

CIB Working Commission 108: Climate Change and the Built Environment



PART II National Report

IRELAND

[For Public Comment: 18 November 2010]



2009 - Severe Flooding in the West of Ireland

On 3 March 2010, Ireland submitted a revised 5th National Communication (NC5) under the United Nations Framework Convention on Climate Change. On 2 November 2010, the UNFCCC issued a report on its in-country In-Depth Review (IDR) of Ireland's NC5, which was co-ordinated by the UNFCCC Secretariat and conducted by an Expert Review Team (ERT), in Dublin, from 21-26 June 2010.

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2. Ireland in the European Union & The UNFCCC Framework

Worldwide, the Construction Sector serves an essential purpose in the Social Environment ... providing shelter for over 6 Billion people ! As a large Sector within the Economic Environment, it typically accounts for about 10-15% of direct employment.

Construction has a very large adverse impact in the Built Environment, with (on average)

...

- 40% energy consumption ;
- 40% CO₂ emissions ;
- 30% consumption of natural resources ;
- 30% waste generation ;
- 20% water consumption.

People – particularly in the case of the most developed economies - may spend almost 90% of their lives inside buildings.

Ireland's National Report will present a general overview of Climate Action in the country, followed by a more in-depth consideration of its Construction Sector.

2 a) International Legal Base & Wider Concerns

Ireland is listed, among many other Developed Countries, in Annexes I & II of the 1992 United Nations Framework Convention on Climate Change (UNFCCC). A significant number of those countries are Member States of the European Union (E.U.). Ireland is also listed, among Developed Countries, in Annex B of the legally binding 1997 Kyoto Protocol (entry into force: 16 February 2005) to the United Nations Framework Convention on Climate Change. This Annex specifies the quantified emission limitation or reduction commitment of each 'state party' to the Protocol ... expressed as a percentage of the base year '1990' (see Convention Article 2 & Kyoto Protocol Articles 3 and 25).

The European Union later re-allocated ... on a consensus, 'burden-sharing' basis ... the Kyoto commitments among its Member States. Within this separate process, Ireland's adjusted allocation came to +13% of 1990 GHG Emissions ... as opposed to the -8% of 1990 GHG Emissions within the legally binding process of the Kyoto Protocol.

At the beginning of Annex A, in the 1997 Kyoto Protocol, the following Greenhouse Gases (GHG's) are specified as falling within its scope:

1. Carbon Dioxide (CO₂) ;
2. Methane (CH₄) ;
3. Nitrous Oxide (N₂O) ;
4. Hydrofluorocarbons (HFC's) ;
5. Perfluorocarbons (PFC's) ;
6. Sulphur Hexafluoride (SF₆).

However ... targeting compliance with the Protocol's legally binding emission targets solely in terms of Carbon Dioxide and/or Carbon Dioxide Equivalents runs the risk, particularly in a sector such as Construction, of missing significant emissions from the Fluorinated/Industrial Gases, i.e. HFC's, PFC's and SF₆. It is of concern to note that use of SF₆ was almost entirely overlooked in the 2003 Environmental Protection Agency (EPA) Report on 1998 Emissions of Industrial Greenhouse Gases (HFC's, PFC's and SF₆). Furthermore, Ireland has chosen '1995' as its benchmark year for these gases.

Article 3.2 of the Kyoto Protocol required that each Party to the Protocol make demonstrable progress in achieving its commitments by 2005. Ireland did not demonstrate this progress.

In early 2010, Ireland's GHG Emissions Reduction Performance was unlikely to meet even its adjusted European Union commitments under the Kyoto Protocol ... a performance which has been guided by an official policy of exploiting to the maximum all of the UNFCCC Kyoto Protocol's Flexibility Mechanisms while showing a stark indifference to Adaptation, an over-reliance on Marketing Campaigns in the public media as opposed to mandatory implementation on the ground, and a preference for 'Soft' Performance Estimation on Paper/Computer rather than the more painful 'real' performance calculation, which would generate reliable data and statistics to be managed by Ireland's Central Statistics Office, in co-ordination with EuroStat in Luxembourg. See Appendix A.

However, on 22nd October 2010, when the full extent of Ireland's economic decline was finally being revealed ... the Environmental Protection Agency (EPA) ... the statutory body responsible for protecting the environment in Ireland ... published provisional estimates for GHG Emissions in 2009, which were described as being 62.32 Mt CO₂eq, or 7.9% (5.36 Mt CO₂eq) lower than the level of emissions in 2008 ...

- Industry and Commercial Sectors - emissions were 20.0% (2.31 Mt CO₂eq) lower in 2009 compared with 2008. This reflects decreases in CO₂ emissions from, primarily, food processing and cement production. Data from the EU Emissions Trading Scheme, which has been published annually by EPA since 2005, show that CO₂ emissions from the cement sector peaked in 2007 and decreased by 11% (0.43 Mt CO₂eq) between 2007 and 2008 and a further 38% (1.30 Mt CO₂eq) between 2008 and 2009 ;
- Energy Sector – emissions (primarily power generation) were 10.7% (1.57 Mt CO₂eq) lower in 2009 compared with 2008 ;
- Transport Sector – emissions were 7.7% (1.09 Mt CO₂eq) lower in 2009 compared with 2008.

These recent provisional estimates are tending to reinforce a 'Business as Usual' - 'It'll be Alright on the Night' - approach to Climate Change Action in Ireland ... and directly causing a further delay in any necessary, fundamental changes to the organization and future development of the country's Social, Built and Economic Environments.

2 b) Climate Challenges Beyond 2012

Following the E.U. Council's Spring Summit, in Brussels on 8th and 9th March 2007, and the G-8 Group of Countries Summit in Heiligendamm, Germany, from 6th to 8th June 2007 ... the UNFCCC and its Kyoto Protocol must now be seen as the beginning of a century-long exercise in extensive environmental repair, economic reform and social re-organization. Although not ambitious in its performance targets (from the viewpoint of 2010 !), the 1997 Kyoto Protocol has served as a valuable indicator of Political Will, Institutional Capacities, and Public Support for Behavioural Change in each of the E.U. Member States.

Whether or not a comprehensive Kyoto-like legal instrument enters into force at international level after 2012 ... the European Union will proceed independently ... in accordance with the Climate Protection Policy Targets recorded in Paragraphs #30-32 of the E.U. Council's Presidency Conclusions from Spring 2007 ...

Paragraph # 30

The European Council reaffirms that absolute emission reduction commitments are the backbone of a global carbon market. Developed countries should continue to take the lead by committing to collectively reducing their emissions of greenhouse gases in the order of 30% by 2020 compared to 1990. They should do so also with a view to collectively reducing their emissions by 60% to 80% by 2050 compared to 1990.

Paragraph # 31

In this context, the European Council endorses an EU objective of a 30% reduction in greenhouse gas emissions by 2020 compared to 1990 as its contribution to a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries to contributing adequately according to their responsibilities and respective capabilities. It invites these countries to come forward with proposals for their contributions to the post-2012 agreement.

Paragraph # 32

The European Council emphasises that the EU is committed to transforming Europe into a highly energy-efficient and low greenhouse-gas-emitting economy and decides that, until a global and comprehensive post-2012 agreement is concluded, and without prejudice to its position in international negotiations, the EU makes a firm independent commitment to achieve at least a 20% reduction of greenhouse gas emissions by 2020 compared to 1990.

