Irish Climate Policy for 2012: An Assessment

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Abstract

The Irish government plans to reduce greenhouse gas emissions by 3 per cent per year. This can only be achieved by drastic measures on the demand side, such as a rapid reduction in the number of cattle or people. The Irish government also plans to introduce a carbon tax. A tax that applies to emissions that are not covered by the EU emissions trading system, and that roughly equals the expected permit price, would achieve emission reduction at almost the lowest possible cost. A carbon tax that is levied on emissions covered by the EU ETS, would not reduce emissions, but would cost Ireland and the rest of the EU money.

1. Introduction

As elsewhere, climate policy in Ireland is intensifying – but as with most things in Ireland, the acceleration is particularly strong. Previously, Irish policy lagged behind that of other European countries, but Ireland now seems to be ahead. There may be three reasons for this. First, the media frenzy in the UK has affected the Irish public. Second, Ireland is no longer a poor country in the EU, and expectations for environmental policy are higher. Third, the Green Party entered government.

The historical development of Irish carbon dioxide emissions is surprising at first sight. Diakoulaki and Mandaraki (2006) show that industry emissions grew by 25 per cent between 1990 and 2003, while output grew by 150 per cent for the same period. This implies that industry decarbonised at a rate of more that 5 per cent per year – an astounding rate, perhaps the highest in the world, and achieved without much of a climate policy. In 1990, Irish manufacturing

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emitted 825 tonnes of CO_2 for every million Euro value added, compared to an EU average of 790 g/€. In 2003, the EU average had fallen to 636 g/€, but the number for Ireland was only 261 g/€ – second to Sweden only. The main reason for this dramatic change is that Irish growth was concentrated in energy-extensive sectors (services, pharmaceuticals), while some energy-intensive production (base chemicals, metal) actually shrank. Power generation was modernised too; and new capacity has been gas-fired and wind-powered.

This places Ireland in a good position with regard to its emissions. The same is not true for further emission reduction. Much of the low-hanging fruit has been picked. There are no old peat or fertiliser plants that can be closed. A large share of Irish infrastructure, whether in transport, in power generation or in buildings, is of recent date (if not still under construction), and will not be replaced for decades. In 2005, 32 per cent of CO_2 emissions were from power generation, 28 per cent from transport, and 15 per cent from residential energy use. This reduces the ability of climate policy to influence energy use in the medium term.

The rapid and perhaps unanticipated shift in position has left Irish climate policy in a state of flux. There is a clear mismatch between ambition and implementation. McCarthy and Scott (2007) focus on the policy instruments that are envisaged to meet the emission targets. In this paper, the focus is on two key elements of the climate policy of the current government: the 3 per cent per year target (Section 2), and the carbon tax (Section 3). Section 4 concludes.

