



# Ireland's Greenhouse Gas Emissions Projections

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2010-2020

April 28, 2010

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## ***1. Executive Summary***

The National Climate Change Strategy (NCCS 2007)<sup>1</sup> designated the EPA with responsibility for developing annual national emission projections for greenhouse gases (GHG) for all key sectors of the economy, in collaboration with relevant State and other bodies. Emission projections serve to inform national policy initiatives, such as the annual Carbon Budget, and allow Ireland to comply with EU reporting obligations on projections (e.g. Council Decision 280/2004).

The EPA produces GHG emission projections annually which allows the most recent environmental and other policy developments to be taken into account as well as updates to key assumptions (such as revisions to anticipated economic growth). The projections presented here update the previous set of national emissions projections which were published in March 2009<sup>2</sup> by the EPA.

These projections are, primarily, based on SEI's energy forecasts<sup>3</sup> which are underpinned by the ESRI's *World Recovery* scenario<sup>4</sup>. The ESRI assumes a recovery in economic growth from 2011 onwards following two years of significant contraction in economic activity in 2009 and 2010. The strong recovery is predicated on the assumption that the world economy, and hence world demand for Irish exports, will have recovered from the current slowdown by 2011.

There are two emissions projections scenarios presented:

- (i) The *With Measures* scenario is based primarily on SEI's *Baseline* energy forecast<sup>3</sup> which incorporates the anticipated impact of policies and measures that were in place (and legislatively provided for) by end of 2008.
- (ii) The *With Additional Measures* scenario is based on SEI's *White Paper Plus* energy forecast<sup>3</sup>. The *White Paper Plus* energy forecast builds on the *Baseline* energy forecast with additional assumptions included to incorporate the targets and planned measures in the Energy White Paper<sup>5</sup>, Ireland's National Energy Efficiency Action Plan<sup>6</sup> and also relevant measures agreed in the Programme for Government. Therefore this scenario includes existing *and* planned policies and measures.

### **Comparison with Kyoto Protocol Limit (2008 – 2012)**

The projections indicate the level of total national emissions in Ireland over the Kyoto period 2008 – 2012. The impact of forest sinks is included in each scenario as allowed for under Article 3.3 of the Kyoto Protocol. The implications for Government use of Kyoto Mechanisms and/or the need for additional domestic action is summarised below:

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

<sup>2</sup> Ireland's Greenhouse Gas Emissions Projections 2008-2020. Environmental Protection Agency. (2009).

<sup>3</sup> Energy Forecasts for Ireland to 2020. Sustainable Energy Ireland (2009)

<sup>4</sup> Recovery Scenarios for Ireland. Economic and Social Research Institute. (2009).

<sup>5</sup> Delivering a Sustainable Energy Future for Ireland. The Energy Policy Framework 2007-2020. Department of Communications, Marine and Natural Resources. (2007).

<sup>6</sup> Maximising Ireland's Energy Efficiency. The National Energy Efficiency Action Plan 2009 - 2020. Department of Communication, Energy and Natural Resources. (2009).

- Under the *With Measures* emission projection, total national emissions are projected to be on average 63.0 Mtonnes of CO<sub>2</sub>e per annum over the period 2008-2012. The projections have been disaggregated into EU ETS and non-ETS sectors to allow the implications for Government purchase of carbon credits or additional domestic action to be assessed. Under the *With Measures* emissions projection, a ‘gap’ of 3.0 Mtonnes of CO<sub>2</sub>e per annum (or 15.0 Mtonnes of CO<sub>2</sub>e over the 5-year Kyoto period) is projected. This ‘gap’ can be bridged through the use of the Kyoto Protocol flexible mechanisms and/or additional domestic action.
- Under the *With Additional Measures* emission projection, a ‘gap’ of 2.5 Mtonnes of CO<sub>2</sub>e per annum (or 12.7 Mtonnes of CO<sub>2</sub>e over the 5-year Kyoto period). This ‘gap’ can again be bridged through the use of the Kyoto Protocol flexible mechanisms and/or additional domestic action.

### Comparison with EU 2020 Targets for non-ETS sector emissions

To allow a comparison to be made with the 2020 target for non-ETS sector emissions, the projections have been disaggregated into EU ETS and non-ETS sectors. It was agreed by the EU Parliament and Council in December 2008 that, in the event that an international agreement on global reductions is not approved by the Community by 31 December 2010, Member States may include emissions and removals from activities related to land-use, land-use change and forestry (LULUCF) towards meeting the 20% reduction target (relative to 1990)<sup>7</sup>. The aim is that this proposal would enter into force from 2013 onwards.

- Under the *With Measures* scenario, non-ETS sector emissions are projected to be 12.4 Mtonnes of CO<sub>2</sub>e higher in 2020 than our 2020 target. Including the impact of carbon sinks reduces the distance to target to 7.6 Mtonnes of CO<sub>2</sub>e.
- Under the *With Additional Measures* scenario, national emissions are projected to be 7.6 Mtonnes of CO<sub>2</sub>e higher in 2020 than our 2020 target. Including the impact of carbon sinks reduces the distance to target to 2.8 Mtonnes of CO<sub>2</sub>e. A significant reduction in the distance to the 2020 target is projected in this scenario relative to the *With Measures* scenario. This is attributable to the projected impact of all policies and measures outlined in the Energy White Paper<sup>5</sup>, the National Energy Efficiency Action Plan<sup>6</sup> and the Programme for Government which predominantly come into effect between 2010 and 2020.
- It is important to note that the *With Additional Measures* scenario assumes that (i) all the relevant policies and measures outlined in relevant Government policy documents will be adopted and fully implemented on time and (ii) all relevant measures will achieve the full emissions reductions anticipated. Failure to deliver these measures or a reduction in their environmental effectiveness will result in higher emissions levels than projected. The difficulties associated with meeting these criteria should not be underestimated.

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<sup>7</sup> Article 9 of 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

## 2. Background

The greenhouse gas emission projections presented here are based on data provided by a range of other State agencies and organisations, most notably Sustainable Energy Ireland (SEI) for energy forecasts and Teagasc for forecast animal numbers. Energy-related emissions projections are based on energy forecasts published by SEI in December 2009<sup>3</sup>. These energy forecasts are based on the same macro-economic assumptions that underpin the ESRI's *World Recovery* scenario<sup>4</sup> which assume average real GNP growth of -9.0% in 2009, -1.9% in 2010, increasing to, on average, 5.5% per annum between 2010 and 2015 and 3.3% between 2015 and 2020. In terms of GDP, growth rates are -7.8 % in 2009, -2.3% in 2010, 5.2% between 2010 and 2015 and 3.3% between 2015 and 2020.

The latest projections are given below with a discussion of the key trends and a commentary on the significance of the figures in relation to Ireland's commitments for the Kyoto period, 2008 – 2012, and in relation to the EU 2020 emission targets for non-ETS sector emissions.

