



Ireland's Greenhouse Gas Emissions Projections

2011-2020

April 16th 2012

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1. Executive Summary

The National Climate Change Strategy (NCCS 2007)¹ designated the Environmental Protection Agency with responsibility for developing annual national emission projections for greenhouse gases for all key sectors of the economy, in collaboration with relevant State and other bodies. Emission projections serve to inform national policy initiatives and allow Ireland to comply with EU reporting obligations on projections. The projections presented here will be submitted to the European Commission under Council Decision 280/2004².

The EPA produces greenhouse gas emission projections annually taking into account the most recent environmental and other policy developments as well as updates to key assumptions (such as revisions to anticipated economic growth and future fuel prices). These projections update the previous set of national emission projections which were published in April 2011³ by the EPA.

The projections are, primarily, based on SEAI's energy forecasts⁴ which are underpinned by a set of macroeconomic projections for Ireland produced by the ESRI for SEAI in September 2011.

In terms of the overall picture, greenhouse gas emissions out to 2020 are projected to be substantially lower than historical emissions which, according to our latest estimates⁵, peaked in 2001 at 70.0 Mtonnes of CO₂eq.

Compliance with Kyoto Protocol (2008 – 2012)

The projections indicate a total 'distance to target' for the Kyoto Protocol period of 4.1 – 5.1 Mtonnes of CO₂eq. This compares to a total 'distance to target' of 6.3 – 8.1 Mtonnes of CO₂eq in the April 2011 projections. In estimating Ireland's distance to target under the Kyoto Protocol, the impact of forest sinks is included as allowed for under Article 3.3 of the Kyoto Protocol. Ireland is on track to meet its Kyoto commitment taking unused allowances from the EU Emissions Trading Scheme (EU ETS) new entrants reserve into account and/or the potential use of credits already purchased by the State.

Compliance with EU 2020 Targets for non-ETS sector emissions

A second, and different, set of legally binding limits applies under the EU Commission's *Climate and Energy Package* which was agreed by the European Parliament and Council in December 2008 and became law in June 2009. Under this package, Ireland is required to deliver a 20% reduction in non-ETS greenhouse gas emissions by 2020 (relative to 2005 levels). In addition, Ireland also has binding annual emission limits over the period 2013-2020 to ensure a gradual move towards the 2020 target. The non-ETS sectors cover those

¹ National Climate Change Strategy 2007 - 2012. Department of Environment, Heritage and Local Government (2007)

² Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol

³ Ireland's Greenhouse Gas Emissions Projections 2010-2020. Environmental Protection Agency (2011)

⁴ Energy Forecasts for Ireland to 2020. Sustainable Energy Authority of Ireland (2011)

⁵ Ireland's Greenhouse Gas Emissions in 2010. (2012).

http://www.epa.ie/downloads/pubs/air/airemissions/GHG_1990-2010_2012_v3.pdf

sectors that are outside the EU Emissions Trading Scheme and include agriculture, transport, residential and waste. The projections indicate that total non-ETS emissions will be 4.1 – 7.8 Mtonnes of CO₂eq above the 2020 target. This compares to a projection of 4.1 – 8.8 Mtonnes of CO₂eq above the 2020 target in the April 2011 projections. In addition, the projections indicate that Ireland will exceed its binding annual limit in 2015-2017 and will exceed our obligations over the 2013-2020 period by 1.9-20.6 Mtonnes of CO₂eq.

Whilst the reduction in the distance to target for both the Kyoto Protocol period and the 2020 target is a positive outcome in terms of compliance, its occurrence is, primarily, a direct result of the current economic recession and economic outlook for the future. In order to meet future targets, Ireland cannot rely on a recession and needs to develop as a low carbon economy going forward. In moving towards 2020, the impact of the recession on greenhouse gas emissions is offset somewhat by the projected strong growth in the agriculture sector as a result of Food Harvest 2020⁶. Agriculture emissions are projected to increase by 7% in 2020 on current levels. This estimate is 1.1 Mtonnes higher in 2020 than last year's emission projection. The increase in emission levels from agriculture is largely attributable to revised projected animal numbers and fertiliser use data for the sector.

In relation to land use, land use change and forestry (LULUCF), the Commission published a legislative proposal in March 2012 to provide, as a first step, a legal framework for accounting rules for emissions and removals from the LULUCF sector. The proposal does not provide for the use of LULUCF for compliance with the targets set under the *Climate and Energy Package*. This is important for Ireland because it is estimated that forest sinks could provide a removal of 4.6 Mtonnes of CO₂ in 2020 and 32 Mtonnes of CO₂ over the 2013-2020 period which illustrates the important role that LULUCF could play in helping Ireland meet its emission reduction targets.

Another important issue to note is the assumption that Government targets will be met in full. Under the more optimistic policy scenario, called *With Additional Measures*, the targets set out in Government policy documents such as Ireland's National Energy Efficiency Action Plan (NEEAP)⁷ and the National Renewable Energy Action Plan (NREAP)⁸ are assumed to be achieved. The difficulties associated with meeting these targets should, however, not be underestimated. Failure to meet these targets will result in higher emissions levels than those projected under this scenario and thus result in Ireland moving further from its emission reduction target.

⁶ Food Harvest 2020. A Vision for Irish agri-food and fisheries. Department of Agriculture Food and Forestry (2010).

⁷ Maximising Ireland's Energy Efficiency. The National Energy Efficiency Action Plan 2009-2020. Department of Communications, Energy and Natural Resources, 2009.

⁸ National Renewable Energy Action Plan, Ireland. Submitted to the European Commission under Article 4 of Directive 2009/28/EC. Department of Communications, Energy and Natural Resources, 2010.

2. Background

The greenhouse gas emission projections presented here are based on data provided by a range of State agencies and organisations, most notably Sustainable Energy Authority of Ireland (SEAI) for energy forecasts and Teagasc for forecast animal numbers, crop statistics and nitrogen fertiliser use.

Energy-related emissions projections are based on energy forecasts published by SEAI in December 2011⁴. These energy forecasts are based on a set of macroeconomic projections for Ireland produced by the ESRI in September 2011 which represent one possible view of economic growth. Table 1 outlines the key macroeconomic assumptions that underpin the projections.

Table 1. Key macroeconomic assumptions underlying the projections

	Average Annual % Growth			
	2011-2015		2016-2020	
GDP	3.0%		3.3%	
GNP	2.3%		3.6%	
Personal Consumption	0.2%		2.9%	
	2010	2011	2015	2020
Housing Completions ('000)	15	10	32	33
Stock of cars ('000)	1,917	1,819	1,891	2,032
Population ('000)	4,428	4,427	4,484	4,603
ETS Carbon €₂₀₀₉/tCO₂	-	14.50	25.00	33.00
Carbon tax €₂₀₀₉/tCO₂	-	15.83	25.00	33.00
Coal \$₂₀₀₉/tonne	-	97	98	106
Oil \$₂₀₀₉/barrel	-	106	108	110
Gas \$₂₀₀₉/MBtu	-	10	11	12
Peat \$₂₀₀₉/MWh	-	15	15	15

Agriculture emissions projections are based on data from Teagasc's FAPRI-Ireland model which were provided to the EPA in December 2011. The FAPRI-Ireland model is a dynamic, partial equilibrium model which is linked both to the FAPRI-EU and world modelling systems. A key assumption underpinning the agriculture emissions projections is that the Food Harvest 2020⁶ targets will be met in full.