Based on its less than impressive track record up to 2010, the implications for Ireland of any ambitious, post-2012 GHG Emission Reduction scenario will be harsh !

2 c) Necessary Integration of Climate Action

Another concern ... targeting the Construction Sector's performance solely towards reducing Kyoto Greenhouse Gas (GHG) emissions, i.e. in a manner which is not properly integrated into critically related and equally urgent issues, e.g. Sustainable Human & Social Development ... will pose significant dangers both for the future of the Irish Construction Industry and for Social Wellbeing in Ireland.

To take a small example from Europe ... the panic to conserve energy in the late 1970's and early 1980's led to a dramatic reduction in rates and quantities of direct, natural ventilation to the habitable spaces of buildings. This, in turn, had an adverse impact on Indoor Air Quality (IAQ), and led to a sharp rise in Asthma among building occupants.

It is also important to note that Article 2.1 of the Kyoto Protocol states:

'Each Party ..., in achieving its quantified emission limitation and reduction commitments under Article 3, in order to promote sustainable development, shall:
... '

2 d) Construction Life Cycle Costing

It is generally not understood that the Full Life Cycle of a Construction Project is lengthy and complex. To take the various and interlinked stages of the design, construction, operation and use of a Building, for example ...

- Expression of the needs/wants/desires/requirements of the Client/Client Organization ;
- Planning Brief and Performance Specification for the Building ;
- Site Analysis and Evaluation ;
- Design ;
- Preparation for Construction - begins only after completion of the design ;
- Construction ;
- 'Early Life' of the Building in Use - including management, maintenance, and servicing ;
- Adaptable 'Middle Age' of a Building in Use - including renovation, refurbishment, modification, alteration, and extension ;
- De-Construction ;
- Disposal & End of Life.

Too much emphasis, in Ireland, continues to be placed on the Initial Capital Investment required to complete a building. This conceals the considerable costs of Building Operation from the Client/Client Organization. Costing over the Full Building Life Cycle must become standard practice and, if necessary, be legally regulated to become such.

As the minimum period for a Sustainable Building in Use is 100 Years, nothing less than a recurrence interval of 100 years should be used in design calculations for events such as flooding, severe storms or deluge rainfalls, etc.

3. Overview of Proposed Climate Action in Ireland

In the spring of 2007, the Department of Environment, Heritage & Local Government (DEHLG) - Ireland's statutory Authority Having Jurisdiction (AHJ) - published the 'National Climate Change Strategy 2007-2012'. This document can be accessed and downloaded at ... <http://www.environ.ie/en/Environment/Atmosphere/ClimateChange/> It is of concern to note, however, that 'Climate Change' related content is not easy to find on this WebSite ! Comprehensive Enabling Climate Change Legislation, which this Department, and the Irish Government, initially promised for Easter 2010 ... and then June 2010 ... has, at the time of writing (mid-November 2010), still not made an appearance in the Dáil (Ireland's Parliament) !

The Department of Environment, Heritage & Local Government (DEHLG) lacks strong and competent political direction and the institutional capacity to effectively co-ordinate and oversee the implementation of National Climate Action. For this reason, closer scrutiny of its activities will be required from the Dáil Committee System.

Contrary to current practice ... Foreign Development Aid should not be used to obtain any sort of domestic or in-country credit for Ireland's National Climate Change Strategy !

Specifically concerning Climate Change Adaptation ... the following is stated on Page 45 of the 2007-2012 National Climate Change Strategy Document ...

'As part of a comprehensive policy position on climate change, the Government is committed to developing a national adaptation strategy over the next two years. This strategy will provide a framework for the integration of adaptation issues into decision-making at national and local level.'

The DEHLG does not, however, intend to publish a National Climate Change Adaptation Strategy until 2013. With regard to the development of this Strategy, the approach being adopted is to work with the World Resources Institute (Washington, USA) National Adaptive Capacity (NAC) Assessment Framework. Completion of this NAC Assessment will be one important component in the National Strategy.

Using self-assessment by Governmental/Non-Governmental Agencies ... (inherent flaws with this process !) ... the following NAC Context Headings require detailed answers to be entered into a National Adaptive Capacity (NAC) Answer Worksheet ...

- Political Landscape ...
 - Description of the current national political context in which Adaptation will take place - identification of potential entry points and barriers ;
 - A political economy analysis of the relevant actors, organizations, and processes ;
 - The major processes, either already in place or ongoing/upcoming, relating to sectoral planning - identification of key institutions/interests ;
 - Major policies, plans, or programmes, either established or upcoming, relating to poverty reduction - identification of key institutions/interests ;
 - Major policies, plans, or programmes, either established or upcoming, relating to disaster risk reduction - identification of key institutions/interests ;
 - Environmental planning tools or processes (e.g. sustainable development plans, EIA procedures, SEA, etc.) - identification of key institutions/interests.
- Equity/Participation ...
 - Existing policies and laws relating to freedom of information - description of the rights to information ;
 - Mechanisms in place to ensure stakeholder involvement and engagement in national planning processes.
- Budgetary Processes ...
 - Country's budgetary process - when and how does national budgeting occur - identify institutions involved in allocating and distributing funds to ministries and sub-national governments ;
 - Budgetary review and oversight - identification of key institutions/interests.

Elsewhere ... 2007 saw the commencement of the Environmental Protection Agency's Environment Climate Change Research Programme (CCRP) 2007-2013 ... which is intended to address the need for research in Ireland to inform policy-makers and other stakeholders on a range of questions in relation to environmental protection. The scope of the research programme is limited ... its primary focus is 'environmental protection'.

In 2009, the Environmental Protection Agency (EPA) published the First Report under the Climate Change Research Programme 2007-2013: 'A Summary of the State of Knowledge on Climate Change Impacts for Ireland'.

Directly relevant here, this first research report contains a superficial review of some(!) adverse impacts on the following sectors ...

- Biodiversity & Agriculture ;
- Forests & Peatlands ;
- Surface Water, Coastal & Marine Resources ;
- Settlement and Society ;
- Human Health ;
- Tourism, Transport & Communication ;
- Energy & Industry ; and
- Insurance.

The full series of Ireland's Climate Change Research Reports, stretching back to 2002, can be accessed and downloaded at the Environmental Protection Agency (EPA) WebSite ... <http://www.epa.ie/downloads/pubs/research/climate/>

4. Meteorology & Extreme Weather Events

The Community Climate Change Consortium for Ireland (C4I) Project was established in 2003 ... and comprises the following Irish agencies: Met Éireann (the Irish National Meteorological Service), the Environmental Protection Agency (EPA), University College Dublin (UCD), the Sustainable Energy Authority of Ireland, and the Higher Education Authority. Based in the headquarters of Met Éireann, its main objective is to consolidate and intensify the national effort in climate change research by building a capacity for carrying out regional climate modelling in Ireland and to provide assistance to Irish scientists utilizing climate model output for their analyses. A comprehensive database of results on the future climate of Ireland is available at the C4I WebSite ... <http://www.c4i.ie/>

In June 2008, MET Éireann and University College Dublin published the Report: 'Ireland in a Warmer World - Scientific Predictions of the Irish Climate in the Twenty-First Century'. Its key findings were ...