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

- *With Measures*
- *With Additional Measures*

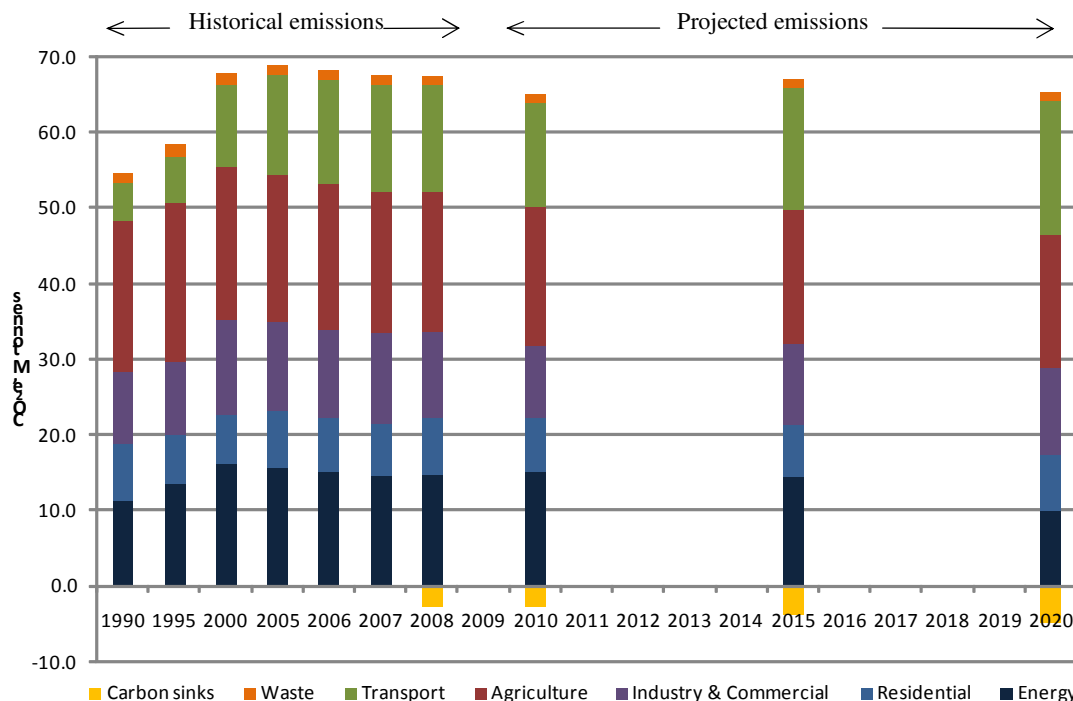
A description of the two scenarios is provided in Table 1.

*Table 1. Description of Projection Scenarios*

Scenario	Basis for Projection
<b><i>With Measures</i></b>	<p><u>Energy-related emissions projections</u></p> <ul style="list-style-type: none"> <li>• Based on SEI <i>Baseline</i> energy forecast<sup>3</sup>. These energy forecasts are based on the ESRI's <i>World Recovery</i> scenario<sup>4</sup>.</li> </ul> <p><u>Agriculture emission projections</u></p> <ul style="list-style-type: none"> <li>• Based on forecast animal numbers, nitrogen fertiliser use and crop statistics produced by Teagasc in February 2010.</li> </ul> <p><u>Waste</u></p> <ul style="list-style-type: none"> <li>• Assumes that the Landfill Directive targets (Directive 1999/31/EC) will be reached in 2010, 2013 and 2016.</li> </ul> <p><u>Forestry</u></p> <ul style="list-style-type: none"> <li>• Projections of the future impact of forest sinks were provided by COFORD. Estimates of forest cover are based on current rates of afforestation (ca 7,000 hectares per year at present, rising to 10,000 hectares per year by 2012).</li> </ul>
<b><i>With Additional Measures</i></b>	<p><u>Energy-related emissions projections</u></p> <ul style="list-style-type: none"> <li>• Based on SEI White Paper Plus energy forecast<sup>3</sup>. The White Paper Plus energy forecast builds on the Baseline energy forecast with additional assumptions to incorporate the targets and planned measures in the White Paper on Energy<sup>5</sup>, Ireland's National Energy Efficiency Action Plan<sup>6</sup> and also those measures agreed in the Programme for Government.</li> </ul> <p><u>Agriculture emission projections</u></p> <p><u>Waste</u></p> <p><u>Forestry</u></p> <ul style="list-style-type: none"> <li>• Same as <i>With Measures</i> scenario.</li> </ul>

### ***With Measures Emission Projection***

The trend in emissions from 1990 to 2008, with projected trends for the *With Measures* scenario is shown in Figure 1. Sinks are only calculated and reported from the beginning of the Kyoto period (i.e. 2008) and up to 2020.

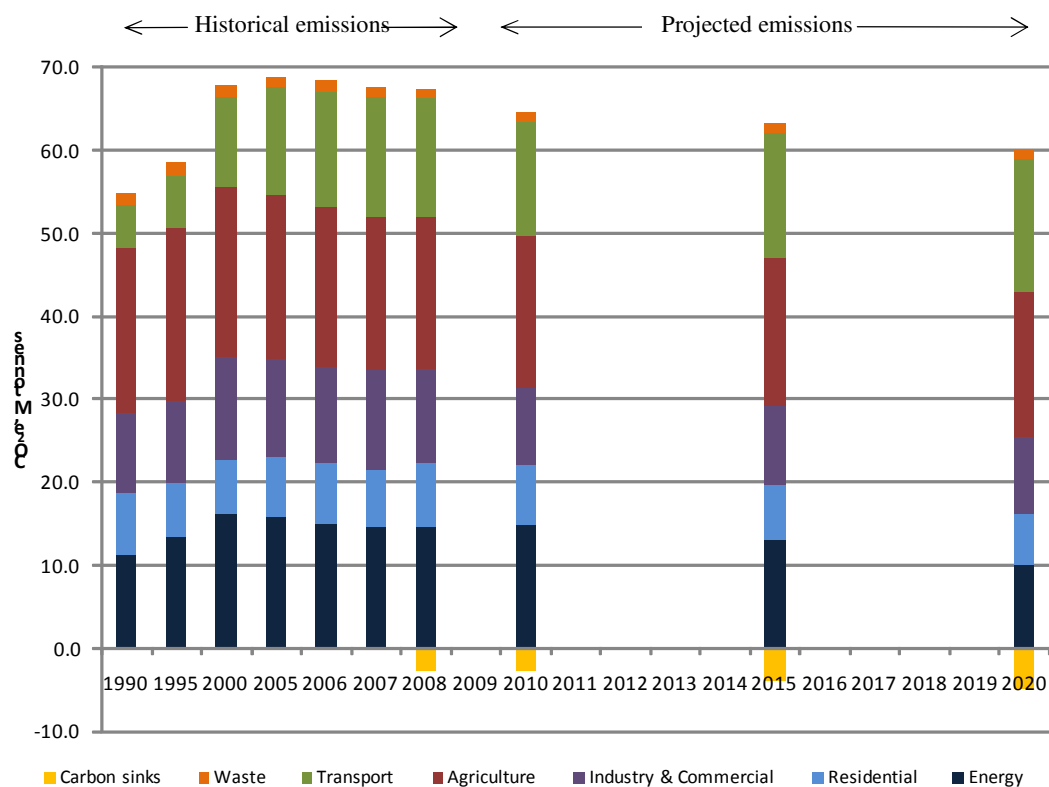


**Figure 1. Historical and projected trends in greenhouse gas emissions for the *With Measures* scenario 1990-2020**

- The *With Measures* scenario is based on SEI’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, GHG emissions in Ireland are projected to decrease by 6% between 2008 and 2020, implying an average annual reduction of 0.5%.

### ***With Additional Measure Emissions Projection***

The trend in emissions from 1990 to 2008, with projected trends for the *With Additional Measures* emission projection is shown in Figure 2. Sinks are only calculated and reported from the beginning of the Kyoto period (i.e. 2008) and up to 2020.



