IRELAND'S PATHWAY TO KYOTO COMPLIANCE

COMMENTARY AND RECOMMENDATIONS – COMPRISING PROPOSALS FOR INCLUSION IN A REVISED NATIONAL CLIMATE CHANGE STRATEGY

COMHAR – SUSTAINABLE DEVELOPMENT COUNCIL

September 30, 2006

PREFACE

In July 2006, the Minister for the Environment, Heritage and Local Government issued *Ireland's Pathway to Kyoto Compliance – Review of the National Climate Change Strategy (IPKC)*. It is organized into two Parts and 11 chapters – Part 1 OVERVIEW (Introduction, Emissions Trends and Projections, Impacts and Adaptation) Part 2 SECTORAL ANALYSIS (Energy, Transport, Built Environment and Residential, Industry Commercial and Services, Agriculture, Waste, Sinks, Conclusion).

The Minister asked for comments on 'any aspects of the issues covered – or indeed any proposals for measures which have not been addressed in the Paper itself'.

We appreciate the invitation and the opportunity to provide feedback. Getting this Strategy 'right' should rank as a serious priority for us all.

This Commentary and Recommendations represents the feedback from Comhar – the Sustainable Development Council (SDC) to the Minister's invitation to respond the IPKC paper and provide recommendations for the revised National Climate Change Strategy (NCCS) it addresses.

We first provide some feedback on the overall substance and style of the draft, and then review each chapter. In each section, we provide some brief analysis, and conclude with some proposals.

We note with satisfaction that Comhar is invited to review and update the comprehensive paper it submitted on the use of communication as a critical success factor in determining whether the necessary behavioural change will be effected. We will do so.

This analysis was done as follows: The Climate Change Group of the Council reviewed the report, and fed back critiques and proposals – both individually and in group - to the Comhar SDC Executive. A draft Commentary and Recommendations was the compiled, based on the Group's feedback and on evidence accessed from various government and academic sources. This draft was considered and approved by the full Council at its meeting on September 20, 2006, at which further feedback was provided. The Comhar SDC response was then re-drafted and circulated again to Council for comment, before being finalised. We are very committed to evidence based analysis, and have tried in the short time available to support our findings with credible evidence and analysis. The authorship was led throughout by Lisa Ryan, our Director of Research.

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EXECUTIVE SUMMARY

Comhar SDC welcomes the publication of the document *Ireland's Pathway to Kyoto Compliance – Review of the National Climate Change Strategy (IPKC)* and is pleased to take the opportunity to respond to it. Comhar's 25 members are drawn from five pillars: the State sector, economic sectors, environmental NGOs, social/community NGOs and the professional/academic sector and therefore is in a unique position to provide recommendations on climate change across a wide range of sectors and perspectives. Comhar SDC regrets the delay in publishing the IPKC consultation document and considers that a final National Climate Change Strategy (NCCS) should have been in place to underpin the second National Allocation Plan (NAP) prepared for the European Union Emissions Trading Scheme (EU ETS) before it was sent to the European Commission.

This response comes in two parts – the first section provides overall comments on the document, while the second section gives specific comments on the individual chapters in the sectoral analysis.

Generally we find that the IPKC document provides a well laid out and argued analysis of the issues and options. The structure used for each sector - trends and projections, progress re 2000 NCCS, policies and measures in the pipeline, additional areas and measures that have potential to deliver further reductions – provides a welcome consistency and coherence of approach, and the glossary of terms is very welcome. A missing item however, is the general lack of structured quantitative analysis, both of the policy measures that have been put in place, and the future measures to be included in the next NCCS. While the Appendix 1 contains a list of additional measures, there is no overview provided of the mitigation potential and the costs of the policy measures included. Comhar SDC proposes a template to assist in evaluating the costs and effectiveness associated with each policy measure.

Comhar SDC recommends that the revised NCCS include an *annual review* of the progress made in reducing Ireland's greenhouse gas (GHG) emissions. While the publication of the IPKC paper is welcomed, it is necessary to review the NCCS on a more regular basis than has been performed to date. Monitoring plays a significant part in keeping any plan on track and the climate change strategy is no different in this. A detailed evaluation of each sector would not be required on an annual basis; however a broad overview of the policies implemented should provide ongoing up-to-date information regarding the status of the National Climate Change Strategy. Comhar SDC does not make any recommendation regarding the most suitable body to undertake this task but would be willing to play a role in its implementation.

Comhar SDC approves the attention given in the paper to *adaptation* and recommends that more detail and urgency be given to further measures to

manage these effects. This is a complex task and requires appropriate research and economic analysis extending far beyond the reach of most current and conventional public sector cost-benefit analysis frameworks. Similarly, while the case for integration of adaptation measures into other policies is made, there is no further detail as to how it is to be achieved. Furthermore, since the main climate change impacts will be experienced in the developing world, Comhar proposes that the Strategy should support the setting up of climate change adaptation projects in the developing world.

We note that a few key themes and approaches have either not been addressed, or not adequately so. These include:

- Discussion of the Post-Kyoto (2012) period – the expected GHG emissions and mitigation measures that will be required.
- Key role of Information and Research and Development in mitigating emissions and adapting to climate change.
- Linkage between climate change policy and other policy areas.
- The importance of addressing cross-sectoral consumption
- Education as a policy measure

The second part of the Comhar SDC comments refers to the sectoral analyses. The chapters in the IPKC provide a good overview of the policies that are currently in place to mitigate GHG emissions. However, there is not a clear distinction in the paper between the policy measures that are *likely* to be implemented in the revised NCCS and those that are only *under consideration* as additional measures and their associated mitigation potential, which leads to uncertainty regarding the challenges remaining to be addressed. As stated above, Comhar SDC recommends that more quantitative analysis of the costs and benefits associated with individual policy measures be presented in the revised NCCS in order to be able to compare policy instruments. The key comments relating to the individual chapters are listed as following:

Chapter 4 Energy

- Additional policies for future implementation are limited to co-firing, CHP, micro-CHP, ocean energy, carbon capture, and promotion of efficient energy use by supplier. We recommend the revised NCCS give consideration to other renewable electricity generation technologies such as hydrogen fuel cells, photovoltaic or passive solar heating, particularly in the longer term.
- Attention should be given to other policy options such as electricity distribution infrastructure and downstream measures in the future options.

Chapter 5 Transport

- Some of the most significant policies listed in 2000 NCCS have not been implemented, particularly CO_2-differentiated Vehicle Registration Tax (VRT) and annual motor tax, while vehicle labelling has not been introduced effectively. Both measures should be introduced as soon as possible.

- Biofuels are assigned a high mitigation potential at a level, which seems very ambitious, and therefore further measures, particularly demand-side will be necessary in the revised NCCS.

Chapter 6 Residential and Built Environment

- Energy efficiency needs improvement in both new and old housing stock. The 'House of Tomorrow Programme administered by Sustainable Energy Ireland has shown that a 40 per cent improvement on the current (2005) standards can be achieved. Comhar SDC recommends that building regulations and performance standards be continuously tightened in terms of energy efficiency.

Chapter 7 Industry, Commercial and Services

- Comhar SDC recommends that industry be strongly encouraged to participate in energy management schemes such as the Energy Management Audit Scheme and Energy Agreements Programme and that in the future if there is a lack of participants that consideration be given to introducing legislation in this area.

Chapter 8 Agriculture

- REPS should continue to be supported as a potential low cost means to reduce GHG emissions from agriculture. Energy crops have the potential to act as sinks when cultivation occurs on set-aside or tillage land and should be treated as such in the NCCS. Similarly, anaerobic digestion should be given more consideration as a policy option. However, only modest GHG-emission reductions can be expected as a result of the alternative slurry spreading techniques described in the IPKC document and therefore less emphasis should be put on this option.
- For continued longer-term reduction of GHG emissions, it is recommended overall in this sector to promote (a) research to quantify GHG reductions possible from agriculture; (b) information and advice to farmers regarding cost-effective GHG mitigation strategies; and (c) a pilot trading scheme for GHG emissions in agriculture.

Chapter 9 Waste

- The strategy of waste-to-energy needs careful consideration in terms of the full life-cycle and all GHG emissions (not just methane) compared with other waste management and treatment options. The revised NCCS should present estimations of the full costs and benefits of waste management systems under consideration.

Chapter 10 Sinks

- The afforestation target is not being reached and therefore more support is needed overall to this area and also to ensure that sufficient non-conifer trees are planted.

I. General Comments

The draft provides a well laid out and argued analysis of the issues and options. The template used for each sector - trends and projections, progress re Strategy, policies and measures in the pipeline, additional areas and measures that have potential to deliver further reductions – provides a welcome consistency and coherence of approach, and the glossary of terms is very welcome. However, Comhar SDC regrets that the IPKC consultation document has only just been published and considers that a final NCCS should have been in place to underpin the second NAP before it was sent to Brussels.

Annual Progress Review

Comhar recommends that the revised National Climate Change Strategy include an annual review of the progress made in reducing Ireland's greenhouse gas (GHG) emissions. Monitoring plays a significant part in keeping any plan on track and the climate change strategy is no different in this. A detailed evaluation of each sector would not be required on an annual basis; however a broad overview of the policies implemented should provide ongoing up-to-date information regarding the status of the National Climate Change Strategy. Comhar does not make any recommendation regarding the most suitable body to undertake this task but would be willing to play a role in its implementation.

