (400 kV each) by 2016; however, the challenge remains the limited interconnection capacity between Spain and France.

Energy efficiency
The energy intensity of the economy is slightly below the EU average in Portugal. The ENE 2020 addresses, inter alia, the promotion of energy efficiency. Government policies proposed in the Portuguese National Climate Change Programme — such as MAe1 (Energy efficiency improvement in the electricity generation sector), Mae2 (Energy efficiency improvement in the energy supply systems, considering electricity generation from cogeneration) and Mae3 (Improvement in energy efficiency from the electricity demand side) — aim to improve energy efficiency.
Energy **taxation** is relatively low in comparison to other EU countries. Portugal had removed its reduced VAT rate on electricity and natural gas as part of its Economic Adjustment Programme in 2011, increasing it from 6 % to 23 % (normal rate). However, Bill 525/XII/3a and Bill 542/XII/3a propose a return to the reduced 6 % VAT rate for electricity. The bills are under discussion in the Assembly of the Republic. However, the government published on 30 April 2014 its Fiscal Strategy Document (Documento de Estratégia Orçamental (DEO)) for the period 2014–2018 and an increase of 0.25 % in the normal VAT rate was proposed.
Portugal is aiming to increase the share of electricity generation from **cogeneration**. Investment subsidies and specific tariffs for cogeneration have been implemented by Decree-Law 23/2010.
Energy-intensive **industries** are subject to the Energy Intensive Consumption Management System, which obliges them to reduce energy consumption. Financial support is provided by the Portuguese Energy Efficiency Fund (Fundo de Eficiência Energética (FEE)), which launched new calls to encourage energy efficiency among others in the industry sector in early 2014. The call 'Encouraging the Promotion of Energy Efficiency 2014' addresses measures in industry aiming at the installation of insulation systems, conduction of energy audits and implementation of consumption management equipment.
In the **building sector**, relevant instruments to increase energy efficiency are the Regulation for the Characteristics of the Thermal Behaviour of Buildings, which regulates energy use and efficiency requirements for new residential and small office buildings, and the Regulation on Heating, Cooling and Air Conditioning,

which sets out minimum energy performance requirements. It is expected that the regulations will increase the energy efficiency of buildings by 40 % by 2020. Financial support is provided by the Efficient Building 2012 programme.

Transport
The transport sector is the greatest sectoral contributor to emissions mainly due to an increased number of private cars and road freight transport. Incentives for efficient driving and the purchasing of efficient cars include a registration tax and ownership taxes that are based on engine volume and CO_2 emissions. The State Budget for 2014 increased the Single Circulation Tax. The taxes now range from EUR 57.76 for vehicles with CO_2 emissions up to 120 g/km to EUR 321.99 for vehicles with CO_2 emissions with more than 250 g/km. Portugal has distance-based road tolls that are, however, currently rather low compared to other EU Member States. Diesel and petrol are taxed at around EU average (European Commission, 2013) and a gradual tax harmonisation is foreseen for diesel fuel. Within the Auto Oil Programme, voluntary agreements have been concluded with the car manufacturing associations to reduce the carbon intensity of light passenger vehicles (EEA, 2013). Portugal had an end-of-life vehicle disposal incentive programme that ended in 2010 and an incentive for the demolition of old cars for acquiring an electric car that was cancelled in 2011. The Council of Ministers agreed in April 2014 to amend the legal framework of electric mobility to liberalise the public network of charging stations, introduce competition in the sector and facilitate the integration of charging points in private areas to further promote the use of electric vehicles. The government might also introduce tax benefits when buying an electric vehicle. Renewables in transport are promoted through tax exemptions for small producers of biofuels.
Portugal is also investing in the expansion and new building of metro networks in Lisbon and Porto and promoting the use of public transport, aiming to replace 5 % of conventional transport through public transport.

Agriculture
Emissions from the agricultural sector have decreased in Portugal since 1990 mainly due to reduced livestock and a generally decreasing agricultural activity. The main climate-related measures are the promotion of carbon sequestration in agricultural soil and the promotion of treatment and energy recovery of livestock waste (UNFCCC, 2012). Furthermore, agriculture is addressed by the national energy efficiency plan, which funds programmes also in the agricultural sector.

Waste
In March 2014, the Portuguese Environment Agency released a draft version of the Strategic Plan for Urban Solid Waste (PERSU 2020). The Plan needs to be discussed with the involved entities and will subsequently be open for public approval. The Plan's focus is to review the Plan for the Prevention of Urban Waste (Plano de Prevenção dos Resíduos Urbanos (PPRU)), achieve a target of 70 % of recycling of packaging waste by 2020, reduce the amount of biodegradable municipal waste sent to landfills and increase the annual per capita recycling rate. Furthermore, Portugal has implemented the Directive on packaging and packaging waste (2004/12/CE) with the Decree-Law 366-A/97.

Land use, land-use change and forestry
Portugal has adopted a Programme for the Sustainable Development of Portuguese Forests (adopted by RCM 27/99) to reduce GHG emissions. The Programme entails incentives for new tree plantations and provides financial support. In addition, Portugal intends to promote the forests' carbon sink capacity by improving forest management in general (EEA, 2013).

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Key climate- and energy-related data — Romania

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	141.3	121.5	118.8	107.7	4 544.2
GHG per capita (t CO_2-eq./cap.)	6.6	6.0	5.9	5.4	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	833	468	437	380	350
Share of GHG emissions in total EU-28 emissions (%)	2.7 %	2.6 %	2.6 %	2.4 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	0.0	51.2	47.9	42.4	1 848.6
Share of EU ETS emissions in total emissions (%)	0.0 %	42.2 %	40.3 %	39.4 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	n.a.	– 31.5 %	– 36.9 %	n.a.	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	n.a.	8.7 %	28.3 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	63.8	62.5	63.3	65.2	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			21.2 %	22.9 %	14.1 %
() = including all biofuels consumed in transport	(17.6 %)	(23.2 %)			
Share of renewable energy for electricity (%)	28.8 %	30.4 %	31.1 %	33.6 %	23.5 %
Share of renewable energy for heating and cooling (%)	17.9 %	27.2 %	24.3 %	25.7 %	15.6 %
Share of renewable energy for transport (%)			2.0 %	4.1 %	5.1 %
() = including all biofuels consumed (%)	(1.0 %)	(3.1 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	36.7	34.3	34.8	33.6	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	1.7	1.7	1.7	1.7	3.1
Final energy consumption (Mtoe)	24.7	22.6	22.8	22.7	1 104.5
Final energy consumption per capita (Mtoe/cap.)	1.2	1.1	1.1	1.1	2.2
Efficiency of conventional thermal electricity and heat production (%)	54.4 %	53.1 %	49.7 %	50.2 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.11	1.13	1.11	n.a.	1.42
Space heating and cooling (toe/dwelling)	0.53	0.57	0.55	n.a.	0.96
Water heating (toe/dwelling)	0.15	0.13	0.13	n.a.	0.18
Cooking (toe/dwelling)	0.33	0.31	0.31	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.10	0.12	0.12	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 1.8 %	2020 ESD target (% vs base year)	+ 19.0 %
2013 ESD emissions (% vs base year)	– 7.0 %	2020 ESD projections WEM (% vs base year)	+ 7.4 %
		2020 ESD projections WAM (% vs base year)	+ 3.9 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

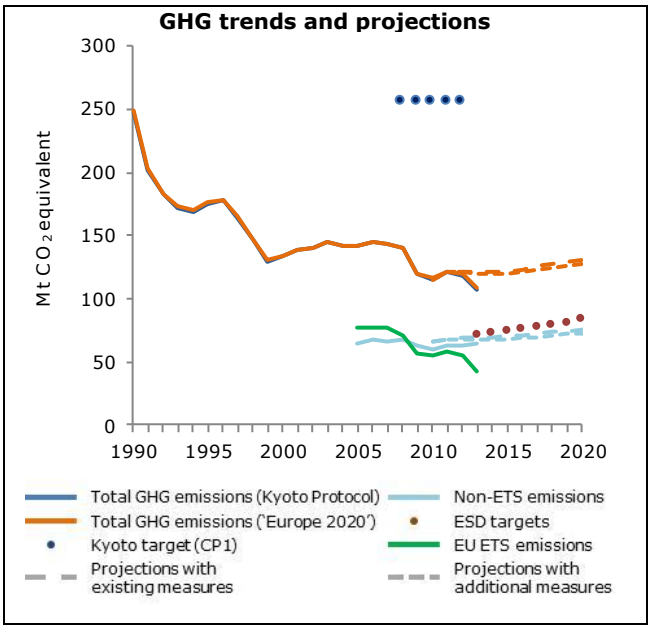
2012 RES share in gross final energy consumption (%)	22.9 %	2011–2012 indicative share from RES Directive (%)	19.0 %
2020 RES target	24.0 %	2012 expected share from NREAP (%)	19.0 %

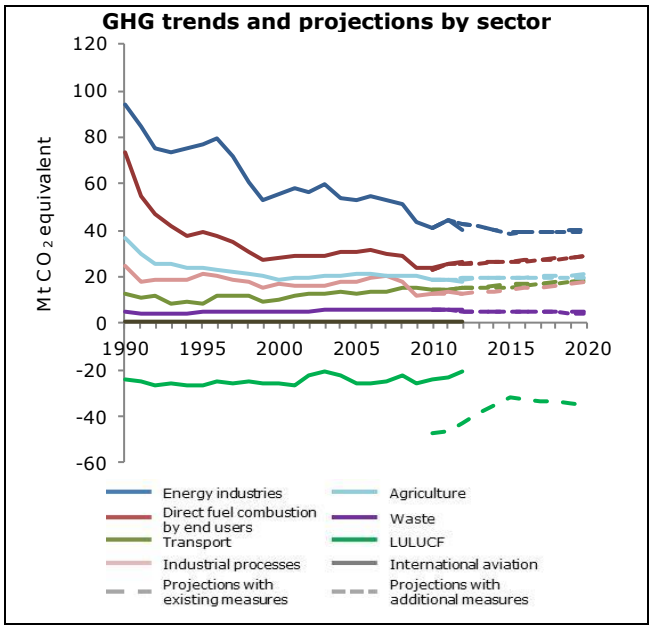
The average share of renewable sources in gross final energy consumption for 2011–2012 was 22.1% (5.4 Mtoe), which is higher than the indicative RED target for 2011–2012 (19.0%). At the same time, the share of renewables in 2012 (22.9 %) is higher than the expected 2012 NREAP target (19.0 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 2.8%. In order to reach its 2020 NREAP target, Romania needs an average annual growth rate of 3.4% in the run-up to 2020. In absolute terms, this is equivalent to 1.8 time its cumulative effort so far.

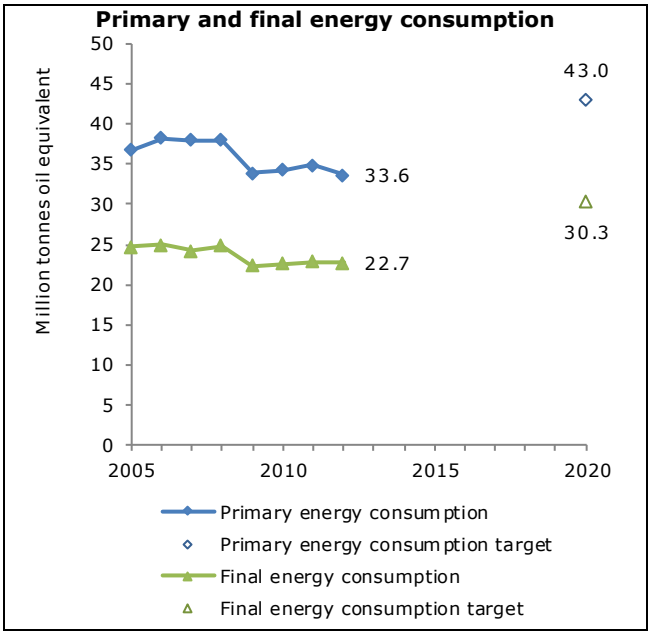
Progress towards energy efficiency targets

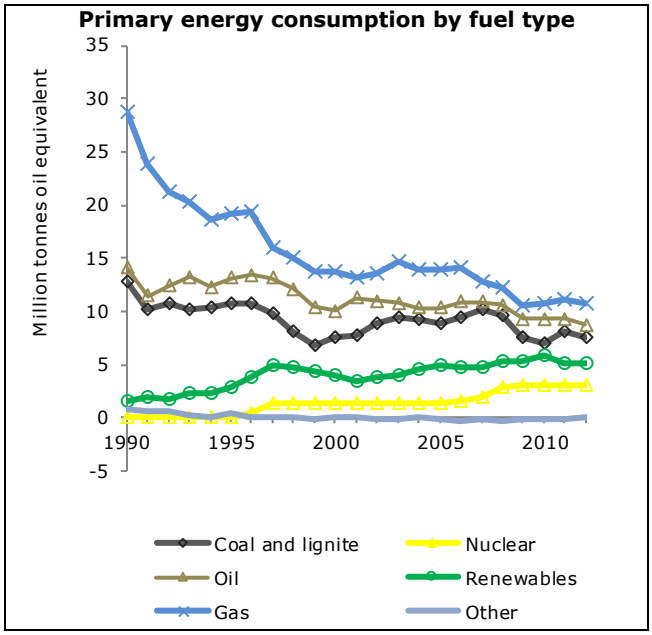
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 1.3 %	2005–2012 average annual change	– 1.2 %
2012–2020 average annual change to target	+ 3.1 %	2012–2020 average annual change to target	+ 3.7 %

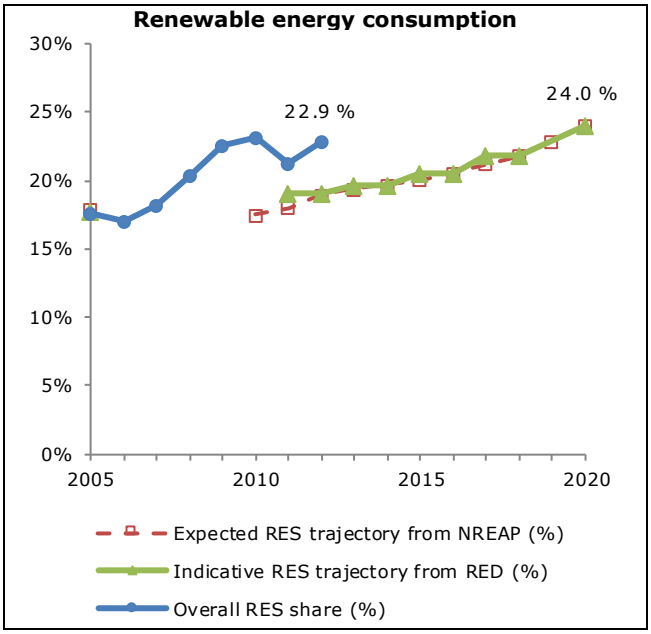
Between 2005 and 2012, primary and energy consumption decreased by more than 8 % respectively. These reductions were a combined result of improvements in energy efficiency, as well as the effects of the economic recession. Distribution losses decreased by 29 % between 2005 and 2012, while the consumption in the energy sector decreased by 36 % over the same period. Energy efficiency improvements also took place in the industry and the residential sectors. With positive 2020 energy consumption targets, compared to 2005, Romania can focus on stabilising or limiting the increase in energy consumption. This could be achieved, in particular, by improving the conversion efficiency of power plants (in particular those using solid fuels) and the energy efficiency in the transport and residential sectors.