3. Description of emissions scenarios

Two emissions projections are presented which show two potential outlooks to 2020 depending on policy development and implementation. These are called

- *With Measures*
- *With Additional Measures*

The *With Measures* scenario is based primarily on SEAI's *Baseline* energy forecast⁴ which incorporates the anticipated impact of policies and measures that were in place (and legislatively provided for) by end of 2010.

The *With Additional Measures* scenario is based on SEAI's *NEEAP/NREAP* energy forecast⁴. The *NEEAP/NREAP* energy forecast builds on the *Baseline* energy forecast with additional assumptions included to account for Ireland's National Energy Efficiency Action Plan (NEEAP)⁶ and the National Renewable Energy Action Plan (NREAP)⁷. Therefore this scenario includes existing *and* planned policies and measures.

The two scenarios are summarised in Table 2.

Table 2. Description of Projection Scenarios

<i>With Measures Scenario</i>	<p><u>Energy-related emissions projections</u></p> <ul style="list-style-type: none"> Based on SEAI <i>Baseline</i> energy forecast⁴. These energy forecasts are based on a set of macroeconomic projections for Ireland produced by the ESRI in September 2011. <p><u>Agriculture emission projections</u></p> <ul style="list-style-type: none"> Based on forecasts of animal numbers, crop statistics and nitrogen fertiliser use produced by Teagasc in December 2011 which assume achievement of "Food Harvest 2020⁶" targets. <p><u>Waste</u></p> <ul style="list-style-type: none"> Assumes that the Landfill Directive targets (Directive 1999/31/EC) will be reached in 2013 and 2016. <p><u>Forestry</u></p> <ul style="list-style-type: none"> Projections of the future impact of forest sinks were provided by Department of Agriculture, Food and the Marine. Estimates of forest cover are based on maintaining planting rates of 8,000 hectares per year into the future.
<i>With Additional Measures Scenario</i>	<p><u>Energy-related emissions projections</u></p> <ul style="list-style-type: none"> Based on SEAI <i>NEEAP/NREAP</i> energy forecast⁴. The <i>NEEAP/NREAP</i> energy forecast builds on the <i>Baseline</i> energy forecast with additional assumptions to account for Ireland's National Energy Efficiency Action Plan⁶ and National Renewable Energy Action Plan⁷. This includes measures such as 20% improvement in energy efficiency across all sectors, 40% renewable electricity (RES-E) share and 10% renewable transport (RES-T) share (including 10% electric vehicles penetration target). <p><u>Agriculture emission projections</u></p> <ul style="list-style-type: none"> As above <p><u>Waste</u></p> <ul style="list-style-type: none"> As above <p><u>Forestry</u></p> <ul style="list-style-type: none"> As above

4. Compliance with the Kyoto Protocol

Under the Kyoto Protocol, Ireland is required to limit total national greenhouse gas emissions to 314.2 Mtonnes of CO₂eq over the five year period 2008 – 2012 which is equivalent to 62.8 Mtonnes of CO₂eq per annum. The Kyoto Protocol limit is calculated as 13% above Ireland's 1990 baseline value which was established and fixed at 55.61 Mtonnes of CO₂eq following an in-depth review of Ireland's 2006 greenhouse gas inventory submission to the UNFCCC.

Figure 1 shows emissions for the period 1990 to 2020 for both *With Measures* and *With Additional Measures* scenarios and compares with the Kyoto Protocol limit for the 2008 – 2012 period. Projected emissions for the Kyoto period include the impact of forest sinks as allowed for under Article 3.3 of the Kyoto Protocol.

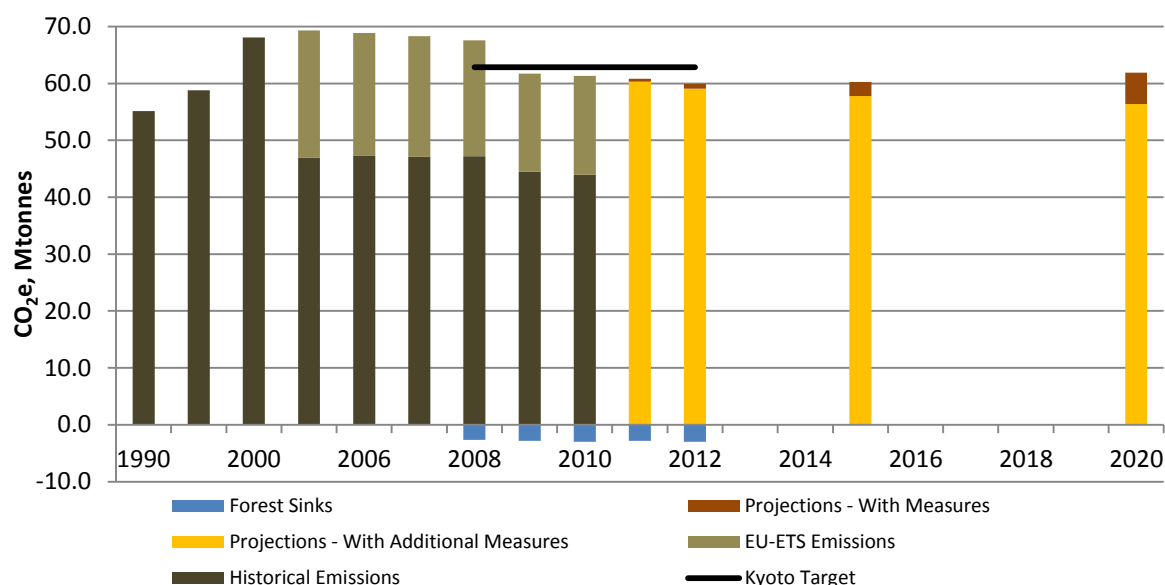


Figure 1. Historical and projected greenhouse gas emissions (including forest sinks for the 2008 – 2012 period) for each scenario and the Kyoto Protocol target

Projected annual average emissions for the period 2008 – 2012 for the *With Measures* and *With Additional Measures* scenarios, including forest sinks, are outlined in Table 3. As stated, the Kyoto Protocol limit for Ireland is, on average, 62.8 Mtonnes of CO₂eq per annum over the 5-year Kyoto period. To determine compliance with the Kyoto Protocol, it is necessary to consider the relative contributions of the ETS and non-ETS sector emissions. The second National Allocation Plan⁹ allocates 22.3 Mtonnes of CO₂ annually to those installations covered by the EU Emissions Trading Scheme. The remainder (i.e. 62.8-22.3=40.6 Mtonnes of CO₂eq) is compared with projected non-ETS sector emissions (including the impact of forest sinks) to assess the distance to target.

⁹ Ireland's National Allocation Plan for Emission Trading 2008 – 2012. Final Allocation Decision. Environmental Protection Agency. (2008).

Table 3. Projected annual average emissions for 2008 – 2012 and distance to Kyoto Protocol limit

	With Measures	With Additional Measures
	Mt CO ₂ eq	Mt CO ₂ eq
Total National Emissions (with sinks)	59.4	59.1
Less ETS Emissions	17.8*	17.8*
Total Non-ETS Emissions (with sinks)	41.6	41.4
Kyoto Limit	62.8	62.8
Less ETS Allocation	22.3	22.3
Total Non-ETS Limit	40.6	40.6
Distance above Kyoto limit (excluding forest sinks)	3.9	3.7
Forest sinks	-2.9	-2.9
Distance above Kyoto limit (including forest sinks)	1.0**	0.8***

* Emissions from sectors covered by the ETS are projected to be below the annual allocation as set out in the second National Allocation Plan 2008 – 2012 of 22.3 Mtonnes of CO₂ per annum. However, it is important to note that not all of this amount will be distributed to installations in the ETS sector. Actual allocation to installations in 2009 were 20.03 million allowances, in 2010 were 20.96 million allowances and in 2011 were 21.5 million allowances. The remainder is mainly reserved for New Entrants over the 5 year period 2008 – 2012 and if not fully utilised will revert to the national account.