1. The Irish climate will continue to warm, particularly in the summer and autumn seasons: possible increases of 3-4 degrees C towards the end of the century. The greatest warming will occur in the south and east of the country.
2. Autumn and winter seasons will become wetter: increases in the range 15-25% towards the end of the century. Summers will become drier: 10-18% decrease towards the end of the century. Regional details remain elusive, due to the large uncertainty in local projections.
3. Mean wind speeds are not expected to change significantly over the coming decades, but there is likely to be an overall reduction in strengths towards the end of the century, particularly in summer (4-5%).
4. The frequency of very intense cyclones affecting Ireland is likely to increase.
5. The seas around Ireland have been warming at the rate of 0.3-0.4 degrees C per decade since the 1980's; over the Irish Sea a greater warming has been observed (0.6-0.7 degrees C per decade). The trends are consistent with what has been observed globally and are predicted to continue over the coming decades.
6. Sea levels are rising on average about 3.5 cm per decade around Ireland.
7. Ocean modelling results indicate an increase in the frequency of storm surge events around Irish coastal areas; in the northwest, the increase in surge heights between 50 and 100 cm is around 30% by mid century. Extreme wave heights are also likely to increase in most regions.
8. Changes in precipitation and temperature are likely to lead to a rise in winter stream flows (increasing the risk of flooding), and a reduction in summer flows.
9. Changes in the climate may impede the recovery of the ozone layer; together with a warmer climate, there may be negative health consequences due to a greater exposure to UV radiation.
10. Demand for heating energy is likely to reduce significantly as the climate warms.

However, this Report and other similar research work is failing to sufficiently highlight the more frequent occurrence of extreme events, e.g. severe flooding, storm force winds, and particularly deluge rainfalls ... almost unknown in Ireland until recent years. Irish roads and buildings are still not being designed to cope with such rainfalls.

Furthermore ... at the height of the Celtic Tiger Economic Boom in Ireland, significant signs of a surge in air conditioning, even in simple building types, e.g. housing, could be witnessed. This trend should have been foreseen back in the 1990's.

5. Ireland's GHG Emission Reduction Efforts So Far

On 29th March 2010, Ireland's Environmental Protection Agency (EPA) issued the following Briefing Note: 'Ireland's Greenhouse Gas Emissions in 2008'. In summary, it stated the following ...

The EPA has submitted final estimates of Ireland's 2008 Greenhouse Gas Emissions to the European Commission, in accordance with reporting obligations under (E.U.) Decision 280/2004/EC. This submission will also be forwarded to the secretariat of the United Nations Framework Convention on Climate Change to meet the 15 April deadline for reporting annual greenhouse gas inventories under the Convention. Following normal practice, the estimates include revision of previously published values for earlier years, as appropriate, taking into account any updated information obtained from key data providers, improvements in methodologies and recommendations following review of Ireland's submission to the UNFCCC secretariat in 2009. This briefing note summarises the status of Ireland's GHG emissions based on these latest estimates.

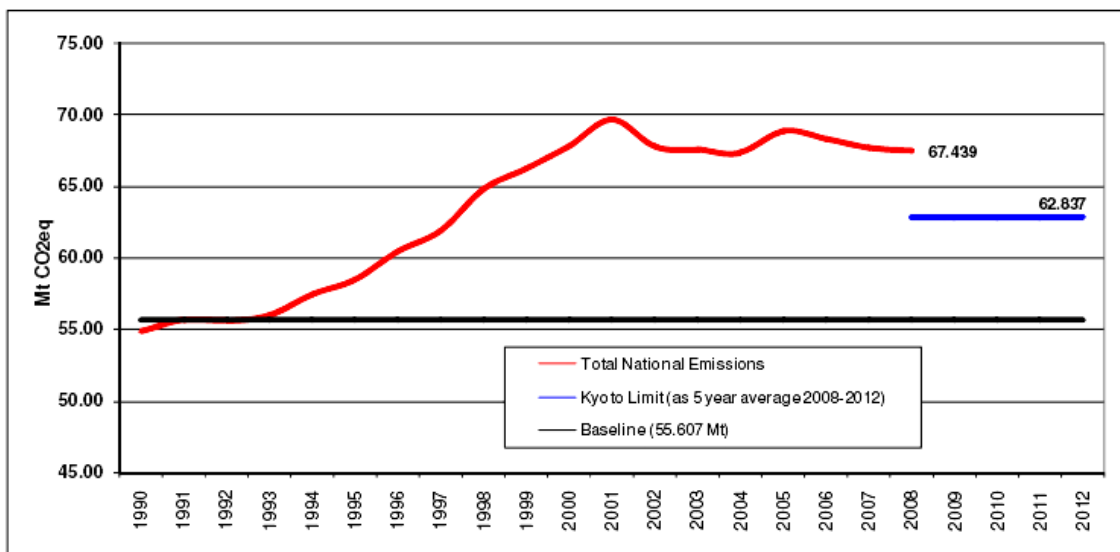


Figure 3. Distance to Ireland's Kyoto Limit

Key features of the 2008 estimates:

- Overall

Total GHG emissions were 67.44 million tonnes carbon dioxide equivalent (Mt CO₂eq), which is 0.21 Mt CO₂eq (0.3 percent) lower than the level of emissions in 2007.

Improvements in methodology for the Energy and Waste sectors underlie the revised time-series of GHG emissions covered by this briefing note. The effect of these methodological changes is to decrease emissions by 0.56 in Mt CO₂eq in 1990 and by 1.56 Mt CO₂eq in 2008.

Separate to the reductions resulting from improvements in methodology, the actual year on year reduction in GHG emissions was 0.21 Mt CO₂eq. This is disappointingly small when seen in the light of the downturn in economic activity already impacting during 2008 and the expected initial impact of the measures already adopted under the National Climate Change Strategy, and further emphasises that it is essential to keep the already adopted reduction measures under review and where necessary to extend them or to adopt additional measures.

The effects of the economic downturn are mainly evident in the 522,710 tonne reduction (4.4%) in emissions from the Industry and Commercial sector with smaller decreases (<1%) from the Agriculture and Transport sectors. Energy sector emissions are largely unchanged. However, an increase in emissions of 603,710 tonnes from the Residential sector (reflecting colder winter months) cancels the benefit of these reductions to a large extent.

- Industry and Commercial

Emissions decreased by 522,710 tonnes (4.4 percent) from 11.92 Mt CO₂eq in 2007 to 11.40 Mt CO₂eq in 2008 mainly from combustion sources.

- Agriculture

The emissions from Agriculture decreased by 172,400 tonnes or 0.9 percent in 2008, continuing the downward trend from the 1998 peak. The decline in emissions reflects lower sheep and cattle numbers and reduced use of fertiliser.

- Transport

Transport emissions were 121,100 tonnes CO₂eq lower in 2008 than in 2007. This represents a decrease of 0.8 percent on 2007 levels, following sustained increases in this sector since 1990. Emissions in 2008 were 176 percent higher than the 1990 transport emissions.

- Energy

Emissions in 2008 were similar to 2007 with an increase of 98,560 tonnes CO₂eq or 0.7 percent.

- Residential

Emissions in 2008 increased by 603,710 tonnes CO₂eq or 8.7 percent from the 2007 level. This was the largest sectoral change in 2008 and would appear to reflect increased use of domestic heating as a result of the winter months of 2008 being significantly colder than for the same period in 2007.