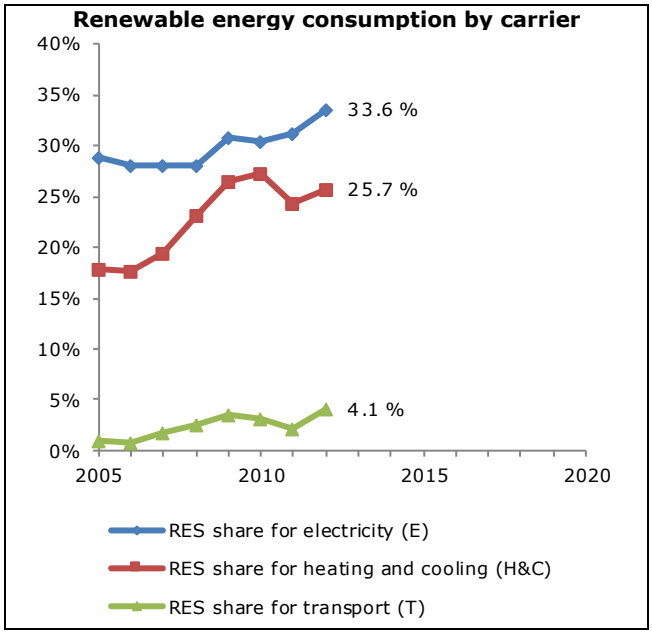

GHG trends and projections
Mt CO2 equivalent
300
250
200
150
100
50
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
120
100
80
60
40
20
0
-20
-40
-60
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
50
45
40
35
30
25
20
15
10
5
0
2005
2010
2015
2020
43.0
33.6
30.3
22.7
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
35
30
25
20
15
10
5
0
-5
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
22.9 %
24.0 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
40%
35%
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
33.6 %
25.7 %
4.1 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Romania has the third most energy-intensive economy in the EU. Improvements in the whole energy chain would reduce avoidable energy use and associated spending of final consumers. Investments in energy efficiency improvements in particular in the building sector — incentivised, for example, through reliable support programmes with stable and transparent financing conditions and application procedures — could stimulate the local construction and renovation sector and thus also local employment. For homeowners as well as for tenants, efficiency improvements would increase living quality and increased energy prices could be offset by reduced consumption.
In the transport sector, emissions have steadily increased since 1990. The main challenge is the high number of old and inefficient cars. The existing taxation framework with low taxation rates for the transport sector is not sufficiently incentivising the purchasing of efficient cars. A car substitution scheme with 20 000 vouchers has had little effect in the light of the 3.2 million registered vehicles that are older than 10 years — even if it were to be taking place every year. Additional fiscal incentives for using more efficient and environmentally friendly cars and targeted measures to encourage a switch to alternative means of transport could contribute to reducing greenhouse gas (GHG) emissions and local pollution. Currently, public transport and train services are rather unattractive and unreliable for the citizens, and alternative means of transport such as cycling (in particular) and car sharing are only utilised at very low levels compared to actual potentials. Making these transport means more attractive in cities and countrywide would contribute to diversifying the means of transport, thus reducing congestion and improving the cityscape while leading to GHG emissions and air pollutants reduction.

Climate and energy strategies
Romania adopted a Climate Change Strategy in July 2013 that addresses mitigation, adaptation and afforestation (MMediu, 2012). An Action Plan for Implementing the Romanian Climate Change Strategy is under development. In addition, the Romanian and British Ministers of the Environment signed a Joint Statement on Green Growth in December 2013 to identify best practices for creating green jobs, improving general conditions for low-carbon growth, and green business opportunities for British and Romanian companies (MMediu, 2014). The Romanian energy strategy for 2007 to 2020 highlights energy security, affordability and energy efficiency as being key criteria. A new strategy for 2014 to 2035 is underway, focusing on projection of energy supply and demand and the need for new power and grid capacities. In general, the focus of energy policy has shifted from the development of renewables to domestic shale gas resources. In mid-April 2013, the government ended the March 2012 moratorium on shale gas exploration and issued licences for exploration in the Dobrogea region (MMediu, 2013). However, this decision has been followed by public protests across the country. Nuclear power remains another important focus of attention in the country's energy policy.

Renewable energy
Romania generates renewable energy mainly from biomass for heating using traditional stoves and hydropower for electricity generation. The main support mechanism for renewable electricity is the Green Certificate Scheme: renewable electricity producers receive between 1 and 6 certificates per MWh for power plants accredited until 31 December 2013 and depending on the technology. For installations accredited after 1 January 2014, between 1 and 3 certificates are allocated. Producers can sell the certificates to electricity suppliers and producers that have to present a certain number of green certificates by the end of each trimester. The Scheme faced several cuts in 2013, including the postponing of the issuance of a share of certificates by several years and the reduction of the number of certificates for small hydro, wind power and photovoltaic installations. However, the planned annual cap on renewable capacity that can be accredited for benefiting from the Scheme in line with the Renewable Energy Action Plan was not introduced. The subsidy programme Renewable Energy RO06 – RONDINE, with a budget of RON 37.5 million (EUR 8.4 million), offers grants for the refitting of existing hydropower stations and initial investments and reengineering of geothermal power plants for thermal energy production.
Renewables in heating and cooling are supported through the Casa Verde Programme for installing heating systems using renewables for public institutions or private homes. Grants are allocated to new, replacing or complementing heating systems based on all kinds of renewable technologies. However, due to budgetary constraints, no call for applications was issued in 2013, and there is no final decision on a new call for applications in 2014 since project applications from the last call in 2011 are still under evaluation.

Energy networks
The energy infrastructure both for district heating and electricity is poorly maintained and transmission losses are quite high. In addition, the electricity network lacks connection capacities for renewables especially at the distribution network level. There is investment support of 40–50 % of eligible costs for improving networks' efficiency and increasing the electricity and gas network interconnections to neighbouring countries (SOP-IEC, Priority Axis 4) (Intermediary Agency for Energy, 2012). However, the last call ended in June 2013 and no new budget has been allocated since then. In addition, a gas pipeline between Romania and the Republic of Moldova was agreed in August 2013. The project's budget amounts to EUR 26.5 million, of which EUR 7 million is financed by the European Neighbourhood and Partnership Instrument (MDRT, 2013).

Energy efficiency
Romania aims to reduce its final energy intensity by 41 % between 2007 and 2020. The potential for primary energy savings is estimated at 27–35 % in 2020, with 20–25 % in industry, 40–50 % in buildings and 35–40 % in transport.

The level of energy **taxation** is the 2nd lowest in the EU and exemptions apply to electricity if it represents more than 50 % of the product cost and to energy products used by households and charity organisations. However, Romania is one of the few countries where excise duties are indexed to inflation, which has been agreed as part of the economic adjustment programme.
Combined heat and power is eligible for support through a bonus payment for electricity or by regulated prices for selling electricity and thermal energy. The cogeneration plants have to achieve fuel savings of at least 10 % compared to a separate production. On 1 January 2014 lower tariffs entered into force, regulated under Ordinance No. 77/2013.
For the **industrial sector**, the government proposed to reduce the purchasing obligation of green certificates for energy-intensive industrial consumers for 10 years if they commit to preserve jobs during this time and reduce their energy consumption by 20 % until 2020. The purchasing obligation is reduced by 85 %, 60 % or 40 % for companies with energy costs compared to overall costs of more than 20 %, and between 10 and 20 % and 5 and 10 %, respectively. **Small and medium-sized enterprises** (SMEs) can get support through a support programme funded by the Financing Mechanism of the European Economic Area with a budget of EUR 8 million, and from a credit line of EUR 10 million allocated by the UniCredit Tiriac Bank as part of the European Bank for Reconstruction and Development's (EBRD) Sustainable Energy Finance Facility (RoSEFF) supporting SMEs and housing associations to improve efficiency and introduce renewables.
In the **building** sector, minimum energy performance standards have been introduced and since July 2013 energy certification is also mandatory for a real estate that is sold or rented. The Programme for Refurbishment of Multi-Storey Family Buildings supports building refurbishment measures like thermal insulation of exterior walls, roof or ground floor, and replacement of windows and doors. Former budgets for 2010 and 2011 amounted to around RON 150 million (EUR 34 million).

Transport
Incentives for purchasing low-carbon and efficient cars include a vehicle registration tax based on carbon dioxide (CO_2) emissions, engine capacity, EURO emission standard and the vehicle's age, and an ownership tax based on engine capacity for passenger cars or weight for lorries (ACEA, 2012). For the replacement of cars older than 8 years, the Programme on Stimulating the Modernisation of the National Car Fleet offers vouchers of RON 6 500 (EUR 1 500). In total, 20 000 vouchers will be allocated in 2014 with a budget for 2014 amounting to RON 140 million (EUR 31.8 million). In addition, eligible parties may benefit from an eco-bonus of RON 500 (EUR 110) in case the purchased vehicle is a hybrid car, a EURO 6 emissions standard vehicle or emits less than 100 g/km CO_2 (MMediu, 2014e). Petrol and diesel are taxed at the lowest level in the EU (COM, 2013). A time-based vignette system for roads outside the cities is in place with tariffs being low compared to other Member States using national vignettes (CE Delft, 2012); however, the government proposed to increase road tariffs by 12.5–40 % depending on the validity period, which is still being debated by parliament (Gov, 2013a, 2013b). A blending quota applies to biofuels fulfilling specific sustainability criteria.
Over the next 5 years Romania wants to reduce the use of cars by 5 % (MMediu, 2014c). Measures improving public transport and shifting from road to rail include the rehabilitation of the railway line between Craiova and Calafat with a budget of around EUR 400 million provided by the European Cohesion Fund. Additional funds of around EUR 1 billion will be invested into modernising all harbours along the Danube River and at the Black Sea and into improving the interconnection between railways and harbours (Ministry of Transport, 2013). A governmental memorandum on 'measure to improve the efficiency of Romanian railway transportation for the General Romanian Transport Master Plan', approved by the government in June 2014, elaborates on the possibility to reconstruct shut-down railway lines for public transportation or bicycle lanes (adevarul.ro, 2014). In addition, a EUR 10 million cycling infrastructure project in Bucharest has been initiated in May 2014 financed from EU Emissions Trading System (ETS) revenues (MMediu, 2014b). However, by September 2014 concerns rose that the project might not be realised as no concrete steps have been taken to start the construction work (RL, 2014).

Agriculture
Romania wants to reduce its GHG emissions from agriculture through the improvement of quality of nutrition for cattle, sheep and goats as well as through the improvement of manure management. In addition, the European Economic Recovery Plan provides funds for priorities defined in the Health Balance of the Common Agricultural Policy (CAP) — i.e. for a more efficient use and better storage of nitrate fertilisers (NC6, 2014). The National Plan for Rural Development 2014–2020 focuses on modernising the agricultural sector, for example by utilising renewable energy sources, increasing the sector's productivity while decreasing the sector's environmental impacts, for example by promoting organic farming or other environmentally friendly agricultural practices (MADR, 2013a). Romania also provides grants for maintaining traditional means of stock breeding in disadvantaged regions according to Decision No. 898/2013 (MADR, 2013b).

Waste
The National Waste Management Strategy and the National Waste Management Action Plan were updated in 2013 and focus on enhanced waste prevention and recycling while strengthening the polluter-pays-principle (MMediu, 2014d). Existing measures include the take-back systems for waste from electrical and electronic waste, polyethylene terephthalate (PET) bottles and aluminium packaging. A voluntary agreement between the government, retailers and waste management enterprises on waste take-back systems aims to increase the collection of waste from sales packaging and transport packaging by 20 %, for example through automatic recycling machines set up in various supermarkets (MMediu, 2013).
The government furthermore aims to reduce organic waste going to landfills by increasing recycling and processing, and methane emissions from landfills should be captured and used as a source of energy. Landfills not fulfilling certain criteria will have to cease their activity by the end of 2017 (NC6, 2014; NRP, 2014). The first incineration plant will be built in Timisoara to produce electricity and heat from waste.

Land use, land-use change and forestry

The 2010 National Programme for Reforestation foresees the continuous re- and afforestation of 160 000 ha of degraded and agricultural land from 2012 to 2020 (MMediu, 2010). The National Forestry Agency (ROMSILVA) initiated various tree planting projects and campaigns on national and regional levels (ROMSILVA, 2013). Investments into forestry infrastructure are envisaged as part of the National Plan for Rural Development 2014–2020. In addition, the Romanian government fostered the maintenance of pastures by issuing Emergency Ordinance No. 34/2013 addressing the organisation, administration and exploitation of pastures. This Ordinance forbids construction and building on pasture land. Governmental Decision No. 470/2014 on the rules for the origin, the transportation and the marketing of wood mainly aims at addressing the increasing share of informal wood consumption and illegal wood extraction. The act introduces an electronic monitoring system for wood tracing all the way from its source of exploitation to the processing phase (Gov, 2014). Furthermore, the Ministry of Water, Forest and Fisheries presented various drafts for revising the Romanian Forest Code during 2013 and 2014. However, the legislative proposals have all been rejected by the Romanian parliament, most recently in June 2014. The Ministry intends to put the draft of the Forest Code to vote once again in autumn 2014 (AFR, 2014).

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Key climate- and energy-related data — Slovakia

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	50.3	44.7	42.7	42.7	4 544.2
GHG per capita (t CO_2-eq./cap.)	9.4	8.3	7.9	7.9	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	690	438	407	400	350
Share of GHG emissions in total EU-28 emissions (%)	1.0 %	1.0 %	0.9 %	1.0 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	25.2	22.2	20.9	21.8	1 848.6
Share of EU ETS emissions in total emissions (%)	50.2 %	49.7 %	49.0 %	51.2 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 17.2 %	– 31.9 %	– 37.4 %	– 32.3 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	5.0 %	5.7 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	21.0	20.3	19.6	20.8	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			10.3 %	10.4 %	14.1 %
() = including all biofuels consumed in transport	(5.5 %)	(9.0 %)			
Share of renewable energy for electricity (%)	11.6 %	17.8 %	19.3 %	20.1 %	23.5 %
Share of renewable energy for heating and cooling (%)	5.0 %	7.8 %	9.1 %	8.7 %	15.6 %
Share of renewable energy for transport (%)			5.0 %	4.8 %	5.1 %
() = including all biofuels consumed (%)	(1.1 %)	(4.8 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	17.8	16.8	16.2	15.7	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.3	3.1	3.0	2.9	3.1
Final energy consumption (Mtoe)	11.6	11.5	10.8	10.3	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.2	2.1	2.0	1.9	2.2
Efficiency of conventional thermal electricity and heat production (%)	61.0 %	60.8 %	59.5 %	58.0 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.48	1.30	1.33	n.a.	1.42
Space heating and cooling (toe/dwelling)	0.97	0.87	0.88	n.a.	0.96
Water heating (toe/dwelling)	0.30	0.24	0.26	n.a.	0.18
Cooking (toe/dwelling)	n.a.	n.a.	n.a.	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.20	0.19	0.18	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 2.3 %	2020 ESD target (% vs base year)	+ 13.0 %
2013 ESD emissions (% vs base year)	– 8.0 %	2020 ESD projections WEM (% vs base year)	– 24.2 %
		2020 ESD projections WAM (% vs base year)	– 25.6 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

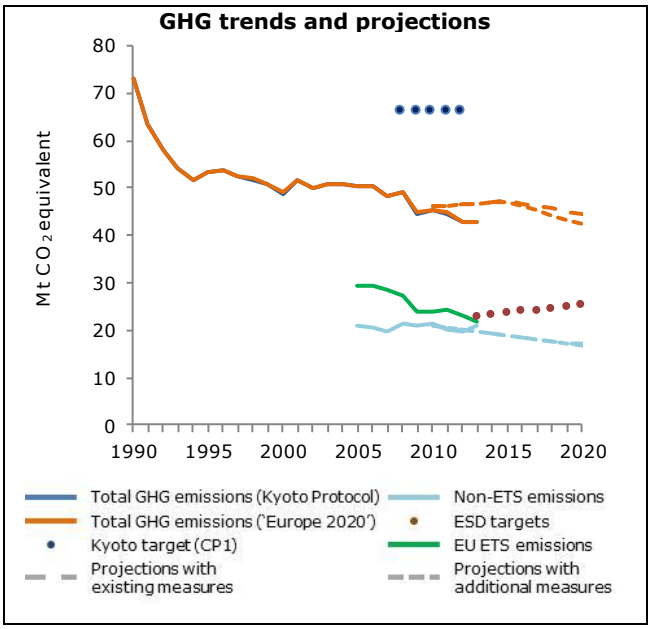
2012 RES share in gross final energy consumption (%)	10.4 %	2011–2012 indicative share from RES Directive (%)	8.2 %
2020 RES target	14.0 %	2012 expected share from NREAP (%)	8.2 %

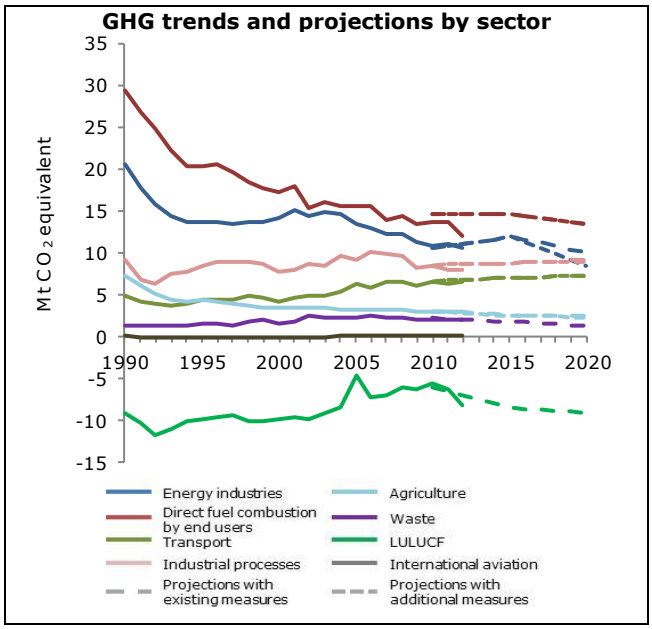
The average share of renewable sources in gross final energy consumption for 2011–2012 was 10.3% (1.1 Mtoe), which is higher than the indicative RED target for 2011–2012 (8.2%). At the same time, the share of renewables in 2012 (10.4 %) is higher than the expected 2012 NREAP target (8.2 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 8.1%. In order to reach its 2020 NREAP target, Slovakia needs an average annual growth rate of 5.5% in the run-up to 2020. In absolute terms, this is equivalent to 1.3 time its cumulative effort so far.