** 62.8 (Kyoto Limit) – 22.3 (Annual Allowance Allocation for ETS) = 40.6 Mtonnes of CO₂eq. 41.6-40.6 = 1.0 Mtonnes of CO₂eq

*** 62.8 (Kyoto Limit) – 22.3 (Annual Allowance Allocation for ETS) = 40.6 Mtonnes of CO₂eq. 41.4-40.6 = 0.8 Mtonnes of CO₂eq
Numbers may not sum exactly due to rounding.

This year's emissions projections indicate a 'distance to target' for the Kyoto Protocol of 0.8 – 1.0 Mtonnes CO₂eq per annum. This compares to emissions projections published last year, in April 2011, which indicated a 'distance to target' for the Kyoto Protocol of 1.3 – 1.6 Mtonnes of CO₂eq per annum.

Implications for Government Purchasing Requirement

Based on these projections, the Government purchasing requirement is projected to be 0.8 – 1.0 Mtonnes of CO₂eq per annum over the five-year Kyoto period which equates to 4.1 – 5.1 Mtonnes of CO₂eq in total. The estimated credits acquired or to be acquired by the State in the 2008 – 2012 period is currently 8.3 million¹⁰. This means that, based on these projections, there is a surplus of 3.2 – 4.2 Mtonnes of CO₂eq above Ireland's Kyoto Protocol commitments.

Furthermore, under the National Allocation Plan 2008 – 2012⁹, the EPA established a New Entrant Set-Aside where allowances were set aside for new entrants coming into the EU ETS and for the expansion of existing installations over the 2008 – 2012 period. In addition, where an installation closes in the years 2008 – 2012, the allowances in respect of future years are withheld and added to the New Entrant Set-Aside. It was stated in the National Allocation Plan⁸ that any allowances remaining unused in the New Entrant Set-Aside at the end of the 2008 – 2012 period will be retired for Kyoto compliance. It is currently estimated that there

¹⁰ Comptroller and Auditor General Annual Report. Accounts of Public Services 2008. (September 2009)

will be approximately 6 million allowances remaining in the New Entrant Set-Aside at the end of the Kyoto period.

It remains to be resolved in 2012 during the international climate negotiations whether excess credits can be used in the second Kyoto commitment period. Furthermore, the EU Effort Sharing Decision allows Member States to make limited use of credits over the period 2013-2020 subject to certain restrictions. This may provide some use for the remaining credits that have been purchased by the State.

5. Compliance with EU 2020 Target for the Non-ETS Sector Emissions

In 2007, a series of demanding climate and energy targets were agreed by EU Heads of State and Government known as the "20-20-20" targets, to be reached by 2020. These are:

- A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels
- 20% of EU energy consumption to come from renewable resources
- A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency

In January 2008 the European Commission proposed binding legislation to implement the 20-20-20 targets. This *Climate and Energy Package* was agreed by the European Parliament and Council in December 2008 and became law in June 2009. The core of the package comprises four pieces of complementary legislation of which the Effort Sharing Decision (Decision 406/2009)¹¹ is one component.

The Effort Sharing Decision establishes 2020 targets for each Member States that covers non-ETS sector emissions *and* provides for annual binding targets for the period 2013 – 2020 to ensure a gradual move towards the 2020 targets. These targets concern emissions from sectors not included in the EU Emissions Trading System (ETS) – such as transport, agriculture, residential and waste. Member States are permitted to meet their annual targets through a number of mechanisms which include carry forward of a quantity of its annual emission allocation from the following year, use of transfers from other Member States who may transfer part of their annual emission allocation and the limited use of credits from project activities as long as certain criteria are met.

The target for Ireland's non-ETS sectors is to reduce emissions by 20% in 2020 relative to 2005 levels. This limit is provisionally calculated by the EPA as 37.5 Mtonnes of CO₂eq¹². It is estimated that Ireland will exceed its 2020 limit by 4.1 – 7.8 Mtonnes of CO₂eq. This is 3.5% – 11.3% below 2005 levels compared with a limit of 20% below 2005 levels.

Figure 2 shows projected emission levels for non-ETS sector emissions under the *With Measures* and *With Additional Measures* scenarios. In addition, it shows the annual compliance/non-compliance in relation to the annual binding emission limits.

¹¹ DECISION No 406/2009/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020

¹² 69.3 Mtonnes of CO₂eq (Total 2005 National Emissions) – 22.4 Mtonnes of CO₂ (2005 ETS Emissions without De-minimis) = 46.8 Mtonnes of CO₂eq (2005 non-ETS Emissions) - 20% = 37.5 Mtonnes of CO₂eq. However, some further adjustment of this figure is anticipated due to corrections for alterations to the scope of the ETS.

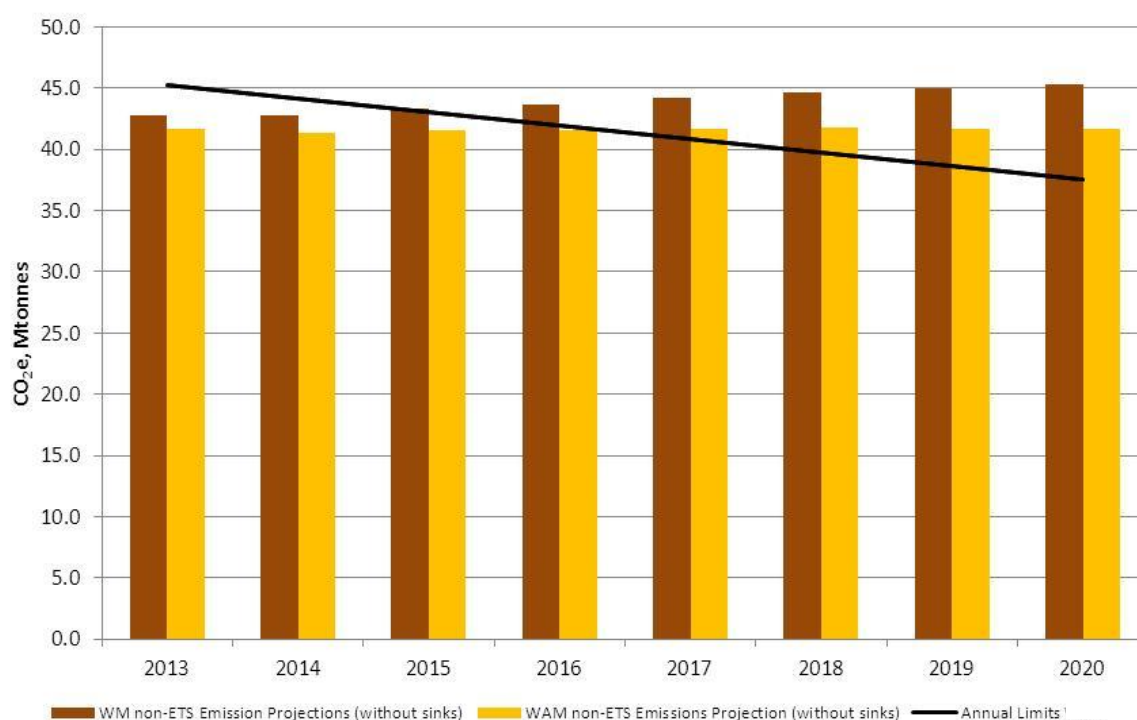


Figure 2. With Measures and With Additional Measures greenhouse gas emissions projections and comparison with the linear reduction pathway required between 2013 and 2020

In terms of the annual limits over the period 2013-2020, Ireland is projected to exceed its limit in 2015 under the *With Measures* scenario and in 2017 under the *With Additional Measures* scenario. Table 4 indicates the range of the annual compliance/non-compliance over the period 2013-2010.