**Figure 2. Historical and projected trends in greenhouse gas emissions for the With Additional Measures scenario 1990-2020**

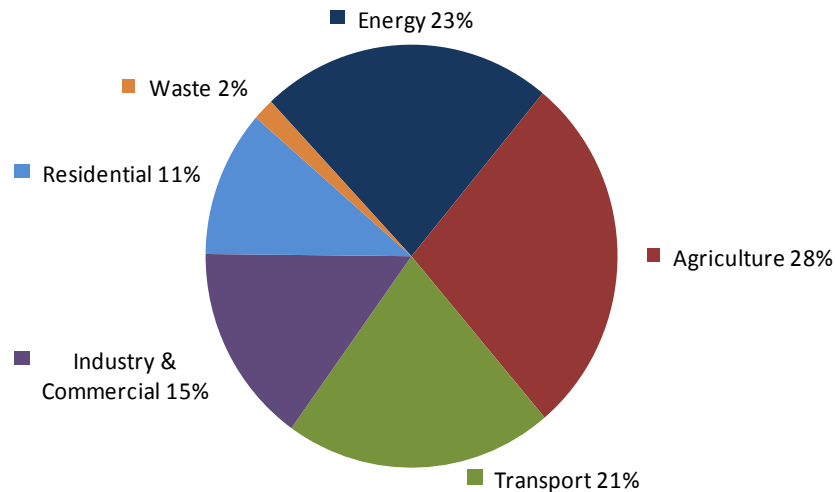
- The *With Additional Measures* scenario is based on SEI’s *White Paper Plus* energy forecast and projects emissions under a scenario where existing *and* additional policies and measures are taken into consideration. Additional policies and measures are defined as those that are currently committed to in Government policy documents, such as the Energy White Paper and the National Energy Efficiency Action Plan, but are not yet implemented.
- Under the *With Additional Measures* emission projection, GHG emissions in Ireland are projected to decrease by 15% between 2008 and 2020 which implies an annual average reduction of 1.3%.
- The key additional measures 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)

### 3. Sectoral Emissions Projection

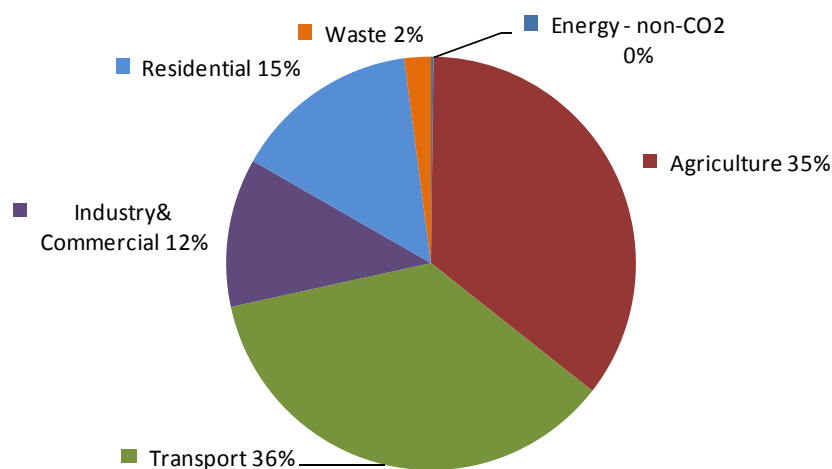
Figure 3 shows the projected contributions from each of the sectors in relation to total national emissions for the *With Measures* and *With Additional Measures* scenario over 2008 – 2012. Agriculture and transport sector emissions account for around 50% of emissions under both scenarios.



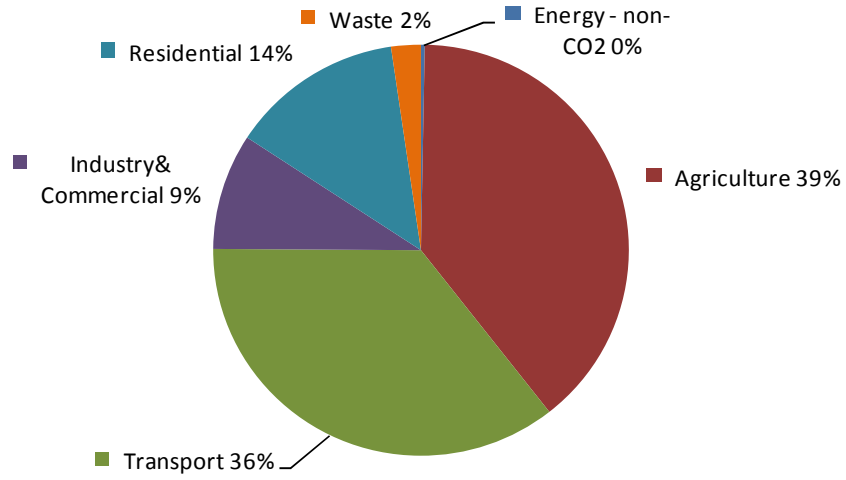
**Figure 3. Projected sectoral share of total greenhouse gas emissions over the period 2008 – 2012 for the *With Measures* and *With Additional Measures* scenarios**

Figure 4 (a and b) shows the projected contributions from each of the non-ETS sectors to total non-ETS sectors emissions for both *With Measures* and *With Additional Measures* scenarios in 2020. Under the two emissions projections, agriculture and transport sector emissions account for over 70% of total non-ETS emissions. This illustrates the important role that both transport and agriculture will have to play in developing mitigation options for achieving the 2020 targets in relation to non-ETS sector emissions.

**(a) With Measures**



**(b) With Additional Measures**



*Figure 4. Projected sectoral share of non-ETS greenhouse gas emissions in 2020 for the With Measures (a) and With Additional Measures(b) scenarios*

## Transport

- Under the *With Measures* scenario, transport emissions are projected to increase by 25% over the period 2008 – 2020 to 17.8 Mtonnes of CO<sub>2</sub>e. The *With Measures* scenario includes the impact of VRT and motor tax changes (introduced in 2008), improved fuel economy of private cars and renewable penetration of 3% by 2020 (with biofuels making the largest contribution and the use of renewable electricity in electric vehicles a smaller contribution).
- Under the *With Additional Measures* scenario, transport emissions are projected to increase by 12% over the period 2008 – 2020 to 16.0 Mtonnes of CO<sub>2</sub>e. In this scenario, it is assumed that renewable energy penetration is 10% which includes 10% electric vehicle penetration. In addition, policies and measures such as Mobility Management and Travel Plans, E-working, Sustainable Transport Fleets and Efficient Driving Methods are included.
- The growth in transport emissions is projected to slow significantly when compared with the annual growth rate between 1990 and 2008. This is attributable to a projected slow-down in economic growth, particularly up to 2011. Improving the quality and robustness of transport emission projections will be a key focus for future work. Transport sector emissions are highly dependent on key forecast variables including economic indicators such as GDP, vehicle technology and the future travel behaviour of individuals. A continual focus on these underlying influencing factors and their impact on transport emission levels will be important.