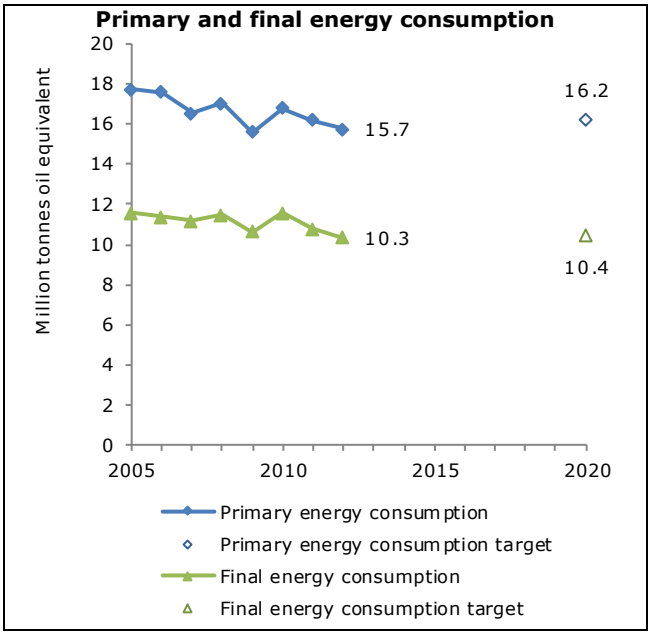
Progress towards energy efficiency targets

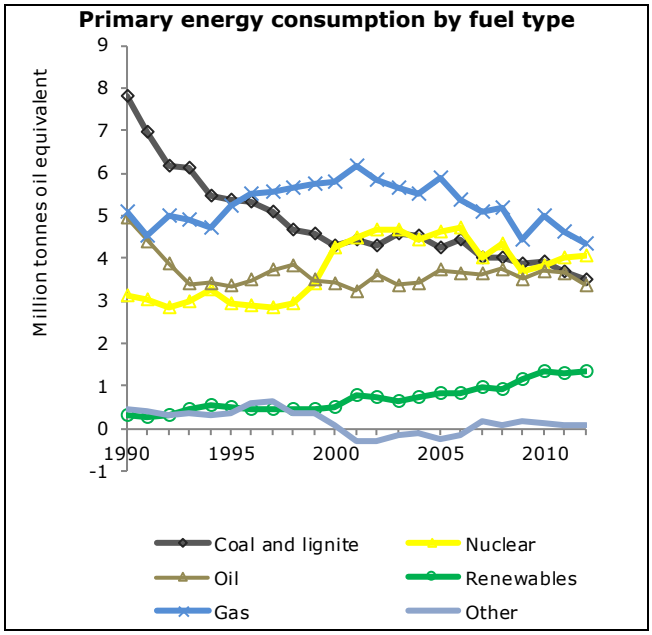
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 1.7 %	2005–2012 average annual change	– 1.6 %
2012–2020 average annual change to target	+ 0.4 %	2012–2020 average annual change to target	+ 0.1 %

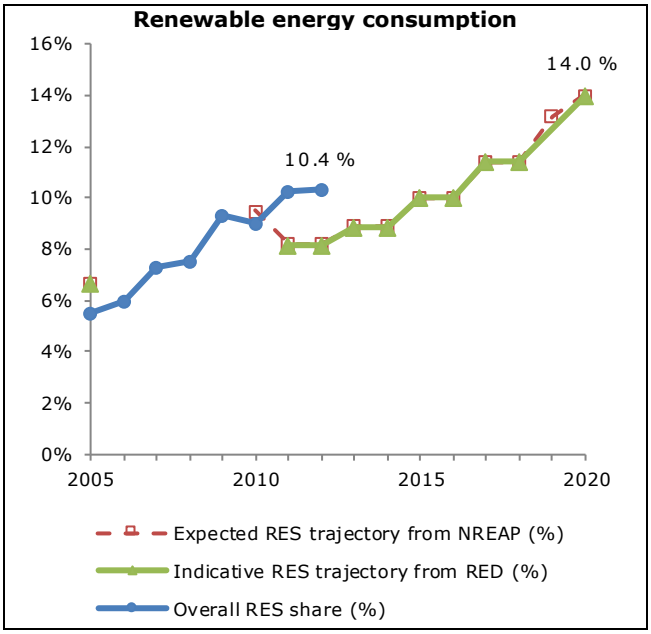
Between 2005 and 2020, primary and final energy consumption in Slovakia decreased at a faster pace than is necessary to meet the 2020 targets. This was a combined results of energy efficiency policies, as well as the effects of the economic recession. Distribution losses and the consumption of the energy sector decreased significantly since 2005. Improvements in energy efficiency took place in final sectors such as industry and the residential sectors. Given the share of energy intensive industries in the Slovak economy, further efforts to limit electricity consumption in industry (which represents 50 % of total final electricity consumption) could also contribute to further reducing final energy consumption. Further improvements in conversion efficiency for power generation (which have been decreasing in recent years due to reduce production from hydro power and increase in nuclear power) could also help limiting primary energy consumption.

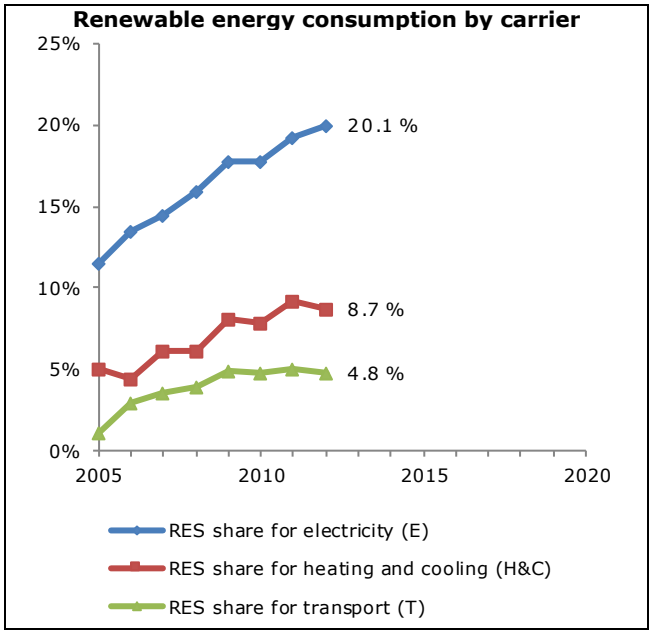

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
15.7
10.3
16.2
10.4
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
14.0 %
10.4 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
20.1 %
8.7 %
4.8 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Slovakia's economy exhibits high energy intensity and is, despite major efforts, still the fifth most energy-intensive economy in the EU. Since 2009, previous progress on energy efficiency in the industrial sector has been reversed, especially due to developments in the steel industry, which is the biggest energy consumer. Efficiency improvements in the household sector have also been rather slow. At the same time, taxes on energy are significantly below the EU average and while the introduction of a carbon tax for the non-Emissions Trading System (ETS) sectors has been considered, so far no progress has been made. Therefore, while a decision of the Slovak government to significantly reduce fossil fuel subsidies is encouraging, there is still room to shift taxation towards energy and away from labour and other areas, with the potential to boost employment and reduce energy bills in the long run.
Another challenge is the decarbonisation of Slovakia's energy supply. The energy mix is quite diversified, including gas, nuclear, oil and solid fuels, but Slovakia's efforts to reduce emissions in the electricity supply largely focus on the further development of nuclear energy. However, cost overruns and delays in the development of the Mochovce nuclear power plant are significantly increasing the cost of this strategy. Renewables could be increased but since 2012 the Slovak government reduced the financial support for renewables to prevent electricity costs from rising (MFSR, 2012). However, renewables are already cost competitive in various contexts if compared to nuclear energy and could lead to local jobs and revenues.

Climate and energy strategies
At present, Slovakia has not adopted a climate strategy; however, the Slovak government has established a working group at the Commission for the Coordination of Climate Change Policies to prepare and coordinate Slovakia's Low-carbon Development Strategy and the Climate Change Adaptation Strategy.
Slovakia's Energy Policy Strategy (Energetická politika SR) is expected to be approved in May 2014 and outlines the long-term energy objectives and priorities of the energy sector until 2035 with an outlook to 2050. The Strategy focuses on increasing domestic production of nuclear and hydro energy sources to reduce import dependency, which is above the EU average, and outlines the development of several energy projects, including the construction of a new nuclear power plant in Jaslovské Bohunice, a 180 GWh hydropower plant in Sered', and a 600 MW pumped storage hydropower plant in Ipeľ (Energia, 2013e). The last Energy Policy of the Slovak Republic strategy was approved in 2008.

Renewable energy
The Slovak Republic is making good progress on renewables, but renewable electricity was dominated by hydro and a small contribution of biomass, until the photovoltaic (PV) sector increased sharply in 2011. Since 2009, the Slovak government has supported renewables through a feed-in tariff (FIT) that guarantees payment for 15 years (Act. No. 309/2009). Renewables are given priority connection and dispatch. Recent reforms to Slovak renewable support are aimed at cost reduction, as the government fears disproportionate increases in electricity prices. Therefore, the recent amendments to the Renewable Energy Act scale back FITs for all technologies, and limit support for solar PV to installations on buildings and rooftops with a maximum capacity of 30 kW. The amendment also raises the current minimum share of renewable energy and allows for support of gases generated as by-products of metallurgical production processes (CFO, 2013). The Slovak government has also taken efforts to decrease administrative barriers to small-scale renewables up to 10 kW, issuing a development plan in July 2013 and the new Renewable Energy Act simplifies the connection process, guarantees free grid connection at existing delivery points for these producers, and requires distribution system operators to provide for the free installation of a bi-directional meters measuring the amount of electricity taken from and fed into the grid (Energia, 2013d).
Biomass accounts for the largest share of heat from renewable sources, but its use is still minimal in comparison to other EU countries, despite the implementation of a National Action Plan for Biomass Use (FES, 2012). The support of heat from renewable energy sources mainly takes the form of a building obligation for the use of renewable heating and financial support for investments, including subsidies from the Operational Programmes funded by the European Regional Development Fund (ERDF) and the Slovak Ministry of Economy. There is also a professional training programme for installers.

Energy networks
The volume of investments by the Slovak transmission system operator Slovenská elektrizačná prenosová sústava (SEPS) has more than doubled from EUR 41.6 million in 2012 to EUR 95.9 million in 2013 (Energia, 2013a). Moreover, in June 2013 representatives of the regulatory authorities of the Czech Republic, Hungary, Poland and Slovakia (the Visegrad Four) decided at their first joint meeting to establish a permanent forum on energy regulation issues in order to strengthen the existing cooperation on 'projects of common interest' in cross-border energy infrastructure.

Energy efficiency
The Energy Efficiency Concept of the Slovak Republic (Koncepcia energetickej efektívnosti SR) from 2007 is a strategic document aimed at supporting the implementation of energy efficiency measures with an outlook to 2020. Slovakia's implicit tax rate on energy in 2011 was EUR 48.5 per toe, the lowest registered in Europe. Energy products are subject to excise duties and value-added tax. However, revenues from electricity, coal and natural gas are relatively low mainly due to a large number of exceptions, some of which the Slovak Ministry of Finance is considering abolishing in order to generate additional revenues for the state budget (Program stability, 2013). Subsidies for electricity generated from domestic coal, which had been in place since 2005,

were significantly lowered since 2011 (Ministerstvo spravodlivosti, 2011). However, no progress has been seen in a previously proposed carbon tax for the non-ETS sector.
Cogeneration, mainly from fossil fuels, is supported through a FIT under the same act promoting renewables (Act. No. 309/2009). Energy efficiency in **industry** is promoted through an obligation to carry out energy audits but no specific targets have been established. Financial support is provided by the SlovSEFF programme for restructuring, upgrading and modernising installations and the Operational Programme 'Competitiveness and Economic Growth' to increase innovative activities and ensure technology transfer to companies.
Slovakia introduced a new obligation for **municipalities** to report their aggregated energy consumption data for 2013 until the end of March 2014 to the Slovak Innovation and Energy Agency in order to allow for reliable records of energy consumption in municipalities. Moreover, Act No. 476/2008 Coll. on Energy Efficiency provides the obligation to develop a concept for a 10-year period and defines minimum technical requirements for heat insulation and hot water distribution networks, as well as minimum standards of transfer, transport and distribution of heat.
Efficiency improvements in **households** are promoted through the Slovak Law on Thermal Energy. It includes an obligation for residential consumers to install heating meters in all residential buildings with an area above 500 m² and to notify the energy regulatory office Úrad pre reguláciu sieťových odvetví (URSO) about their heat production. More frequent inspections of biomass- and biogas-fired boilers have also been introduced by Act No. 314/2012 Z.z. in order to improve their operation. Act No. 300/2012 provides a regulation on Energy Performance Certificates for buildings. Moreover, financial support for energy efficiency measures is provided, among other places, by the State Housing Development Fund, in the form of grants and favourable loans for thermal insulation of residential buildings and apartments.

Transport
Measures addressing emissions from transport are rather limited. There is no registration tax and an existing ownership tax on vehicles used for business purposes is not based on CO_2 emissions and is relatively low compared to other EU Member States. The petrol tax rates are at EU average, but diesel is taxed well below the EU average (European Commission, 2013). Slovakia levies an annual vignette for cars and a distance-based road toll for heavy-duty vehicles on specific highways (ACEA, 2012; CE Delft, 2012) and EURO 6 standards are expected to be introduced in 2015. The Slovak transport sector has a biofuel energy content target and an obligatory minimum biofuel quota, and supports the use of biofuels with reduced excise duties. A strategy published by the Slovak Association for Electromobility (SEVA) in March 2013 that seeks to promote and identify the potential for electric mobility was subsequently adopted by the Ministry of Economy and a joint memorandum between the government and SEVA was signed (Energia, 2013b). While the updated Concept of Combined Transport Development by 2010 (approved in 2001) defines measures targeting modal shift in the Slovak Republic and some subsidies are provided, little progress is observed in this field.

Agriculture
For the first time, the Rural Development Programme for 2014–2020 incorporates climate change measures regarding plant production. The recommendations of the Common Agricultural Policy (CAP) mostly regarding manure management and agricultural soils were implemented in Governmental Decision No. 488/2010 and should lead to decreasing emissions. Current legislation and recommended good agricultural practice mainly concerns the storage of waste from animal production and the integration of waste into agricultural land.

Waste
Landfilling is still the predominant method of waste disposal in Slovakia and waste incineration only played a minor role. The Consolidating Waste Act aims at reducing the practice of landfilling, including through the conditional increase in composting. However, only few investments are taken in waste-to-energy projects due to a lack of investment security as a result of frequent legislative changes in the Slovak heating sector (Energia, 2013c).

Land use, land-use change and forestry
Within the framework of the Rural Development Programmes for the periods 2007–2013 and 2014–2020, the Slovak Republic plans to afforest 800 ha of low-productive land with fast-growing trees, grassing of 50 000 ha of arable land by 2015, and to afforest 23 000 ha of agricultural land by 2015 and 2020, respectively.

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Key climate- and energy-related data — Slovenia

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	20.3	19.5	18.9	18.2	4 544.2
GHG per capita (t CO_2-eq./cap.)	10.2	9.5	9.2	8.9	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	518	448	430	416	350
Share of GHG emissions in total EU-28 emissions (%)	0.4 %	0.4 %	0.4 %	0.4 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	8.7	8.0	7.6	7.4	1 848.6
Share of EU ETS emissions in total emissions (%)	42.9 %	41.1 %	40.2 %	40.5 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 4.6 %	– 2.8 %	– 7.5 %	+ 8.0 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	10.0 %	47.0 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	11.6	11.5	11.3	10.8	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			19.4 %	20.2 %	14.1 %
() = including all biofuels consumed in transport	(16.0 %)	(19.2 %)			
Share of renewable energy for electricity (%)	28.7 %	32.1 %	30.8 %	31.4 %	23.5 %
Share of renewable energy for heating and cooling (%)	18.9 %	25.5 %	28.7 %	30.6 %	15.6 %
Share of renewable energy for transport (%)			2.1 %	2.9 %	5.1 %
() = including all biofuels consumed (%)	(0.3 %)	(2.8 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	7.0	7.0	7.2	6.9	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.5	3.4	3.5	3.3	3.1
Final energy consumption (Mtoe)	4.9	4.9	5.0	4.9	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.5	2.4	2.4	2.4	2.2
Efficiency of conventional thermal electricity and heat production (%)	46.2 %	46.7 %	45.9 %	46.8 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.61	1.59	1.61	n.a.	1.42
Space heating and cooling (toe/dwelling)	1.02	1.03	1.05	n.a.	0.96
Water heating (toe/dwelling)	0.27	0.28	0.28	n.a.	0.18
Cooking (toe/dwelling)	0.06	0.06	0.06	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.26	0.22	0.22	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	+ 2.3 %	2020 ESD target (% vs base year)	+ 4.0 %
2013 ESD emissions (% vs base year)	– 7.2 %	2020 ESD projections WEM (% vs base year)	+ 4.1 %
		2020 ESD projections WAM (% vs base year)	– 10.7 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections indicate that 2020 ESD emissions are expected to be above the 2020 ESD target, only if measures planned until 2013 are fully implemented.