More Focus on Adaptation

The attention devoted in Section 3 to adaptation to climate change is also welcome. The effectiveness - or otherwise – with which we respond to this challenge will significantly influence our economy and quality of life in the future. In particular, the commitment given on p.27 that "Assessment of the impact of climate change must become integrated into the formulation and development of policy in all sectors" requires early and thorough implementation. Such implementation will necessarily extend far beyond the traditional policy reach of DEHLG, and will thus also necessarily need to be accompanied by appropriate institutional arrangements. A cross-cutting, horizontal, approach to the problem is already operational, to some extent in that current co-ordination of flood policy is led by the OPW. Since the impact of climate change in Ireland will be more far-reaching than flooding alone and will most likely comprise other effects such as raised temperatures and storms, bringing implications in their wake for several entire sectors of the economy (notably insurance and financials services[1], housing, agriculture, forestry and transport and infrastructure), the Strategy

[1] As a possible indicator of climate change induced effects, it is reported in 'Higher Insurance Costs hit US Coastal Living' by Joseph b. Treaster, *International Herald Tribune*, September 26, 2006, p. 18 that insurance companies have paid out $57 billion to cover damage from Katrina and related storms; along US costs from Texas to Maine, insurance premia have increased in some locations by twelve fold, and this in turn is 'having a meaningful impact on sales, and prices.'

should include more details on further measures and timescales to manage these effects. To be truly cost-effective, adaptation measures (whether programmatic or individual) require future-proofed forward planning accompanied by coherent and transparent risk-assessment tools and methodologies. Investment costs need to be cross-referenced against mitigation measures, mitigation benefits and co-benefits. This is a complex task and requires appropriate research and economic analysis extending far beyond the reach of most current and conventional public sector cost-benefit analysis frameworks. Similarly, while the case for integration of adaptation measures into other policies is made, there is no further detail as to who or how it is to be achieved. Furthermore, the main climate change impacts will be experienced in the developing world. The Strategy should propose that climate change adaptation projects in the developing world be supported by Ireland, perhaps setting up an adaptation fund as part of Overseas Development Aid (ODA).

Presentation

Key general recommendations for the final strategy include a focus on costs and payoffs and organizational delivery mechanisms that could be presented in the text in summary matrix format.

1. Present elaborated Costs and Payoff Matrix
While GHG 'payoffs' are estimated for each proposed additional measure, these data are not summarized, the costs of delivering this payoff are not estimated, nor are the number of years for which the payoffs can be expected to last. This makes it impossible to evaluate and compare the cost effectiveness of the options and who pays. A column that identifies the risks associated with each option would also give a sense of the reliability of the measures in question.

2. Combine with Policy Instrument and Organisational Matrix
There is an impressive pulling together of the various disparate pieces of evidence that informs the analyses. But there is insufficient focus on the policy instruments that can deliver the reductions that are posited, or the organizations that can deliver them.

For each additional area that can yield reductions, some combination of policy instruments can be mobilized, either singly or in combination. The following is illustrative of a template that could be used:

Table 1: Template to evaluate policy measures

Policy Instrument	Payoff in GHG reductions (range estimate)	Risks	Costs	Who pays?	Impacts on Competitiveness And quality of life	Who leads (responsible for delivery) Minister and agency?
1. Information (to consumers, and/or producers)						
2. Regulation (command and control)						
3. Direct Investment						
4. Settlement policy and land use planning						
5. Fiscal measures						
(a) subsidies						
(b) taxes and charges						
6. Emissions trading						
7. Research and development						
8. Liability						
9. Green purchasing						
10 Voluntary approaches						
11 a Policy Instrument combination (specify)						
11b Policy Instrument combination (specify)						

Content

We note that a few key themes and approaches are either not addressed, or not adequately so.

1. Post Kyoto

As the name implies the dominant focus of the IPKC paper is on the Kyoto period (2008-12) and mainly defers to the EU in regard to what happens thereafter. It is important that we have a clear national view as to what would work and provide some leadership in the Union in this regard. A long-term strategy regarding the reduction of greenhouse gas emissions is necessary, due to the longevity of the emissions and their potential to cause damage over a long period. This requires putting in place an approach for climate change mitigation and adaptation that will serve Ireland post 2012. A national strategy is needed that will help Ireland plan ahead and anticipate future challenges so that cost-efficient and timely action can be taken. It is already clear that the business community need to have clarity on the future of the European Union Emissions Trading scheme post 2012, and this logic applies across the board.

2. Key role of Information and Research and Development

Information as Power: The information needed to make the right decisions, monitor performance and adapt strategy in time requires timely investment, which should be overtly built into the Strategy.

Achieving competitive advantage through innovation: The ERTDI research and development programme has produced valuable information and insight as regards impacts and responses. In the next R&D programme, we need a substantial portfolio work addressed to the following:

- The costs of addressing climate change will damage competitiveness unless we can convert challenge into opportunity by helping *householders* find new, low cost and interesting ways to adapt and to reduce emissions.

- R&D investment should be linked to ongoing EU R&D programmes so that there is synergy with other significant research efforts and value for money is obtained.

- There are a variety of hardware and software product and service development opportunities that can create new businesses if they can deliver low cost emission reductions. *Irish entrepreneurs* need to be facilitated to team with research groups at universities and elsewhere to create and exploit these niches. In addition to supporting the development of new products and services, the R&D portfolio needs to focus on the how – what policy instruments work in what combination, to what effect, how the public can be engaged, how demand side management – in transport, electricity use etc can be mobilized, etc.

3. Linkage to other policy areas.
Successfully addressing the climate change strategy can also positively advance progress in other areas. For example there is a strong symmetry of interest between relieving traffic congestion, reducing acid precursors (NOx ammonia, SOx) and particulates, and making progress on climate change. Where there are multiple benefits, we can afford to be ambitious. These connections need to be overtly made. There are also tradeoffs, and these also need to be identified.

4. Cross-sectoral consumption
Ultimately consumer purchasing decisions are the most important driver of carbon emissions in a western economy. Carbon emissions can be attributed to the delivery of products and services to meet the needs of the consumer. The NCCS policy measures fail to address this important driver, instead confining themselves to sectoral initiatives that reflect the direct GHG emissions accounted for in the National Inventory. The IPKC sets out proposals for tackling Ireland's direct emissions i.e. a territorial based analysis, these do not take into account those emissions generated by the demand for goods and products and consumption associated with Irish residents. This is a fundamental boundary issue, should policy and initiatives only focus on Ireland's direct emissions (geographical principle) or include those emissions generated by consumption associated with the island's residents (responsibility principle)? Ireland, along with many other developed countries may be able to reduce their direct GHG

emissions due to a shift in the manufacturing base overseas to developing countries, particularly China. However, this does not take into account 'indirect' emissions i.e. those emissions that occur to meet Irish demand for consumer products. A different set of policies is needed to address consumption by Irish residents. These policies need to be evidence-based and there is a clear need for research that would calculate the embodied energy/carbon emissions in imports to Ireland and an indicator needs to be developed that allows monitoring and evaluation of this 'burden-shifting'. Consumers should be encouraged to purchase products that entail lower carbon emissions in their production and use. One option is to consider a carbon allowance system for individuals, such as that described in the box below. Greenhouse gas emissions are global pollutants and in the longer term it will not be enough to tackle emissions directly in Ireland and ignore those that are generated elsewhere by demand by Ireland.

Individual carbon allowances

Since the government has ruled out the introduction of a carbon tax to control non-ETS emissions, we provide an example an emissions allowance system, which has been considered by the British Government. This could work as follows:

- Every adult in the country would be sent, by post, a certificate entitling them to an equal share of whatever was the target level for emissions from activities outside the ETS system. Children would get their allowance through the family allowance system.
- Within a year of getting their certificates, people would have to take them to a bank or post office and sell them for whatever they were worth that day, exactly as if they were selling a dollar draft. Any certificates not sold during the year would lose their validity.
- Companies producing fossil fuel within Ireland or importing it for non-ETS uses would be required to obtain emissions certificates covering the emissions from all the fuel they sold. They would purchase the necessary certificates from the banks. If, as everyone expects, the non-ETS sectors wished to emit more greenhouse gases than there were certificates available, the banks would purchase ETS allowances (EUAs) or the equivalent in Clean Development Mechanism or Joint Implementation certificates and supply those to supplement the certificates they had bought from the public. The Treasury Management Agency could source these extra emissions permits for the banks but this would probably not be necessary.

This system would mean that the cost of any imported emissions allowances would not fall on the taxpayer. It would be paid by the producers and importers of fossil fuels and would be passed on by them in their prices. The system would also mean that anyone living in an energy frugal way, causing fewer emissions to be released than their annual allowance, would receive more money from the sale of their certificates than the cost of the goods and services they bought would increase as a result of the energy suppliers' need to buy emissions certificates. The poor would thus be protected automatically. The British Government has recently floated the idea of introducing individual emissions allowances but in an administratively more complex way.

5. Education

This will be addressed as part of our response on communication in a separate input.