- Waste

The new emissions time-series for this sector shows a decrease of 94,570 tonnes CO₂eq or 8 percent from the 2007 level. Emissions in 2008 are 16 percent lower than in 1990.

- Kyoto Protocol

Ireland's limit in relation to the Kyoto Protocol has been set as 314.184272 Mt CO₂eq for the five-year commitment period 2008-2012. This equates to an average of 62.837 Mt CO₂eq per annum over the period (i.e. 13 percent above the baseline estimate). Compliance with the Kyoto Protocol limit is achieved by ensuring that Ireland's total GHG emissions in the period 2008-2012, less any offsets from approved forest sinks as well as any surrender of purchased Kyoto Protocol credits, are below the limit at the end of the five-year period.

However in order to calculate a current 'distance to target', it is necessary to take account of the impact of the European Union's Emissions Trading Scheme as follows:

Year: 2008	Mt CO ₂ eq	
Total National Emissions	67.44	
Less Verified Emissions for ETS	20.38	
Total Non-ETS Emissions		47.06
Kyoto Limit (as 5 year average)	62.84	
Less ETS Allocation (as 5 year average)	22.28*	
Total Non-ETS Limit (as 5 year average)		40.56
Distance to target (excluding forest sinks)		6.50
Forest sinks under KP Article 3.3	2.76	
Distance to target (including forest sinks)		3.74

* Not all of this amount was distributed to installations in the ETS sector in 2008 (actual allocation to installations in 2008 was 19.97 Mt which was below the verified emissions of 20.38 Mt). The remainder is mainly reserved for New Entrants over the 5 year period 2008-2012 and if not fully utilised will revert to the national account.

6. A Climate Adaptation Project - Lacking Policy Integration

In Ireland, it has been proposed ... as an Adaptation Project which will cost approximately €600 million, devour many material resources and have an adverse environmental impact ... to divert water from the River Shannon, a large river in the mid-west of the country ... to Dublin, the capital city, which is located over 100 kilometres away on the east coast ... in order to deal with the expected shortage of water which will be caused, among 'other relevant factors', by future climate change.

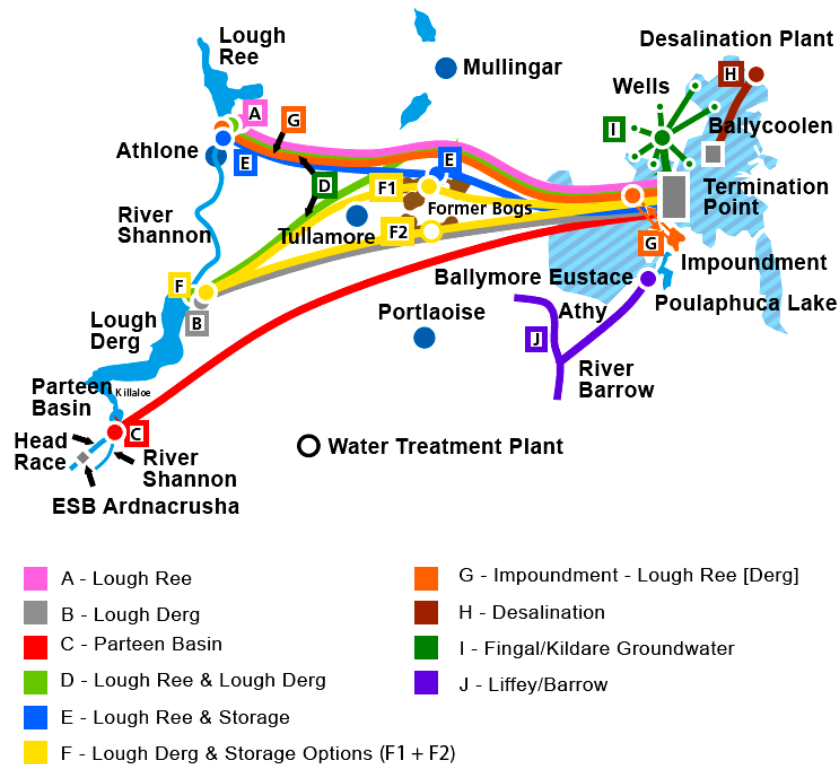


Figure 2 - Proposed Dublin City Region Water Supply Project

But ... just how 'sustainable' is this Adaptation Project, if the following 'other relevant factors' are considered ?

- i) Since the 1960's ... a dysfunctional and corrupt Spatial Planning System in the Dublin City Region has actively encouraged an uncontrolled, urban and suburban horizontal sprawl to take place. Today, this pattern of development remains unchecked.
- ii) At this time, there are still no residential water charges in Dublin. The concept of water conservation is, therefore, almost unknown among householders.
- iii) There are enormous un-intended losses, i.e. leaks, from the public potable water distribution system ... approximately 40% even in the good times, and recently, well in excess of 60% following the National Snow Emergency in Ireland.
- iv) Water supplied to houses in the Dublin City Region is not yet metered. There is no urgency, therefore, in locating and repairing water leaks which occur between the private property boundary of a house and the house itself.
- v) There are no requirements in Ireland's National Building Regulations to harvest any rainwater in any buildings, or on any hard surfaces in the vicinity of those buildings.
- vi) In 2005-2006, at the height of the Celtic Tiger Economic Boom ... the existing foul and storm water drainage infrastructure in the City Region was already stretched to keep pace with the 'wild' demands for new development land. Overloading of the existing systems was evident from a marked deterioration in water quality, increased risks of flooding and pollution, and concerns that the drainage system and sewage treatment plants had insufficient capacity to cater for future development.
- vii) Sustainability Impact Assessment (SIA) ...

'a continual evaluation and optimization assessment - informing initial decision-making, or design, and shaping activity/product/service realization, useful life and termination, or final disposal - of the interrelated positive and negative social, economic, environmental, institutional, political and legal impacts on balanced and equitable implementation of Sustainable Human & Social Development'

... is not yet a standard procedure, at any level, within national, regional and local Authorities Having Jurisdiction (AHJ's). If it were, the most glaring flaw in this project would rapidly be identified. There is no comprehension at all, in the minds of Dublin City's decision-makers, that water is a very valuable, but limited, resource !

7. Ireland's Construction Sector

During 2005, Ireland was rapidly approaching the pinnacle of economic and property-related development 'madness' in the Celtic Tiger Boom. The following statistics from the Central Statistics Office (<http://www.cso.ie/>), for that year, illustrate both the scale and the imbalanced nature of this 'bubble' ... a bubble which would dramatically implode shortly afterwards ...

7 a) i) Output & Structure

- ◆ It was estimated that the Value of Output in the construction industry was almost €32 billion. This compares to €17.6 billion in 2000.
- ◆ Construction was estimated to have accounted for 20% of Gross Domestic Product (GDP), or 23% of Gross National Product (GNP).
- ◆ Residential Construction output more than doubled from €9.5 billion in 2000 to €20.9 billion in 2005.

7 a) ii) Investment, Taxation & Revenue

- ◆ Public Capital Programme investment in productive infrastructure reached almost €4.3 billion, while investment in social infrastructure was approximately €3.5 billion.
- ◆ Over €2.4 billion, or 29% of the total Public Capital Programme, was spent in the Transport Sector while in excess of €1.5 billion was spent on housing.
- ◆ Stamp Duty on property transactions amounted to €2 billion and this accounted for 75% of the total revenue raised from stamp duty.