## Energy

- Energy sector emissions comprise emissions from power generation, oil refining, peat briquetting and fugitive emissions. Emissions from power generation accounted for 96% of energy sector emissions in 2008 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 31% over the period 2008 – 2020 to 10.1 Mtonnes of CO<sub>2</sub>e. This reduction in emissions from the energy sector is attributable to increased electricity generation from renewable and a sharp decline in peat consumption in 2020 following the termination of the Public Service Obligation (PSO) supports for peat-burning power stations.
- Under the *With Measures* scenario, it is assumed that 20% of Ireland's gross electricity consumption comes from renewable energy by 2010 increasing to 27% by 2020. In 2008, 11.4% of electricity generation was from renewable energy. Wind generation is projected to grow strongly between 2008 and 2012, at 8.3%, reflecting increased capacity, but slows to 4.2% following this period in line with the conclusion of Gate 2<sup>8</sup>. Wind is projected to deliver 85% of renewable energy in 2020. Hydro and

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<sup>8</sup> Since December 2004 renewable generators wishing to connect to the transmission or distribution systems have been subject to group processing of connection applications through a series of successive "Gates". There have been two Gates to date. Gate 1 was finalised in December 2004 and processed applications equating to 373 MW of renewable capacity. The principles and criteria for Gate 2 were finalised in June 2006. Gate 2 could potentially see a further 1300 MW of renewable generation capacity connected to the system.

biomass generation remain relatively static over the period, with close to zero annual growth rates. Hydro is projected to deliver 12% of renewable electricity in 2020 and biomass is projected to deliver 3%. In relation to peat, the Public Service Obligation (PSO) supports for the peat-burning power stations at Edenderry runs out in 2015 and in 2019 for the ESB plants which impacts on their dispatch merit and results in a lighter running duty. This results, in particular, in a significant reduction (94%) in peat consumption in 2020 which subsequently impacts on emissions in that year.

- Under the *With Additional Measures* scenario, total energy sector emissions are projected to decrease by 31% over the period 2008 – 2020 to 10.1 Mtonnes of CO<sub>2</sub>e. In this scenario, it is assumed that 21% Ireland's gross electricity consumption comes from renewable energy by 2010 increasing to 41% by 2020. This is consistent with the amended Energy White Paper targets on the achievement of renewables penetration (including biomass co-firing) and power generation fuel diversity targets. In this scenario, wind is assumed to deliver 65% of renewable electricity in 2020, followed by biomass (17%), ocean energy (11%) and hydro (8%). In relation to peat, consumption is projected to be significantly higher in 2020 in comparison with the *With Measures* scenario which reflects the impact of co-firing of peat with biomass. As biomass co-firing targets are assumed to be met under the *With Additional Measures* scenario, the consumption of peat and therefore emissions **increases** in 2020 relative to the *With Measures* scenario (where it is assumed that the PSO supports for the ESB peat plant ends in 2019). Emissions attributable solely to combustion of peat in 2020 are 1.6 Mtonnes of CO<sub>2</sub>e higher under the *With Additional Measures* scenario. This is a significant policy finding whereby it appears that increasing renewables consumption in terms of biomass co-firing with peat may actually result in higher emissions through increased peat consumption and cancel out savings from the increased penetration of other renewables on the system.
- 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 Plan<sup>9</sup>. 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 generated from renewables.

## Agriculture

- There is only one scenario for agricultural emission projections. Emission projections are developed for enteric fermentation, manure management and nitrogen application to soils in the form of manures and synthetic fertiliser. Enteric fermentation, manure management and nitrogen application to agricultural soils account for on average 47%, 28% and 20%, respectively of total emissions from agriculture. Emissions from the combustion of fossil fuels accounts for on average 5% of total emissions from agriculture.
- Emissions projections for enteric fermentation, manure management and nitrogen application to soils are based on forecast animal numbers, crop areas and projected

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<sup>9</sup> Ireland's National Allocation Plan for Emissions Trading 2008-2012. Environmental Protection Agency. (2008).

nitrogen fertiliser nitrogen application to soils produced by Teagasc in February 2010. These estimates take into account the agreed increases in the national milk quota prior to quota removal in 2015, the expansion of the dairy herd thereafter and the projected national livestock population including cattle, sheep, pigs and poultry out to 2020.

- Total emissions from agriculture are projected to decrease by 5% over the period 2008 – 2020 to 17.5 Mtonnes of CO<sub>2</sub>e. Combined emission from enteric fermentation, manure management and nitrogen application to agricultural soils are projected to decrease by 6% over the period 2008-2020 whilst emissions from agricultural combustion are projected to increase by 18% over the same period.

## **Residential**

- Under the *With Measures* scenario, emissions from the residential sector are projected to decrease by 4% to 7.3 Mtonnes of CO<sub>2</sub>e between 2008 and 2020. The following measures are included in the *With Measures* emission projection: SEI's Home Energy Saving Scheme; Efficient Boiler Standard; and the 2008 Building Regulations.
- Under the *With Additional Measures* scenario, emissions are projected to decrease by 20% between 2008 and 2020 to 6.0 Mtonnes of CO<sub>2</sub>e. Under this scenario, the impacts of the following measures are included: 2010 and 2013 Building Regulations; and unspecified measures, yet to be identified, that are required to meet the targets set out in the National Energy Efficiency Action Plan. 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).

## **Industry and Commercial Services**

- Under the *With Measures* scenario, emissions from the industry and commercial services sector are projected to increase by 1% to 11.5 Mtonnes between 2008 and 2020. The significant downturn in the cement industry, as a result of the downturn in the economy is included in this emission projection. In addition, the impact of SEI Energy Agreements, Large Industry Network, the Accelerated Capital Allowance Scheme and SEI Small Business Supports are taken into account.
- Under the *With Additional Measures* scenario, emissions from the industry and commercial services sector are projected to decrease by 17% to 9.4 Mtonnes between 2008 and 2020. In this scenario, energy demand from industrial and commercial services sectors decreases relative to the *With Measures* scenario as energy efficiency policies and measures are assumed to be adopted and implemented. These include achieving CHP targets (400MW installed CHP by 2010 and 800MW by 2020), implementation of 2010 Building Regulations and additional measures (as yet unspecified) which are required to meet energy efficiency targets set down in the National Energy Efficiency Action Plan. In addition, increased penetration of renewables is assumed in the *With Additional Measures* scenario in line with meeting the national RES-H target (i.e. 12% thermal heat from renewables by 2020).

## Waste

- There is only one scenario for waste sector emissions projections.
- Greenhouse gas emissions from the waste sector are projected to decrease by 6 % between 2008 and 2020 to 1.0 Mtonnes of CO<sub>2</sub>e. It is assumed that the Landfill Directive targets (Directive 1999/31/EC), for the diversion of biodegradable waste from landfill, are met progressively in 2010, 2013 and 2016. The achievement of the Landfill Directive targets in Ireland is assumed on the basis of measures and initiatives designed to divert biodegradable waste from landfill. These include guidance recently published by the EPA<sup>10</sup> for EPA landfill licence holders in relation to biodegradable waste diversion obligations and the introduction of the Waste Management (Food Waste) Regulations 2009<sup>11</sup> which come into force on July 1 2010 and are designed to promote the segregation and beneficial use of food waste arising in the commercial sector.
- It is assumed that CH<sub>4</sub> capture increases from 63% of CH<sub>4</sub> generated in 2008 to 75% in 2020.
- In relation to incineration, it is assumed that Carranstown and Poolbeg waste incinerators come into operation in 2011 and 2015, respectively, and operate at full capacity from 2012 and 2017, respectively. Carbon dioxide equivalent emissions from incineration are projected to be 31% of total waste emissions in 2020.

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<sup>10</sup> Municipal Solid Waste – Pre-treatment & Residuals Management. An EPA Technical Guidance Document. (2009)

<sup>11</sup> Waste Management (Food Waste) Regulations 2009. S.I. No. 508 of 2009.