Progress towards renewable energy targets

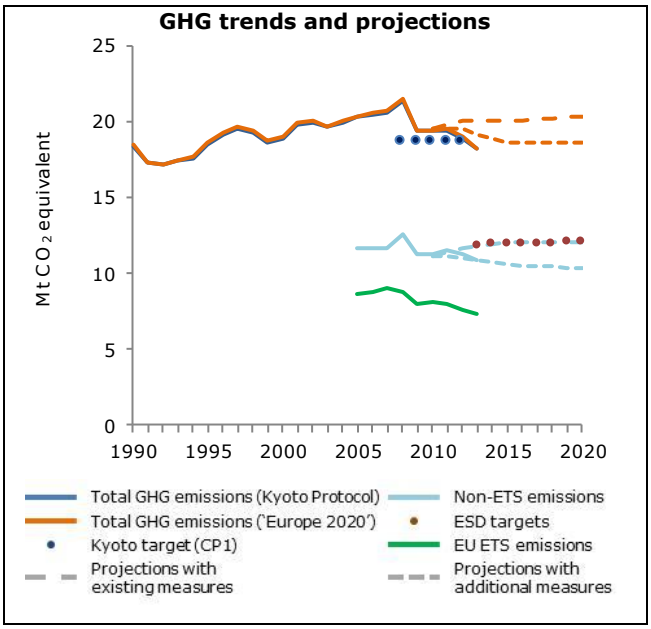
2012 RES share in gross final energy consumption (%)	20.2 %	2011–2012 indicative share from RES Directive (%)	17.8 %
2020 RES target	25.0 %	2012 expected share from NREAP (%)	18.7 %

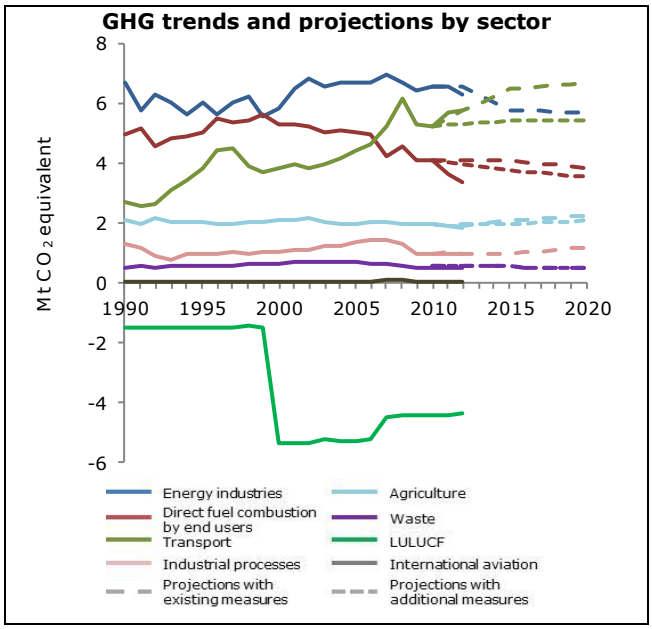
The average share of renewable sources in gross final energy consumption for 2011–2012 was 19.8% (1.0 Mtoe), which is higher than the indicative RED target for 2011–2012 (17.8%). At the same time, the share of renewables in 2012 (20.2 %) is higher than the expected 2012 NREAP target (18.7 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 3.5%. In order to reach its 2020 NREAP target, Slovenia needs an average annual growth rate of 3.3% in the run-up to 2020. In absolute terms, this is equivalent to 1.4 time its cumulative effort so far.

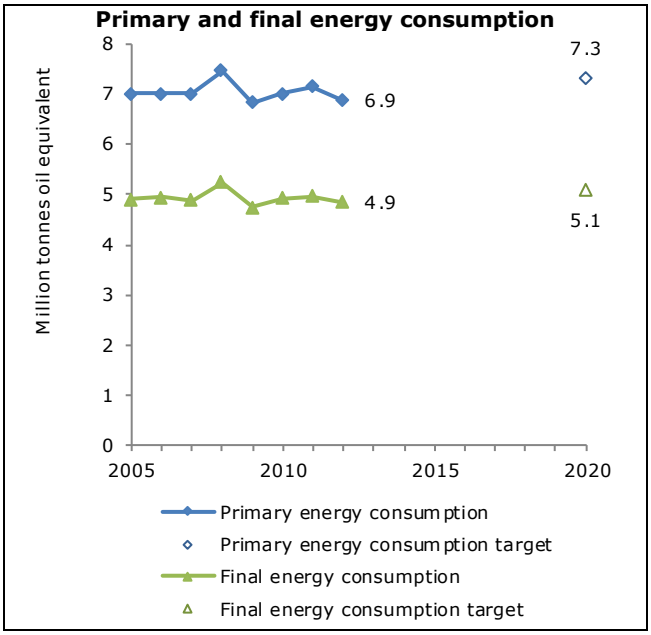
Progress towards energy efficiency targets

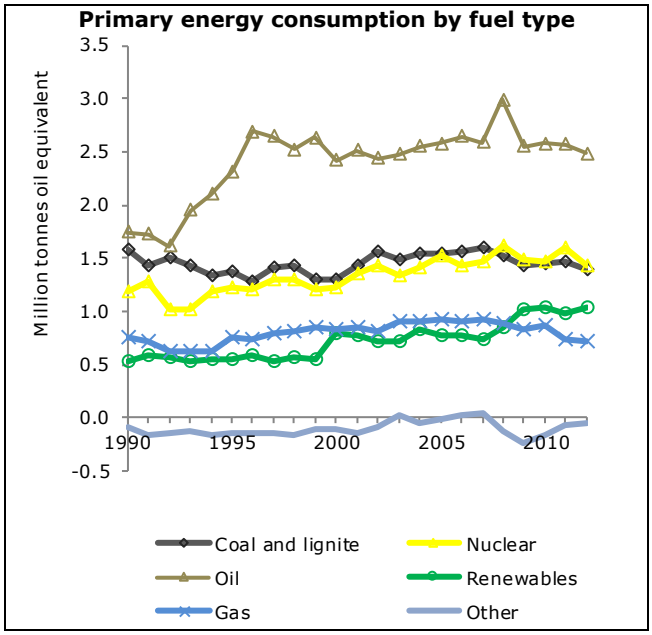
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 0.3 %	2005–2012 average annual change	– 0.1 %
2012–2020 average annual change to target	+ 0.8 %	2012–2020 average annual change to target	+ 0.6 %

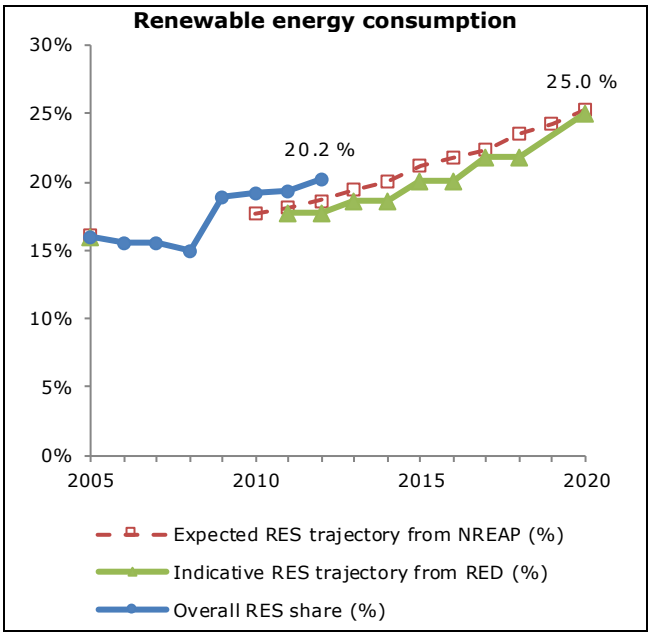
Slovenia has positive targets for both primary and final energy consumption, compared to 2005. Over the period 2005–2012, energy consumption decreased as a combined result of energy efficiency policies (such as those targeting improvements in conversion efficiency (CHP) and industry), as well as the effects of the economic recession. Slovenia can therefore focus on stabilising its energy consumption. Further efforts to limit the consumption of the energy and the transport sectors (which have been increasing since 2005) and electricity consumption in the residential and services sectors, could contribute to keep the country on track to meet its 2020 target.

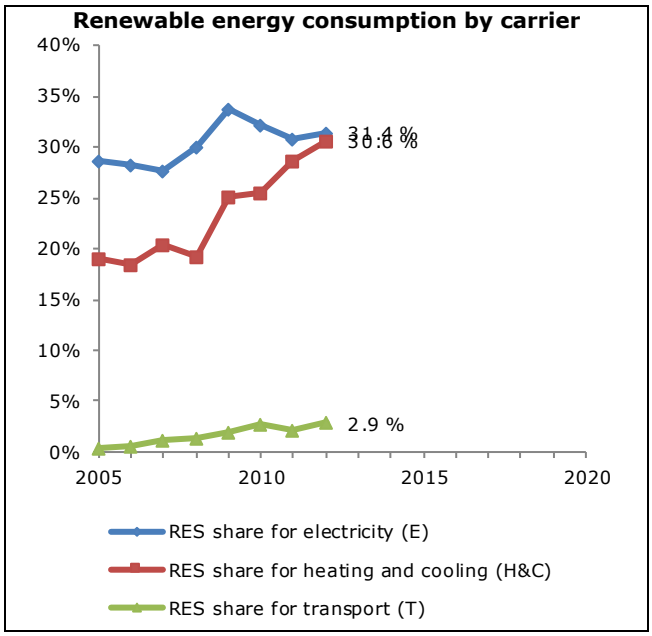

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
6.9
4.9
7.3
5.1
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
20.2 %
25.0 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
31.4 %
30.6 %
2.9 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
Slovenia faces rising greenhouse gas (GHG) emissions from the transport sector since 1990 with some fluctuations. The share in total emissions doubled from 15 % to 31 % as GHG emissions were almost stable or reduced in most of the other sectors. The increase of emissions reflects a rapid shift to private motor vehicle use. Moreover, as fuel prices are government-set in Slovenia whereas these are left to the market in neighbouring Italy and Austria, prices at the pump in Slovenia have at times been markedly lower than those across the border, leading to fuel sales to non-residents. Increasing the share of public transport and balancing fuel taxation with neighbouring countries could help to reduce GHG emissions, oil imports, and transport-related air and noise pollution.
Another challenge is the energy consumption and associated GHG emissions of buildings. The consumption of residential buildings for space heating is above the EU average although it decreased in recent years (SI-Stat, 2013). In the public sector, statistics show that a third of the buildings are without insulation. Heating and electricity for public buildings alone cost the state EUR 150 million per year. The renovation of public sector buildings, which comprise more than 9 million square metres, would require an investment of around EUR 350 million in the next 7 years, which could — if realised — stimulate the construction sector and related job creation, according to REUS JSS (2013). According to the government, annual investment of EUR 50 million in building refurbishment could create 1 200 new direct jobs and twice as many indirect jobs. The investments would also have a positive effect on public revenues through inflows of taxes and contributions of up to four times the investments, and lead to a significant reduction in the overall spending on energy (MZIP, 2013).

Climate and energy strategies
An Operational Programme for Reducing GHG Emissions until 2020 with a View to 2030 (OP GHG - 2020) is in preparation and will define indicative sectorial objectives to reduce GHG emissions until 2020 and framework objectives until 2030. A draft version made available in February 2014 foresees further support of the use of biomass and a continuation of efforts in building refurbishment.
The 2014 Energy Act provides a legal basis for the adoption of national strategic documents that will determine the long-term trend in energy supply and use. Furthermore, the Act gives the government greater powers in deciding to what extent renewables will be promoted in the future, and introduced new measures, including energy efficiency certificates for buildings, and a new district heating regime. In a next step, Slovenia will develop an Energy Concept of Slovenia and a National Energy Development Plan, which will guide major investments in energy infrastructure and help with the creation of local and regional energy concepts.

Renewable energy
Slovenia's renewable energy is mainly generated from hydropower and biomass. Electricity from renewables is promoted primarily through a feed-in tariff (FIT), a premium tariff, and a series of subsidies and loans for the installation of renewables. FITs are differentiated by technology and installation size and a steep regression rate is in place for photovoltaics. The costs of the FIT scheme are covered by a surcharge on final consumer bills. This surcharge was raised last year, but subsequently slightly lowered for energy-intensive industries, leading to a tariff deficit. The loan and grant programme provides low-interest loans and non-refundable grants to purchase renewable energy equipment. Due to the high demand the allocated financial resources get depleted very quickly each year.
Wind farms still represent a negligible portion of renewables, a main bottleneck being administrative barriers. However, Slovenia introduced its first large-scale wind power plant in Dolenja vas in May 2013, which may serve as a role model for further development. In addition, a new state land use act will be adopted soon to facilitate the build-up of wind energy. Slovenia also plans to construct 10 new hydropower plants by 2034.
Renewable heating is mainly promoted through loans and subsidies for district biomass heating, individual biomass heating systems and public sector buildings. The support is co-financed by the EU. Additional measures include an energy counselling and awareness programme (EnSvet), and minimum renewable requirements for new and reconstructed buildings, which can also be met with renewable heating.

Energy efficiency
Slovenia's energy **taxation** is above the EU average and the highest among New Member States. However, there are various exceptions, such as for electricity if it represents more than 50 % of costs of production of a product, as well as motor fuels used in a number of industry, transport, agriculture and forestry applications. Since 1996, Slovenia has an explicit carbon tax for carbon dioxide (CO_2) emissions resulting from the combustion of fossil fuels and incineration of combustible organic substances, with exemptions for EU Emissions Trading System (ETS) participants and some cogeneration. A Working Group was also established in 2012 to develop proposals on a green tax reform.
Cogeneration of electricity and heat, largely from fossil fuels, is promoted by means of a FIT.
Under the Energy Act, **energy companies are obligated** to promote end-use efficiency through the implementation of projects that lead to energy consumption reductions. In **industry**, some support programmes exist to carry out energy efficiency measures (EEW, 2013; Odyssee, 2012). The planned linking of exemptions from the CO_2 tax to the obligation of having an energy management system in place was abandoned.
In the **building** sector, minimum energy performance requirements have been introduced. An Energy Performance Certificate scheme was recently adopted, but was heavily criticised as having been speedily implemented under pressure from the European Union, without a real debate on its flaws. The primary measures to promote energy efficiency, including in buildings, are low-interest loans and grants, primarily

made available through a government-affiliated administering organisation known as the Environmental Public Fund (Eco Fund). Moreover, an analysis of energy efficiency in Slovenia in the public and service sectors was done in 2013 that will serve as a starting point for the assessment and planning of energy efficiency measures at strategic and operational levels in 2014 (REUS JSS, 2013).

Transport
Slovenia levies a registration tax that is partly based on CO_2 emissions and an ownership tax based on the motor volume. Additionally, an annual environmental pollution tax, a time-based national vignette system for passenger cars, light trucks and motorcycles, and a distance-based toll for heavy-duty vehicles apply (ACEA, 2012; CE Delft, 2012). Petrol is taxed at EU average, but it is the highest rate in the EU-13 Member States. The tax rate for diesel is significantly lower but this is partly outweighed by the higher CO_2 tax so that diesel is taxed above EU average.
Other government efforts regarding the transport sector include a biofuel quota obligation (4.1 % for petrol, 6.0 % for diesel), which however was not met in 2012 (only 0.7 % share of biofuels besides a goal of 5.5 %). Incentives to purchase electric vehicles are provided mainly by the Eco Fund. Tax exemptions on biofuels existed, but were abolished in April 2014 due to finance consolidation efforts.
Slovenia's government seeks to promote public transportation and make personal road traffic less attractive. The government has allocated EUR 8 million for 'Park and Ride' measures from the EU Cohesion Fund. Moreover, public transport subsidies are available for students and the government has undertaken efforts to synchronise public transport and establish public transport zones. Some city centres have also been closed for car traffic and new public bus lines are being implemented. In addition, the government has recently increased investment in railway lines.

Fluorinated gases (F-gases)
Slovenia is one of only three countries in the EU with a special tax on F-gases in place and keeps extensive records on the amount of F-gases and their intended use. For a first filling or manufacture of F-gases, only a 5 % tax is paid, while for a refilling a 100 % tax is paid. The tax is paid per unit of pollution equivalent to 1 kg CO_2. The price of the tax imposed on the use of fluorinated GHGs is calculated to amount to a rate that is five times lower than the tax imposed on fuel combustion and amounts to EUR 12.5 per tonne of CO_2.