7 a) iii) House Completions & Housing Stock

- ◆ Over 86,000 dwelling units were completed in Ireland. This compares to less than 20,000 completed in 1990 and 50,000 in 2000.
- ◆ New dwellings were completed at a rate of 21 units per 1,000 of population, and added over 5% to Existing Housing Stock.
- ◆ Close to half of the Units Completed in Ireland in 2004, the latest year for which data is available, were Semi-Detached Houses. This compares to about 30% in 2000.
- ◆ In the April 2006 Census of Population, the CSO identified a total of 1.8 million Private Residences and Communal Establishments throughout the State. Of these, about 275,000 were vacant at the time of the Census.

7 a) iv) Planning Permissions & Land

- ◆ Planning Permission was granted for the construction of 55,000 Multi-Development Houses, 21,000 One-Off Housing Units and 24,000 Apartments.
- ◆ The Average Floor Size for Houses granted planning permission in a Multi-Unit Development was 125 m². For One-Off Houses, the average floor area was 214 m².
- ◆ The amount of Zoned Serviced Land for residential construction increased from 10,800 hectares (with a potential for over 263,300 Units) in 2000 to almost 14,800 hectares (with a potential of almost 460,000 Units). The potential housing density of this available land increased from 24 Units per hectare in 2000 to more than 31 Units per hectare in 2005.

7 a) v) Regional Analysis

- ◆ The Dublin Region accounted for 34% of Total Construction Output in 2000 and for less than 28% in 2004.
- ◆ In the second quarter, there were over 242,000 Workers in the Construction Sector. Of these, almost 53,000 lived in Dublin while 37,500 lived in the South-West.
- ◆ According to the Department of Environment, Heritage & Local Government (DEHLG), the Average Price of a New House in Dublin was €386,000 in 2005. A New House in Galway cost €275,000 and in Cork €265,000.
- ◆ Almost one in every three Dwelling Units completed in 2004 were located in Dublin or the Mid-East region.

7 a) vi) Comparison with Europe

- ◆ Ireland's House Completion Rate (21 units per 1,000 of population) was four times the average for other European countries.
- ◆ In Ireland, 77% of Homes are Owner-Occupied. Hungary, Spain, Slovakia and Norway had higher ownership rates. In contrast to this, 45% of German Homes and 35% of Homes in Switzerland are Owner-Occupied.
- ◆ Construction Output per Capita is highest in Ireland, at approximately €7,600. This is more than double the corresponding average figure for E.U. Member States.

7 b) Construction in Ireland - Legal & Regulatory Frameworks**7 b) i) Relevant Legislation**

- a) Ireland's Spatial Planning Law is concerned with the appropriateness of development in any particular part of the country.
- b) Building Regulations are concerned with the adequacy of building construction. Currently, these only specify minimum construction performance within a restricted framework of health and safety objectives.
[The model used for Building Regulations in Ireland continues to be the Building Regulations for England & Wales, with minor modifications ... an inadequate model.]
- c) Safety at Work Law (implements European Union Law at national level) is concerned with the protection of workers during the process of construction and, when buildings are occupied, in places of work.
- d) Environmental Impact Law (implements E.U. Law at national level) is concerned with mitigating the adverse 'environmental impacts' ... at the level of individual construction projects, and at a strategic, i.e. regional, level.
- e) Public Procurement Law (implements E.U. Law at national level) is concerned with ensuring that Public Contracting Authorities treat Economic Operators equally, transparently and in a non-discriminatory manner.

7 b) ii) National Framework of Technical Control

Regulation of the Construction Sector in Ireland is poorly resourced and is primarily 'bureaucratic'. In actual practice, it is often poorly executed and piecemeal. A confusing array of national and local bodies is responsible for 'technical control', which leads to disjointed and inefficient monitoring. Insufficient attention is paid to 'real' building or construction performance. Institutional Capacities within the relevant national Authority Having Jurisdiction (AHJ), i.e. the Department of Environment, Heritage & Local Government (DEHLG), and Local Authorities are inadequate and dysfunctional.

7 c) Reliability of Construction Data & Statistics

Ireland does not have a National Construction Database.

The Central Statistics Office (CSO) does not manage Ireland's Energy or Kyoto Greenhouse Gas Emission Databases.

No reliable statistics can be presented with regard to building or construction performance in 1990, 2005 or 2010. No coherent predictions, therefore, can be made for the years 2020, 2030 or 2050 ... under any futures scenario.

7 d) Sectoral Options

Bearing in mind the earlier contents of this Report, the Construction Sector in Ireland does not have any Options. Nothing less than immediate, concerted and radical Climate Protection Measures are required to meet our International and European obligations.

To examine this point in depth ... Article 2.1(a) of the 1997 UNFCCC Kyoto Protocol places 'energy efficiency in relevant sectors' first in a lengthy list of policies and measures to be implemented and/or further elaborated in accordance with the national circumstances of each state party to the Protocol.

The enormous potential for improving energy efficiencies and conserving energy in the design, construction and operation of buildings in Ireland has hardly been tapped. For that reason, it is urgent that existing policies and measures be re-engineered.

7 e) Blueprint for Meeting UNFCCC & EU 2020 Targets

7 e) i) Ireland's Construction Sector Infrastructural Gaps

- ◆ Immediately re-establish an independent National Institute for Spatial Planning & Construction Research (formerly known as An Foras Forbartha), having joint responsibility with the Central Statistics Office (CSO) for maintaining a Reliable National Construction Database. Research and Innovation must be prioritized. As a matter of priority, regional and local Hazard Maps must be published.
- ◆ Immediately establish an independent and fully accredited National Construction Research & Testing Laboratory Complex in Ireland.
- ◆ Immediately inject adequate resources into the Irish National Accreditation Board (NAB) ... and closely monitor, using competent 3rd Parties, the Quality of its work.
- ◆ Immediately inject adequate resources into the National Standards Authority of Ireland (NSAI), and ensure that Ireland participates actively in the European Standards Organizations (CEN & CENELEC) and the International Standards Organizations (ISO & IEC). Closely monitor, using competent 3rd Parties, the Independence and Effectiveness of its activities.
- ◆ Immediately inject adequate resources into an independent Irish Agrément Board ... and closely monitor, using competent 3rd Parties, the Quality of its output.
- ◆ Immediately inject adequate resources into awareness raising, training and education for Competence at all levels in the Sector, including all design disciplines.
- ◆ Immediately establish a comprehensive National Building & Infrastructure Insurance Scheme, which specifically emphasizes Climate Change within its remit. It should be quickly evaluated whether certain private organizations, such as those providing public services and critical infrastructure, need to be covered by compulsory standard weather-related insurance. Where insurance is not available, e.g. for buildings located in flood plains, a publicly supported insurance scheme will be required.

7 e) ii) National Building Regulations Weaknesses

Immediately rationalize and increase the effectiveness of Irish Building Regulations as the primary legal instrument in Ireland for setting building performance standards. Ensure that the interpretation and operation of the Building Regulations by the Department of Environment, Heritage & Local Government (DEHLG), Local Authorities and other relevant Agencies ... is harmonized and competent across the country.