II. Individual Chapter Comments

Chapter 4: Energy

With emissions from the energy sector[2] accounting for 24% of national emissions in 2004 and projected to account for an even larger share (26% on average) during the years 2008-2012, this is clearly a sector requiring the utmost concentration and focus from the NCCS.

This necessity is reinforced by a projected growth in emissions from the sector starting in 2005 and extending upwards and onwards out beyond the Kyoto First Commitment Period (FCP, corresponding to the years 2008-2012) to the point that they represent the largest share of national emissions throughout the period, having grown by 58% on average compared to 1990 emissions. Policies and measures for the energy sector need to address this problem in a coherent and targeted manner.

The sector is unique in that 93% of its total emissions (represented by CO_2 from powergen) are already subject to upstream control as result of implementation in Ireland of the European Emission Trading Scheme (ETS). In theory, such control offers substantial opportunities to decouple emissions from demand for services from the sector, resulting in a progressive decarbonisation of the electricity system. The scale of the projected increase in demand for electricity between now and 2020 (+ 27.5% from 2005) means, however, that a substantially improved rate of decarbonisation will be required over the relatively slow rate of progress achieved since 1990.

This chapter in the IPKC document provides a good overview of the main recent trends in energy production, focusing on electricity generation, and a general description of the main policies and measures to reduce greenhouse gas (GHG) emissions from this sector. However, it lacks discussion of the costs and benefits of these policies in terms of GHG reductions and economic costs. It provides only a limited discussion of additional policies that may be introduced over the coming period to reduce GHG emissions further. Finally, it does not discuss possible ways to reduce GHG reductions in the long term, which may be outside the scope of the report but useful for general awareness of current policy options that may influence long-term trends, such as R&D investments and generating plant investments.

The report could specify where carbon savings are the result of one-off events such as the replacement of older generating plants with more efficient plants. Additional savings from such events will not be available in the future and could

[2] Emissions included from electricity generation, oil refining, gas production and distribution, and solid fuel production (DoEHLG 2006).

be distinguished from policies and measures such as the deployment of renewable energy, which will provide more opportunities for emission savings beyond the 2008-2012 compliance period.

While upstream control of emissions (at point source) is more efficient and cost-effective than downstream management, government must now also seriously address available downstream opportunities, particularly those capable of providing price-signal feedbacks to the upstream end of the energy sector's investment framework.

Policy options: The section on future policy options is limited to the following policies:

- Co-firing
- Combined Heat and Power (CHP) and embedded electricity generation
- Micro-CHP
- Ocean energy
- Carbon capture

The section omits consideration of other renewable electricity generation technologies such as hydrogen fuel cells, photovoltaic or passive solar heating (although passive solar is briefly mentioned in Chapter 6 – Built Environment and Residential). There is no discussion of possible fiscal policies, for instance a carbon tax or other incentives. While Comhar SDC strongly supports co-firing in power stations and industrial plants, the discussion of micro-CHP could be expanded to include other forms of microgeneration, e.g. micro-windpower. There could also be a more general analysis of support measures for distributed and renewable generation such as direct subsidies and tradable green certificates.

This chapter in the IPKC would benefit from a more detailed description of the potential benefits and costs of these and other policy options. The IPKC should provide (e.g. in appendix as well as in table summary in chapter) a detailed breakdown of the costs and benefits to society as well as GHG payoffs of each policy option. The discussion of policy options for the future could be further developed for the NCCS in the following areas:

1. Electricity generation

- New generating capacity: Ireland must install new generating capacity over the next five years – this is unusual among EU member states and provides Ireland with an opportunity to lock in cleaner electricity generation.
- Fuel mix: The Irish energy sector should move away from fossil fuels, including peat, if it is to reduce its GHG emissions over the long term. The IPKC document mentions co-firing, for instance generating electricity from a mixture of peat and biomass. This has been shown to be economically

feasible but the NCCS would benefit from a more detailed presentation of the economic and environmental costs of using peat for electricity generation as well as the benefits (employment, security of energy supply). This could be compared with the possible benefits in terms of GHG reductions (but also including employment, environmental, security of supply) of switching to biomass. The revised strategy should also describe the overall potential contribution of biomass to electricity generation over the Kyoto compliance period and in the longer term.

- Other renewable energy: An analysis of the potential contribution of other renewable electricity generation technologies apart from wind energy and biomass over the Kyoto compliance period is needed in the IPKC document. These include gas from wastewater and landfill, geothermal, and solar thermal. Other technologies like photovoltaic and hydrogen (for electricity production through combustion or in fuel cells) may be some years from economic viability but the Review could present the current state of potential deployment of such technologies and their possible contribution in pilot projects. There is no mention of R&D in renewable energy technologies except for ocean and ocean energy. This huge potential source of indigenous RES is only just beginning to be exploited in Ireland, largely still on a pilot scale. The scale of the opportunities offered, however, can be seen from the rate at which interest in this resource is being developed by the private sector. Given the potential security of supply, (and thus, potential contribution to baseload) of these technologies (particularly tidal energy) should be prioritised for tariff and capital support. Such support can be additionally justified with a view to further developing an emergent Irish leadership in the development of these technologies.
- Efficiency in generation: the IPKC document points out that increasing efficiency in generation can be much more cost effective than investing in new generating capacity. Ireland's generating efficiency is currently about 40 percent, compared with 60 percent in Denmark. The NCCS should quantify ways to improve Ireland's generating efficiency to levels appropriately benchmarked against the best-performing European countries.
- Carbon capture may be a necessary component of generating electricity with fossil fuels in the future. The estimate of €500 million for the retrofitting of Moneypoint power station to include carbon capture should not be presented on its own. Instead, the Review should refer to the cost of continuing to emit CO_2 under different projections for the price of CO_2 under the EU Emissions Trading Scheme (the SEI report provides different estimates, with carbon capture becoming financially viable under projections of CO_2 prices in the range of €20–60/tCO_2) (SEI 2005). The IPKC paper could look at the experience of other countries (especially Norway) in capturing CO2 and using it for recovering fossil fuels through underground injection.
- CHP (micro and large): Combined Heat and Power (CHP) is an effective way of increasing generating capacity as well as improving security of supply. The 2000 National Climate Change Strategy set a target of 0.25 Mt reduction of CO2 per annum attributable to CHP, relative to business as usual, to be

achieved by 2010. According to ESB National Grid, an additional 250 MW of new CHP plant would need to be installed by 2010 to achieve this target. The report (e.g. in section 4.2.2) should quantify Ireland's gap from this target and describe additional measures that would be needed to meet this target.

2. Electricity distribution infrastructure

- There is only minimal discussion of the potential for distributed or embedded generation in Ireland. The revised NCCS could look at the impending decisions on investment in the Irish electricity distribution network that are due to be made in near future, including in the context of an all-Ireland grid (SEI 2004). A description of the costs and benefits of making the grid more accessible to distributed generation should be included in the Review, e.g. drawing on existing studies on two-way metering options for small-scale renewable electricity generation (SEI 2005).
- Likewise, the IPKC paper could discuss whether the underlying infrastructure is capable of accommodating increased renewable energy, especially from intermittent sources, into the future. According to Eirgrid, the national grid continues to be configured to continuous rather than intermittent generation, which, if not addressed, could pose long-term problems to the wider deployment of wind energy (Eirgrid 2005).

3. Supporting policies

- Downstream measures: There are many significant downstream mitigation opportunities within the closely related arenas of energy efficiency and demand side management. In the absence of direct command and control measures (regulation) and carbon taxes, substantial other low cost mitigation opportunities exist in the form of product labelling coupled to consumer choice and public awareness and education programmes designed to change behaviour and ultimately influence market forces upstream. Forthcoming implementation of the Directive on energy efficiency in end-use and energy services should therefore be embraced by NCCS and operated to improve Irish energy efficiency substantially faster than the required minimium rate (1% per year from 2008) and closer to the recognisably achievable rate of 2-3% per year already achieved upstream between 1990 and 2004.
- Labelling and communication: in order to achieve the scale of CO_2 emissions reduction in the previous paragraph, labelling and communications campaigns need to be closely coupled to appropriate feedbacks to the investment cycle.
- Incentives: The IPKC paper could mention the need for additional fiscal measures to raise the cost of carbon-intensive energy to market levels at least, and preferably to include external costs. It could also present the arguments for and against the introduction of a carbon tax. Although the proposed carbon tax was withdrawn in 2003, the IPKC paper should discuss the costs and benefits of such a tax and the cost (or benefit) of reducing carbon emissions through alternative policies.

- The only support mechanism mentioned is REFIT, which provides a feed-in tariff for electricity from renewable sources. The performance of REFIT in terms of GHG reductions and economic costs compared with other support systems, including direct subsidies and tradable green certificates, could be presented, which might also provide opportunity for cooperation with support schemes in other EU countries.
- EU Emissions Trading Scheme: it could be helpful to include a range of costs to the economy and individual sectors based on different projected CO_2 prices.
- R&D investment: this is at the centre of any strategy to develop new technologies for energy efficient electricity generation. Public research, development and demonstration programmes are needed to ensure that Ireland exploits its potential in this area. Therefore the revised NCCS should provide a description of research funding for future energy technologies other than ocean energy. The potential long-term benefits to Ireland in terms of developing indigenous expertise in emerging technology should also be assessed.