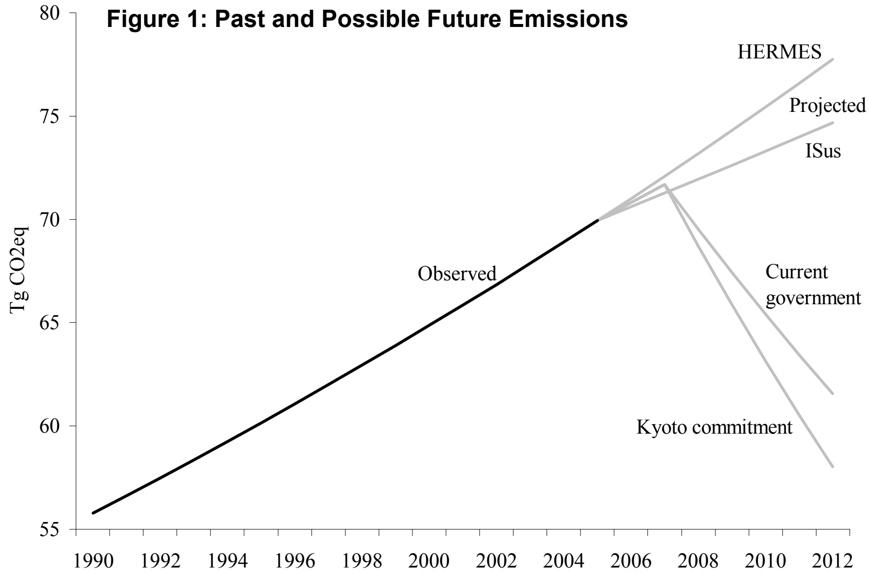
2. The 2012 Emission Reduction Target

As part of the agreement for government, Ireland is to reduce its greenhouse gas emissions by 3 per cent per year. It is not clear where this target comes from: 3 per cent per year corresponds to an 80 per cent emission reduction in 50 years time. This is in line with stabilisation of the atmospheric concentration of greenhouse gases at 400 ppm CO_{2eq}. Such a concentration would imply an 85 per cent chance of keeping the rise in the global mean temperature below 2°C (den Elzen and Meinshausen, 2006). A maximum global warming of 2°C is the official target of the European Union.

However, the 2°C target does not meet the cost-benefit test (Nordhaus and Yang, 1996) and its justification on non-economic grounds is questionable too (Tol, 2007). Furthermore, there are cheaper strategies to meet a 400 ppm CO_{2eq} target. In general, one would not recommend a constant rate of emission reduction. Rather, one would let the price of carbon rise with the interest rate (Hotelling, 1931). With constant prices and technologies, this would imply that emission abatement accelerates over time. Climate policy would accelerate stronger if the price of fossil fuels rises over time, and if technological progress reduces the costs of renewable energies (Wigley *et al.*, 1996). This is the cheapest way of meeting any target.

Figure 1 shows the implication of the 3 per cent target: a rather sharp trend break. Figure 1 also shows the Kyoto commitment – under the EU burden sharing agreement, Irish emissions are to be 113 per cent of their 1990 value, averaged over the period 2008-2012. A 3 per cent per year emission reduction would bring 2008-2012 emissions to 118 per cent of 1990. The new government is as committed to the Kyoto Protocol as the previous government.

Figure 1: Past and Possible Future Emissions



Therefore, the logical interpretation is that whereas the previous government had planned to cover the gap between actual and target emissions by importing emission permits, the current government intends to cut emissions in Ireland by 3 per cent per year and buy permits only for the gap between the 118 per cent and the 113 per cent. Carbon permits can be imported through the EU Emissions Trading System, and through Joint Implementation and the Clean Development Mechanism under the Kyoto Protocol.

Figure 1 also shows projected emissions in the absence of policy, with average emissions growth rates of 1.5 per cent per year (*HERMES*; Fitz Gerald *et al.*, 2002) and 0.9 per year (ISus; O'Doherty and Tol, 2007). An absolute 3 per cent emission reduction per year implies a 3.9-4.5 per cent annual emission reduction from baseline, or 21.1-24.6 per cent in the five year period of government. This is a considerable task.

Estimates of the costs of emission reduction suggest the following relationship:

$$\frac{C}{Y} = \alpha \left(\frac{R}{E} \right)^2 \tag{1}$$

where C is emission reduction cost, normalised by gross domestic product Y; R is emission reduction, normalised by business as usual emissions E; and a is a parameter, interpretable as unit cost (€/tCO_2). Estimates of a vary between 1 and 2, for a cost-effective implementation (see Barker *et al.*, 2007; Weyant *et al.*, 2006). For the short term, $a = 2$ may be more appropriate. This means that a 1 per cent emission reduction from baseline would cost 0.02 per cent of GDP; and that a 10 per cent emission reduction would cost 2 per cent of GDP. The carbon tax would be in the order of €400/tCO_2 – about 8 times higher than the expected price of permits in the EU ETS, and about 40 times higher than the estimated social cost of carbon (Tol, 2005). €400/tCO_2 is about 25 ¢/kWh and ¢90 per litre gasoline.