Immediately re-format, revise and horizontally integrate the Building Regulations:

- To incorporate Sustainability Impact Assessment (SIA) for construction activity which is likely to have a significant adverse/damaging impact on the environment and/or the social wellbeing of the wider community ... in order to reduce those impacts to a minimum ;
- To establish and maintain a proper level of human health, convenience and comfort during the use/occupation of a building ;
- To improve the structural robustness of buildings generally ;
- To adapt, now, to the more severe climatic conditions expected within the next 100 years. Current design practice is entirely inadequate ;
- To dramatically improve 1997 UNFCCC Kyoto Protocol GHG Emission Reductions, and prepare Ireland for meeting the much more stringent requirements of a post-2012 Kyoto-like international legal instrument ... and the European Union's

- o agreed 2020 emission reduction targets. Special attention should be paid to the Industrial Greenhouse Gases (HFC's, PFC's and SF₆) ;
- o To include renewable energy/heat, rainwater harvesting and sustainable drainage in all construction projects. See Appendix B.

Sustainability Impact Assessment (SIA): A continual evaluation and optimization assessment - informing initial decision-making, or design, and shaping activity/product/service realization, useful life and termination, or final disposal - of the interrelated positive and negative social, economic, environmental, institutional, political and legal impacts on balanced and equitable implementation of Sustainable Human & Social Development.

Sustainable Residential Buildings (See Appendix B): A sustainable, i.e. holistic, approach to built environment development begins with spatial planning, takes the whole building life cycle into account and embraces integrated building design processes. This approach is essential to maximize the potential of individual technologies and innovations. It begins at a community planning level to gain efficiencies on a larger scale than can be achieved in individual buildings and to integrate other energy uses, such as transport. Sustainable spatial planning considers the community in its entirety as well as single buildings. Some new urban centres are being created from scratch with an entirely sustainable plan, like Dongtan near Shanghai, China. But many existing and rapidly growing cities have little room to manoeuvre due to existing constraints. In that case, spatial planning has to be implemented within the existing urban environment framework. In individual buildings, energy efficiency is improved with a greater degree of collaboration between specialists from the earliest stages of the design process. Integration helps to adopt approaches, technologies and materials which can significantly lower building energy use in economically attractive ways. Costs will be minimized with this holistic approach to integrated design and innovation. [2007 WBCSD Energy Efficiency in Buildings (EEB) Project]

Immediately introduce new, and/or strengthen existing, legal requirements in the Building Regulations concerning building design 'flexibility', 'adaptability', and 'accessibility' for building users ... in order to extend and prolong Building Life Cycles.

Flexibility: The extent to which a building interior is designed, when new, to be capable of being easily modified at any later stage during the life cycle of that building - with minimal cost and user inconvenience - because of a person's changing living or working needs.

Adaptability: The extent to which a building, or a building component, is designed when new, or capable of being easily modified at any later stage, to meet the changing life and living needs of the broad range of potential users, who may or may not have activity limitations or develop a health condition during the life cycle of that building or component.

Accessibility: Ease of independent approach, entry, evacuation and/or use of a Building and its services and facilities, by all of the building's potential users - with an assurance of Individual Health, Safety and Welfare during the course of those activities.

Immediately incorporate into the Building Regulations ... Minimum Building-Related Life Cycles ...

Structure	150 yrs ;
Building Fabric	100 yrs ;

Services	25 yrs ;
Furniture & Fittings	10 yrs.

Immediately incorporate into the Building Regulations:

- The Essential Requirements (Annex I) of the European Union Construction Products Directive 89/106/EEC ;
- A Revised Requirement to apply greatly improved 'disproportionate damage' provisions to all buildings of 2 storeys and higher ;
- National Measures implementing the European Union's Energy Performance of Buildings Directive 2002/91/EC.

The World Business Council for Sustainable Development (WBCSD) has identified buildings as one of the five main users of energy where 'megatrends' are needed to transform energy efficiency. They account for 40% of primary energy (primary energy includes the energy required to generate, transmit and distribute electricity, as well as energy directly consumed on site) in most developed countries, and consumption is rising. [2007 WBCSD Energy Efficiency in Buildings (EEB) Project]

The International Energy Agency (IEA) estimates that current trends in energy demand for buildings will stimulate about half of energy supply investments up to 2030. [IEA World Energy Outlook 2006]

Positive Energy Buildings: Buildings in which Primary Energy Consumption is less than or equal to 15 kWh/m²/yr. Renewable Energy Systems contribute a quantity of energy which covers ...

- the (negative) Primary Energy Consumption of the building ;
- the (negative) energy consumed, per year, by private transport associated with the building ;
- a Degradation Factor, per year, which takes account of the energy efficiency degradation normally expected during the building's life cycle, and/or caused by wasteful patterns of building management and/or use ;
- a (positive) energy contribution to an Intelligent Regional or District Grid exceeding the total energy consumed, per year, by the building.

Immediately introduce requirements concerning the widespread application of Intelligent Energy Conservation/Efficiency and Remote Building Management ... in new and existing, simple and complex building types ... in order to support more energy saving and efficient patterns of building use by occupants. Incentivize the installation of building performance monitoring and targeting systems throughout the Sector.

To facilitate these and other measures ... Innovative Construction Products, Systems and Processes must be speedily introduced to the market, and approved as being 'fit for intended use'. The costs for Ireland of non-compliance with the legally binding 1997 UNFCCC Kyoto Protocol and a post-2012 Kyoto-like international legal instrument must be fully considered when deciding on the levels and range of Incentives.

Technologies available today can achieve dramatic improvements in building energy efficiency, but market failures and behavioural barriers are blocking progress towards the WBCSD vision of the Positive Energy Building. The challenge in the first phase of the EEB Project was to understand those impediments. In the next phase, the Project explored ways to overcome them and develop a roadmap with practical measures that businesses can implement.

WBCSD EEB Research has found that perceptions of the cost necessary to achieve more sustainable buildings are likely to be significantly higher than the actual

cost. The average perception was a 17% premium, but cost studies on actual properties have shown much lower figures. For commercial properties, the Fraunhofer Institute in Germany has shown (2006) that the energy demand of new office buildings can be reduced by 50% compared with the existing building stock without increasing construction costs.

7 e) iii) Essential Up-Skilling Transition Period 2011-2013

Incentivize better than minimal, i.e. required by Building Regulations, energy conservation & efficiency performance in all new buildings and a widespread, significant improvement in existing buildings. A transition period will be essential for the Construction Sector to up-skill in order to meet new standards of 'real' building performance, for the many design practitioners to be re-educated, and design school curricula to be upgraded.

Incentivize better than minimal, i.e. token, installation of renewable energy systems in all new and existing buildings. A transition period will be essential for the Construction Sector to up-skill in order to install these new systems, for the many design practitioners to be re-educated, and design school curricula to be upgraded. The sourcing of mature, approved and cost-effective renewable energy systems, which are appropriate for use in Ireland, will also require some considerable time and effort !

The costs for Ireland of non-compliance with the 1997 UNFCCC Kyoto Protocol and a post-2012 Kyoto-like international legal instrument must be fully considered when deciding on the levels and range of incentives.

7 e) iv) Energy Performance Targets up to 2020

From the Beginning of 2014, i.e. after the Essential 3-Year Up-Skilling Transition Period (2011-2013) ...