Chapter 5 Transport

Data given in the IPKC paper makes it clear (p. 22) that the 144% increase in emissions from the transport sector between 1990 and 2004 is a major reason why Ireland is unlikely to meet its Kyoto target without purchasing emissions credits using the Kyoto flexible mechanisms. Indeed, had transport emissions been maintained at their 1990 level, Ireland's total emissions would have been 61.7 Mtonnes in 2004, less than the 63 Mtonnes Kyoto goal.

Ninety six per cent of Irish transport emissions now come from road vehicles and almost all road vehicles are powered by oil. As substitutes for oil are going to be difficult to find and transport is fundamental to modern life, the price of oil can be expected to rise significantly in real terms. Unfortunately, as Ireland has allowed itself to become more heavily dependent on oil than its EU partners, this will damage our cost competitiveness in relation to them. Moreover, Ireland will experience a heavier drain on its resources than other EU states because of the need to earn enough foreign income to purchase the expensive imported fuel and to pay for the emissions permits required to burn it. (Although transport is currently outside the EU's emissions trading system, if Ireland overshoots its Kyoto target, it will be required to buy emissions rights to cover the overshoot.)

One of the reasons the 2000 NCCS has failed in relation to transport is that some of its key elements were not put into effect. For example, the 2000 NCCS proposed that the excise duty on motor fuels should be raised, making it more expensive to use a vehicle, while Vehicle Registration Tax should be lowered, making it cheaper to own one. As the IPKC paper points out, many studies indicate that these measures would reduce emissions by encouraging people to

buy more fuel-efficient vehicles and to use those vehicles less. The 2000 NCCS also proposed basing the VRT on a vehicle's fuel efficiency. Again, this was not done, with the result that, as IPKC also points out, the gains that would have accrued because of the greater fuel efficiency of new vehicles were lost because people bought larger and more vehicles overall. O'Leary et al (2006) point out that the specific average fuel efficiency of new petrol cars in 2005 (7.2 litres per 100 km) was 1.6% less than the average for 2000, and the number of cars with engines size larger than 1.2 litres all show increasing trends. People are buying bigger engine cars with lower fuel efficiency. Comhar SDC recommends that the measures recommended in 2000, but not put into effect, be implemented as soon as possible.

While the IPKC mentions that vehicle labelling is in place to assist consumers to purchase more fuel-efficient vehicles, unfortunately the label design used in Ireland is not very easy to understand for consumers compared with other designs available and therefore this measure has not been very effective (Ryan 2004). There is scope to improve the label design and link it to vehicle taxes in order to raise awareness among consumers regarding the CO_2 emissions of vehicles they purchase. Furthermore, the responsibility for publishing the Irish annual guide to fuel economy continues to rest with the Irish motor industry and the current guide has not been updated since 2004. Comhar SDC suggests that the NCCS should propose an independent agency to oversee this role.

In Comhar's view, a major limitation of the transport chapter of the IPKC is that it does not clearly present a summary of the CO_2 emissions mitigated by the measures proposed in the options for the future section so that it is difficult to assess the effectiveness of the measures. It states that "without any further measures to tackle emissions from transport" emissions will rise to an average of 13.03 Mtonnes a year in the Kyoto period, an increase of 0.45 metric tonnes above the 2004 figure. There are mitigation measures described in the IPKC paper, however these are not clearly divided into measures that will *definitely* be implemented as part of the NCCS and those that might only *perhaps* be implemented in the future. Some measures described are assigned values of CO_2 emissions reduced such as 0.25 Mt (from biofuels), 0.075Mt (from the Spatial strategy) and 0.13 Mt (from increased public awareness), a total of 0.455 Mtonnes, indicating that emissions should stabilise. However the effectiveness of many of the measures nor the costs associated with their implementation are not provided.

Moreover, the estimated savings shown for the major element of this reduction – that from biofuels – are very high. They were derived assuming that 2% of motor fuel would be biofuel, and that biofuels cause no net emissions as the carbon they release is taken from the atmosphere by plants. Consequently, 2% of the 2004 emissions, 12.58Mt, would be saved. This amounts to 0.25 Mt. But the assumption that biofuels are carbon neutral is incorrect. There is no agreement about the cost in fossil fuels to produce biodiesel from rape, but the energy gain

is not likely to be 100%. For example, the USDA has stated that the energy return is 3.2 times the energy invested if soya oil is used to make biodiesel, as is being done at Whitegate[3]. Bioethanol is said to produce a 1.3 to 1.6 energy gain. If we take the 3.2 figure for biodiesel and a 1.5 figure for bioethanol, the emissions savings from a 2% biofuel content work out at 70% saving with diesel, and a 33% saving with petrol. The petrol to diesel ratio in 2004 was 35.6 to 47.5, so the average reduction would be 54%. In other words, we can expect only a 0.135 Mt reduction from this source.

We believe that the IPKC's discussion of average emissions between 2008 and 2012 may not the best way of considering the problem. What this approach conceals is that the government considers that transport emissions are likely to rise by 0.075 Mtonnes a year until the end of the Kyoto period. We believe that the overall goal in the NCCS should be to bring about a year on year fall in the rate of growth in transport emissions during the Kyoto period with a view to achieving stabilisation. Accordingly, it should set a target for each year from now until 2012 and be prepared to use whatever market mechanisms are necessary to ensure that the target is kept. At the latest, 2010 should be taken as the year at which emissions peak.

The IPKC suggests some measures by which this might be done. For example, it quotes evidence to show that a cumulative reduction in emissions of 0.02 Mtonnes a year might be achieved if fuel taxes and VRT were changed to increase the cost of travelling a kilometre and make it more expensive to buy fuel-heavy vehicles. This reduction, of course, depends on the number of vehicles on the road staying constant. It would be eroded if the number of vehicles increased.

The real cost of driving a car a kilometre has fallen from 138 seconds of work at the average industrial wage in 1984 to 56.6 seconds in 2005[4]. This trend should be reversed and we recommend that raising the cost of using, rather than owning, vehicles by increasing in the excise duty on motor fuels should be a significant measure implemented to reach the emissions target. The rise in revenue would compensate the government for the cost of buying emissions permits on behalf of the transport sector.

Fuel consumption by road freight increased by 264 per cent (9 per cent per annum) over the 1990-2005 period, making it the mode with the highest growth (O'Leary et al, 2006). We also recommend that any subsidies given to road freight transport should take into account the externalities of this mode of transport such as congestion, greenhouse gas emissions, road damage, noise, air pollutants and accidents. We propose that in the same way a subsidy should be given to rail transport, which reflects not just the lower emissions from rail transport but also its lower social and environmental costs (EEA 2006). The

[3] http://www.gobluesun.com/html/pdf/Biodiesel_Lifecycle.pdf)
[3] Computed by Feasta with data from the AA and the CSO.

government should set itself a target of reversing the recent decline and the amount of freight carried by rail. At 2% of total freight (EEA 2006), the Irish figure is the second lowest percentage in Europe if countries without a rail network are excluded.

Comhar SDC believes that the introduction of other vehicle user charges, such as congestion charging, should not wait until new public transport systems are in place. At present, a congestion charge is in fact already indirectly charged in units of time spent in traffic. This is an inefficient way of charging for the use of the limited resource since no-one benefits. The lost time is wasted while a cash payment could be used to make other modes of transport more attractive. An impact assessment of the implementation of a cash form of congestion charging should be performed. If congestion charging were introduced, it could be expected that the reduction in vehicle numbers could enable the existing public transport system to work more effectively. Bus journey times would be shorter and timetables better observed.

Charges designed to control the number of vehicles using particular stretches of road should also be introduced whenever major road improvements are completed. These improvements reduce the cost in terms of time of making a journey, and consequently more people wish to make it. This can lead to congestion removing any benefit – in terms of emissions or anything else – that the road improvements were intended to bring. Accordingly, tolls or other road charges should be used to ensure that there is no net increase in the level of traffic.

The integration of land use and transportation policies at national, regional and local level has the potential to significantly reduce reliance on the private car, with positive spin-offs for reducing greenhouse gas emissions. The spatial planning policy arena at national level promotes this agenda; however, improvements could be made at local level. Guidance in this regard could take the form of models for calculating emissions of various land-use scenarios at local level, and in turn, integrating with the SEA (Strategic Environmental Assessment) process. The identification of quantifiable models for use with existing data would potentially increase the scope for cross-sectoral policy integration.

Finally, Comhar SDC feels that Ireland should not rely on biofuels as the primary means of bringing its transport emissions down as this country does not have a large enough land area to meet all its transport, heating and food needs (see next section comments on agriculture). It recommends that a mixed alternative fuel strategy should be undertaken, including technologies such as light electric and compressed air vehicles, particularly cars, as these are well-suited to the short journeys that most people make every day (particularly in urban areas). Ireland's offshore wind resource could be used to charge up both types of vehicle if a smart metering system was used which made it expensive to charge a

vehicle if the wind was not blowing. Owners would also be able to charge the vehicles from PV panels on their roofs. Both types of vehicle are emerging technologies and it would be possible for manufacturing to be undertaken here.