#### 4. Comparison between With Measures and With Additional Measures

Figure 5 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 as allowed for under Article 3.3 of the Kyoto Protocol.

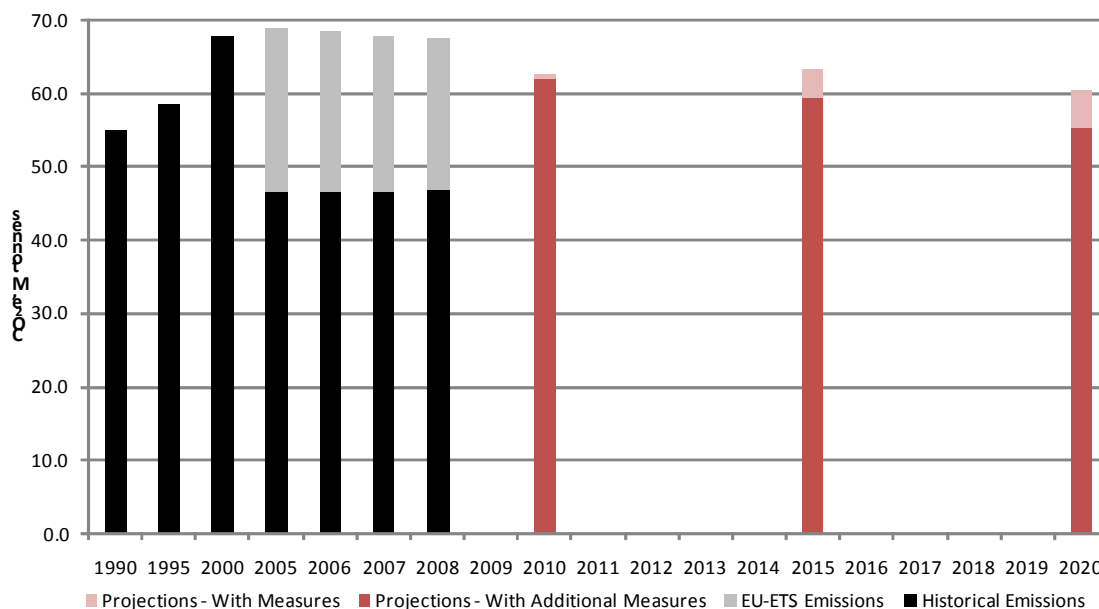


Figure 5. Historical and projected greenhouse gas emissions for *With Measures* and *With Additional Measures* (including sinks)

The difference between the *With Measures* and *With Additional Measures* scenario shows the impact of additional policies and measures and renewables penetration assumed to meet the amended Energy White Paper targets. The total impact of additional policies and measures and renewables penetration is projected to be 0.6 Mtonnes of CO<sub>2</sub>e in 2010, 3.8 Mtonnes of CO<sub>2</sub>e in 2015 and 5.2 Mtonnes of CO<sub>2</sub> in 2020. Table 2 shows the sectors where the additional savings are assumed to take place.

Table 2. CO<sub>2</sub>e savings from additional policies and measures by sector

Sector	2010 Mtonnes CO <sub>2</sub> e	2015 Mtonnes CO <sub>2</sub> e	2020 Mtonnes CO <sub>2</sub> e
Energy	0.21	1.31	-0.02*
Industry	0.15	0.51	0.92
Residential	0.03	0.42	1.24
Transport	0.13	0.95	1.87
Services	0.07	0.59	1.22
<b>Total</b>	<b>0.59</b>	<b>3.78</b>	<b>5.23</b>

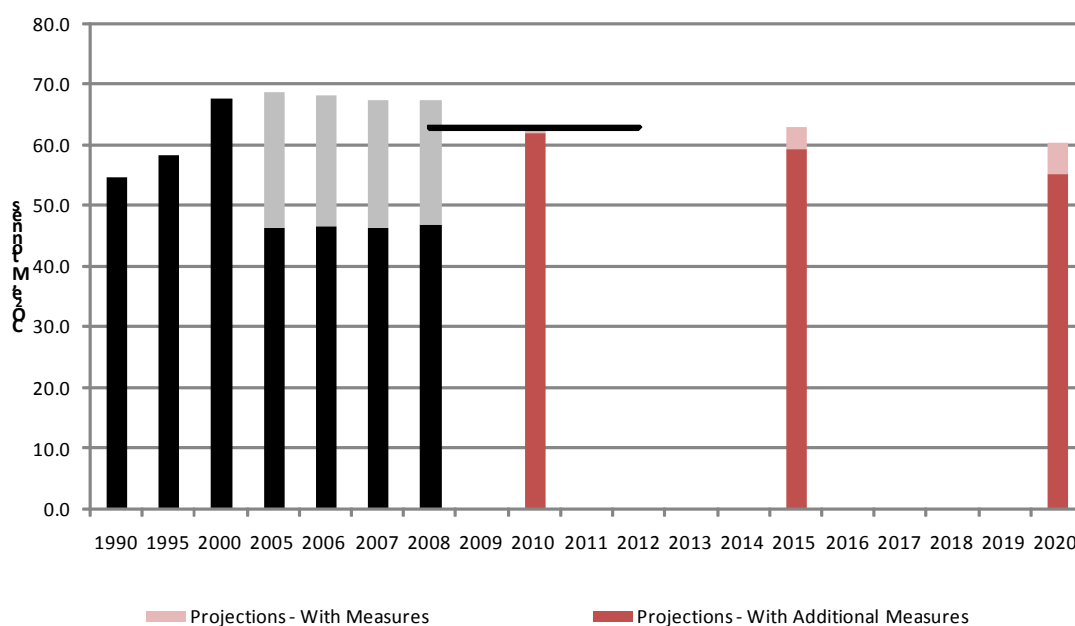
\*Increased peat consumption, needed to meet the targets on co-firing, results in higher emissions in the *With Additional Measures* scenario compared with the *With Measures* scenario

It should be noted that while the *White Paper Plus* energy forecast and therefore the *With Additional Measures* scenario assumes that targets in the Energy White Paper, the National Energy Efficiency Action Plan and those agreed in the Programme for Government are met, not all of the targets are currently associated with detailed policies and measures. Of the savings outlined in Table 2 above, 20% in 2015 and 35% in 2020 account for unspecified policies and measures. **Therefore, policies and measures still need to be identified to reach the level of emissions projected in the *With Additional Measures* scenario.**

## 5. Comparison with Kyoto Protocol Limit

Under the Kyoto Protocol, Ireland is required to limit total national greenhouse gas emissions to 314.2 Mtonnes of CO<sub>2</sub>e over the five year period 2008 – 2012 which is equivalent to 62.8 Mtonnes of CO<sub>2</sub>e per annum. This is calculated as 13% above Ireland’s 1990 baseline value which was established and fixed at 55.61 Mtonnes of CO<sub>2</sub>e following an in-depth review of Ireland’s 2006 greenhouse gas inventory submissions to the UNFCCC.

Figure 6 shows emissions for the period 1990 to 2020 for each scenario and compares with the Kyoto Protocol limit for the 2008 – 2012 period. Projected emissions include the impact of forest sinks as allowed for under Article 3.3 of the Kyoto Protocol.