Table 4. Range of annual compliance/non-compliance based on the With Measures and With Additional Measures

Mtonnes of CO ₂ eq	2013	2014	2015	2016	2017	2018	2019	2020	Total
	<i>Annual compliance/non-compliance</i>								
Annual Limits*	45.2	44.1	43.0	41.9	40.8	39.7	38.6	37.5	
With Measures	-2.5	-1.4	0.3	1.8	3.4	5.0	6.3	7.8	20.6
With Additional Measures	-3.5	-2.8	-1.4	-0.4	0.9	2.1	3.0	4.1	1.9

*Estimated by the EPA

**A negative sign indicates that emissions are below the annual allowed limit.

It is important to note that the *With Additional Measures* scenario assumes that all targets in Government policy documents such as the NEEAP⁶ and NREAP⁷ are met. The difficulties associated with meeting these targets should not, however, be underestimated. Failure to meet these targets will result in higher emissions levels than those projected under this scenario and result in Ireland's emission levels moving further from its emission reduction targets.

Furthermore, it is important to note that in March 2012, the Commission published a legislative proposal to provide, as a first step, a legal framework for robust, harmonised and comprehensive accounting rules for emissions and removals from the LULUCF sector. The proposal is based on new international rules agreed at the UN climate change talks in Durban in December 2011. The Commission aims, through this proposal, to establish a legal framework for the LULUCF sector which is separate from the frameworks regulating the existing EU commitments (i.e. the EU ETS and the Effort Sharing Decision). This means that the proposal does not foresee LULUCF contributing to the EU 20% greenhouse gas emission reduction target at this stage. The Commission have indicated that only once robust accounting rules and monitoring and reporting are in place, could the LULUCF sector be formally included in the Union's emission reduction targets. This is important for Ireland because it is estimated that forest sinks could provide a removal of 4.6 Mtonnes of CO₂ in 2020 and 32 Mtonnes of CO₂ over the 2013-2020 period which illustrates the important role that LULUCF could play in helping Ireland meet future emission reduction targets.

The emissions projections published last year, in April 2011, indicated that non-ETS sector emissions would be 4.1 – 8.8 Mtonnes of CO₂eq over the 2020 target. The reduction in the distance to target under the *With Additional Measures* scenario is attributable to a decrease in projected emissions in the Transport, Industry and Residential sectors which is countered somewhat by a 6% projected increase in agriculture emissions relative to last year.

6. National and Sectoral trends

National Trend - With Measures Emissions Projection

The trend in total emissions (i.e. both ETS and non-ETS sector emissions) from 1990 to 2020, with projected trends for the *With Measures* scenario is shown in Figure 3. Forest sinks are only calculated and reported for the Kyoto period.

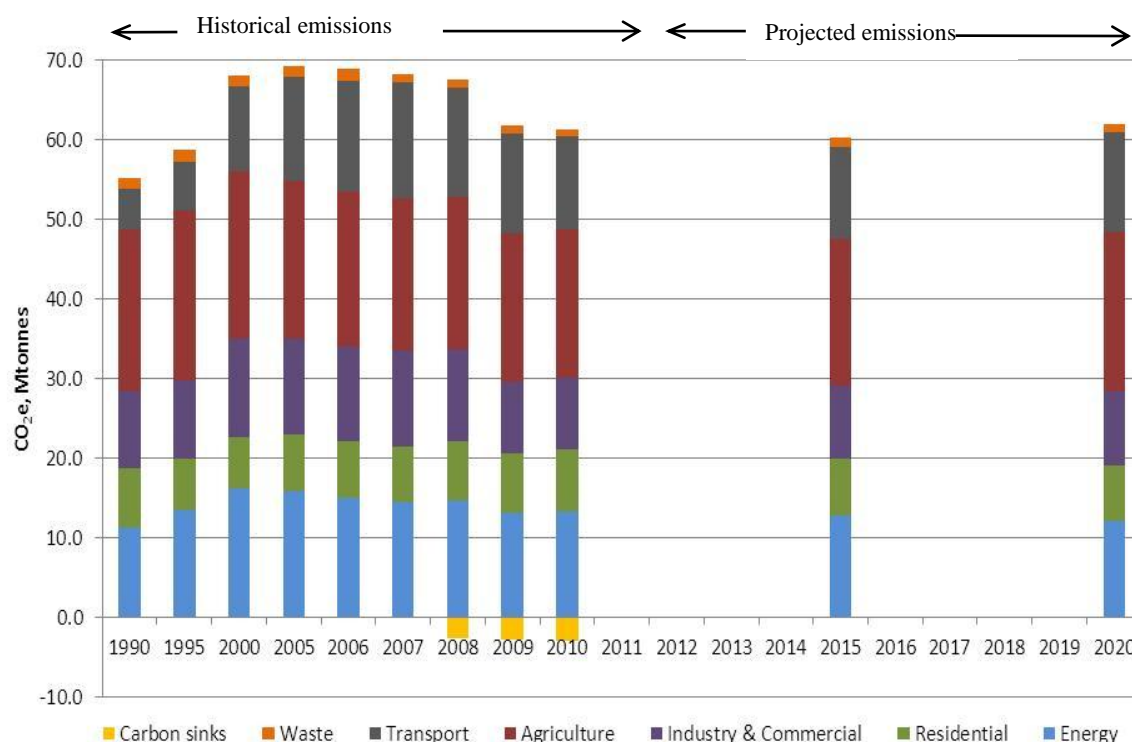


Figure 3. Historical and projected trends in greenhouse gas emissions for the *With Measures* scenario 1990 – 2020

The *With Measures* scenario is based on SEAI's *Baseline* energy forecast and projects emissions under a scenario where only existing policies and measures (i.e. those that are currently agreed and implemented) are taken into consideration.

Under the *With Measures* scenario, total greenhouse gas emissions in Ireland for 2020 are projected to be 0.9% higher than 2010 levels.

National Trend - With Additional Measures Emissions Projection

Figure 4 shows the trend in total national emissions (i.e. both ETS and non-ETS sector emissions) from 1990 to 2020, with projected trends for the *With Additional Measures* emission projection. As above, sinks are only calculated and reported for the Kyoto period.