In summary, this section could be substantially improved with more detailed description of the expected timeframe, CO_2 emissions mitigated and the specific costs per tonne CO_2 emissions mitigated by the policy measures outlined in this section. The policy measures proposed in 2000 NCCS, but as yet not put into effect, should be implemented. However, without systematic and transparent estimations it is very difficult to examine and compare policy measures, both within a sector and cross-sectorally, to devise an efficient and effective NCCS for the transport sector.

Chapter 6: Residential and Built Environment

The IPKC document clarifies that for the purpose of reporting greenhouse gas emissions, this sector only includes emissions arising from direct energy consumption in private dwellings and water heating. Emissions from non-residential buildings, the production of electricity for residential buildings, and emissions from private transport are dealt with elsewhere. Nevertheless the sector is a significant contributor to total emissions accounting for 10% of total greenhouse gas emissions in 2004.

The Review document highlights projected decreases in emissions for the period 2008-2012 due to ongoing improvements in building efficiencies and continued fuel switching. The total number of households is projected to increase to 1.74 million by 2012 but the average emissions per household are expected to fall to 55% of their 1990 level over the same period.

Higher thermal performance standards of buildings through amendments of Part L of the Building Regulations in 2002 and 2005 have already produced significant savings in CO_2 emissions. The House of Tomorrow Programme of Sustainable Energy Ireland achieves 40 per cent more in terms of energy efficiency than the Regulations. In view of the continuing strong projections for construction output Comhar SDC supports further raising of the thermal performance standards in the Building Regulations and extension of the programmes for energy efficiency design and technology to underpin the capacity of the sector to make a greater contribution to reduction of CO_2 emissions.

In this regard, significant progress is being made at local level through the incorporation of higher energy standards and renewables targets in Local Area Plans, most notably in Counties Fingal and Dun Laoghaire.

A significant challenge remains in improving energy efficiency of the existing building stock with 62% of the housing stock constructed prior to the introduction

of modern building regulations. Full implementation of the EU's Energy Performance in Buildings Directive will be an important dimension in advancing the energy efficiency of the existing building stock after 1st January 2009 but other measures are also necessary. Comhar supports expansion of SEI's Greener Homes Scheme and the local authority housing regeneration programme and other schemes, which target the existing building stock. Another option would be to provide incentives in the form of reduced planning levies to buildings with higher energy efficiency.

As with other sectors, the revised Strategy should quantify the costs of the additional measures and potential reductions in CO_2 emissions.

Chapter 7: Industry, Commercial and Services

The IPKC paper provides an overview of the comprehensive measures already in place to tackle industry GHG emissions. The paper points out that the vast majority of industry emissions are covered by the emissions trading scheme (ETS). In Annex 1 we provide a summary of Irish installation emissions and compare them with the allowances received under the scheme. It can be observed that approximately 84 percent of industry emissions were covered by allowances grandfathered (granted) to industry.

The other main policy measure in place to mitigate GHG emissions from industry is the negotiated agreements programme managed by Sustainable Energy Ireland (SEI). As noted in the IPKC paper the original incentive for this programme was an exemption from the then proposed carbon tax. Since there is no longer a carbon tax proposed by Government, the emphasis of these agreements has shifted to the implementation of energy management schemes. Comhar SDC recommends that industry be strongly encouraged to participate in such schemes and that in the future if there is a lack of participants that consideration be given to introducing legislation in this area.

Chapter 8: Agriculture

Fig. 8.1 in the IPKC document provides a clear illustration of GHG emission sources within the agricultural sector. The document should highlight in this chapter the unusually large proportion (28%) of national emissions that Irish agriculture is responsible for. This reflects the large agricultural land area (4.4 M ha) relative to population size, and the dominance of GHG-intensive livestock farming, which utilises over 90% of agricultural land (i.e. over 3,875,000 ha). We recognise the current and future policy measures outlined in the IPKC paper and propose some further options for the NCCS.

1. CAP reform

The decoupling of direct payments from production could have a particularly significant impact on national GHG emissions in Ireland. Section 8.1 identifies the most recent FAPRI-Ireland modelling estimate of a 12% reduction in 2012 agricultural GHG emissions, relative to 1990, arising from a decline in animal numbers in response to subsidy decoupling. This estimate is lower than the original estimate provided by Binfield et al. (2003), of a 2.86 Mt CO_2 eq. a^{-1} (15%) reduction in 2012 GHG emissions relative to 1990 levels. Further reductions in livestock numbers and associated GHG emissions may result from further trade liberalisation under World Trade Organisation reforms, as indicated by Matthews and Walsh (2005), although negotiations in the current Doha Round have stalled.

It is predicted that part-time farmers will account for 70% of all farmers, and farm numbers will decline to 105,000 by 2015 (Agri-Vision 2015 Report). Dixon and Matthews (2005) predict declines of 9.5% and 12.9% in long term agricultural output and labour, respectively, in their IMAGE2 model. Minimisation or reversal of such socio-economic impacts within the agricultural sector requires the development of new products and markets, which could include GHG mitigation products and services. In section 8.2.1, the IPKC document refers to the consideration of policies to reduce agricultural GHG emissions balanced against the socio-economic objective of promoting development within the rural economy. These objectives need not necessarily be in conflict, as indicated later in this section, and regarding them as such may be a hindrance to optimum policy development for the NCCS.

2. Reducing emissions per animal

It is difficult to predict the potential scale of GHG emission reductions arising from future developments in animal husbandry, and the cost of research and altered practices required to achieve them. Section 8.2.3 of the IPKC document emphasises ongoing research to identify improvements in animal husbandry and other means to decouple production from GHG emissions. Obviously it is important that Ireland continues to fund, through Teagasc and other research institutions, such research. Value for money could be maximised by encouraging more research coordination with other countries (some of whom have larger agricultural research budgets).

Overall, it is likely that policies aimed at reducing emissions per animal will play a smaller role in GHG emission reductions over the near-term, compared with other policy options. Changes to animal diet, resulting in reductions in enteric fermentation methane emissions of up to 5-6% per animal according to the IPKC document, could potentially result in maximum national GHG emission reductions from agriculture of 0.554 Mt CO_2 eq. a^{-1} (if extrapolated to all livestock). The cost of such a reduction, although poorly quantified, is thought to be high, and would presumably be borne by the farmer, who, in the absence of agricultural GHG

emission trading, would receive no benefit. The upstream GHG emission consequences of dietary supplements aimed at reducing methane emissions, in particular replacing roughage or forage feeds with concentrates, also require quantification and careful consideration. For example, GHG emissions arising from the cultivation, manufacture and transport of concentrate feed may counteract reduced enteric fermentation benefits. The use of clover to fix N into the soil and improve pasture quality should be a cost effective GHG emission abatement option, reducing both fertiliser N requirements and enteric fermentation emissions, but the problem of low pasture reseeding rates referred to in the consultation document limit the scale of potential emission reductions achievable this way.

The GHG emission reductions arising from agricultural restructuring are largely ancillary to the main aims of stimulating allocative efficiency and reducing trade distortions. There is considerable scope to manage the response of the agricultural sector to these changes so as to maximise potential environmental, and in particular GHG, benefits. For example, there is some evidence from Life Cycle Assessment (LCA) studies that more intensive livestock farming results in higher emissions per unit area, but lower emissions per unit product (i.e. maximising livestock productivity may reduce emissions). Further research is necessary in an Irish context to establish the most efficient distribution of livestock from a GHG emission perspective, and optimisation with other environmental, economic and social objectives. Rather than spread remaining livestock farming over the total area of land currently devoted to livestock, destocking could be managed to make land available for alternative uses, such as riparian zones buffering water courses from diffuse nutrient pollution, and the planting of forestry or the cultivation of energy crops.

3. Rural Environmental Protection Scheme (REPS)

As an established, regulatory environmental protection scheme, REPS has good potential to instigate low-cost GHG emission reductions through the promotion of good practice, and also through the potential extension of requirements for subsidy payments. For example, nutrient management planning (NMP) may reduce fertiliser costs and reduce GHG emissions (and other environmental impacts). For every tonne of reduced N application, direct and indirect soil N_2O emissions could be reduced by approximately 19.5 kg (6.045 t CO_2 eq.), and manufacturing emissions (outside Ireland) reduced by 8.63 t CO_2 eq. A 10% reduction in national fertiliser-N application could result in a total national emission reduction of 0.535 Mt CO_2 eq. a^{-1}. Well-directed fertiliser reductions may result in small or no decreases in productivity, and including the money saved on fertiliser purchase, would result in NMP being either a low-cost GHG-emission abatement option, or a no-regret measure. Teagasc would need to be responsible for leading any reduction in fertiliser application through the advice it offers farmers, both inside and outside of REPS.

REPS currently advises farmers on forestry plantation, which may lead to considerable GHG emission reductions through low maintenance-emissions combined with soil and vegetation C sequestration. Additional GHG-abatement measures could be included in the REPS code of good practice, such as improved slurry-application methods (see above), etc. The cost of these measures may be compensated for by the Department of Agriculture and Food (DAF) through additional REPS payments for compliance with these measures, or may be borne by farmers in order to ensure receipt of REPS payments.