Agriculture
An overall action plan for climate change mitigation and adaptation in the agricultural sector existed for the years 2010 and 2011, but has not been updated since then. Slovenia's agricultural policies focus on the reduction of methane and nitrous oxide through animal husbandry and manure management policies. Additionally, numerous measures are being implemented within the context of the Rural Development Programme and the Ministry of Agriculture and Environment runs a successful programme for the promotion of local food production and consumption.

Waste
The Communal Waste Management Programme from 2013 sets out Slovenia's objectives with respect to emission reductions from waste. It aims at a reduction of GHG emissions by at least 20 % by 2020 compared to 1990 levels in the waste sector through an increase in the share of separately collected recycling fractions of municipal waste, the thermal treatment of waste and a greater use of organic ingredients. The most significant reduction of GHG emissions can be achieved by reducing landfilling of biodegradable municipal waste, for which a new operational plan for the period after 2013 is being prepared. Moreover, the CO_2 tax applies to emissions from landfills and the FIT applies to electricity generation from captured landfill gas.

Land use, land-use change and forestry
The 2007 Resolution on the National Forest Programme (ReNFP) has sustainable forest development as one of its fundamental objectives. Moreover, the Action Plan for increasing the competitiveness of the forest–wood chain in Slovenia by 2020 stipulates measures to promote the felling of trees in accordance with forest management plans. This includes, for instance, a definition of the maximum permitted felling of trees for the period 2011–2020.

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Key climate- and energy-related data — Spain

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	431.4	345.9	340.8	315.6	4 544.2
GHG per capita (t CO_2-eq./cap.)	10.0	7.4	7.3	6.8	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	434	310	302	281	350
Share of GHG emissions in total EU-28 emissions (%)	8.3 %	7.5 %	7.5 %	7.1 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	183.6	132.7	135.6	122.8	1 848.6
Share of EU ETS emissions in total emissions (%)	43 %	38 %	40 %	39 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	+ 6.7 %	– 12.4 %	– 12.0 %	– 20.5 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	20.7 %	28.0 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	229.1	201.6	194.0	189.7	2 566.6

Key data on renewable energy	2005	2010	2011	2012	EU 2012
Share of renewable energy in gross FEC (%)			13.2 %	14.3 %	14.1 %
() = including all biofuels consumed in transport	(8.4 %)	(13.8 %)			
Share of renewable energy for electricity (%)	19.1 %	29.7 %	31.6 %	33.5 %	23.5 %
Share of renewable energy for heating and cooling (%)	9.4 %	12.6 %	13.6 %	14.0 %	15.6 %
Share of renewable energy for transport (%)			0.4 %	0.4 %	5.1 %
() = including all biofuels consumed (%)	(1.0 %)	(4.7 %)			

Key data on energy consumption	2005	2010	2011	2012	EU 2012
Primary energy consumption (Mtoe)	135.9	122.8	121.4	121.3	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.1	2.6	2.6	2.6	3.1
Final energy consumption (Mtoe)	97.8	89.1	86.7	83.1	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.3	1.9	1.9	1.8	2.2
Efficiency of conventional thermal electricity and heat production (%)	46.7 %	48.7 %	46.3 %	44.0 %	50.0 %

Energy consumption per dwelling by end use	2005	2009	2010	2011	EU 2011
Total energy consumption per dwelling (toe/dwelling)	0.96	0.97	0.97	0.96	1.42
Space heating and cooling (toe/dwelling)	0.49	0.50	0.49	0.49	0.96
Water heating (toe/dwelling)	0.21	0.20	0.23	0.21	0.18
Cooking (toe/dwelling)	0.08	0.07	0.07	0.07	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.19	0.21	0.18	0.19	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 4.4 %	2020 ESD target (% vs base year)	– 10.0 %
2013 ESD emissions (% vs base year)	– 17.6 %	2020 ESD projections WEM (% vs base year)	– 1.4 %
		2020 ESD projections WAM (% vs base year)	– 3.0 %

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. However, projections indicate that 2020 ESD emissions are expected to be above the 2020 ESD target, despite the implementation of measures planned until 2013.

Progress towards renewable energy targets

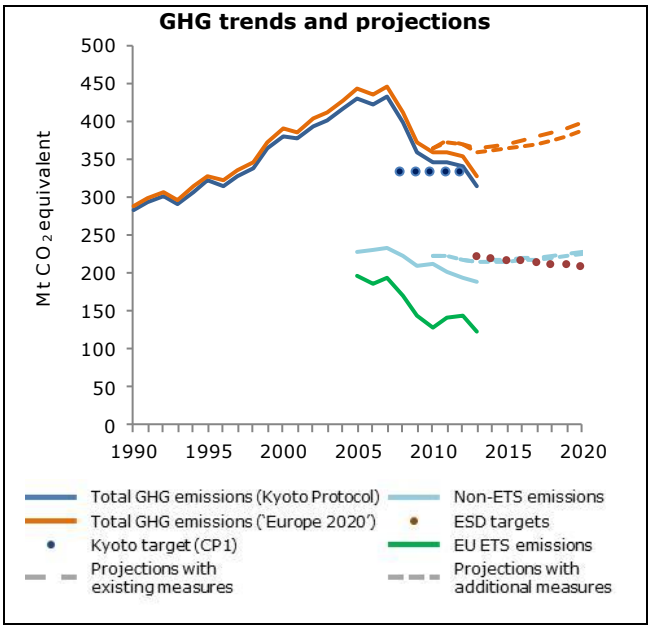
2012 RES share in gross final energy consumption (%)	14.3 %	2011–2012 indicative share from RES Directive (%)	11.0 %
2020 RES target	20.0 %	2012 expected share from NREAP (%)	15.1 %

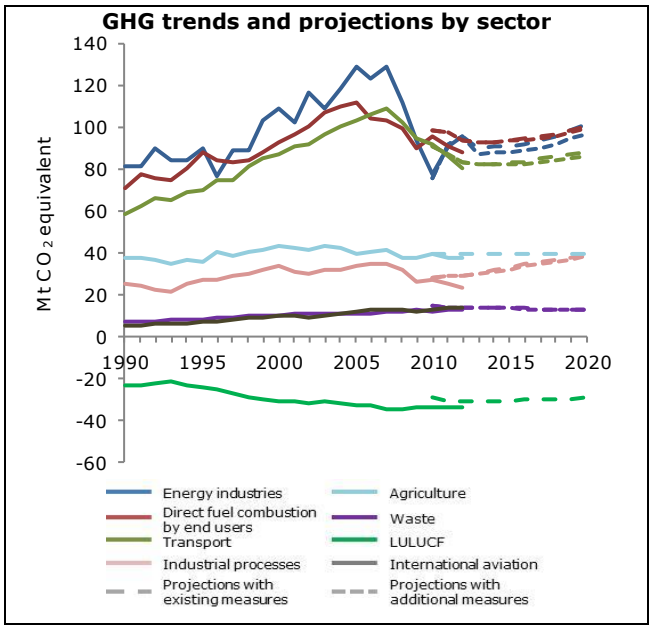
The average share of renewable sources in gross final energy consumption for 2011–2012 was 13.7% (12.0 Mtoe), which is higher than the indicative RED target for 2011–2012 (11.0%). At the same time, the share of renewables in 2012 (14.3 %) is lower than the expected 2012 NREAP target (15.1 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 5.8%. In order to reach its 2020 NREAP target, Spain needs an average annual growth rate of 6.7% in the run-up to 2020. In absolute terms, this is equivalent to 2.1 times its cumulative effort so far.

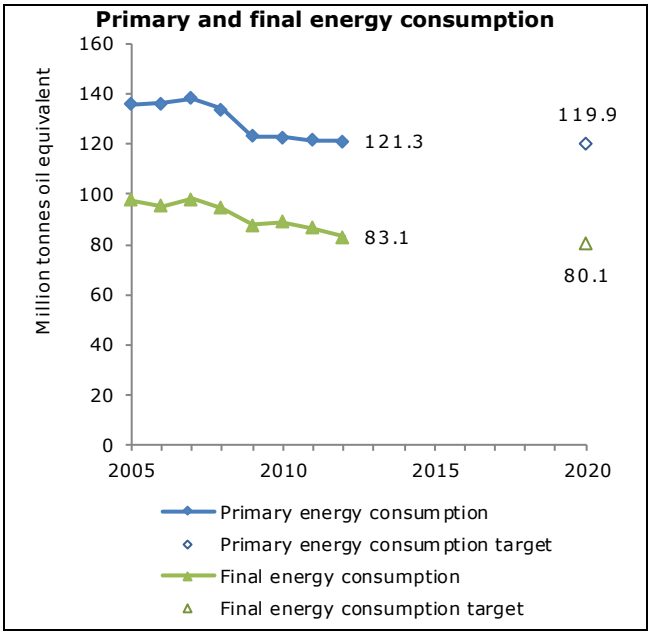
Progress towards energy efficiency targets

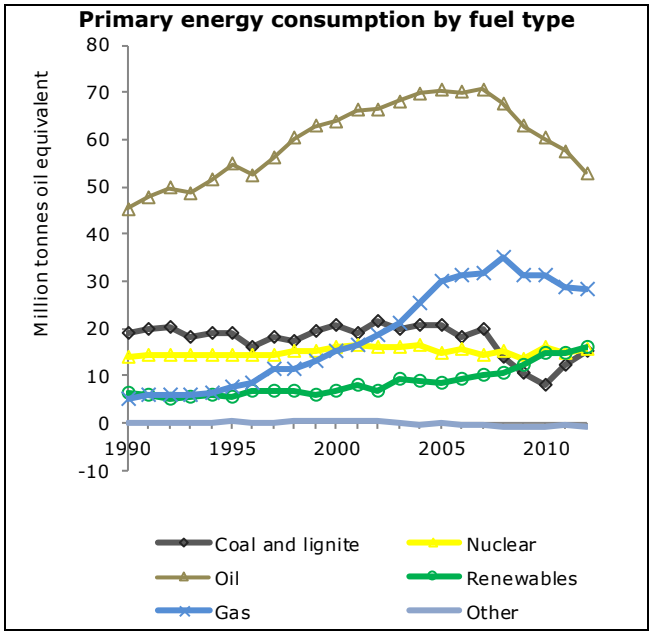
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-1.6 %	2005–2012 average annual change	-2.3 %
2012–2020 average annual change to target	-0.1 %	2012–2020 average annual change to target	-0.5 %

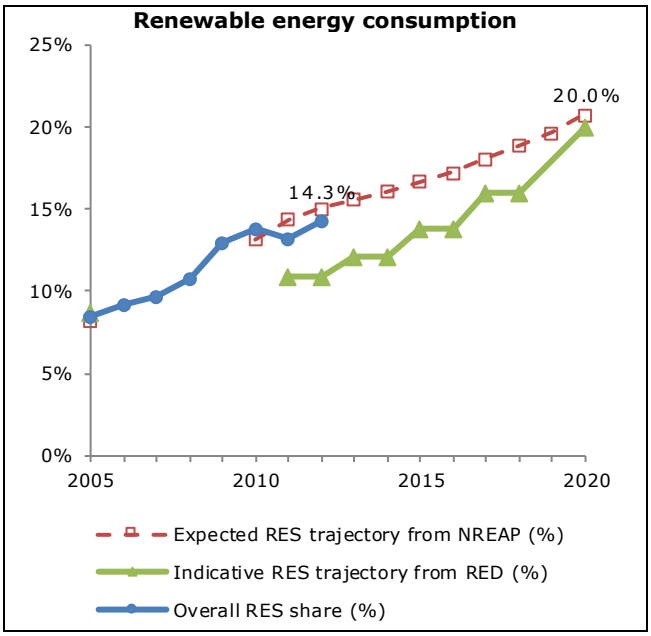
Between 2005 and 2012, energy consumption decreased at a faster pace than is necessary to meet the 2020 targets. This was a combined result of energy efficiency policies as well as the effects of the economic recession. More efficient household equipment is being used and conversion efficiency improved, due to a higher share of natural gas in electricity production until 2009. Tackling the consumption of the energy sector, which increased by 33 % between 2005 and 2012, as well as the deterioration of conversion efficiency since 2010 (due to a 91 % increase in the use of solid fuels) could contribute to stabilising Spain's energy consumption. Electricity consumption in the residential and services sectors could also be further addressed in order to limit final energy consumption.

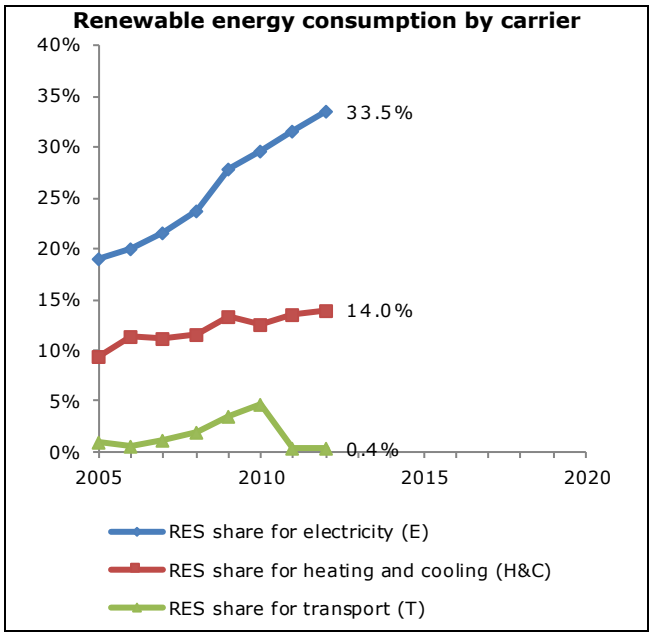

GHG trends and projections
Mt CO2 equivalent
500
450
400
350
300
250
200
150
100
50
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
140
120
100
80
60
40
20
0
-20
-40
-60
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
160
140
120
100
80
60
40
20
0
2005
2010
2015
2020
121.3
83.1
119.9
80.1
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
80
70
60
50
40
30
20
10
0
-10
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
20.0%
14.3%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
40%
35%
30%
25%
20%
15%
10%
5%
0%
2005
2010
2015
2020
33.5%
14.0%
0.4%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
In the aftermath of the economic crisis, the rising debt level of the state made austerity an important consideration of Spanish policymaking. This has imposed the need to take the cost efficiency of policy measures into account even more so than before. Public acceptability of any policy-related costs imposed on consumers is also particularly limited due to high unemployment rates. Under these circumstances, policies that can generate a direct positive economic impulse without additional cost to the economy are of particular interest, and Spain has the potential to deploy such measures. A shift of taxation from labour to environmental taxes has the potential to improve performance on environmental goals without creating an additional economic burden while at the same time creating a stimulus investment into clean jobs or technologies. Transport, one of the largest emitting sectors, has significant potential for emission reductions and could be tackled effectively in this way.
In the energy sector, support for renewable sources of energy was suspended in early 2012 to tackle the persistent tariff deficit of the electricity system. The deficit arises from the problem that the costs of the electricity system are not balanced by revenues from retail prices, because these are regulated. Since then, the expansion of renewables in Spain has halted. Furthermore, the retroactive measures have worsened the profitability of existing projects and damaged investor confidence. However, a successful uptake of investment in renewable energies could revive the renewable energy industry and create profits and employment in green sectors, pushing forward the transition of Spain to a green economy, as set out in the 2011 Sustainable Economy Act. In 2012, around 80 000 direct jobs and nearly EUR 9 billion of turnover were generated by the renewable energy sector alone, without even considering the supplying industries (EurObserv'ER, 2012).

Climate and energy strategies
The overarching strategy is the 2007 Spanish Strategy for Climate Change and Clean Energy outlining the policy framework and targets until 2020. The Strategy is complemented by the National Energy Efficiency Action Plan (NEEAP) 2011–2020 and the Renewable Energy Action Plan. The NEEAP 2011–2020 was approved in 2011 and constitutes a continuation of previously approved plans as part of the Saving and Energy Efficiency Strategy 2004–2012. The Plan presents targets and measures that include investment incentives, promotion, training, dissemination and legislative actions (IDAE, 2012). The Renewable Energy Action Plan 2011–2020 aims to promote a total investment of more than EUR 62 million, of which more than EUR 55 million is earmarked for electricity-generating installations and more than EUR 6 million for facilities for thermal use. Most support is planned for wind and hydropower, but photovoltaics, thermal electric installations and biomass are also planned to be supported.

Renewable energy
Spain had made considerable progress in the application of renewable energies, especially regarding renewable electricity between 2005 and 2011. However, support for renewable electricity has taken a sharp turn from 2012 onwards. Access to the feed-in support scheme as well as the premium tariff was blocked in January 2012; Royal Decree Law 2/2013 suspended remuneration schemes for existing installations, which severely affected the economics of those projects and, finally, Royal Decree Law 9/2013 phased out both renewable electricity support schemes. These measures were taken as the support schemes were considered to be one of the main reasons for the failing cost coverage in the electricity system, causing the so-called tariff deficit. Law 24/2013 introduced a new 'specific remuneration system', which pays a supplementary compensation on the market price. It was implemented to allow renewable energy producers to recover costs and a suitable return that cannot be recovered by selling the electricity on the market. The calculation of the premium is based on a theoretical renewable plant and on the average costs incurred by a well-managed company running a renewable installation. The Law also regulates the priority connection and priority dispatch of renewables if these do not constitute a danger for the grid itself. The remuneration system is applicable to both existing and newly installed facilities. The final provision also states that entities that consume the energy they produce would still need to contribute to the financing of costs and services of the grid in the same amount as consumers that take the electricity directly from the grid.
There is no support scheme for heating and cooling in place.