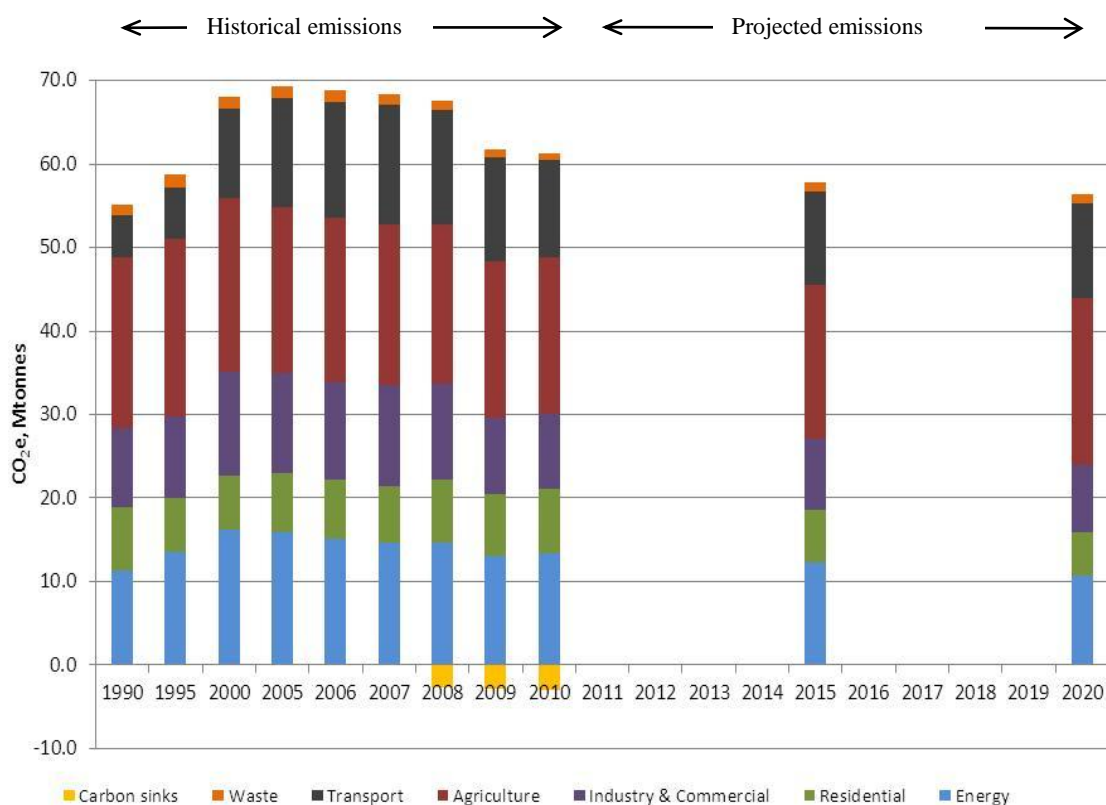


Figure 4. Historical and projected trends in greenhouse gas emissions for the With Additional Measures scenario 1990 – 2020

The *With Additional Measures* scenario is based on SEAI's *NEEAP/NREAP*⁴ energy forecast and projects emissions under a scenario where existing *and* additional policies and measures are taken into consideration. Additional policies and measures are defined as those that are currently committed to in Government policy documents, such as the National Energy Efficiency Action Plan⁶ and the National Renewable Energy Action Plan⁷ but are not yet fully implemented.

Under the *With Additional Measures* emission projection, GHG emissions in Ireland are projected to decrease by 8.1% between 2010 and 2020 which implies an annual average reduction of 0.8%. This will return 2020 greenhouse gas emissions to 1993 levels.

The key additional measures that are assumed to be achieved in full and are included in the *With Additional Measures* emission projection are:

By 2020, Ireland will have achieved

- 20% improvement in energy efficiency across all sectors
- 33% energy end-use efficiency savings target for the public sector
- 40% renewable electricity (RES-E) share
- 12% renewable heat (RES-H) share
- 10% renewable transport (RES-T) share (including 10% electric vehicles penetration target)

Emissions Trading Sectors

- Under both *With Measures* and *With Additional Measures* emissions projections, combined emissions from all ETS sectors in the period 2008 – 2012 are projected to be below the annual allocation of allowances that operators received under the second National Allocation Plan⁹. This is as a result of the projected slow-down in economic growth over the short-term and, in addition, a projected increase in electricity generation from renewables. It is not possible to say if putting a price on carbon has also contributed to this downward trend due to the dramatic decreases in industrial production.

Transport

- Under the *With Measures* scenario, transport emissions are projected to increase by 7.7% over the period 2010 – 2020 to 12.5 Mtonnes of CO₂eq. The *With Measures* scenario includes the impact of VRT and motor tax changes (introduced in 2008). In addition, improvements to the fuel economy of private cars, supported by the EU Regulation reducing maximum levels of CO₂g/km of new cars to 120g/km in 2015 and 95g/km in 2020, is included in the *With Measures* scenario. Renewable energy penetration of 3% is assumed out to 2020 supported by the Mineral Oil Tax Relief Scheme and the Biofuel Obligation Scheme 2010¹³.
- Transport sector emissions are projected to be 1.1 Mtonnes of CO₂eq lower in 2020 compared with last year's projection. This is attributed to reduced demand for freight transport and high levels of emigration in the “car-owning” population which results in a stabilisation of car ownership levels out to 2020. In addition, the ESRI developed a new approach to modelling energy use in the transport sector which has also had an impact on the energy forecast for this sector relative to last year.
- Under the *With Additional Measures* scenario, transport emissions are projected to decrease by 1.4% over the period 2011 – 2020 to 11.4 Mtonnes of CO₂eq returning transport emission to 2002 levels by 2020. In this scenario, it is assumed that renewable energy penetration is 10% by 2020 – this is the RES-T target which is a binding target under the Renewable Energy Directive¹⁴. The Biofuels Obligation Scheme 2010¹² and the rollout of Electric Vehicles (EVs) underpin the achievement of this target. It is assumed that the electric vehicle target of 200,000 electric vehicles will be achieved by 2020. Electric vehicles account for only 1% of the RES-T target by 2020, with biofuels contributing the remaining 9%. In addition, more efficient road traffic movements and public transport efficiencies are assumed to deliver savings.

Energy

- Energy sector emissions comprise emissions from power generation, oil refining, peat briquetting and fugitive emissions. Emissions from power generation accounted for

¹³ <http://www.dcenr.gov.ie/Energy/Sustainable+and+Renewable+Energy+Division/Biofuels+Obligation+Scheme.htm>

¹⁴ Renewable Energy Directive of June 2009 (28/EC/2009)

97% of energy sector emissions in 2010 and are responsible for a similar share of emissions over the projection period.

- Under the *With Measures* scenario, total energy sector emissions are projected to decrease by 8.7% over the period 2010 – 2020 to 12.2 Mtonnes of CO₂eq. The decrease in emissions is caused by a displacement of gas by renewables which are projected to reach 27% penetration in 2020.
- Under the *With Additional Measures* scenario, total energy sector emissions are projected to decrease by 19.8% over the period 2010 – 2020 to 10.7 Mtonnes of CO₂eq. In this scenario, it is assumed that renewable energy reaches 40% penetration by 2020 with the largest contribution coming from wind⁴. It is envisaged there will be an expansion of biomass electricity generation capacity to 270 MW through the implementation of co-firing biomass, the construction of two waste to energy units and the continued development of landfill gas electricity generation and biomass CHP. In addition the construction of at least 75 MW of wave energy is forecast.