4. Bioenergy crops

We welcome the setting up by the government of an inter-ministerial group to progress an integrated policy vis-à-vis biofuels. No mention of the EU Biofuels Directive (2003/30/EC) is made in the agricultural section of the consultation document. This directive set successive targets for national biofuel market penetration of 2% by 2005 and 5.75% by 2010, and Ireland is currently some way off meeting the latter target after failing to meet the former. Interest is increasing in biofuels as the price of oil increases, and clear targets need to be set for such fuels.

The relatively intense production methods used for traditional annual bio-fuel crops (e.g. rape seed and sugar beet), including annual soil preparation, sowing and harvesting and high chemical inputs, result in significant net GHG emissions from the combustion of such fuels as mentioned above (i.e. whilst they offer GHG benefits when compared with petrol and diesel, they are far from CO_2-neutral). Perennial energy crops are environmentally preferable, and may be planted on a wider range of soils. Pilot trials of evolving processes (e.g. lignocellulosic digestion and gasification) used to convert solid biomass into liquid biofuels could make a useful contribution towards maximising future GHG emission reductions from energy crops.

The statement that “Greater uptake of bio-energy crop production in the agricultural sector will not lead to reduced greenhouse emissions in the agriculture sector…” is potentially misleading. This would be true if traditional, annual biofuel crops (such as rape-seed and sugar-beet) were cultivated on tillage land, or if environmentally preferable perennial energy crops (such as short-rotation-coppice willow and *Miscanthus*) were cultivated on destocked grassland. However, agricultural GHG emissions would be decreased if perennial energy crop cultivation occurred on set-aside land, or displaced conventional agricultural production. LCA work (Styles and Jones, 2006) has indicated that emissions from perennial energy crop (short-rotation-coppice willow and *Miscanthus* grass) cultivation equate to around 1.39 and 2.01 t CO_2 eq. ha^{-1} a^{-1}, including all upstream emissions such as fertiliser manufacture. This compares with equivalent emissions of 12.07, 5.27, 3.75,and 3.49 t CO_2 eq. ha^{-1} a^{-1} for typical dairy, beef-cattle, sheep and tillage systems. Planting perennial energy crops on tillage land is likely to result in prolonged and significant soil C

sequestration, estimated to be in the region of 0.51 and 1.16 t C ha^{-1} a^{-1} (Matthews and Grogan, 2001). Thus, like forestry, energy crop cultivation could be regarded as a sink activity under Article 3.4 of the Kyoto Protocol (referred to in section 10.3 of the consultation document), when it occurs on set-aside or tillage land and should be treated as such in the NCCS.

Simple, indicative scenarios may be used to indicate the potential GHG emission reductions possible from energy crop cultivation. For example, willow and *Miscanthus* displacing cattle and sugar-beet (or similar tillage) cultivation, respectively, could result in annual agricultural emission reductions equivalent to 3.85 and 5.75 t CO_2 eq. ha^{-1} a^{-1}, respectively (including soil C sequestration on tillage land). Note however that we need to be cautious about introducing rapidly growing exotics into an environment without natural controls or predators. The potential damage needs to be assessed before crops such as *Miscanthus* are widely adopted.

Table 2: cost estimation of CO_{2eq}. mitigation through bioenergy crops

Crop	$tCO_2eq/ha/a$ saved	Lifetime (yrs)	Cost (€/ha)	Cost/tCO2eq saved
Willow	3.85	23	2700	30.49
Miscanthus	5.75	16	2500	27.17

The main barrier to increased cultivation and supply of environmentally preferable perennial energy crops is the high cost of establishment set against the long return period and market uncertainty. Table 2 provides details of a simple estimation of the cost of mitigating CO_2 emissions through bioenergy crops. These figures include the emissions avoided when energy crops displace existing agricultural production, but the additional emission reductions will be attributable to fossil-fuel displacement, which have not been included in this calculation. The main barrier of establishment costs is not significantly alleviated by the current €45 ha^{-1} a^{-1} bio-energy crop subsidy, and short-rotation-coppice willow plantations are not eligible for forestry grants. If energy crops are to be promoted, the risk associated with the high establishment costs needs to be reduced through either substantial establishment grants or low risk, low interest loans from government (perhaps with future repayments dependent on profitability). Although this could require substantial upfront expenditure by the government[5], through DAF, much of this money could be retrieved through repayments in later years, and could represent cost-effective GHG mitigation (when both agricultural and end-user GHG emission reductions are considered). Table 2 shows that at the costs given above CO_2 mitigation costs are equivalent to €30.5 and €27.2t-1 CO_2 eq., excluding the GHG emission reductions from end-users. The establishment of forestry may offer similar GHG emission benefits to energy crops. Although the annual biomass productivity of forests may be lower than for energy-crops, they offer long-term C-sequestration for

[5] For example, if 10,000 ha of energy crops establishment was subsidised at €2000 ha^{-1}, the total cost would be €20 million.

wood-product-bound C that may, after useful product lifetimes, also be used to substitute fossil-fuel emissions.

5. Manure management through the use of new and emerging technologies

The IPKC document refers to alternative methods of slurry application. Band spreading and trailing-foot slurry application may result in NH_3 emission reductions of 40-70%, whilst injection may result in NH_3 emission reductions of 60 to 90 %, compared with conventional splash-plate spreading (Ryan, 2005). Of the 110,700 t NH_3 emitted in 2004, approx. 33% was from slurry spreading (Ryan, 2005). However, the alternative spreading techniques are expensive and the effect of these on direct soil N_2O emissions is likely to be small. The maximum potential national indirect N_2O emission savings[6] equate to 80,605 and 109,915 t CO_2 eq. a^{-1} and there may be some further indirect N_2O emission reduction through reduced slurry runoff to water. Thus, it is likely that while new slurry spreading techniques may be promoted based on reduced NH_3-emissions, nutrient runoff and odour, only modest GHG-emission reductions can be expected as an otherwise uneconomic ancillary benefit (see Annex 2 for further estimations).

Also rather briefly referred to in the consultation document is anaerobic digestion, and some current barriers to its application. Anaerobic digestion has good GHG mitigation potential in that it could contribute to reductions both in the 2.58 Mt CO_2 eq. a^{-1} emissions arising from agricultural manure management and power generation emissions. Ancillary benefits of anaerobic digestion include reduced slurry pathogen content, increased nutrient availability for plants, reduced biological oxygen demand (reduced water pollution potential) and reduced odour.

An EPA discussion paper (EPA, 2005) explored the economics of anaerobic digestion at centralised facilities taking waste from surrounding farms, supplemented by 20% food sector (especially abattoir) waste. Such facilities require sufficient waste production density from farms within 8-13 km radius of centralised plant location, though such locations are scattered across Ireland. They conclude that high establishment costs and small green-electricity premiums were the main barriers to profitability. They estimate that when displaced electricity emissions of 516.7[7] t CO_2 are included, and conservatively assuming avoided food-waste decomposition emissions equivalent, on a per-weight-waste-avoided basis, to be equal to 2,688 t CO_2 eq. a^{-1}, results in a total CO_2 eq. reduction of 13,957 t and a mitigation cost of €25.08 t CO_2 eq (Annex 2 provides more details). Therefore Comhar SDC recommends that further consideration be given to the development of a strategy to support anaerobic digestion.

[6] Based on an IPPC indirect N_2O-N emission factor of 0.01 for atmospheric NH_3-N, following deposition.
[7] Based on electricity C intensity of 0.624 kg CO_2 per kWh electricity.

However, as referred to in the IPKC document, current legislation prohibits spreading of digestate from animal proteins on pastureland. Consultation between the relevant government departments is needed to discuss the merits of lifting this ban. Government could provide capital investment grants, perhaps most suitably through SEI, or the investment could be stimulated by higher green-energy price premiums (DCMNR).

Both energy crop cultivation and anaerobic digestion could be stimulated by:

1) Government-provided establishment grants or loans to reduce investor risk;
2) Higher price guarantees for renewable electricity and heat generation;
3) The extension of carbon trading to cover other GHGs and sectors.

6. *Strategy direction*

Ultimately, both formulation and assessment of GHG-emission abatement policies for the agricultural sector should ensure integration with other policies, objectives and sectors. For example, including both NH_3 and indirect GHG emission reductions in cost-benefit analysis of alternative slurry-spreading could reduce the calculated marginal abatement costs for both pollutants. Considering potential emission reductions in the agricultural, energy and domestic sectors arising from energy crop utilisation increases the apparent efficiency of energy crop cultivation as a GHG-emission-abatement strategy, and decreases calculated abatement costs. Similarly, anaerobic digestion reduces agricultural and power generation emissions, whilst also having ancillary nutrient-management benefits.

Sustainable rural development is a key policy objective. In 2005, tourism brought €4,272 million into Ireland. Agriculture and forestry together occupy 70% of Ireland's land area, and play a crucial role in maintaining the unique landscapes that attract a substantial portion of this tourism. The IPKC document alludes to the rationale behind the SFP, as a mechanism to reimburse farmers for their provision of public goods, such as landscape management and carbon sequestration. However, there remains a need to make the link between public goods and direct payments more explicit and direct. Ultimately, this necessitates a long-term goal to quantify the public goods provided by specific farming practices, and attribute economic values to these goods. In terms of GHG mitigation strategies, such as carbon sequestration in crops and soils, this concept may be applied through an extension of the current carbon-trading scheme to cover non-CO_2 emissions and C sequestration within the agricultural sector. This needs to be pursued and implemented at the EU level, but Comhar SDC generally recommends that Ireland begin to take steps towards this by:

i) Promoting research to quantify GHG reductions possible from agriculture (DAF, Teagasc, DEHLG);
ii) Providing information and advice to farmers regarding cost-effective GHG mitigation strategies (DAF, Teagasc);

iii) Implementation of a pilot trading scheme for GHG in agriculture (DAF, DEHLG, EPA, Teagasc).