- ◆ Require all new buildings to achieve a minimum Building Energy Rating (BER) of 'A1' ... indicating a primary energy consumption less than or equal to 25 kWh/m²/yr. And require 40% of primary energy consumed to be, directly or indirectly, from renewable energy sources ;
- ◆ Require all existing buildings to achieve a minimum Building Energy Rating (BER) of 'B1' ... indicating a primary energy consumption less than or equal to 100 kWh/m²/yr. And require 15% of primary energy consumed to be, directly or indirectly, from renewable energy sources. Retain incentive measures to achieve better performance with regard to energy efficiency and/or renewable energies ;
- ◆ Require buildings of historical, architectural or cultural importance to achieve a minimum Building Energy Rating (BER) of 'C1' ... indicating a primary energy consumption less than or equal to 175 kWh/m²/yr. Retain incentive measures to achieve better energy efficiency performance. No legal requirements or incentives with regard to renewable energies should apply to buildings of historical, architectural or cultural importance.

From the Beginning of 2016 ...

- ◆ Require all new buildings to be 'Positive Energy Buildings' ;
- ◆ Require all existing buildings to achieve a minimum Building Energy Rating (BER) of 'A2' ... indicating a Primary Energy Consumption less than or equal to 50 kWh/m²/yr. And require a positive energy contribution of (+)25 kWh/m²/yr to be from renewable energy systems installed in the building.

- ◆ Require buildings of historical, architectural or cultural importance to achieve a minimum Building Energy Rating (BER) of 'B1' ... indicating a primary energy consumption less than or equal to 100 kWh/m²/yr. Retain incentive measures to achieve better energy efficiency performance. No legal requirements or incentives with regard to renewable energies shall apply to buildings of historical, architectural or cultural importance.

Beginning in 2012, and at 4-Year Intervals thereafter ... thoroughly review actual progress concerning 'real' energy conservation/efficiency performance and renewable energy output in buildings, and amend legislation and technical control procedures accordingly.

7 e) v) Technical Control of Construction & Post-Occupation Buildings

Post-completion repairs and/or system retrofitting always involve compromises and are very rarely cost-effective or adequate. Any proposed Building Energy Efficiency/Conservation and Renewable Energy Improvements must take place in a context of stringent control during construction (by competent Local Authority Building Controllers and/or Independent Technical Controllers) and rigorous post-construction energy performance monitoring (using long wave Infra-Red Thermal Imagery, in conjunction with building roof and external wall Air Seepage Testing, etc). Observation of post-occupation building energy performance will also be necessary. Introduce mandatory 5-Yearly Energy Surveying for all building types.

Immediately inject adequate resources into all Building Control Authorities ... which must be directed at the provision of Competent Staff (e.g. building controllers, inspectors, administrative and legal support), Reliable Equipment (e.g. comprehensive range of monitoring equipment) and Technical Support (e.g. training, library facilities and access to research and testing).

Immediately introduce a mandatory and integrated Monitoring Inspection System on all construction projects, at the following stages ...

- Foundations ;
- Drainage ;
- Ground Floor Construction ;
- Super-Structure (above Radon Resisting Membrane) ... inspections to take place at a level no higher than first floor ;
- Roof.

Such a monitoring inspection system must operate uniformly across the country. Piecemeal variations and maverick procedures introduced by individual Local Authorities or other relevant Agencies can no longer be tolerated.

Immediately introduce Certificates of Building Completion. The current system of RIAI/Law Society 'Opinions on Compliance' is inadequate and offers no protection to the Irish Consumer. Before any Building can be occupied, a Certificate of Completion must be issued by an Independent Technical Controller. The Certificate will include a check on compliance of the Building with relevant legislation, and a survey of its 'Real' Performance.

7 f) Sustainable Infrastructure & Engineering Works

Immediately introduce new, and/or strengthen existing legal requirements concerning engineering design 'flexibility' & 'adaptability' in order to extend and prolong Life Cycles.

Immediately incorporate into legislation ... Minimum Infrastructure/Engineering-Related Life Cycles ...

Structure

150 yrs.

Rapidly and with reliability, identify geographical 'Areas of Risk' in Ireland, e.g. coasts and all river basins, which will be prone to the more severe climatic conditions, e.g. coastal erosion and flooding, expected within the next 100 years. Only where sustainably viable ... engineering works must be commenced, now, to protect existing development in 'areas of risk'. Stringent spatial planning restrictions on inappropriate development must be introduced throughout the country.

7 g) Sustainable Service Utilities (Urban & Rural)

Immediately introduce mandatory planning, co-ordination, access, environmental protection, energy efficiency/conservation, and maintenance requirements to all service utility installations projects in Ireland, whether urban or rural.

Public Procurement Law must be immediately used as an effective tool to dramatically improve Ireland's Kyoto Process Performance. Revise the 2006 European Communities (Award of Public Authorities' Contracts) Regulations, Statutory Instrument No.329 of 2006, to include climate change adaptation performance as one additional criterion for inclusion in all Technical Specifications. The three existing criteria are: i) 'design-for-all', i.e. accessibility for people with disabilities; ii) environmental performance generally; iii) quality performance.

Inform the European Commission in Brussels that a proposal to further revise European Union Public Procurement Directives 2004/17/EC and 2004/18/EC should be immediately initiated.

8. Conclusions - Ireland in Europe

The timelag between the implementation of sufficient and appropriate corrective Climate Protection Measures and their resulting beneficial environmental impacts is too great and full of uncertainty. Such is the serious threat posed to Human Environment Progress and Social Wellbeing by current environmental degradation that Sustainable Climate Action in Europe and Ireland must be uniformly benchmarked at year 1990.

The immediate, concerted implementation of a radical and credible Strategy for Sustainable Human & Social Development (including climate change mitigation and adaptation, protection of biodiversity, eradication of persistent organic pollutants, etc.) will be a complex, phased, cyclical and iterative process; it will not be easy, and it will certainly involve short-term costs. To be gained in the third decade of the 21st Century, however, will be a leaner, more efficient and more competitive national economy, with a Construction Sector capable of effective operation at any level in the European Single Market ... and, in the fourth decade, positive progress in achieving Social Wellbeing - a general condition in our society of health, happiness, creativity, responsible fulfilment and sustainable development.

Recalling that direct and meaningful consultation with people, partnership between all sectors of Irish society, consensus, transparency, institutional openness, and political

accountability, are essential elements in social wellbeing for all - a Social Partnership is a collective of groups and individuals, i.e. the social partners, business, industry, civil society and experts, which acts as a 'catalyst' in enhancing and broadening implementation in an area of human and/or social policy. The Irish Construction Sector must actively participate in such a process of consensus building. At present, the Sector is perceived, by the public, to be an unethical and maverick vested interest which has been primarily responsible for the on-going dramatic implosion of the national economy.

To date, Ireland has not demonstrated any confident progress in achieving its European Union adjusted, 'burden-sharing' Kyoto Protocol Commitments. In comparison with its lead-role and principled position on Foreign Development Aid to Least Developed Countries ... Ireland's current Kyoto Performance can best be described as grudging and unethical; it is also being closely monitored by Developing Countries not listed in Annex B of the 1997 Kyoto Protocol. Foreign Development Aid must not be 'tied' to Ireland's Domestic Climate Change Strategy.