Agriculture

- Agriculture sector emissions comprise emissions from enteric fermentation, manure management and nitrogen application to soils. For agriculture emission projections, there is one scenario or outlook for the future which assumes full achievement of the *Food Harvest 2020*⁶ targets by 2020. The data underpinning the projections are provided to the EPA by Teagasc and include forecast animal numbers, crop areas and projected nitrogen fertiliser application to soils.
- The main targets set out in the *Food Harvest* plan are (i) increase the value of primary output in the agriculture, fisheries and forestry sector by €1.5 billion by 2020 (ii) increase the value added in the agri-food, fisheries and wood products sector by €3 billion by 2020 and (iii) achieve an export target of €12 billion for the sector by 2020.
- Enteric fermentation, manure management and nitrogen application to agricultural soils account for on average 46%, 28% and 22%, respectively of total emissions from agriculture. Emissions from the combustion of fossil fuels accounts for on average 4% of total emissions from agriculture. Total emissions from agriculture are projected to increase by 6.9% over the period 2010 – 2020 to 20.0 Mtonnes of CO₂eq.
- Agricultural emissions are 1.1 Mtonnes of CO₂eq higher in 2020 relative to last year's projections. This is mainly attributable to revised animal numbers and revised nitrogen fertiliser application over the projection period. Teagasc assume that less dairy cows are required to meet the *Food Harvest* milk target of 50% increase in output by volume by 2020 compared with last years projections. In contrast, the beef herd is projected to be larger over the projection period due to more buoyant cattle prices and the requirement to meet the shortfall in beef output from the dairy herd. In addition, the recent (2010 and 2011) increase in fertiliser nitrogen sales is assumed to be maintained into the future.

Residential

- Under the *With Measures* scenario, emissions from the residential sector are projected to decrease by 12.0% to 6.9 Mtonnes of CO₂eq between 2010 and 2020. The following measures are included in the *With Measures* emission projection: Greener Homes Scheme, Warmer Homes Scheme, Home Energy Savings Scheme, Energy Efficient Boiler Standard, 2002 and 2008 Building Regulations.
- Under the *With Additional Measures* scenario, emissions are projected to decrease by 33.8% between 2010 and 2020 to 5.2 Mtonnes of CO₂eq. Under this scenario, the Better Energy Homes (residential retrofit) is projected to deliver significant savings.
- In addition, increased penetration of renewables is assumed in line with meeting the national RES-H target (i.e. 12% thermal heat from renewables by 2020) under the *With Additional Measures* scenario. This is assumed to be driven by newly built homes complying with the renewable energy requirements in the 2008 Building Regulations.

Industry and Commercial Services

- Under the *With Measures* scenario, emissions from the industry and commercial services sector are projected to increase by 4.1% to 9.3 Mtonnes between 2010 and 2020. The effect of the current recession on the construction sector and subsequent downturn in cement production is included in the projection for this sector. In addition, the impact of the Accelerated Capital Allowance Scheme, SEAI energy agreements such as the Large Industry Network, CHP biomass and supports for energy efficiency improvements are included in this scenario.
- Under the *With Additional Measures* scenario, emissions from the industry and commercial services sector are projected to decrease by 10.6 % to 8.0 Mtonnes between 2010 and 2020. In this scenario, energy demand from industrial and commercial services sectors is 5.8% lower than the *With Measures* scenario as energy efficiency policies and measures are assumed to be adopted and implemented. These include the implementation of 2012 Building Regulations and the public and commercial sector components of the National Retrofit Scheme. In addition, increased penetration of renewables is assumed in the *With Additional Measures* scenario in line with meeting the national RES-H target which is driven by recently approved REFIT tariffs for biomass CHP.

Waste

- There is one scenario for waste sector emission projections. Greenhouse gas emissions from the waste sector are projected to increase by 15.3% between 2010 and 2020 to 1.0 Mtonnes of CO₂eq. It is assumed that the Landfill Directive targets (Directive 1999/31/EC), for the diversion of biodegradable waste from landfill, are met progressively in 2013 and 2016 following on from Ireland's achievement of the 2010 Landfill Directive target. Achievement of the targets in 2013 and 2016 is assumed on the basis of measures and initiatives designed to divert biodegradable

waste from landfill. These include guidance published by the EPA¹⁵ for EPA landfill licence holders in relation to biodegradable waste diversion obligations and the introduction of the Waste Management (Food Waste) Regulations 2009¹⁶. The Food Waste Regulations came into force on January 1st 2010 and require commercial operations (e.g. restaurants and workplace canteens) to provide for the source separation and collection for recycling of food waste.

- It is assumed that CH₄ capture increases from the current level of 71.2% of CH₄ generated in 2010 to 75% in 2020.
- The impact of incineration is included in the projection for this sector. Emissions from the waste to energy plant in Carranstown, which began operation in October 2011, are included. In addition, it is assumed that the waste to energy plant planned for Poolbeg will be operational from 2015 onwards. Emissions from incineration are projected to be 31% of total waste sector emissions in 2020.

¹⁵ Municipal Solid Waste – Pre-treatment & Residuals Management. An EPA Technical Guidance Document. (2009)

¹⁶ Waste Management (Food Waste) Regulations 2009. S.I. No. 508 of 2009.

Sectoral Contribution

In terms of sectoral contributions to total national emissions over the Kyoto period, Figure 5 shows the projected share from each of the sectors. The sectoral share is the same for both scenarios over the Kyoto period. Agriculture and transport sector emissions account for almost 50% of emissions under both scenarios.

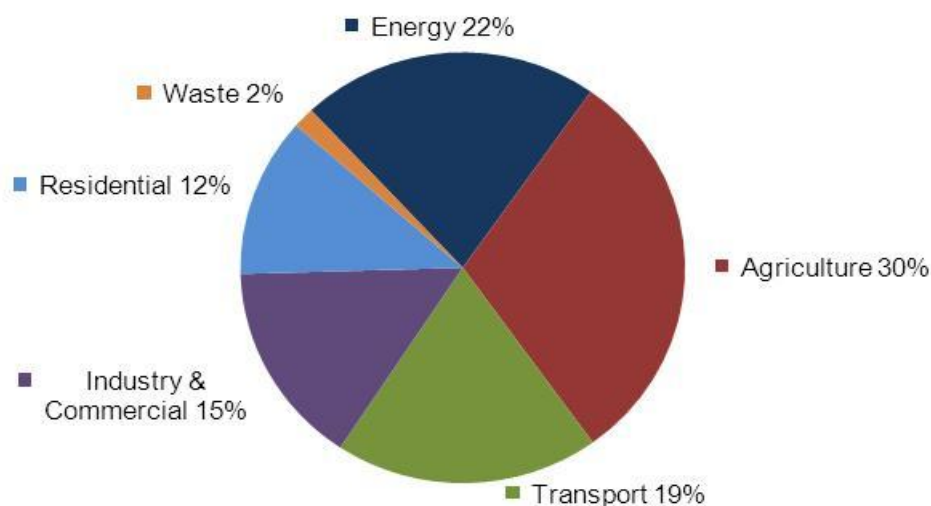


Figure 5. Projected sectoral share of total greenhouse gas emissions over the period 2008 – 2012 for both the With Measures and With Additional Measures scenarios

In terms of the sectoral contribution to total non-ETS sector emissions, Figure 6 shows the projected contributions for the *With Additional Measures* scenario in 2020. Under this scenario, agriculture and transport sector emissions account for 75% of total non-ETS emissions. This illustrates the important role that both transport and agriculture will play in developing mitigation options for achieving the 2020 targets in relation to non-ETS sector emissions.