It is difficult to accurately predict the knock-on effects of some of the policies outlined in the IPKC document in a global context, but it is important that these are at least qualitatively considered. For example, reduced livestock production benefits Ireland's GHG budget significantly, but is this production displaced to other countries, and if so, what are the comparative GHG emissions per unit production in those countries? The answers to such questions are not readily available, and are likely to depend on complex interactions among international trading markets, tariff systems, and product price elasticity, but should be asked. The IPKC paper considers the national situation solely, however upstream GHG emissions associated with energy-intensive fertiliser manufacture are considerable, and have been included in some of the above calculations. These emissions, along with the fertiliser-induced soil N_2O emissions, result in fertiliser application being the largest source of non-livestock agricultural emissions. These emissions arise in the industrial sectors of other countries, but are proportionate to agricultural demand. Ultimately, climate change and GHG emissions need to be considered from a global perspective.

Chapter 9: Waste

The discussion of policies and measures omits an important principle, contained in the 2000 National Climate Change Strategy, that waste generators should pay the full cost of waste collection, treatment and disposal, including the development of charges for household and commercial waste. It is not clear whether or not the principle is now firmly embedded in national policy.

Waste management policy has the potential to influence current and future greenhouse gas emissions. Emissions can be saved through implementing waste prevention policies, while emissions are produced by waste disposal options such as methane from landfill, nitrogen dioxide from composting and NO_2 and CO_2 from incineration or waste to energy. This is explicitly recognised in IPKC "the Government recognises that in overall terms, source separation of MSW (municipal solid waste) followed by recycling (for paper, metals, textiles and plastics) and composting and anaerobic digestion (for putrescible wastes) gives the lowest net generation of greenhouse gases compared to other options for treatment of bulk MSW".

In climate change terms, the Government's waste management strategy and preferred waste treatment options will influence the degree of reduction of greenhouse gas emissions from waste that can be achieved. Consideration of GHG emissions from the waste sector in the IPKC document focuses on methane from landfill and there is no discussion of carbon dioxide or other GHG emissions. The assumption seems to be that because landfills produce methane,

moving material away from landfill will produce a net reduction in emissions, yet this is not supported by analysis of emissions of all GHG from waste management options. Landfills are poor performers in a climate change sense because they generate methane, but this does not necessarily mean that landfills must be poor performers if the efficiency of capture of methane is improved. For example, studies (HM Customs and Excise 2004) have shown that with best practise rates of methane capture (80%), incineration performs worse than landfill in terms of GHG emissions. Therefore the full GHG emissions life-cycle needs to be compared when selecting final waste treatment options for the revised NCCS.

The IPKC states that "the diversion of biodegradable waste from landfill to waste-to-energy is a primary objective of waste management policy on the grounds of environmental efficiency, but will also contribute to a net reduction in emissions". It has already been recognised that the best options for reducing GHG emissions lie at the top of the waste hierarchy, yet the IPKC supports the expansion of waste to energy, which will generate further GHG emissions. 'Waste-to-energy' is a catch all term that refers to a range of technologies with differing impacts on climate change. A recent research report (Eunomia Research and Consulting Ltd 2006) examined the climate impacts of the different waste management options. The main conclusions of the report are outlined below.

When energy from waste technologies were compared to fossil fuel power generation in terms of the amount of fossil fuel derived CO_2 released per unit of energy produced[8], the results show that electricity-only incinerators emit 33% more fossil fuel CO_2 per unit energy generated than gas fired power stations and in 2020 such incinerators will emit 78% more fossil CO_2 than gas fired power stations and only around 5% less than coal-fired power stations.

The study also considered the climate impacts of dealing with residual waste. The best thing to do with residual waste is to phase it out. However residual waste will continue to exist for some time and so must be dealt with. Instead of incineration, a better option from a climate point of view is an MBT process that extracts both the metals and plastics with the stabilised residue going to landfill[2].

Government policy of expanding the role of 'waste to energy' is unpopular with some members of the public and some local authorities. There are other ways of generating energy from wastes (other than incineration) and diverting biodegradable wastes from landfill, which may be more acceptable to the public such as anaerobic digestion (see Chapter 8). The methane produced during this process can be captured for combustion.

[8] The analysis was carried out based on current technology and on what is likely to be possible in 2020 (though not including any carbon capture technologies).

Waste policy is a key part of improving Ireland's sustainability and minimising impacts on the climate. The diversion of biodegradable wastes from landfill to incineration with energy recovery may not be the best option in terms of generation of GHG. Instead, waste policy which focuses on waste prevention and phasing out of residual wastes, recycling and composting, coupled with anaerobic digestion and MBT for residual wastes and increased capture of landfill gas, will deliver more from both the perspective of decreasing GHG emissions and wider environmental sustainability. The revised NCCS should give careful consideration to all the impacts of different waste management options.

Environmental policy is interconnected and there is a need for consistency across different policy areas. There is currently discussion within Europe, on the Commissions proposals for the Thematic Strategy on Waste Prevention and Recycling and the redraft of the Waste Framework Directive. In particular, the issue of what should be defined as recovery has become an issue. To maximise the synergies between delivering a reduction in Ireland's greenhouse gas emissions and reducing resource use, Ireland should support the inclusion of the five step waste hierarchy with clear differentiation between recycling and composting; and energy recovery. It is clear from both a resource use and a climate point of view it is more efficient to prevent, reuse or recycle waste, so incineration should not be promoted in this way as it will lead to diversion of waste down the waste hierarchy.

Other specific comments:

- Similar to the other chapters, the chapter on waste should quantify the opportunities for and costs of GHG emission reductions in this sector. The potential for renewable energy through the capture of the biodegradable fraction of municipal waste should be quantified both in terms of GHG savings and costs per tonne of CO_2 equivalent (tCO_2e). The cost-effectiveness of such activities under different carbon-price scenarios could provide a point of comparison.
- Waste incineration (thermal treatment) is a controversial subject due in part to the suspicion that thermal treatment, since it requires a predictable supply of waste for fuel, could undermine efforts to improve recycling and waste avoidance. The NCCS should address this suspicion by indicating what (if any) accompanying measures will be taken to promote the other components of the waste hierarchy (e.g. avoidance, minimisation, recycling).
- The revised NCCS should distinguish between the incineration of the biodegradable fraction of municipal waste (classified as renewable energy from biomass under the 2001 EU Directive[9]) and the use of waste to co-fire peat power stations or cement kilns. This latter point (co-firing) could be

[9] "Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market"

clarified and quantified; it did not appear in the 2004 draft National Strategy Biodegradable Waste but is briefly mentioned in the 2006 update of the strategy.[10]

Chapter 10: Sinks

The Chapter demonstrates that the forestry sector in Ireland has the potential to account for over twice the anticipated carbon sequestration – 2.074 Mt CO_2 per annum compared with 1 Mt CO_2 per annum as forecast in the 2001 National Climate Change Strategy. This difference appears to be due to accounting methodologies rather than to a greater-than-anticipated rate of afforestation; indeed afforestation since 2001 has been consistently below government targets.[11] The revised NCCS should quantify the performance in terms of carbon sequestration due to actual afforestation as opposed to differences in accounting methodologies.

The revised NCCS should quantify the cost of afforestation, not just in terms of €/tCO_2e but also social and other ancillary benefits. Given the larger-than-expected contribution of forestry to Ireland's Kyoto targets, other non-forestry policies and measures may not be required, especially if afforestation is a relatively cheap way of meeting emission-reduction targets. Therefore it might be important to consider the "opportunity cost" in terms of the ancillary benefits of non-forest projects.

Specific comments:

- Peatland sinks: The role of bogs as sinks is not mentioned, although peatlands and other wetlands are considered to be major stores of carbon. The effect of afforestation on the ability of bogs to sequester carbon may be very significant, given that much afforestation is taking place on bogs.[12] However, planting on poor quality mineral soils is preferable in terms of carbon uptake to planting on peat soils (NCCS 2000).
- CDM: Since Ireland is permitted to benefit from credits through the Clean Development Mechanism, it would be interesting to know if high-quality

[10] *National Strategy on Biodegradable Waste*, Draft Strategy Report, April 2004; 2006 update available on http://www.environ.ie/DOEI/DOEIPol.nsf/0/c8f71c4e05251d8280256f0f003bc802/$FILE/Biodegradable%20Waste.pdf#search=%22National%20Strategy%20on%20Biodegradable%20Waste%202006%22

[11] The 1996 strategy, *Growing for the Future*, set a target of 20,000 hectares of land per annum from 2000, but actual afforestation since then has been less than 15,000 hectares per annum (EPA 2006).