The planned 3.9-4.5 per cent emission reduction would thus cost about 0.3-0.4 per cent of GDP per year. (If climate policy were not cost-effective, the costs could be much higher.) Over a period of 5 years, this would amount to 1.5-2.0 per cent of GDP. To phrase this differently, the Irish economy is currently projected to grow by 2.9 per cent. This is without climate policy. With climate policy, projected growth is 2.5-2.6 per cent – a reduction in the growth rate of one-fifth to one-tenth. Put differently still, the economy would grow in 10 years what it would otherwise grow in 8 or 9 years.

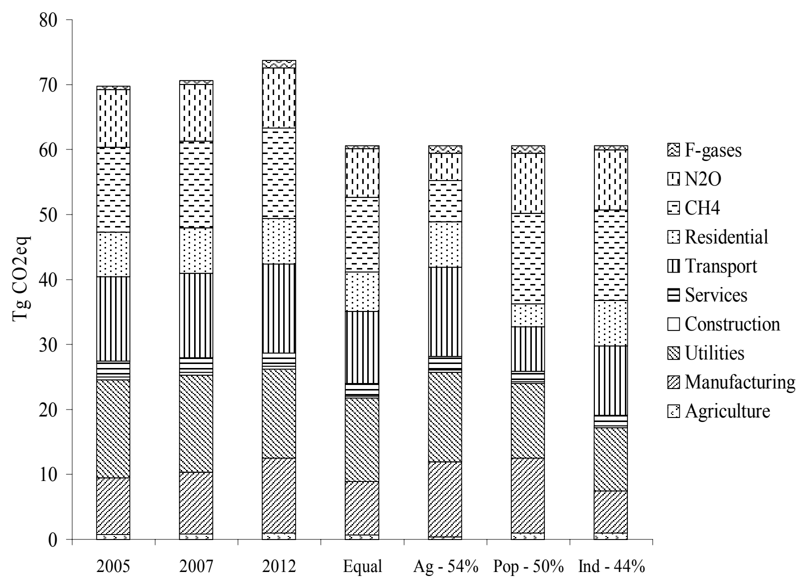
In fact, the problem is more severe than these numbers suggest. The above relationship is for emission reduction that is announced well in advance. It assumes that the bulk of emission reduction would be achieved at the supply side of the energy sector – particularly fuel switching and energy efficiency improvement – without reducing the services provided by energy use. In a five-year period, however, emissions are by and large reduced at the demand side, that is, by reducing the volume of energy services.

According to Lyons *et al.* (2007), some 10 per cent of the power generation capacity needed for 2012 does not yet exist – but there is planning permission for two new gas-fired plants. This means that at most 20 per cent of 2012 electricity will be carbon-neutral – only slightly higher than what it is today. The gas-fired power plants will replace oil-fired ones, but as the oil plants are used at peak times only, the effect on emissions is minimal. Closing existing plant before the end of their economic lifetime would be very expensive, and would lead to electricity shortages as the lead time to build new plant is too long. The current government, therefore, has almost no control over the stock of power plants in 2012, and the amount of carbon dioxide emitted from electricity generation.

Similar reasoning holds for other major emission sources. The 2012 housing stock will not be very different from today's, as buildings currently under construction and those with planning approval are subject to the current building standards. Public transport will expand at best marginally between now and 2012. The Irish car fleet is relatively young, and with slowing economic growth, fewer people will replace their cars. On a time scale of 5 years, emission reduction policy can affect the demand side only. The supply side is largely fixed.

Figure 2 has the 2005 distribution of emissions over the main sectors, and the projected emissions for 2007 and 2012. This gives some idea of the size of the challenge to reduce emissions by 3 per cent per year. To make things easy, the low projection is used, so that an emission reduction of one-fifth rather than one-quarter is required.