Energy efficiency
Energy **taxation** is rather low with the level of excise duties being below the EU average. In addition, there are exemptions in place, for example for coal used for chemical reduction and in electrolytic and metallurgical processes and lower electricity rates for business. In 2014, the Ministry of Industry, Energy and Tourism has opted for an increase of the weight of the fixed component of the electricity bills to 60 % (electricity bills in Spain have a fixed and a variable component). This has been read by some parts of the industry as a disincentive to reduce consumption and use electricity most efficiently.
An **obligation scheme** for energy market operators is planned, but the outline is unclear so far.
The Energy Efficiency Action Plan 2011–2020 intends to achieve energy savings in **industry** of 4 489 ktoe. To meet this target, the Plan includes the introduction of energy audits, improved equipment and process technology, as well as implementation of energy management systems. A grant scheme for improvements in equipment and processes is in place; furthermore, subsidies for energy audits and **cogeneration** of electricity and heat are provided.
In the **building sector**, minimum energy performance standards for new and modernised buildings are implemented. Additionally, as of June 2013, owners of buildings are required to present an energy efficiency certificate to buyers or renters of flats, which evaluates the efficiency level of the building in terms of energy

consumption and carbon dioxide (CO_2) emissions. Financial support for efficiency improvements in existing buildings is provided through grants covering between 22 and 35 % of investment costs under the Renove Plan, focusing on rehabilitation of the thermal casing. Furthermore, the government has approved the PIMA SOL plan with the aim to reduce CO_2 emissions from hotels by up to 70 %. The overall budget amounts to EUR 400 million, 50 % of which comes from the European Investment Bank (EIB). The plan will cover around 500 hotels and is estimated to contribute to the creation of about 8 000 jobs (ABC, 2013; Mercados de las Energias, 2013; RDL 635/2013).

Transport
Following the Energy Efficiency Action Plan, measures in transport can be grouped into three categories: a modal shift to reduce demand for conventional vehicles, fleet renewal to incorporate new technological advances in vehicle energy efficiency, and increasingly rational use of transport methods. The main measures in this regard include a registration tax that is based on CO_2 emissions. The ownership tax is based on horse power. Petrol is taxed at around the EU average but diesel is taxed well below it. A high distance-based road charge is applied on specific parts of the road network (CE Delft, 2012). Biofuels are promoted through a quota system.
The Strategic Infrastructure and Transport Plan defines basic guidelines for action in infrastructure and transport for 2005–2020, including the promotion of intermodal transport and public transport. The Plan aims to shift personal and freight transport to rail. In 2014, Royal Decree 128/2014 initiated the third round of the Plan of Support to the Environment (PIMA 3), promoting the purchase of efficient and/or hybrid vans, cars and motorcycles as well as bicycles with assisted pedalling. The aim of this Plan is to achieve compliance with the goals set by the Ambient Air Quality Directive. The Plan's budget amounts to EUR 5.5 million and the amount of support will vary from EUR 350 to 2 500, depending on the vehicle type.

Agriculture
The Agriculture and Fisheries Action Plan 2011–2020 aims to realise energy savings in this sector by applying measures based on economic incentives and training, such as promotion and training techniques for efficient use of energy, improving energy efficiency and boosting irrigation facilities for migrating sprinkler systems to drip irrigation systems, as well as energy audits and support of sustainable agriculture. The Plan to Reduce the Use of Fertilisers is among the rules derived from the Common Agricultural Policy (CAP) and targets the rationalisation of fertiliser use.

Waste
The 2008–2015 National Waste Plan encourages the parties involved to consolidate an integrated form of management, which combines effectively the guiding principles governing EU waste policy and achieves a significant change towards a more sustainable waste management in Spain. The cornerstone of this Plan is a limit to the amount of biodegradable municipal waste going to landfills.

Land use, land-use change and forestry
The Socioeconomic Plan of Forest Activation has been presented in 2014. This Plan is active at the national level and is closely tied to the programming of the European Agricultural Fund for Rural Development (EAFRD). The Fund will run for 7 years and will finance a variety of measures with priority given to the ones that are aimed at improving environmental conservation and climate change mitigation. The Fund intends to tackle the latter by exploiting the CO_2-capturing capabilities of forests and by increasing the use of biomass as a fuel. In parallel, the Plan aims to diversify the economic activity of rural communities, thereby improving the quality of life of their inhabitants.

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Key climate- and energy-related data — Sweden

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	66.9	60.8	57.6	56.0	4 544.2
GHG per capita (t CO_2-eq./cap.)	7.4	6.5	6.1	5.9	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	271	205	188	179	350
Share of GHG emissions in total EU-28 emissions (%)	1.3 %	1.3 %	1.3 %	1.3 %	100.0 %
EU ETS verified emissions (Mt CO2-eq.)	19.4	19.9	18.2	20.1	1 848.6
Share of EU ETS emissions in total emissions (%)	29.0 %	32.7 %	31.5 %	35.9 %	40.7 %
ETS emissions vs allowances (free, auctioned, sold) (%)	– 13.0 %	– 12.6 %	– 20.1 %	– 46.8 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	8.1 %	36.9 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	43.5	38.7	37.2	35.3	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%) () = including all biofuels consumed in transport	(40.5 %)	(47.2 %)	48.8 %	51.0 %	14.1 %
Share of renewable energy for electricity (%)	50.9 %	56.0 %	59.9 %	60.0 %	23.5 %
Share of renewable energy for heating and cooling (%)	51.8 %	60.9 %	62.5 %	65.6 %	15.6 %
Share of renewable energy for transport (%) () = including all biofuels consumed (%)	(3.9 %)	(7.2 %)	9.4 %	12.6 %	5.1 %
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	48.7	48.7	47.8	48.0	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	5.4	5.2	5.1	5.1	3.1
Final energy consumption (Mtoe)	33.7	34.1	32.4	32.4	1 104.5
Final energy consumption per capita (Mtoe/cap.)	3.7	3.6	3.4	3.4	2.2
Efficiency of conventional thermal electricity and heat production (%)	89.7 %	87.2 %	88.5 %	88.3 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	1.71	1.61	1.47	1.08	1.42
Space heating and cooling (toe/dwelling)	1.17	1.09	0.94	1.08	0.96
Water heating (toe/dwelling)	0.18	0.17	0.17	n.a.	0.18
Cooking (toe/dwelling)	0.03	0.03	0.03	n.a.	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.33	0.32	0.32	n.a.	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)			
2013 ESD target (% vs base year)	– 7.0 %	2020 ESD target (% vs base year)	– 17.0 %
2013 ESD emissions (% vs base year)	– 19.5 %	2020 ESD projections WEM (% vs base year)	– 19.3 %
		2020 ESD projections WAM (% vs base year)	– 20.3 %

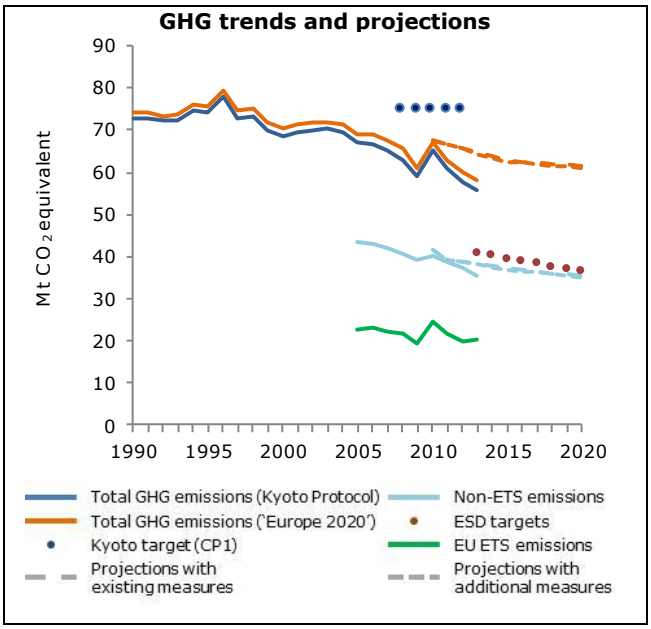
Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

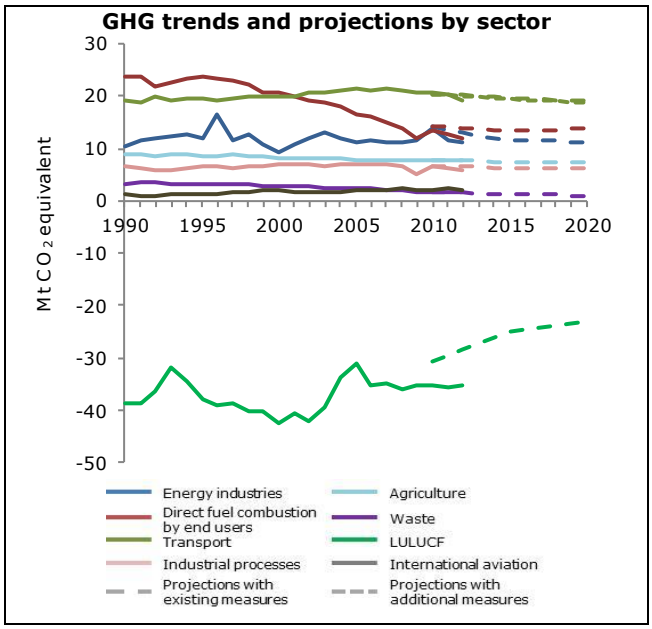
Progress towards renewable energy targets			
2012 RES share in gross final energy consumption (%)	51.0 %	2011–2012 indicative share from RES Directive (%)	41.6 %
2020 RES target	49.0 %	2012 expected share from NREAP (%)	44.9 %

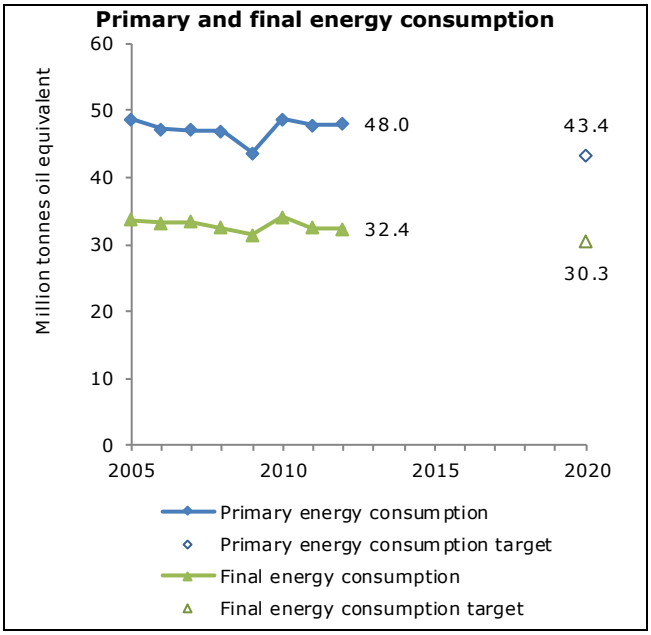
The average share of renewable sources in gross final energy consumption for 2011–2012 was 49.9% (17.5 Mtoe), which is higher than the indicative RED target for 2011–2012 (41.6%). At the same time, the share of renewables in 2012 (51.0 %) is higher than the expected 2012 NREAP target (44.9 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 3.4%. In order to reach its 2020 NREAP target, Sweden needs an average annual growth rate of 1.2% in the run-up to 2020. In absolute terms, this is equivalent to 0.5 time its cumulative effort so far.

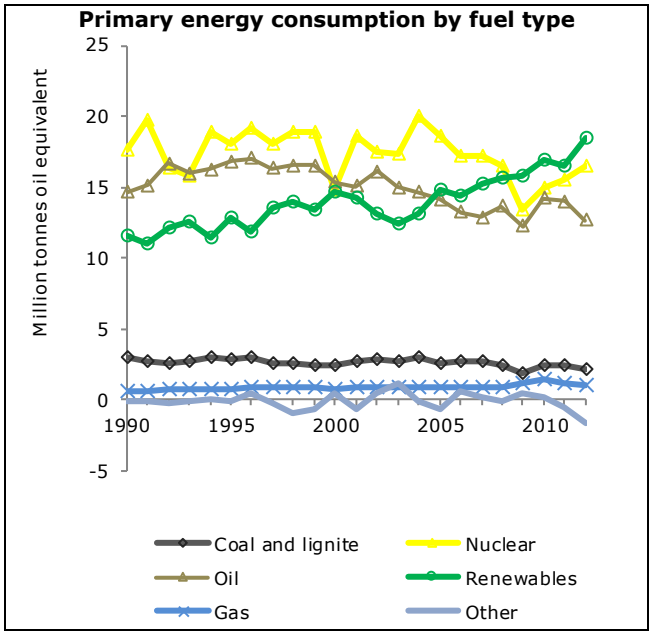
Progress towards energy efficiency targets			
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	– 0.2 %	2005–2012 average annual change	– 0.6 %
2012–2020 average annual change to target	– 1.2 %	2012–2020 average annual change to target	– 0.8 %

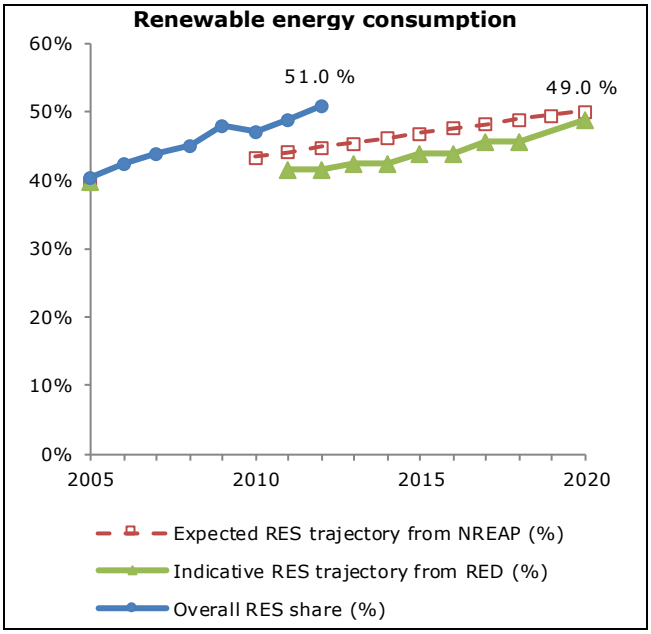
Between 2005 and 2012, primary and final energy consumption did not decrease at a sufficient pace for Sweden to be on track to meet the 2020 reduction targets, despite energy efficiency improvements in conversion (through the penetration of renewable powered CHP) and in end-user sectors (through dedicated programs for energy intensive industries, measures targeting the building stock, such as building labelling requirements, and high penetration of renewables in the commercial sector). Tackling the increasing consumption of the energy sector (+ 15 % between 2005 and 2012) and electricity consumption in the service sector (+ 18 % over the same period) could contribute to further reduce energy consumption and put Sweden fully on track to meet its 2020 energy targets.a

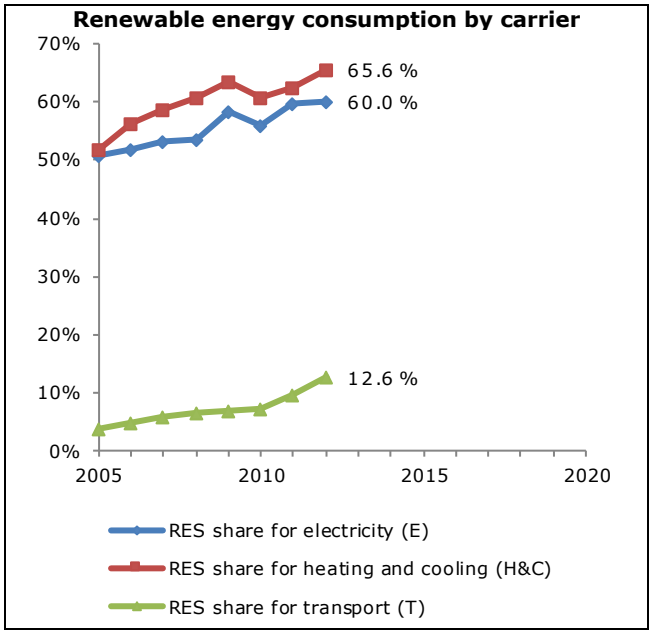

GHG trends and projections
Mt CO2 equivalent
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
48.0
43.4
32.4
30.3
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
51.0 %
49.0 %
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
65.6 %
60.0 %
12.6 %
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
While Sweden is very successful in deploying renewable energy, other sectors such as transport, energy efficiency in industry and buildings, and agriculture remain a challenge. Transport is the largest emitter with 33 % of national emissions. Carbon dioxide (CO_2) emissions per kilometre of newly registered cars have declined considerably during the last decade but remain at the upper end of old EU Member States, despite targeted tax measures. If 12 % of all petrol cars were replaced by plug-in hybrids and electric cars, emissions could be reduced by 20 %, according to Vägval Energi (2008).
Industrial energy efficiency is noticeably lower in Sweden than the EU average and the main policy instrument — voluntary agreements with industry in exchange for tax reductions — was discontinued in 2012. However, the reduction of energy consumption of industry would reduce GHG emissions and would also help to increase competitiveness of Swedish companies in the long term. Studies suggest that cumulative energy savings potential among the Swedish energy-intensive industry is high and that many measures would have payback times of less than a year, including industrial insulation (Xylia and Silveira, 2014; Ecofys, 2012).
Also, energy efficiency of households scores low in comparison to other EU Member States. Residential buildings currently account for 21 % of Sweden's overall energy consumption. A recent study suggests that annual energy demand in residential buildings could be reduced by 53 % and associated CO_2 emissions by 63 % (compared to 2005 levels) if a catalogue of measures was implemented, such as heat recovery systems or reduction of indoor temperatures (Mata et al., 2013).