[12] According to Friends of the Irish Environment, quoting the European Environment Agency, up to 84 percent of recent afforestation in Ireland is on bogs. http://www.friendsoftheirishenvironment.net/fnn/article.php?sid=177

forestry projects that export the best practices of Irish forestry to developing countries would be feasible.

- Species mix: While carbon sequestration in Irish forests may be maximised in the short term by growing fast-growing crops to maximise storage of carbon, felling the crops and reforesting the area, and converting the harvested wood to long-lived products, this may not be the strategy providing the greatest total carbon storage, for which broadleaves compare favourably with conifers (Gardiner and Gallagher, 2001). The EPA (2004) has stated that there should not be a focus on planting fast-growing conifers only, as conservation of biological diversity (through planting native broadleaves) may be one of the most effective practical responses to climate change; conservation of this biological diversity at all levels (e.g. from genes within species to the array of habitat types across the landscape) will permit native species to adapt as their environment changes (NCCS 2000). Conifer trees represented 79 percent of Irish forests in 2004, with over 50 percent being Sitka spruce. Conifer trees can lead to increased acidification of surface waters in areas where soils are characterised as having a low potential to impart buffering capacity to the run-off water (EPA 2004). Policy measures have been introduced to manage this situation and it is desirable that broadleaf forests should continue to be planted in the future. The revised NCCS should support this strategy.
- CO_2 estimation: While trees are generally regarded as a sink in terms of CO_2 storage, a lifecycle balance needs to account for the oxidation of upland peats following drainage and drying out prior to planting (EPA 2004).
- Research: several commentators in the past (Byrne and Perks (2000); Finnegan (1998)) have noted the urgent need for research to understand the ability of Irish forests and peatlands to sequester and store carbon, taking into account the age, productivity, species and soil type. The revised NCCS should provide an overview of the current state of research.

Conclusions

Comhar SDC welcomes the publication of the IPKC review of the national climate change strategy, and appreciates the opportunity to respond to its contents. The document provides a good overview of the measures in place in each sector in Ireland to address the climate change challenge. Across all sectors, however, the IPKC document lacks consistent quantitative analysis of the costs and benefits of the proposed policy measures. It is also somewhat unclear which policy measures will actually be implemented and in what timeframe.

Therefore, our main recommendations are the following. The revised Strategy should include:

- Provision for an annual review of progress, assessed against specified benchmarks.

- A summary of the costs and benefits associated with policy options across all sectors in order to assess the best policy options. Comhar SDC suggests a template with which to do this.
- Policy measures should be clearly identified as measures that are expected to be implemented with a relevant timescale and those measures considered as further or additional measures and which are either less likely or only longer term prospects for implementation.
- The revised Strategy should address a longer time frame than the Kyoto period alone.
- Adaptation requires more detailed analysis and further policy measures put in place rather than only flood proofing.
- Cross-sectoral consideration of policy measures will be necessary to address climate change and linkage to other policy areas is essential to achieve effective policy implementation.

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ANNEXES

Annex 1 – Distribution of allowances, by company Ireland*

Sector	No. of Insta-llations	No. of comp-anies	Company Name	Initial Allocation 2005-07	2005 Allocation[13]	2005 Actual Emissions	Extent to which 'needs' met (%)[14]
1.Combustion							
Electricity Generation	17		Edenderry Power Ltd;	1,883,028	627,676	860,660	72.9
			Electricity Supply Board (ESB);	33,405,024	9,760,114	12,266,202	79.5
			Huntstown Power Co	2,344,968	781,656	851,847	91.7
			Synergen	2,789,349	929,783	1,131,166	82.1
			Tynagh Energy	1,943,263	0	974	0
Total Elect. Generation	17	5		43,102,559[15]			
Other Combustion	79	59		8,699,788			
Total Combustion installations	96	64		51,802,347			
2. Refining	1	1	ConocoPhillips Ltd	1,214,481	398,522	410,802	97
3. Manufacture of Cement & Lime	8	3	Cement Roadstone Holdings (CRH)	7,603,301	2,572,891	2,637,986	97.5
			Lagan Cement Ltd	1,458,807	486,209	471,772	103
			Quinn Cement Ltd	2,639,217	879,739	1,028,010	85
Total Cement & Lime				11,745,674[16]			
4. Bricks & Ceramics	3	3	CRH	35,067	11,689	8,746	133
			Flemings Fireclays MFG Ltd	23,016	21,089	14,930	141
			Kingscourt Brick Ltd	39,654	13,218	12,442	106
Total Bricks & Ceramics				97,737			
5. Glass	2	2	Waterford	63,267	21,089	14,930	141
			Crystal Ltd; Moyisover Ltd.	31,173	10,391	8,650	120
Total Glass				94,440			
6. Pulp Paper and Board	1	1	Smurfit Recycling Ltd.	52,320	17,440	1,815	961
Total	111[17]	74		65,006,999			

* We gratefully acknowledge the work of Luke Redmond, Research Fellow, Environmental Policy, UCD Dublin, who compiled the data from the public records held by EPA.

[13] The figures in this column indicate the actual quantity of allowances that installations were allocated for the first year of the scheme (2005).

[14] By comparing the allocations that installations received for 2005 against their actual CO_2 emissions for 2005 we were able to determine the extent to which installation's emissions needs were covered.

[15] Adding together the total initial allocations received by the five electricity companies (42,365,632) it is obvious that this does not match the total allocation received by the *electricity generation sector*. The reason for this is that two installations from another emissions trading sector (*Other Combustion*) were entitled to an allocation from the *electricity generation sector* allowance budget on account of the processes taking place at these installations.

[16] Adding together the total initial allocations received by the three cement and lime companies (11,701,325) it is obvious that this does not match the total allocation received by the *cement and lime sector*. The reason for this is that two installations from another emissions trading sector (*Other Combustion*) were entitled to an allocation from the *electricity generation sector* allowance budget on account of the processes taking place at these installations.

[17] The second column in table 2 shows that in total 111 installations received allowance allocations from the various sectors. Given that there are only 106 Irish installations participating in the EU ETS this raises the question of how is this possible. The difference occurs as a result of double counting. 5 installations were entitled to receive allocations from more than one sector on account of the activities taking place on-site of each of these installations

Annex 2 – Mitigation costs in agriculture

Estimation of mitigation costs for manure management

Of the 110,700 t NH_3 emitted in 2004, approx. 33% was from slurry spreading (Ryan, 2005). Applying mean reduction estimates of 55% for band- / trailing foot spreading, and 75% for injection application, maximum potential national indirect N_2O emission savings[18] equate to 80,605 and 109,915 t CO_2 eq. a^{-1}. Based on NH_3-abatement costs quoted by Ryan (2005) for band, trailing-foot and injection application in the region of 20 and 5 € kg^{-1} NH_3 at low and high slurry-N contents, respectively, abatement costs for indirect N_2O emissions equate to approximately 5000 and 1000 € t^{-1} CO_2 eq., respectively. Avoided fertiliser-manufacture emissions[19] (outside Ireland), corresponding to increased soil N retention, equate to further GHG emission reductions of approximately 142,746 and 194,653 t CO_2 eq. a^{-1}, assuming 55 and 75 % NH_3 emission reductions, thus reducing GHG abatement costs to 1,804 and 361 € t^{-1} CO_2 eq. for low and high N content slurries, respectively.

Estimation of mitigation costs for anaerobic digestion

Assuming a 5% interest rate, 15 year operational period and €0.08 kWh^{-1} electricity sale price, EPA (2005) has calculated that a centralised anaerobic digestion plant taking 146,000 t slurry per year could:
Produce 828 MWh electricity per annum;
Avoid 10,752 t CO_2 eq. a^{-1} from waste management[20];
Cost €10.5 M for establishment of plant and storage infrastructure;
Generate a net deficit of €320,667 (discounted) per annum.

With a 50% (€5.25 M) capital investment grant, the plant would operate at a discounted profit equal to €94,000 a^{-1}, and the grant would represent a mitigation cost of €32.55 t^{-1} CO_2 eq. abated from the agricultural sector.

Including displaced electricity emissions of 516.7[21] t CO_2, and conservatively assuming avoided food-waste decomposition emissions equivalent, on a per-weight-waste-avoided basis, to avoided animal waste emissions equal to 2,688 t CO_2 eq. a^{-1}., results in a total CO_2 eq. reduction of 13,957 t and a mitigation cost of €25.08 t CO_2 eq. The total agricultural animal waste electricity-generating potential is equal to 2.759 million MWh per annum (11% of 2001 electricity supply) according to the EPA (2005). Crudely extrapolating the single facility

[18] Based on an IPPC indirect N_2O-N emission factor of 0.01 for atmospheric NH_3-N, following deposition.
[19] Based on life-cycle-assessment emissions of 8.63 kg CO_2 eq. kg^{-1} N-fertiliser (Styles and Jones, 2006).
[20] Calculated as a reduction in national manure management emissions proportionate to the percentage of national agricultural animal waste taken in at the plant
[21] Based on electricity C intensity of 0.624 kg CO_2 per kWh electricity

emission savings up to account for one third of all the managed animal waste from the agricultural sector results in a total potential emission saving of 1.275 Mt CO_2 eq. a^{-1}, of which 0.982 Mt CO_2 eq. a^{-1} are from the agricultural sector.