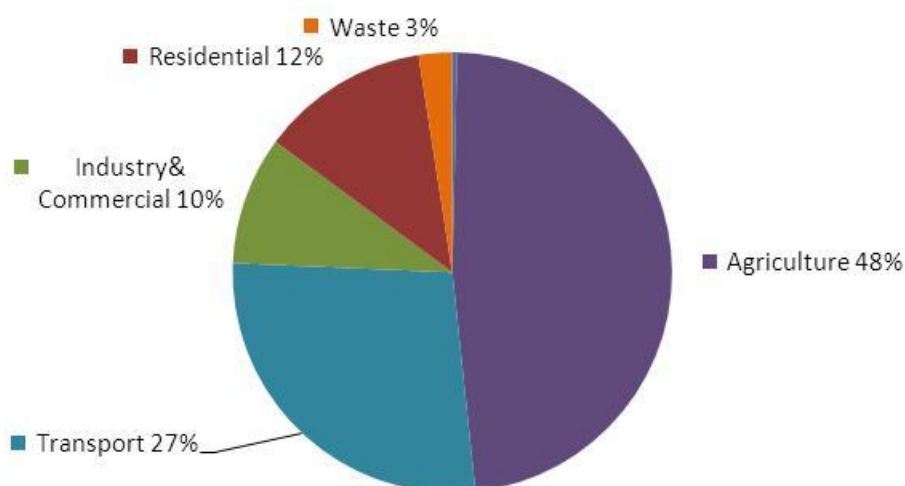


Figure 6. Projected sectoral share of non-ETS greenhouse gas emissions in 2020 for the With Additional Measures scenario.

7. Comparison between With Measures and With Additional Measures

Figure 7 shows emissions for the period 1990 to 2020 for both the *With Measures* and *With Additional Measures* scenario. Projected emissions include the impact of forest sinks over the Kyoto period (2008-2012) as allowed for under Article 3.3 of the Kyoto Protocol.

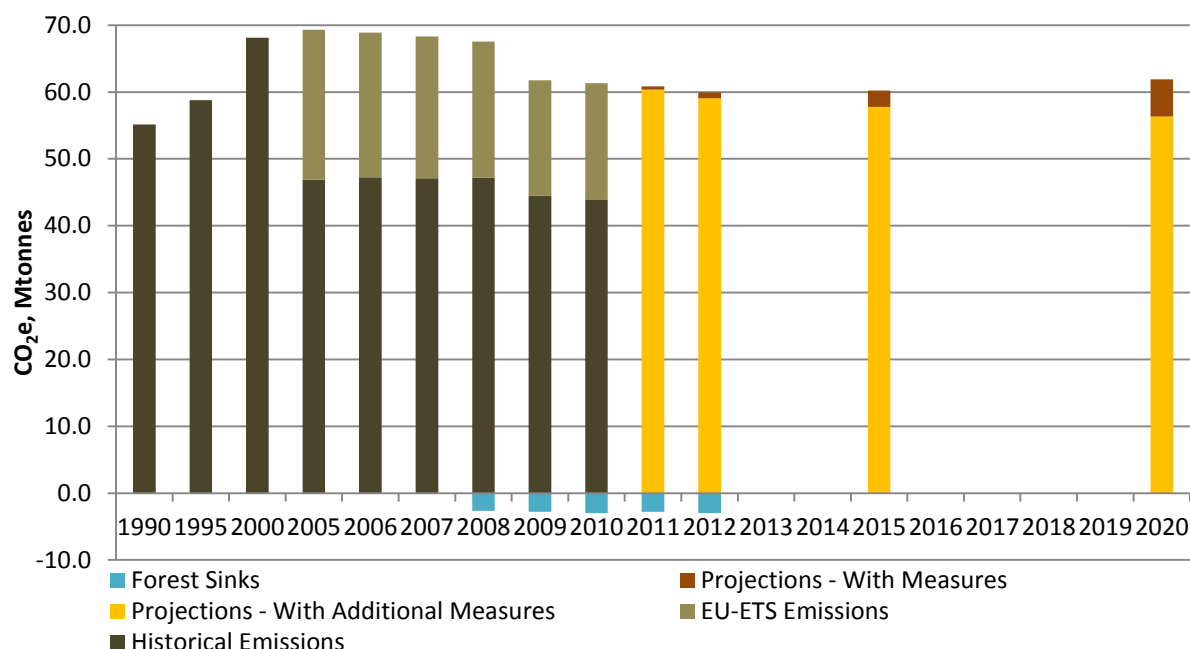


Figure 7. Historical and projected greenhouse gas emissions for With Measures and With Additional Measures (including forest sinks for the current Kyoto commitment period)

The difference between the *With Measures* and *With Additional Measures* scenario shows the impact of additional policies and measures and renewables penetration which are assumed to deliver the NEEAP⁶ and NREAP⁷ targets. The total impact of additional policies and measures and renewables penetration is estimated to be on average 0.68 Mtonnes of CO₂eq per year over the two remaining years of the Kyoto Commitment period (i.e. 2011 and 2012), 2.46 Mtonnes of CO₂eq in 2015 and 5.5 Mtonnes of CO₂eq in 2020. Table 5 shows the sectors where the additional measures are assumed to be implemented.

Table 5. CO₂eq savings from additional policies and measures by sector

CO ₂ eq, Mtonnes	2011-2012	2015	2020
Energy	0.11	0.47	1.47
Industry	0.08	0.32	0.62
Services	0.11	0.36	0.69
Residential	0.31	0.88	1.70
Transport	0.07	0.42	1.05
Total	0.68	2.46	5.54

8. Comparison with 2011 EPA Greenhouse Gas Emissions Projections

The EPA produces greenhouse gas emission projections on an annual basis. Previously emissions projections were published in April 2011. It is instructive to compare the emissions projections presented here with previous work to understand the degree of variability in projecting emissions and where key differences occur. Figure 8 shows a comparison between the projections presented here (called 2012 GHG Emissions Projections) and those published last year (called 2011 GHG Emissions Projections) for the *With Additional Measures* scenario.