Climate and energy strategies
Sweden has established so-called generational goals for 2020, including the limitation of climate impacts. An Environmental Objectives Council, a special government-appointed body, is monitoring the progress towards these objectives. The 2009 Integrated Climate and Energy Policy sets out Sweden's targets for 2020, including 40 % GHG reduction, 50 % share of renewable energy in total energy use, 10 % renewable energy in the transport sector and a 20 % increase in energy efficiency (Climate Bill 2008/09: 162 and 163). Furthermore, Sweden aims at a fossil fuel-independent vehicle fleet by 2030 and zero net GHG emissions by 2050. Various action plans aim at implementing these objectives, including an action plan on energy efficiency and renewable energy. Sweden is currently in the process of agreeing on a 2050 Climate Roadmap for net carbon neutrality, of which a first proposal was published in spring 2014. To implement its climate targets, Sweden mainly makes use of pricing instruments, such as high energy taxes, and additional CO_2 taxation since 1991.

Renewable energy
Sweden has a very high proportion of renewable energy production, due to long-standing utilisation of bioenergy and hydroelectric installations and recent advances in the deployment of wind power. The principal instrument for the promotion of **renewable electricity** is a quota system involving tradable renewable energy certificates, introduced in 2003. In this scheme, electricity suppliers are required to hold certificates for a specific share of their supply. This amount is determined by the government. Since 2012, Norway and Sweden have a common electricity certificate market and a common target.
Since 2009, Sweden also offers investment support for the installation photovoltaics with a funding of SEK 210 million (EUR 24.5 million) between 2013 and 2016 (RES Legal, 2013). Various funding programmes are dedicated to research on hydropower, wind power, solar cells and biofuel production. For wind power, Sweden adopted more favourable conditions in spatial planning. To raise awareness, the 2010 Guarantees of Origin of Electricity Act obliges electricity providers to give final customers clear information on the origins of their electricity.
Sweden supports **renewable heat** through an exemption from the energy tax, the carbon tax and the tax on nitrogen oxide emissions (§ 1 Act No. 1990:613), and household also can benefit since 2009 from an income tax deduction of labour costs of the installation of renewable heat systems. Sweden estimates that fossil-based heating will be discontinued by 2030 with existing instruments only (MoE, 2014).

Energy efficiency
Sweden's energy intensity is still high but the country aims to reduce its energy consumption by 20 % by 2020 and currently is, with some uncertainties, on track to meet this target. The country mainly relies on taxation instruments, research and voluntary measures to promote energy efficiency.
Sweden has the third highest implicit **tax rate** on energy in the EU, with high excise duties on energy products, and a high VAT rate of 25 %. Since 1991, Sweden also levies a CO_2 tax on petrol, diesel oil, heating oil and coal that is gradually increasing. These taxes have helped to reduce emissions from district heating and from the residential and commercial/institutional sectors.
Cogeneration of electricity and heat is promoted through the quota system for renewables as described above. As of 1 January 2013, cogeneration covered by the EU Emissions Trading System (ETS) is exempt from CO_2 tax (MoE, 2014).
To address energy efficiency in **industry**, Sweden has established the Programme for Energy Efficiency in Energy Intensive Industry (PFE), which offered companies an exemption from the energy tax on the electricity used in manufacturing processes. In return, companies have to commit to carry out an energy survey, to introduce an energy management system and to undertake energy efficiency measures with short payback periods. The PFE was introduced in 2004 but is not open anymore to new entrants since it violates EU state aid rules. Sweden is currently working on a new policy instrument (MoE, 2014). Small and medium-sized enterprises and farms are eligible for grants covering 50 % of the costs of energy surveys since 2010. This scheme will continue at least until the end of 2014.

For **buildings**, minimum energy performance standards are in place for new and modernised buildings and Energy Performance Certificates are mandatory. The building regulation setting the performance standards was tightened in 2011 to ensure a more efficient use of heating and electricity in refurbished buildings. The government also supports the demonstration of low-energy and zero-energy buildings (IEA, 2013). Sweden has rolled out smart meters in almost every household, and consumers have the choice of hourly metering. A Smart Grid Council was established to set up a national action plan by end 2014 (IEA, 2013).

Transport
Sweden recently adopted a national transport plan for 2014–2025, with a budget of SEK 522 billion (EUR 58 billion). Sweden also aims at having a vehicle fleet independent of fossil fuels in 2030. Consultations on a new government report, 'Fossil Freedom on the road', were completed in spring 2014. Proposed measures include developing attractive and accessible cities, infrastructure measures, more efficient vehicles, use of biofuels and electric vehicles.
While Sweden does not charge a registration **tax**, its circulation tax is partly based on CO_2 emissions, and cars emitting less than 120 g CO_2/km, alternative fuel cars and electric cars are exempt from the tax for 5 years (environmental car premium). Energy tax rates for both diesel and petrol are among the highest in the EU. Lower rates apply to diesel but this is outweighed by a higher CO_2 tax (European Commission, 2013).
To promote **renewable energy** in transport, the 2006 Renewable Fuels Act requires the majority of filling stations to provide at least one renewable fuel. Since 2013, Sweden exempts sustainable biofuels from the CO_2 tax, and applies reduced energy tax rates. In the 2014 budget, the government proposed a new green car package that will partly replace former policy instruments. It includes continued tax deduction for green cars until 2016, a new compulsory biofuel quota system to increase the proportion of low-blended renewable fuels in petrol and diesel, and continued tax exemption for high-blended biofuels (MoE, 2014).
The new national transport plan promises major investments in railway infrastructure, including new high-speed tracks between major cities, and in 400 km of new cycling paths.

Fluorinated gases (F-gases)
In 2009, Sweden considered introducing a tax on F-gases (Regeringskansliet, 2009) but since then the topic has not been taken up again.

Agriculture
There is no comprehensive strategy for addressing emissions from agriculture and there are few policies that directly address agricultural emissions. Sweden is gradually phasing out the CO_2 tax relief on fuels used in agriculture (currently at 30 % of the standard rate), and full rates will apply from 2015 onwards (MoE, 2014). A tax on fertilisers was abolished in 2010. In addition, the government did not decide to implement a proposal for an action plan to reduce nutrient losses and GHG emissions from agriculture presented in the 2010 programme (MoE, 2014). Reducing nitrogen leakage in agriculture has the potential to reduce CO_2 emissions by 0.5 million tonnes by 2020 (McKinsey, 2008).

Waste
Sweden is a frontrunner in waste management with 50 % of household waste being recycled and only 4 % being sent to landfill. The remainders are used in a Waste-to-Energy programme that helps Sweden to fuel 20 % of its district heating. Forecasts indicate that Sweden will be able to reduce its GHG emissions from waste by 76 % by 2020 compared to 1990 levels (Avfall Sverige AB, n.d.). The 2012–2017 Waste Management Plan sets out the policy measures for waste in the construction sector, in households, resource management in the food chain, waste treatment and illegal export of waste (Naturvårdsverket, 2012). Since 2000, Sweden levies a landfill tax with gradually increasing rates. Additionally, landfill bans were established for separated combustible material (2002) and organic material (2005).

Land use, land-use change and forestry
Over 65 % of land in Sweden is characterised as forest land, and removals from land use, land-use change and forestry have gradually decreased in recent years. In 2011, Sweden started its 'Forest Kingdom' initiative that promotes the sustainable use of forests. As part of this initiative, the government provides increased advice to the forestry sector on improved forest management, started information campaigns on forestry and climate change in the framework of the programmes Forestry in a changed climate and Forest owners and climate (Ministry for Rural Affairs, 2013).

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Key climate- and energy-related data — United Kingdom

Key data on GHG emissions	2005	2011	2012	2013	EU 2012
Total GHG emissions (UNFCCC, Kyoto Protocol) (Mt CO_2-eq.)	674.7	562.8	580.8	570.3	4 544.2
GHG per capita (t CO_2-eq./cap.)	11.2	8.9	9.1	8.9	9.0
GHG per GDP (g CO_2-eq./PPS in EUR)	402	340	342	328	350
Share of GHG emissions in total EU-28 emissions (%)	13.0 %	12.2 %	12.8 %	12.8 %	100 %
EU ETS verified emissions (Mt CO2-eq.)	242.5	220.9	231.3	225.5	1 848.6
Share of EU ETS emissions in total emissions (%)	36 %	39 %	40 %	40 %	41 %
ETS emissions vs allowances (free, auctioned, sold) (%)	+ 17.7 %	– 13.0 %	– 9.6 %	+ 30.0 %	– 14.1 %
Share of CERs & ERUs in surrendered allowances (%)	0.0 %	7.2 %	19.0 %	n.a.	26.4 %
Non-ETS (ESD) emissions, adjusted to 2013–2020 scope (Mt CO2-eq.)	400.4	340.0	347.8	343.3	2 566.6
Key data on renewable energy	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Share of renewable energy in gross FEC (%)			3.8 %	4.2 %	14.1 %
() = including all biofuels consumed in transport	(1.4 %)	(3.3 %)			
Share of renewable energy for electricity (%)	4.1 %	7.4 %	8.8 %	10.8 %	23.5 %
Share of renewable energy for heating and cooling (%)	0.8 %	1.7 %	2.3 %	2.3 %	15.6 %
Share of renewable energy for transport (%)			2.7 %	3.7 %	5.1 %
() = including all biofuels consumed (%)	(0.3 %)	(3.1 %)			
Key data on energy consumption	**2005**	**2010**	**2011**	**2012**	**EU 2012**
Primary energy consumption (Mtoe)	222.8	203.0	189.7	195.4	1 584.8
Primary energy consumption per capita (Mtoe/cap.)	3.7	3.2	3.0	3.1	3.1
Final energy consumption (Mtoe)	152.8	141.3	130.9	134.0	1 104.5
Final energy consumption per capita (Mtoe/cap.)	2.5	2.3	2.1	2.1	2.2
Efficiency of conventional thermal electricity and heat production (%)	44.3 %	45.8 %	45.1 %	42.8 %	50.0 %
Energy consumption per dwelling by end use	**2005**	**2009**	**2010**	**2011**	**EU 2011**
Total energy consumption per dwelling (toe/dwelling)	2.01	1.69	1.75	1.56	1.42
Space heating and cooling (toe/dwelling)	1.36	1.10	1.17	0.98	0.96
Water heating (toe/dwelling)	0.31	0.27	0.27	0.27	0.18
Cooking (toe/dwelling)	0.05	0.04	0.04	0.04	0.08
Electricity (lighting, appliances) (toe/dwelling)	0.29	0.27	0.27	0.27	0.20

Progress towards GHG targets (under the Effort Sharing Decision, i.e. non-ETS emissions)

2013 ESD target (% vs base year)	– 7.9 %	2020 ESD target (% vs base year)	– 16.0 %
2013 ESD emissions (% vs base year)	– 9.3 %	2020 ESD projections WEM (% vs base year)	– 19.4 %
		2020 ESD projections WAM (% vs base year)	n.a.

Based on approximated emission estimates for 2013, emissions covered by the Effort Sharing Decision (ESD) (i.e. in the sectors which are not covered by the EU ETS) are expected to be below the annual ESD target in 2013. Projections also indicate that 2020 ESD emissions are expected to be below the 2020 ESD target, with the current existing measures.

Progress towards renewable energy targets

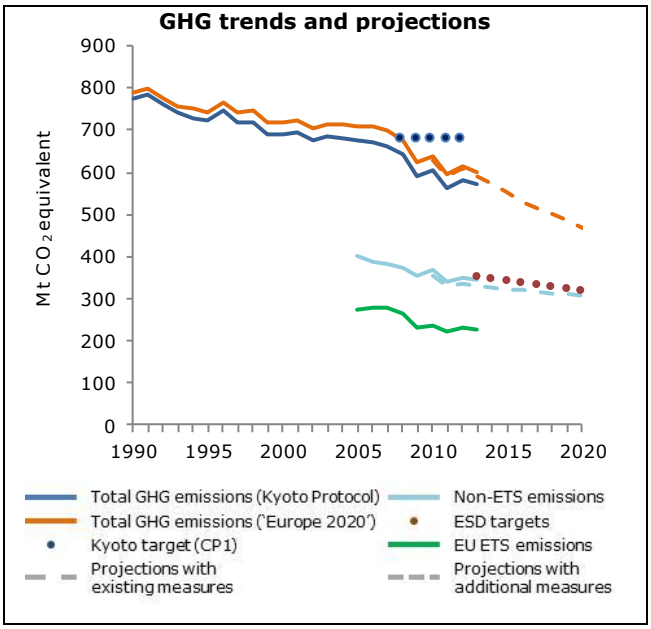
2012 RES share in gross final energy consumption (%)	4.2 %	2011–2012 indicative share from RES Directive (%)	4.0 %
2020 RES target	15.0 %	2012 expected share from NREAP (%)	4.0 %

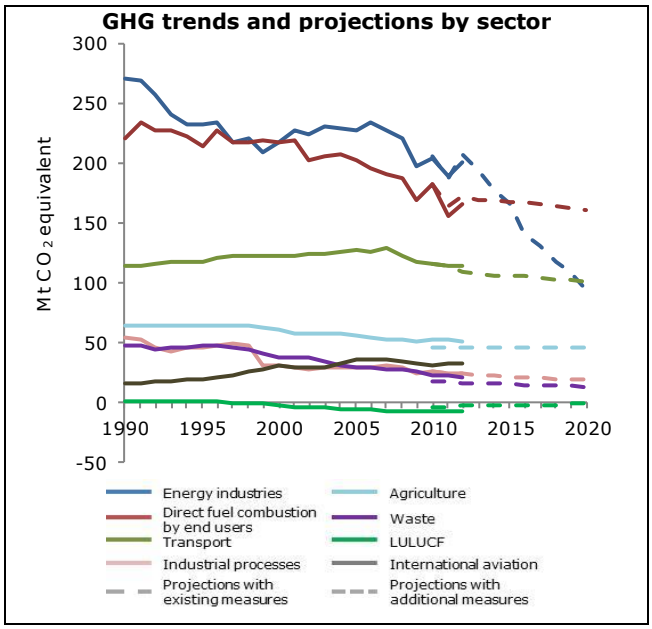
The average share of renewable sources in gross final energy consumption for 2011–2012 was 4.0% (5.3 Mtoe), which is equal to the indicative RED target for 2011–2012 (4.0%). At the same time, the share of renewables in 2012 (4.2 %) is higher than the expected 2012 NREAP target (4.0 %). Over the period 2005–2012 the observed average annual growth rate in renewable energy consumption amounted to 15.9%. In order to reach its 2020 NREAP target, United Kingdom needs an average annual growth rate of 17.6% in the run-up to 2020. In absolute terms, this is equivalent to 4.1 times its cumulative effort so far.