**Figure 6. Historical and projected greenhouse gas emissions (including forest sinks) for each scenario and the Kyoto Protocol target**

Table 3 shows the projected annual average emissions for the period 2008 – 2012 for the *With Measures* and *With Additional Measures* scenarios, including carbon sinks. As stated, the Kyoto Protocol limit for Ireland is, on average, 62.8 Mtonnes of CO<sub>2</sub>e per annum over the 5-year Kyoto period. The second National Allocation Plan<sup>9</sup> allocates 22.3 Mtonnes of CO<sub>2</sub> to those installations covered by the EU Emissions Trading Scheme (refer to footnote below Table 3). The remainder (i.e. 40.6 Mtonnes of CO<sub>2</sub>e) is compared with projected non-ETS sector emissions to assess the Government’s purchasing requirement and/or need for additional domestic action.

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

Mtonnes of CO <sub>2</sub> e	With Measures		With Additional Measures	
	Projected emissions	Distance to Limit	Projected emissions	Distance to Limit
<b>2008-2012</b>	63.0	0.2	62.3	-0.5
<b>Attributed to EU ETS</b>	19.5*	na	19.2*	na
<b>Attributed to Non-ETS</b>	43.6	na	43.1	na
<b>Government Purchases/Additional Domestic Action</b>	3.0**	na	2.5***	na

Numbers may not sum exactly due to rounding.

\* 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 CO<sub>2</sub> 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 2008 was 19.97 Mt which was below the verified emissions of 20.38 Mt). 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 CO<sub>2</sub>e – 43.6 = -3.0 Mtonnes of CO<sub>2</sub>e

\*\*\* 62.8 (Kyoto Limit) – 22.3 (Annual Allowance Allocation for ETS) = 40.6 Mtonnes of CO<sub>2</sub>e – 43.1 = -2.5 Mtonnes of CO<sub>2</sub>e

### ***Implications for Government Purchasing Requirement***

Under the *With Additional Measures* scenario (including the impact of carbon sinks), the Government purchasing requirement is projected to be 2.5 Mtonnes of CO<sub>2</sub>e per annum over the five-year Kyoto period which equates to 12.7 Mtonnes of CO<sub>2</sub>e in total. The estimated credits acquired or to be acquired by the State in the 2008-2012 period is currently 8.3 million<sup>12</sup> which leaves a ‘gap’ of 4.4 Mtonnes of CO<sub>2</sub>e which still needs to be bridged for Ireland to meet its Kyoto commitments.

Under the National Allocation Plan 2008-2012, the EPA established a New Entrant Set-Aside where allowances were set aside for new entrants coming into the EU Emissions Trading Scheme and for the expansion of existing installations over the 2008-2012 period. In addition, where an installation is closed 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 Plan 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 will be around 5 million allowances remaining in the New Entrant Set-Aside at the end of the Kyoto period which will be available for the State to use towards Kyoto compliance. Based on these projections, it is likely that the remaining allowances in the New Entrant Set-Aside will cover the remaining ‘gap’ of 4.4 Mtonnes of CO<sub>2</sub>e and no further purchase of carbon credits will be needed. These projections, therefore, support the recent decision to suspend the National Treasury Management Agency’s purchasing programme of carbon credits.

<sup>12</sup> Comptroller and Auditor General Annual Report. Accounts of Public Services 2008. (September 2009)

## ***6. Comparison with EU 2020 Target for the Non-ETS Sector Emissions***

The Kyoto Protocol is only a first step in addressing the serious global threat of climate change. The ultimate goal of the UNFCCC is to stabilise atmospheric concentrations of greenhouse gases at a level that prevents dangerous human interference with the climate system. Therefore, in January 2008 the EU Commission put forward a package of proposals that will deliver on the European Union's commitments to fight climate change and promote renewable energy up to 2020 and beyond. The package seeks to deliver a 20% reduction in total EU greenhouse gas emissions by 2020 (relative to 1990 levels) and at the same time increase to 20% the share of renewable energies in energy consumption. The emissions reduction will be increased to 30% by 2020 when a new global climate change agreement is reached with appropriate mandatory reductions. Agreement was reached on this package, with some amendments, by the EU Parliament and Council in December 2008 on legally binding targets to cut greenhouse gas emissions by 20%, to establish a 20% share for renewable energy and to improve energy efficiency by 20% by 2020.

In the EU Climate Change Package, the total effort for greenhouse gas reductions by 2020 has been divided between the EU ETS and non-ETS sectors. The following approach has been adopted:

- (i) A single EU wide cap for all emissions covered by the EU ETS, ensuring a level playing field in the single European market for industrial installations, with a 21% reduction in EU ETS sector emissions by 2020 (compared to 2005). The annual cap will decrease along a linear trend line which will continue beyond the end of the third trading period (2013 – 2020). Consequently, there are no specific national emissions targets for emissions from those sectors covered by the EU ETS in 2020.
- (ii) An EU-wide reduction of around 10% in 2020 (compared to 2005) for the sectors that are not covered by the EU ETS. Individual targets for Member States have been agreed which average out at a total 10% reduction in 2020 (compared to 2005). GDP per capita was used as the main criterion when setting the targets for Member States.

The target for Ireland for non-ETS sectors is to reduce emissions by 20% in 2020 relative to 2005 levels; the limit has been provisionally calculated by the EPA as 37.1 Mtonnes of CO<sub>2</sub>e<sup>13</sup>. In addition, Member States must annually limit non-ETS greenhouse gas emissions in a linear manner between 2013 and 2020, including by making use of the flexibilities provided for in the Effort Sharing Decision<sup>14</sup>, in order to ensure that emissions do not exceed the 2020 limit.

Taken together, the combined ETS and non-ETS EU-wide reductions will result in an overall EU-wide reduction of 14% compared to 2005, which is equivalent to a reduction of 20% compared to 1990.

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<sup>13</sup> 68.8 Mtonnes of CO<sub>2</sub>e (Total 2005 National Emissions) – 22.4 tonnes of CO<sub>2</sub> (2005 ETS Emissions without De-minimis) = 46.4 Mtonnes of CO<sub>2</sub>e (2005 non-ETS Emissions) - 20% = 37.1 Mtonnes of CO<sub>2</sub>e

<sup>14</sup> 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

The projections presented here were disaggregated into EU ETS and the non-ETS sectors to allow a comparison to be made with the 2020 target for non-ETS sector emissions. Table 4 deals only with non-ETS sectors and shows the absolute level of emissions projected for 2020, percentage change for each scenario in 2020 relative to 2005 emission levels and the implied distance to the 2020 target.

It was agreed by the EU Parliament and Council in December 2008 that, in the event that an international agreement on global reductions is not reached by the Community by 31 December 2010, Member States may include emissions and removals from activities related to land-use, land-use-change and forestry (LULUCF) towards meeting the 20% reduction target (relative to 1990)<sup>7</sup>. The aim is that this proposal would enter into force from 2013 onwards. It not yet clear how the inclusion of carbon sinks would impact on Ireland's 2020 target and whether including their impact would mean a stricter limit for Ireland. For the purposes of this discussion, it is assumed that the 2020 target would remain unchanged if carbon sinks are to be included.