Figure 2: Greenhouse Gas Emissions by Source as Observed for 2005 and as Projected for 2007 and 2012 – and again in 2012 for Four Extreme Policy Proposals



Four **extreme** policy cases are considered in Figure 2. In the first case, all sectors reduce emissions by the same proportion. In the second case, emissions associated with agriculture are reduced by 54 per cent. Roughly, this would imply that the cattle population would be cut in half. In the third case, residential emissions are cut by 50 per cent, services and transport by half that, and electricity use by one-third. Roughly, this would imply that one-half of the population emigrates – or that the average resident uses 50 per cent less energy. Only some 10 per cent of electricity use is for consumer electronics, so one would have to give up the television, the dishwasher, the washing machine and the refrigerator; and refrain from travelling by car for four days a week. In the fourth case, industrial emissions are cut by 44 per cent, services and transport by half that, and electricity by two-thirds. Roughly, this would imply that more than two-fifths of production would move offshore.

If emissions in the absence of additional policy were to grow by 1.5 per cent per year rather than 0.9 per cent, as assumed here, emission reduction would become harder still. Reducing emissions by 3 per cent reduction per year is a radical proposal.

Besides, the extreme emission reduction scenarios above would not affect climate change, as emissions would increase elsewhere. For Ireland to reduce emissions from agriculture, for example, it would not suffice to ban every second cow from the island. In fact, the consumption of dairy and meat would have to be cut in half, or the reduction in Irish production would be compensated by an increase elsewhere. Similarly, reducing industrial output in Ireland is irrelevant if production is moved abroad. In a statistical sense, one could reduce Ireland's greenhouse gas emissions in the short term by targeting a small group of producers (e.g., farmers). However, actual emissions reduction would affect all consumers.

The emission reduction target of the Irish government can only be met by draconian measures. It would therefore better be abandoned.

3. A Carbon Tax

The government agreement also indicates that there will be a carbon tax, but it is as yet unknown when the tax will be introduced, how high the tax will be, or who will pay the tax.

In principle, a carbon tax is the preferred instrument for reducing greenhouse gas emissions, outperforming even auctioned permits (Pizer, 1999). At present, however, the EU emission trading system (ETS) is the prime instrument. The EU ETS covers only carbon dioxide emissions, and only a part of all CO_2 emissions. This may be politically expedient, but it does increase the cost of compliance. If the Irish carbon tax covered the other emissions, and the carbon tax equalled the permit price, then emission reduction costs would be at their theoretical minimum.

The price of permits has varied considerably (see Figure 3) while taxes are fixed and announced in advance. A carbon tax cannot equal the permit price. However, there is also a futures market for the EU ETS – see Figure 4 – and the government could use this to set the carbon tax. For example, the government could announce the carbon tax in September of the previous year, using the future price of September 1 as the basis.[1]

[1] There is probably sufficient liquidity in the EU ETS to prevent Irish companies from influencing the futures price at the EU market.

Figure 3: The Spot Price of Carbon Permits in €/tCO_2 (top panel) and the Traded Volume in Metric Tonnes of CO_2 (bottom panel)

Source: www.eex.de (2 Oct, 2007).

Figure 4. The Futures Price of 2008 Carbon Permits in €/tCO_2 (top panel) and the Traded Volume in Metric Tonnes of CO_2 (bottom panel)

Source: www.eex.de (2 Oct, 2007).

The actual permit price will deviate from the future permit price. This would lead to a different carbon price in different parts of the economy, and emission reduction would be more expensive than needed. However, the welfare loss is probably limited. Welfare losses are large if direct competitors face different carbon prices, because in that case differentiated regulation creates distortions on the output markets. If it is different sectors that are regulated differently, markets are distorted only to the extent that these sectors compete on the input markets for labour and capital. See Boehringer *et al.* (2006).

There is an interesting twist to this. There are arguments to allow companies, that are not covered by the EU ETS, to voluntarily opt in. A company may do so to enhance its image, or because it can reduce emissions at a lower cost than the expected permit price. If taxes and permits co-exist, then a company can opt out of the tax and opt into the permit market. If the permit price (spot or future) falls below the tax, this is the rational course of action. The permit market would be even more attractive if there is a promise of grandfathered permits in the future. If the opt-in clause for the EU ETS becomes solid, then the expected permit price puts a cap on the effective carbon tax.