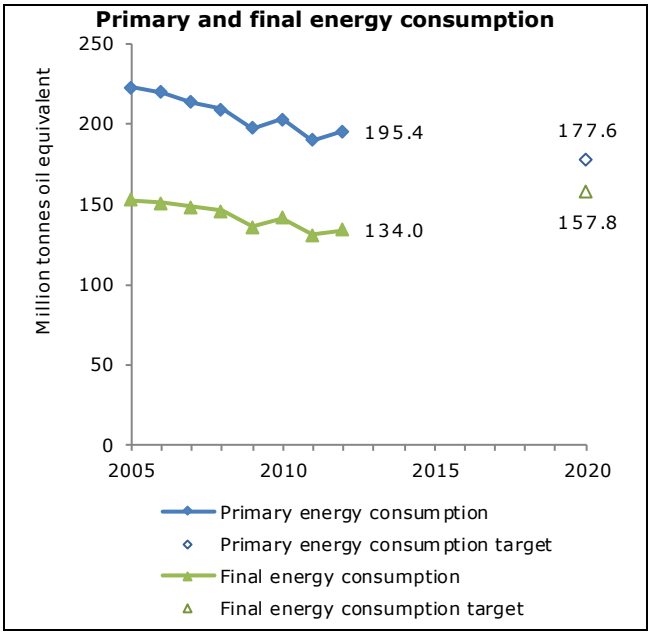
Progress towards energy efficiency targets

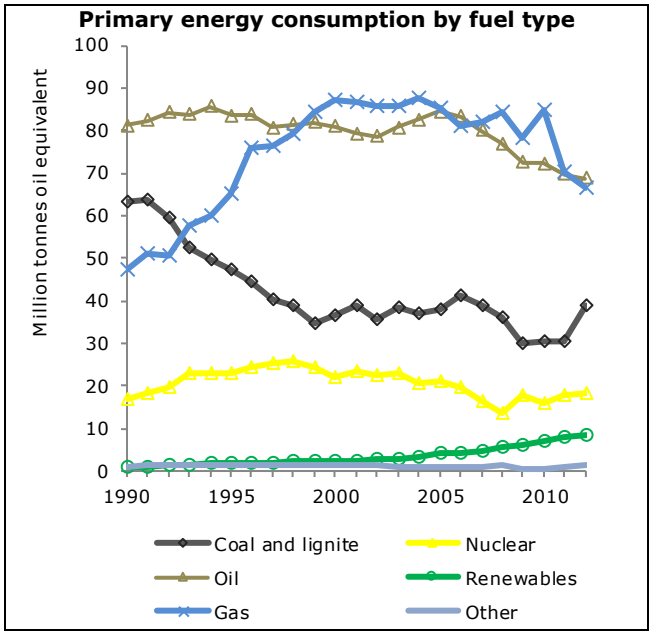
Primary energy consumption:		Final energy consumption:	
2005–2012 average annual change	-1.9 %	2005–2012 average annual change	-1.9 %
2012–2020 average annual change to target	-1.2 %	2012–2020 average annual change to target	2.1 %

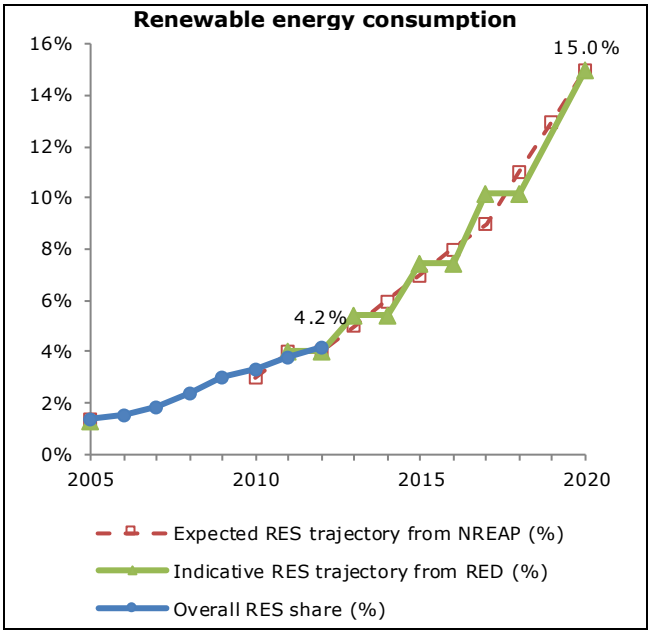
Between 2005 and 2012, energy consumption decreased by more than 12 %, at a faster pace than is necessary to meet the 2020 targets. This was a combined result of energy efficiency policies, such as the Energy Company Obligation Scheme and the financial incentives available to the residential and public sector for energy efficiency improvements, and the effects of the economic crisis. Improving the efficiency in electricity conversion, which has been decreasing in recent years due to a 30 % increase in consumption of solid fuels, could help further reducing primary energy consumption.

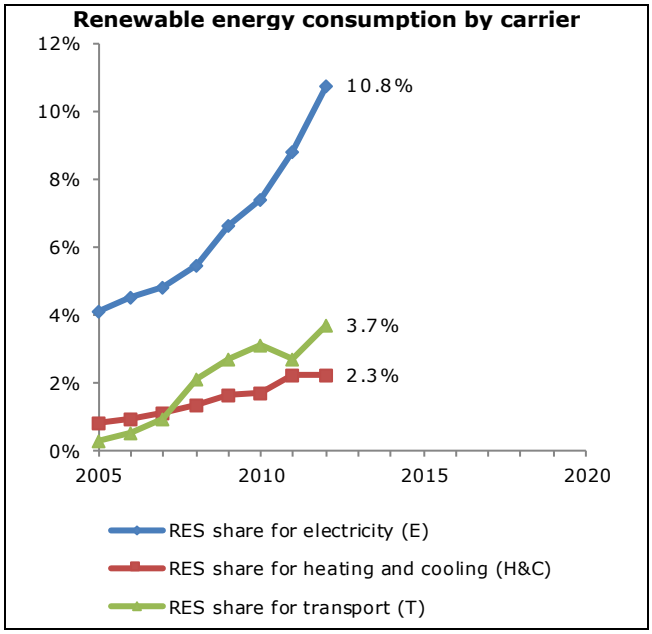

GHG trends and projections
Mt CO2 equivalent
900
800
700
600
500
400
300
200
100
0
1990
1995
2000
2005
2010
2015
2020
Total GHG emissions (Kyoto Protocol)
Total GHG emissions ('Europe 2020')
Kyoto target (CP1)
Projections with existing measures
Non-ETS emissions
ESD targets
EU ETS emissions
Projections with additional measures


GHG trends and projections by sector
Mt CO2 equivalent
300
250
200
150
100
50
0
-50
1990
1995
2000
2005
2010
2015
2020
Energy industries
Direct fuel combustion by end users
Transport
Industrial processes
Projections with existing measures
Agriculture
Waste
LULUCF
International aviation
Projections with additional measures


Primary and final energy consumption
Million tonnes oil equivalent
250
200
150
100
50
0
2005
2010
2015
2020
195.4
134.0
177.6
157.8
Primary energy consumption
Primary energy consumption target
Final energy consumption
Final energy consumption target


Primary energy consumption by fuel type
Million tonnes oil equivalent
100
90
80
70
60
50
40
30
20
10
0
1990
1995
2000
2005
2010
Coal and lignite
Oil
Gas
Nuclear
Renewables
Other


Renewable energy consumption
16%
14%
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
15.0%
4.2%
Expected RES trajectory from NREAP (%)
Indicative RES trajectory from RED (%)
Overall RES share (%)


Renewable energy consumption by carrier
12%
10%
8%
6%
4%
2%
0%
2005
2010
2015
2020
10.8%
3.7%
2.3%
RES share for electricity (E)
RES share for heating and cooling (H&C)
RES share for transport (T)

Climate and energy policy framework

Challenges and opportunities
The United Kingdom (UK) was the first country worldwide to establish a long-term, legally binding emission reduction target for 2050, and now has a wide range of climate change policy instruments in place. However, the landscape of frequently changing and often overlapping instruments is partly inefficient, and the UK is currently not on track to meet its own 2050 target (UK CCC, 2014).
The UK is still far from reaching its 2020 target for renewable energy of 15 %, despite the broad range of policy instruments in place. However, renewable electricity, if successfully promoted, could save the UK up to GBP 160 billion (approximately EUR 195 billion) in energy supply costs to 2050, contribute up to GBP 89 billion (approximately EUR 109.2 billion) to the UK economy and potentially support over 35 000 jobs (DECC, 2013a). The uptake of renewable heat is also very low and some financial and non-financial barriers are still to be eliminated (UK CCC, 2014).
Another challenge remains energy efficiency in the residential sector, but there is also scope in the service and industrial sectors, where currently barriers are less well addressed (DECC, 2012b). Setting strict standards for energy efficiency and tightening obligations for energy suppliers could provide significant opportunities. Studies suggest that the UK has the potential to save 196 TWh in 2020, which is 11 % below business-as-usual scenarios. The related job and revenues potential is high, given that already in 2010/2011 the sector accounted for around 136 000 jobs and revenues of GBP 17.6 billion (approximately EUR 21.6 billion) (DECC, 2012a).
The complex and frequently changing policy landscape has resulted in confusion about available incentives and planning requirements, thus significantly delaying necessary investment decisions in renewable energy and energy efficiency (DECC, 2012b; EREC, 2013). The adoption of the Energy Act in late 2013, including the Electricity Market Reform (EMR), gives hope for more political certainty for investment, but the details of its implementing legislation are still to be decided.

Climate and energy strategies
The 2008 Climate Change Act provides the legal framework for climate policy in the UK and establishes a binding climate target of emission reductions by at least 80 % by 2050 (from the 1990 baseline). Regular 5-year carbon budgets serve as interim targets. An independent Committee on Climate Change advises the government on the emission target, carbon budgets and reports on the progress. Within this overall framework, the UK is implementing a broad set of different climate policy measures that are often adjusted and partially overlap. Much of this policy landscape is being altered by the Energy Act (December 2013), which establishes 'a legislative framework for delivering secure, affordable and low carbon energy' and includes a wide range of measures. Inter alia, the Act enables the Secretary of State to set a 2030 decarbonisation target range for the electricity sector in 2016, and introduces an EMR. For its future energy mix, the UK focuses on renewable energy, the use of nuclear energy, carbon capture and storage (CCS), and unconventional natural gas.

Renewable energy
Renewables still makes up only a minor share of energy consumption in the UK. Policy uncertainty and frequent changes are often named as the main barriers for further development. The 2011 Renewables Energy Roadmap (last updated in December 2013) sets out the plan for accelerating the deployment and use of renewable energy. Specific programmes and strategies are also in place for particular renewable technologies. Additionally, the devolved administrations (Northern Ireland, Scotland, Wales) have set themselves ambitious 2020 targets for both renewable electricity and heat consumption, and have established their own strategies.
The recently passed UK Energy Act provides a new framework for electricity generation from 2014 onwards, and aims to provide more stability, but the specifics are still to be discussed. Currently, the principal instrument for the promotion of **large-scale renewable electricity** is the Renewables Obligation, a quota system introduced in 2002, which requires licensed electricity suppliers to source a proportion of their electricity from eligible renewable sources. The new Energy Act aims to replace this system with feed-in tariffs (FITs) with Contracts for Difference (CfD), for renewables, CCS and nuclear electricity. The first CfDs were already awarded in April 2014 (DECC, 2014b). **Small-scale plants** up to 5 MW can benefit since 2010 from FITs, and it is envisaged that this scheme will be extended to community projects of up to 10 MW. **Renewable heat** is promoted through the Non-domestic Renewable Heat Incentive (RHI), launched in 2011, and the Domestic RHI, launched in 2014. While under the Non-domestic RHI generators of renewable heat for non-domestic buildings are eligible for a fixed tariff for a 20-year period, Domestic RHI guarantees domestic consumers quarterly payments for 7 years. The RHI schemes aim at increasing the share of renewable heat to 12 % by 2020. However, to date, the uptake of RHI has been quite slow and some financial and non-financial barriers still have to be removed (UK CCC, 2014).
Energy networks
The UK needs to upgrade and make its electricity grids more flexible to sufficiently integrate renewable energy, requiring an investment of GBP 19 billion (approximately EUR 23.32 billion) by 2020 (OFGEM, 2010). The government works together with stakeholders in the Electricity Network Strategy Group to address this challenge and to monitor the progress of major electricity transmission projects. The EMR significantly alters the electricity market framework, and it is still open whether it will send the right signals, depending on its concrete implementation. In 2014, the Smart Grid Forum, with representatives from electricity network companies, consumer groups, energy suppliers and wider industry, published its Smart Grid Vision and Routemap that outlines upcoming challenges for electricity distribution network operators.

Energy efficiency
The Energy Efficiency Strategy, updated in 2013, identified main barriers for energy efficiency in the UK — including embryonic markets, information gaps, misaligned financial incentives and undervaluing energy efficiency — and introducing a range of specific measures. The updated Strategy recognises that energy efficiency in the residential, commercial and industrial sectors is already covered by existing instruments, however there still is room for improvement, as there is a great deal of untapped cost-effective potential in the UK (DECC, 2013b). The implicit **tax rate** on energy is already high compared to other EU Member States, and only few exemptions are granted.
Cogeneration is promoted under the 2012 strategic framework for low-carbon heat and can receive support under the Climate Change Levy Exemption, Enhanced Capital Allowances scheme, Renewables Obligation, Renewables Heat Incentive or the FIT. Energy efficiency for **large public and private sector organisations** (consuming more than 6 000 MWh) is promoted through the CRC Energy Efficiency Scheme (or CRC Scheme), targeting emissions not already covered by Climate Change Agreements (CCAs) and the EU Emissions Trading System (ETS). Participants are required to annually surrender allowances to offset their emissions. Under the Enhanced Capital Allowance scheme, businesses can write off costs for energy- and water-saving plants and machinery. Additionally, **energy-intensive businesses** with CCAs are allowed to receive up to a 90 % discount from the UK Climate Change Levy when meeting energy efficiency or emission reduction targets, as set out in the Agreements. The UK also plans to introduce a new Energy Savings Opportunity Scheme for companies in 2014, and to pilot an Electricity Demand Reduction providing financial incentive through the Capacity Market for energy-saving measures (DECC, 2014c). Energy efficiency in **households** is mainly promoted through the 2013 Energy Companies Obligation, which requires larger energy suppliers to deliver energy efficiency measures to domestic energy users, with a particular focus on low-income households. The scheme is complemented by the Green Deal, operational since 2013, that encourages the uptake of energy-saving technologies (power generation, insulation, energy-saving devices) in commercial and residential buildings. It allows consumers to pay back the costs of improvements through their energy bills. The uptake of the scheme was low at the start but recent amendments to the scheme, including higher cash-back rates, might remove existing barriers (DECC, 2014a).

Transport
Although emissions from transport in the UK have been decreasing since 2007, they still account for a fifth of the UK's greenhouse gas (GHG) emissions, 92 % of these resulting from road transport. The UK's approach mainly focuses on promoting **low-emission vehicles**. In 2013, the UK published a Strategy for Ultra-low Emission Vehicles with the aim to effectively decarbonise the fleet by 2050, and committing to funding of GBP 500 million (approximately EUR 613.5 million) from 2015 until 2020. Simultaneously, the UK government and industry published a Strategy for Growth and Sustainability in the UK Automotive Sector setting a pathway for research and commercialisation of low-carbon technologies. The UK does not levy a registration **tax** on passenger cars but a carbon dioxide (CO_2)-based ownership tax with higher rates applying in the first year for high-emitting vehicles (ACEA, 2012). Diesel and petrol are taxed above EU average at equal rates, but rates have not been increasing for years. **Renewable energies in transport** are promoted through the Renewable Transport Fuel Obligation, which obliges fossil fuel suppliers to prove that a percentage of fuels supplied comes from renewable sources and is sustainable. There is, however, no encompassing **modal shift** strategy in place apart from the recently published Door to Door Strategy (March 2013) that aims to better integrate between different modes of sustainable passenger transport. There is no climate-related modal shift strategy for freight transport. The railway network in the UK is privatised but the UK committed to invest more than GBP 16 billion (approximately EUR 19.6 billion) between 2014 and 2019 in the existing rail network, high-speed train connection, a new fleet of energy-efficient intercity trains, and rail electrification.

Agriculture
The UK government and devolved administrations have taken various approaches to emissions from agriculture. In England, the 2011 Agriculture Sector Greenhouse Gas Action Plan is a voluntary, industry-led plan to reduce emissions by 2020 by 3 Mt CO_2 equivalent. Scotland informs farmers through a website on sustainable farming techniques. The 2009 established Welsh Land Use Climate Change Group published its report in 2013 on ways to reduce emissions from agriculture and land-use change until 2050. Northern Ireland, where agriculture is the largest source of emissions (28 %), published in 2011 its Efficient Farming Cuts GHG strategy, a joint initiative of the government, the agri-food industry and environmental stakeholders. In England, the new environmental land management scheme will, from 2016 onwards, provide financing to farmers and land managers, delivering benefits for wildlife, improving water quality and creating woodland.

Waste
The UK aims to move to a zero-waste economy. Since 1996, the UK levies a Landfill Tax to reduce waste production and to encourage recycling as well as the reduction of methane from biodegradable waste. The standard rate has since been gradually increasing from GBP 7 to 80 (approximately EUR 8 to 98) per tonne. A number of voluntary agreements between government and businesses on waste reduction and improved package design exist. England adopted a Waste Prevention Programme in 2013, committing to develop a new Sustainable Electrical Action Plan and Fund supporting local authorities, businesses and civil society organisations in waste prevention. Northern Ireland revised its Waste Strategy in 2013, placing increased emphasis on resource efficiency, and Scotland recently adopted a Blueprint for a more Resource Efficient and Circular Economy aiming to cut total waste from households and businesses by 7 % by 2017 and by 15 % by 2025. Wales follows its strategy Towards Zero Waste, to reduce waste by 27 % and recycle 70 % by 2025.

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