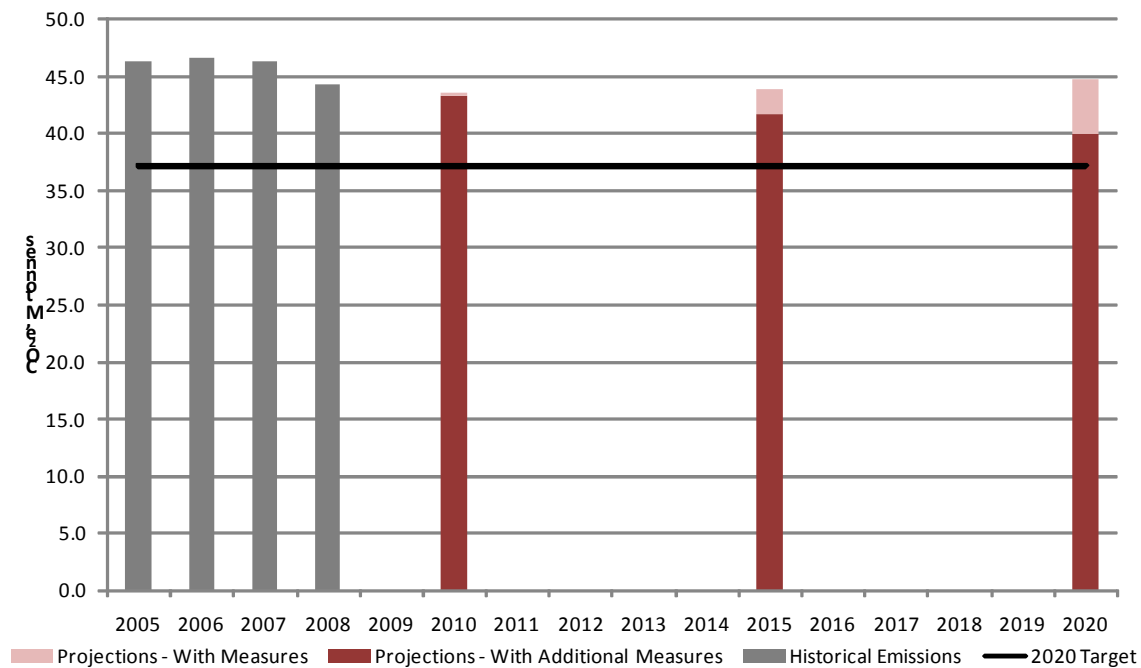
*Table 4. Projected emissions for non-ETS sector emissions, percentage change relative to 2005 emissions and distance to 2020 EU Commission Target*

<b>Mtonnes of CO<sub>2</sub>e</b>	<b>With Measures Scenario</b>	<b>With Additional Measures Scenario</b>
	<b>Without Carbon Sinks*</b>	
<b>2020</b>	<b>49.5</b>	<b>44.8</b>
<b>% change relative to 2005</b>	<b>+6.6%</b>	<b>-3.6%</b>
<b>Distance to 20% 2020 target<sup>#</sup></b>	<b>12.4</b>	<b>7.6</b>
	<b>With Carbon Sinks of 4.8 Mt CO<sub>2</sub>e*</b>	
<b>2020</b>	<b>44.7</b>	<b>40.0</b>
<b>% change relative to 2005</b>	<b>-3.7%</b>	<b>-13.9%</b>
<b>Distance to 20% 2020 target<sup>#</sup></b>	<b>7.6</b>	<b>2.8</b>

\* Carbon sinks = additional afforestation

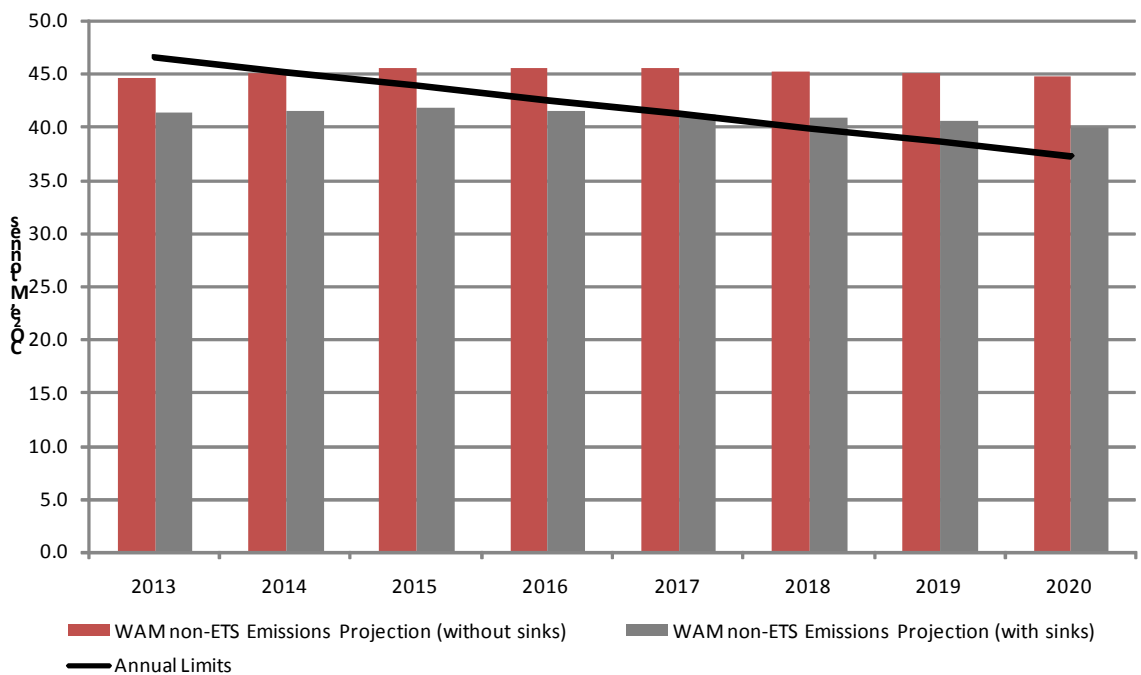
<sup>#</sup> Provisional Target for non-ETS emissions in 2020 is 37.1 Mtonnes of CO<sub>2</sub>e as calculated by the EPA

The importance of carbon sinks is evident from Table 4 where it is projected by COFORD that carbon sinks will sequester in the order of 4.8 Mtonnes of CO<sub>2</sub> in 2020. The inclusion of carbon sinks in emissions accounting post-Kyoto is critically important for Ireland and will play a significant role in bringing Ireland closer to its 2020 target for non-ETS sector emissions and in reaching the annual limit determined by the linear reduction required in non-ETS greenhouse gas emissions between 2013 and 2020. Figure 7 shows emissions for the period 2005 to 2020 (including forest sinks) for each scenario, and Ireland's 2020 target for non-ETS sector emissions.