In the absence of an opt-in clause, tax industries would lobby for inclusion in the EU ETS if the tax is higher than the permit price. Lobbying is probably more intense and perhaps more successful with taxes than with direct regulation, because the difference between carbon tax and permit price is obvious.

In sum, a carbon tax alongside a permit market is not an optimal solution, but it is not bad either – provided that carbon tax and permit price are reasonably close. Market or political forces would prevent divergence of tax and permit price.

However, it is not clear that the carbon tax will apply only to the sectors not covered by the EU ETS. It may be that tax will apply to the ETS sectors as well, as suggested by Minister Eamon Ryan in an interview with the *Irish Times* (July 13, 2007). In the Appendix, we show the consequences with a simple model of the international emission permit market. The results are intuitive.

Let us assume, reasonably, that Ireland is a net importer of carbon permits. A carbon tax would make it less attractive for Irish companies to import emission permits from the rest of the European Union, because extra permits imply higher emissions imply higher taxes. As a result, emissions would fall further in Ireland than in the case without a carbon tax. However, emissions would increase in the rest of the EU as there would be less export of emission permits to Ireland. These two effects exactly offset each other, because the EU ETS imposes a cap on total EU emissions. Total EU emissions are not affected by a carbon tax in Ireland. Only the distribution of emissions between the member states is affected by an Irish tax. A domestic tax superimposed on internationally traded emission permits has a leakage rate of 100 per cent.

Furthermore, the reduced demand for emission permits would depress the European price of emission permits, albeit only slightly.

This means that the rest of the EU exports fewer permits for a lower price – total emission reduction costs rise in the rest of the EU.

However, the drop in the price of emission permits is less than the carbon tax. As a result, in Ireland, the sum of the carbon tax and the permit price is always greater than the permit price if the tax is zero. In Ireland, more emissions are reduced and at a higher price. The cost of emission reduction, therefore, goes up in Ireland too.

In sum, an Irish carbon tax on sectors covered by the EU ETS increases the costs of emission reduction in Ireland and in the other member states. It makes everybody worse off, without improving the environment, as emissions are unchanged.

4. Discussion and Conclusion

Politics and climate policy mix badly. It will take a global, century-long effort to drive greenhouse gas emissions to zero – but every politician wants to be seen doing something in every constituency while in office. The optimal solution for the climate problem consists of a carbon tax that starts low but increases over time – combined with additional incentives for industry to develop energy sources that are cheap, safe, convenient, and carbon-free.[2]

In this paper, two key components of Irish climate policy are discussed. The emission reduction target of 3 per cent per year for the current government period would be very difficult to meet, if not infeasible, and would be very expensive. It is best forgotten. A carbon tax is an excellent idea, provided that the tax does not deviate too much from the price of emission permits in the EU ETS, and provided that the tax is applied to emissions outside the EU ETS only.

[2] A carbon tax provides an incentive for the commercialisation of carbon-free energy, but companies can appropriate only a small share of the benefits of their own R&D. Additional incentives are therefore justified.

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APPENDIX

The model closely follows Rehdanz and Tol (2005), but considers a case that these authors omitted.

Let us assume that there is an international market of tradable emission permits with two players: a small, importing country (Ireland) and a large, exporting country (the rest of the European Union). The importing country levies a tax on emissions.

Companies in the importing country *A* solve the following welfare programme:

$$\min_{R_A, P} C_A = \alpha_A R_A^2 + \pi P - \tau R_A \text{ s.t. } R_A + P \geq E_A - A_A =: T_A \quad \text{(A1)}$$

where *C* are emission reduction costs; *E* are baseline emissions, *A* is the emission allocation, so that *T* is the emission reduction target; R is emission reduction, and *P* are imported permits; *π* is the permit price; *τ* is the carbon tax; *a* is unit emission reduction cost. In a more general set-up, the quadratic specification would be replaced by any convex function, but then the model cannot be explicitly solved.