No benchmark exists for Kyoto GHG Emission Reductions in the Construction Sector, and Ireland cannot afford the time to establish such a benchmark before commencing implementation. A Reliable National Construction Database is essential. Fundamental Sectoral up-skilling, re-training and re-education at all levels, targeted at 'real' Climate Action implementation, must begin immediately. The construction 'crafts' must be properly revived and fostered.

Subsequent to a renewed, rapid and concerted national effort in Futures Studies ... harmonized and integrated short, near and long-term strategic plans in the policy areas

...

- Sustainable Human & Social Development ;
- Biodiversity and Natural Environment Protection ;
- Climate Change, including Extremes and Variations ;
- Eradication of Persistent Organic Pollutants (POP's) ;
- Energy Efficiency, Conservation & Replenishment in the Built Environment ;
- Waste Management ;

... must be specified for implementation over the following time frames:

- (i) up to 2020 ; (ii) from 2021 - 2035 ; (iii) from 2036 - 2100.

Detailed Performance Indicators, both quantitative and qualitative, for all stages of spatial planning, design, construction/de-construction, management, operation, maintenance/servicing and disposal must be used to target improvements in construction related sustainability performance and to reliably verify target attainment. Targets must be continually reviewed, re-adjusted and improved at regular intervals of 3 to 4 years.

A reliable Sustainability Impact Assessment (SIA) must be undertaken for any proposed construction activity which is likely to have a significant adverse or damaging impact on the environment or the social wellbeing of a community; such an assessment must be subject to proper monitoring and control by competent authorities and institutions in Ireland and the European Union.

To be of value, and lasting benefit to ourselves and others ... Ireland's legal Climate Change commitments to the European Union and its ethical/legal duties to the global community of nations and peoples, under the UNFCCC Framework, must be placed within the more coherent, comprehensive and holistic concept of 'Sustainable Human & Social Development. Climate Change Mitigation Efforts are failing here (and elsewhere !); the current economic downturn merely camouflages that unpalatable fact. Climate Change Adaptation rules !!

Appendix A

Climate Change Adaptation or Mitigation ?

The Copenhagen Accord was a political agreement between a small number of Heads of State, Heads of Government, Ministers, and Heads of Delegation from Brazil, South Africa, India and China (BASIC) and the USA ... who attended the UNFCCC Climate Change Summit in December 2009. At the time of writing, many countries have made voluntary submissions, i.e. not legally binding, to Appendices I and II of the Accord.

A general overview of the submissions made by Developed Countries, however, reveals the following about the emissions targets being undertaken ...

- they are highly conditional on the performance of other countries ;
- they are very disappointing, being far below what is required to cap the planetary temperature rise at 1.5 degrees Celsius; and
- there is no consistent emission base year ... varying from 1990, 1992, 2000 to 2005.

This is very far from being a signal of serious intent from Developed Countries ... and is not ... in any way, shape or manner ... an acceptance of historical responsibilities. It would be reasonable, therefore, to surmise that the process of achieving a global, legally binding, consensus agreement on greenhouse gas (GHG) emission reduction targets will be long and difficult. The Climate Change Mitigation Agenda is, to put it mildly, fraught with problems ... and has an unclear future in the short term.

On the other hand, anyone involved in the design, construction, management or operation of the Built Environment must think 'long-term' ... the minimum life cycle for a sustainable building must be at least 100 years. Today in Dublin, buildings which are 250 or 350 years old still look remarkably good, and are well capable of fulfilling an important function within the social and economic environments of the city. 'Politically' and 'technically', therefore, it would be more appropriate for the built environment if we were concerned with the long-term Adaptation Agenda ... rather than a problematic, short-term Mitigation Agenda. But, in terms of a building, is there really a clear difference between measures undertaken for the purpose of mitigation and those implemented for adaptation ? For example, measures to incrementally improve energy efficiency and conserve energy, in accordance with short-term legally binding targets, will serve to mitigate CO₂ emissions ... but the same measures will also serve to adapt the building to rapidly dwindling supplies of climate-damaging fossil fuels. The long-term perspective will exert pressure for more radical actions in the short-term.

Generally ... Climate Change Adaptation encompasses urgent and immediate short, near and long-term actions at local, national, regional and international levels to reduce the vulnerability and strengthen the resilience of the Human Environment, including ecological and social systems, institutions and economic sectors ... to present and future adverse effects of climate change and the impacts of response measure implementation ... in order to minimize the local threats to life, human health, livelihoods, food security, assets, amenities, ecosystems and sustainable development.

More specifically ... Built Environment Climate Change Adaptation means reliably implementing policies, practices, projects and institutional reforms in the Built Environment ... with the aim of reducing the adverse impacts and/or realizing the benefits directly/indirectly associated with climate change, including variability and extremes ... in a manner which is compatible with Sustainable Human and Social Development.

Climate Change Adaptation is one of the most important drivers for Sustainable Design !

Appendix B

Sustainable Residential Buildings

[Refer back to Paragraph #7 e) ii) in the Text]

Sustainable Design Solutions ... are 'person-centred' and 'reliability-based' ... and must be appropriate to **Local** geography, social needs, climate and climate change (including future extremes and variations), economy, culture, language/dialect, etc.

Climate Action, i.e. Climate Change Mitigation and Adaptation Measures, is more cost-effectively implemented ... and operates more efficiently ... when integrated into a wider, more comprehensive 'sustainability' package which facilitates synergies in further improving positive impacts on Individual Welfare, Social Wellbeing and the Human Environment.

Sustainable Residential Buildings ...

1. Have a **Minimum Life Cycle of 100 Years** ... and are **Structurally Robust** ;
2. Are shown to be **Fit for Their Intended Use**, in the Location of Use ... by CE Marking, using European Norms & European Technical Approvals (refer to Part D of the Irish Building Regulations and similar requirements in other European national building codes, European Union Safety at Work and Product Liability Legislation) ;
3. Are **Intelligent**, Electronically Mature and facilitate Remote Building Management ;
4. Are **Flexible** and **Adaptable** with regard to internal layout, and **Accessible** for people with activity limitations - in order to prolong building life cycle ;
5. Are **Super Energy-Efficient**, with negligible thermal bridging and accidental air seepage ... and encourage building users, by design, to **Conserve & Replenish Energy** ;
6. Offer a high level of **Indoor Air Quality (IAQ)** ... including protection from **Natural Radon** (Rn-222, Rn-220 and RnD), and elevated levels of **Carbon Dioxide** (CO₂) ;
7. Have a substantial component of **Renewable Energy & Heat Technologies** ... sufficient to return a multiple of the building's energy consumption to an intelligent district or regional grid (Positive Energy Buildings) ... and incorporate **Recycling, Rainwater Re-Use & Waste Management Technologies** ;
8. Have installed, as standard, a Monitored Fire/Smoke/Heat Detection System and a Sprinkler/Mist Suppression System ... including protection from **Carbon Monoxide** (CO) ;
9. Are set in **Sustainable Landscaping** ... have sustainable drainage installed throughout ... and exhibit a considered relationship between interior spaces and the external environment ; and
10. Are competently built and reliably completed to project programme and cost plan ... with **'Real' Performance-in-Use Measured, Reported and Verified (MRV)**.