**Figure 7. Total non-ETS sector GHG Emissions (including forest sinks) for With Measures and With Additional Measures scenario**

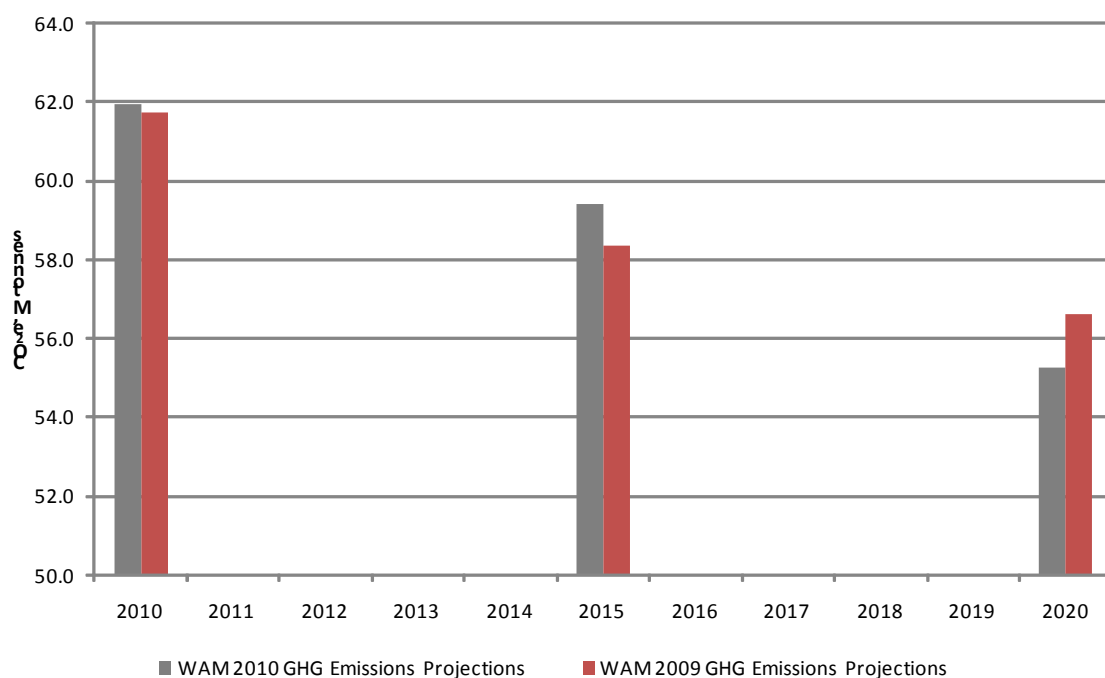
Figure 8 shows projected emission levels with and without carbon sinks in relation to the linear reduction pathway required between 2013 and 2020. Without carbon sinks, it is projected that Ireland will exceed its annual limit in 2014. Including the impact of carbon sinks, it is projected that Ireland will exceed its annual limit in 2017 which again illustrates the importance of carbon sinks.



**Figure 8. Projected greenhouse gas emission levels, with and without carbon sinks, and comparison with the linear reduction pathway required between 2013 and 2020**

## 7. Comparison with 2009 EPA Greenhouse Gas Emissions Projections

The EPA produces greenhouse gas emission projections on an annual basis. Previous to the emission projections discussed in this report, emissions projections were published in March 2009. Since that time significant developments in terms of economic forecasts and policy formulation have occurred. 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 9 shows a comparison between the projections presented here (called 2010 GHG Emissions Projections) and those published last year for the *With Additional Measures* scenario.



**Figure 9. Comparison between 2009 and 2010 greenhouse gas emissions projections for With Additional Measures scenario**

Table 5 shows a comparison between the emissions projections presented in this report and those published in 2009 for the *With Additional Measures* scenario.

**Table 5. Comparison between 2010 and 2009 greenhouse gas emissions projections for With Additional Measures scenario**

Mtonnes of CO <sub>2</sub> e	2010	2015	2020
WAM 2009 GHG Emissions Projections	61.7	58.4	56.7
WAM 2010 GHG Emissions Projections	62.0	59.4	55.3

The emissions projections developed in 2009 were based on GDP growth rates of  $-0.5\%$  between 2008 and 2009,  $4.7\%$  between 2010 and 2015 and  $4.3\%$  between 2015 and 2020. These growth rates, particularly in the short term, deviate from the assumptions underlying the emissions projections presented in this report which are predicated on a much deeper contraction in the economy in 2009 and 2010 ( $-7.8\%$  in GDP in 2009 and  $-2.3\%$  in 2010). Despite this difference in assumptions on economic growth, the *With Additional Measures*

emission projection for 2010 is comparable for both sets of emissions projections. Thereafter, emissions projections deviate more significantly.

For 2010, the most significant difference between both sets of emissions projections is in the power generation sector where emissions are projected to be significantly higher in the emission projections presented in this report. This appears to be off-setting any reductions in emissions that would be evident from more conservative assumptions on economic growth and increased renewables on the system. This difference can be attributed to updated assumptions on key parameters such as oil, coal and carbon price in the latest national energy forecasts which results in a higher share of more carbon intensive fuels (i.e. peat and coal) in the fuel mix used in electricity generation which subsequently results in higher emissions from power generation. This trend continues into 2015, where higher emissions from power generation, in the emissions projections presented in this report, continue to offset emissions reductions due to lower assumptions on economic growth and increased renewables. In 2020, the difference between power generation emissions in both sets of emissions projections is less and results in lower overall projected emissions in 2020 for the emissions projections presented in this report.

## Appendix I

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

**CO<sub>2</sub>e:** total greenhouse gas emissions expressed as CO<sub>2</sub> equivalents. The CO<sub>2</sub> emission is added to the equivalent emission of methane, nitrous oxide and so-called F-gases which are converted to CO<sub>2</sub> equivalents using their global warming potentials.

**F-gases:** These gases comprise the following three gases, HFCs (Hydrofluorocarbons), PFCs (Perfluorocarbons) and SF<sub>6</sub> (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 CO<sub>2</sub>e per annum) for With Measures and With Additional Measures scenarios*

		Energy	Residential	Industry & Commercial	Agriculture	Transport	Waste	Carbon Sinks	Total (Without carbon sinks)	Total (With carbon sinks)	
<b>Historical</b>	1990	11.4	7.5	9.6	20.0	5.2	1.3	-	54.8	-	
	1995	13.5	6.4	9.8	20.9	6.3	1.6	-	58.5	-	
	2000	16.2	6.5	12.4	20.5	10.8	1.3	-	67.8	-	
	2005	15.8	7.3	11.8	19.6	13.0	1.2	-	68.8	-	
	2006	15.1	7.2	11.6	19.3	13.7	1.3	-	68.3	-	
	2007	14.6	7.0	11.9	18.6	14.4	1.2	-	67.6	-	
	2008	14.7	7.6	11.4	18.4	14.3	1.1	2.8	67.4	64.7	
<i>With Measures Scenario</i>											
<b>Projected</b>	2008-12	15.1	7.4	10.0	18.3	13.9	1.1	2.7	65.8	63.0	
	2015	14.4	7.1	10.5	17.9	16.0	1.1	3.8	67.0	63.2	
	2020	10.1	7.3	11.5	17.5	17.8	1.0	4.8	65.3	60.5	
	<i>With Additional Measures Scenario</i>										
	2008-12	14.9	7.3	9.8	18.3	13.7	1.1	2.7	65.0	62.3	
2015	13.1	6.7	9.4	17.9	15.1	1.1	3.8	63.2	59.4		
2020	10.1	6.0	9.4	17.5	16.0	1.0	4.8	60.1	55.3		

\*Note: Numbers may not sum exactly due to rounding

*Table B. Historical and projected emissions for the non-ETS sector (Mtonnes CO<sub>2</sub>e) for With Measures and With Additional Measures scenarios*

		Non-ETS Sector	Forest sinks	Total (With Forest sinks)	
<b>Historical</b>	2005	46.4	-	46.4	
	2006	46.6	-	46.6	
	2007	46.4	-	46.4	
	2008	47.1	2.8	44.3	
	<i>With Measures Scenario</i>				
<b>Projected</b>	2010	46.3	2.6	43.7	
	2015	47.7	3.8	43.9	
	2020	49.5	4.8	44.7	
	<i>With Additional Measures Scenario</i>				
	2010	46.0	2.6	43.4	
2015	45.5	3.8	41.7		
2020	44.8	4.8	40.0		

\*Note: Numbers may not sum exactly due to rounding