The exporting country *B* solves:

$$\min_{R_B, P} C_B = \alpha_B R_B^2 - \pi P \text{ s.t. } R_B - P \geq E_B - A_B =: T_B \quad \text{(A2)}$$

Note that (A1) and (A2) are independent of the initial allocation of permits. Regardless of whether permits are grandparented or auctioned, the initial allocation is a sunk cost or benefit. The permit price in (A1) and (A2) represents the opportunity cost of emissions.

The first order conditions of (A1) and (A2) are:

$$2\alpha_A R_A - \lambda_A - \tau = 0 \quad \text{(A3)}$$

$$2\alpha_B R_B - \lambda_B = 0 \quad \text{(A4)}$$

$$\pi - \lambda_A = 0 \quad \text{(A5)}$$

$$-\pi + \lambda_B = 0 \quad \text{(A6)}$$

$$R_A + P - T_A = 0 \quad \text{(A5)}$$

$$R_B - P - T_A = 0 \quad \text{(A6)}$$

This solves as:

$$\pi = \frac{2\alpha_A \alpha_B (T_A + T_B) - \alpha_B \tau}{\alpha_A + \alpha_B} \tag{A7}$$

$$P = \frac{\alpha_A T_A - \alpha_B T_B - \tau/2}{\alpha_A + \alpha_B} \tag{A8}$$

$$R_A = \frac{\alpha_B (T_A + T_B) + \tau/2}{\alpha_A + \alpha_B} \tag{A9}$$

$$R_B = \frac{\alpha_A (T_A + T_B) - \tau/2}{\alpha_A + \alpha_B} \tag{A10}$$

This solution collapses to the base case of Rehdanz and Tol (2006) for τ=0.

For τ>0, the following holds:

$$R_A + R_B = \frac{\alpha_B (T_A + T_B) + \tau/2}{\alpha_A + \alpha_B} + \frac{\alpha_A (T_A + T_B) - \tau/2}{\alpha_A + \alpha_B} = T_A + T_B \tag{A11}$$

That is, Country A reduces more, but Country B reduces less, and these effects exactly offset one another. As emission reduction is shifted from the country with low emission reduction costs, to the country with high emission reduction costs, total emission reduction costs increase. Note that this follows from the constraints, rather than from the specification of the abatement cost function.

Emission imports fall, and so does the price. However, in Country A, the shadow price of emissions goes up. Equation (A3), (A5), and (A7) imply

$$\pi + \tau = \frac{2\alpha_A \alpha_B (T_A + T_B)}{\alpha_A + \alpha_B} - \frac{\alpha_B \tau}{\alpha_A + \alpha_B} + \tau = \pi_{\tau=0} + \left(1 - \frac{\alpha_B}{\alpha_A + \alpha_B}\right)\tau \tag{A12}$$

In Country A, the shadow price increases, and more emissions are abated; more is done at a higher price, so the total cost goes up. Per (A3) and (A5), this holds for any abatement cost function. The quadratic specification only ensures a neat expression like (A12).

In Country B, less is done at a lower price – but less is exported at a lower price. The latter effect is larger than the former. This is easily seen. The tax in Country A does not affect the cost structure in Country B. As Country B would voluntarily reduce domestic emissions and export more permits if the tax falls, it must be that, at the margin, emission reduction costs are lower permit revenue.

Algebraically, the lost export revenue minus the saved abatement costs equals:

$$\frac{\alpha_B \tau}{\left(\alpha_A + \alpha_B\right)^2}\left[\frac{\tau}{4} + \alpha_B T_B - \alpha_A T_A\right] \tag{A13}$$

This is positive if T_B is large relative to T_A, that is, if the exporting country's emission reduction target is larger, in absolute terms, than the importing country's target. This is a fair assumption for Ireland and the European Union. The tax in Country A, therefore, increases the total costs in Country B.

So, a tax in Country A would increase costs in both countries, and would not change emissions.