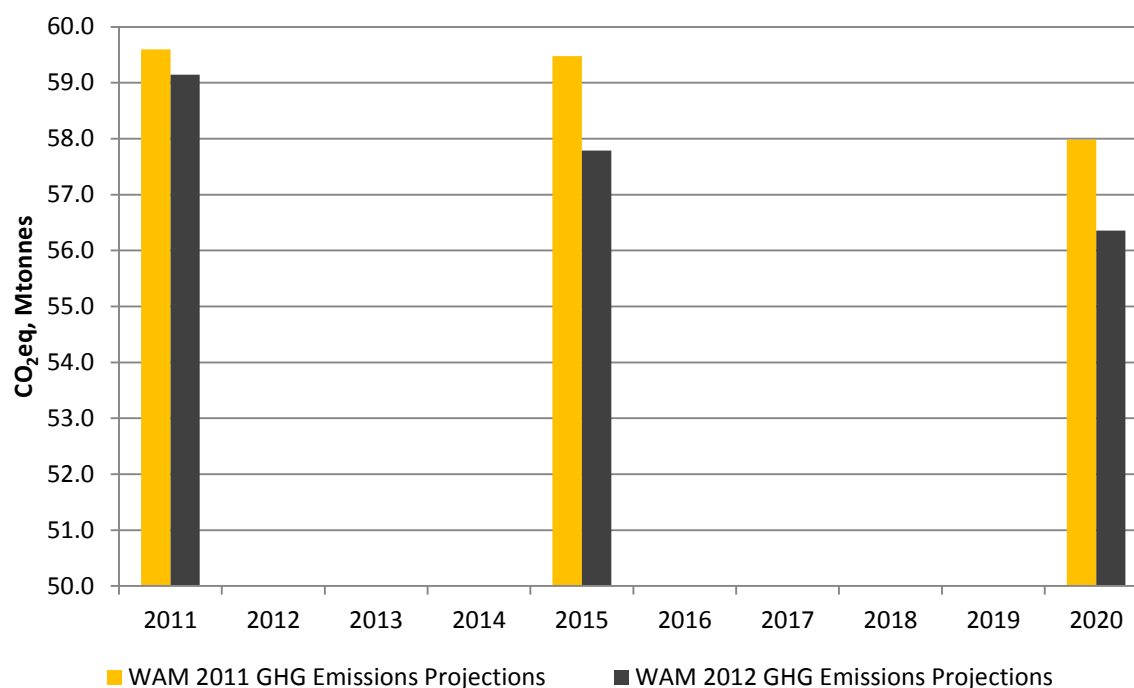


Figure 8. Comparison between 2011 and 2012 greenhouse gas emissions projections for the *With Additional Measures* scenario including forest sinks for the Kyoto commitment period (2011 shows average over Kyoto period)

Table 6 shows a comparison between the emissions projections presented in this report and those published in 2011 for the *With Additional Measures* scenario.

Table 6. Comparison between 2011 and 2012 greenhouse gas emissions projections for the *With Additional Measures* scenario including forest sinks for the current Kyoto commitment period

Mtonnes of CO ₂ eq	2008 – 2012	2015	2020
WAM 2012 GHG Emissions Projections	59.1	57.8	56.4
WAM 2011 GHG Emissions Projections	59.6	59.5	58.0

The 2011 GHG emissions projections were based on GDP growth rates of 3.2% between 2010 and 2015 and 2.1% between 2016 and 2020. The assumptions on economic growth rates underpinning this year's projections are similar for the period 2011-2015 with an average annual GDP growth rates forecast of 3.0%. However, for the period 2016 – 2020 the growth rate is higher at 3.3% per annum. Despite a higher projected economic growth for the

economy in 2020, greenhouse gas emissions are projected to be lower due primarily to lower transport emissions and energy sector emissions.

Under the *With Additional Measures* scenario for the Kyoto period, total national emissions are projected to be 0.8% lower compared with last year's projection. The main differences in sectoral emissions projections for the Kyoto period are:

- transport (7.8% lower)
- energy (3.0% lower)
- waste sector (21.0% lower)
- industry and commercial services (4.4% higher) and
- agriculture (3.5% higher)

For 2020, total national emissions are projected to be 2.8% lower compared with last year's projection, with the most significant differences as follows:

- agriculture sector (5.6% higher)
- energy sector (14.6% lower) and
- transport sector (4.8% lower)

For the agriculture sector, revised animal numbers and nitrogen fertiliser projections have resulted in an increase in emission levels above those produced in 2011.

For the energy sector in the *With Additional Measures* scenario, an increase in the efficiency of generation results in less fuel being required to meet electricity demand. In addition, the implementation of co-firing plans for Edenderry power station, the construction of two waste-to-energy units and the continued development of landfill gas electricity generation and biomass CHP lead to an expansion of biomass electricity generating capacity to 270 MW compared to 153 MW in last year's projections.

For the transport sector, emissions are projected to be almost 0.6 Mtonnes of CO₂eq lower in 2020 compared with last year's projection. The main reasons behind this are a reduction in the demand for diesel in road transport due to the reduced haulage of freight. In addition, ESRI have used a revised modelling approach to project demand for fuel in the transport sector.

Appendix I

Units: 1 Mt = 1,000 kilotonnes = 1,000,000 tonnes

CO₂eq: total greenhouse gas emissions expressed as CO₂ equivalents. The CO₂ emission is added to the equivalent emission of methane, nitrous oxide and so-called F-gases which are converted to CO₂ equivalents using their global warming potentials.

F-gases: These gases comprise the following three gases, HFCs (Hydrofluorocarbons), PFCs (Perfluorocarbons) and SF₆ (Sulphur Hexafluoride). They have very much higher global warming potentials than the naturally occurring GHGs (carbon dioxide, methane and nitrous oxide).

Table A. Historical and projected emissions by sector (Mtonnes CO₂eq per annum) for With Measures and With Additional Measures scenarios

		Energy	Residential	Industry & Commercial	Agriculture	Transport	Waste	Forest Sinks	Total (Without forest sinks)	Total (With forest sinks)
Historical	1990	11.4	7.5	9.6	20.4	5.1	1.3	0.0*	55.2	55.2*
	1995	13.5	6.4	9.8	21.3	6.2	1.6	0.0*	58.8	58.8*
	2000	16.2	6.4	12.4	20.9	10.7	1.4	0.4*	68.1	67.7*
	2005	15.8	7.2	12.0	19.8	13.1	1.4	1.1*	69.3	68.2*
	2006	15.1	7.1	11.7	19.6	13.9	1.5	1.4*	68.9	67.5*
	2007	14.6	6.9	12.0	19.2	14.5	1.1	1.8*	68.3	66.5*
	2008	14.7	7.5	11.5	19.1	13.7	1.1	2.7	67.6	64.9
	2009	13.1	7.4	9.0	18.7	12.5	0.9	2.8	61.7	58.9
Projected	2010	13.4	7.8	9.0	18.7	11.6	0.9	3.0	61.3	58.3
	With Measures Scenario									
	2008-12	13.5	7.5	9.5	18.8	11.9	1.0	2.9	62.3	59.4
	2015	12.8	7.2	9.1	18.6	11.5	1.2	3.7	60.2	56.5
	2020	12.2	6.9	9.3	20.0	12.5	1.0	4.6	61.9	57.3
	With Additional Measures Scenario									
	2008-12	13.5	7.4	9.5	18.8	11.9	1.0	2.9	62.0	59.1
	2015	12.3	6.3	8.4	18.6	11.0	1.2	3.7	57.8	54.1
	2020	10.7	5.2	8.0	20.0	11.4	1.0	4.6	56.4	51.7

Note: Numbers may not sum exactly due to rounding

*Forest sinks have only been officially reported since 2008 (i.e. the first year of the Kyoto Protocol). They are shown here to provide an indication of historical trends in forest sinks.

Table B. Historical and projected emissions for the non-ETS sector (Mtonnes CO₂eq) for With Measures and With Additional Measures scenarios

		Non-ETS Sector	Forest sinks	Total (With Forest sinks)
Historical	2005	46.9	1.1*	45.8*
	2006	47.2	1.4*	45.8*
	2007	47.1	1.8*	45.3*
	2008	47.2	2.7	44.5
	2009	44.5	2.8	41.7
	2010	44.0	3.0	41.0
Projected	With Measures Scenario			
	2011	43.6	2.8	40.8
	2015	43.4	3.7	39.7
	2020	45.3	4.6	40.7
	With Additional Measures Scenario			
	2011	43.2	2.8	40.4
	2015	41.6	3.7	37.9
	2020	41.6	4.6	37.0

Note: Numbers may not sum exactly due to rounding

*Forest sinks have only been officially reported since 2008 (i.e. the first year of the Kyoto Protocol). They are shown here to provide an indication of historical trends in forest sinks.