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Applying the scenarios method to project future Irish GreenHouse Gas emissions to 2020

Tadhg O' Mahony
tadhg.omahony@dit.ie

Dr. Kirk Shanks, Prof. John Ratcliffe and Prof. John Sweeney

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DUBLIN INSTITUTE OF TECHNOLOGY

Overview

1. Introduction and context
2. Emission Scenarios
3. Research Methodology
4. Energy CO_2 scenarios Ireland 2020
5. Results synthesis
6. Additional work
7. Conclusion

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Introduction and context

‘Not everything that counts can be counted, and not everything that can be counted counts.’

Albert Einstein

- Smil (2005) innovations in complex modelling
- Prediction…Cheshire and Surrey (1975) computation becomes a substitute for understanding
- Modelling record repeatedly questioned Craig et al (2002), Linderoth (2002), Smil (2000), O’ Neill and Dessai (2003), IPCC TAR (2001)
- Example: Linderoth (2002) difficulties even when forecast year close to review year
- Smil (2000) advocates moving from detailed quantitative point forecasts to exploratory scenarios
- Dynamic complex system evolution…uncertainty

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Emission scenarios

- Engage with uncertainty and broaden examination of complex inputs to modelling
- Consider unknowns and knowns with uncertain outcomes
- IPCC, IEA, UNEP, EEA advocate using scenarios
- Complex evolution cannot be captured by modelling alone
- Scenarios in the literature focus on energy CO_2, due to relative contribution and uncertain development
- Emission scenarios now being developed more at national level
- The aim is to develop alternative plausible futures
- Propose using scenarios as basis for short and medium term forecasts

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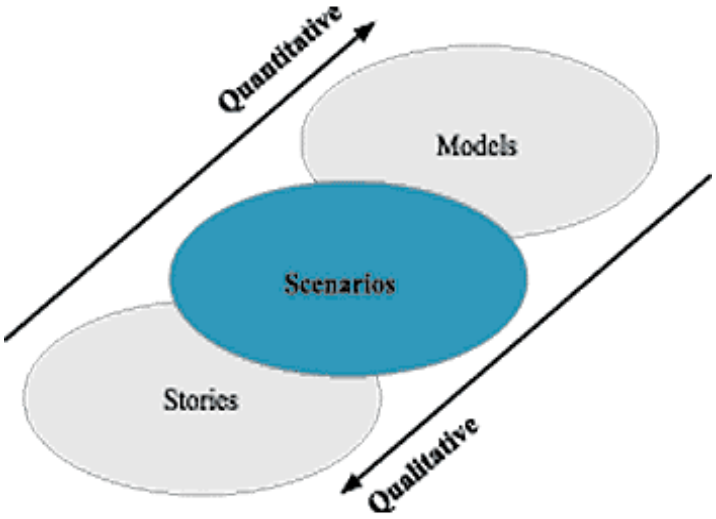
Research Methodology

- First energy/ CO2 scenarios for Ireland
- Methodology see e.g. Nakićenović et al (2000), Ringland, (2002), EEA (2000)
- Quantitative and qualitative
- Expert workshops, horizon scanning of literature and projections, strategic conversations, historical pattern
- Drivers and interactions
- Qualitative scenario narrative
- SRES proposed IPAT/ Kaya identity as framework to establish drivers
- Decomposition analysis to quantify scenarios to 2020
- LMDI explores effects and totals



(Nakićenović *et al*, 2000)

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Research Methodology

Decomposition Analysis

- Index decomposition analysis (IDA) to quantify ‘effects’ in observed change
- Log Mean Divisia Index (LMDI I) preferred method (Ang, 2004)
- Perfect decomposition (leaves no residual) and other desirable properties
- Energy emissions key effects: fuel share, energy intensity, affluence, population, emissions coefficient
- Factorises changes over time
- UNFCCC (2004) Dublin workshop on NC4’s decomposition analysis to understand drivers for development of PAM’s
- This research uses LMDI I chain-linked from 1990-2006

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Research Methodology

Projection through decomposition

- Ang and Zhang (2000) propose projection as next advance in IDA
- Benefits:

1. Looks at changes in effects and absolute change
2. Results relevant to PAM's, strategic insights, as per scenarios
3. Illustrates uncertainty range
4. Critique and support traditional modelling

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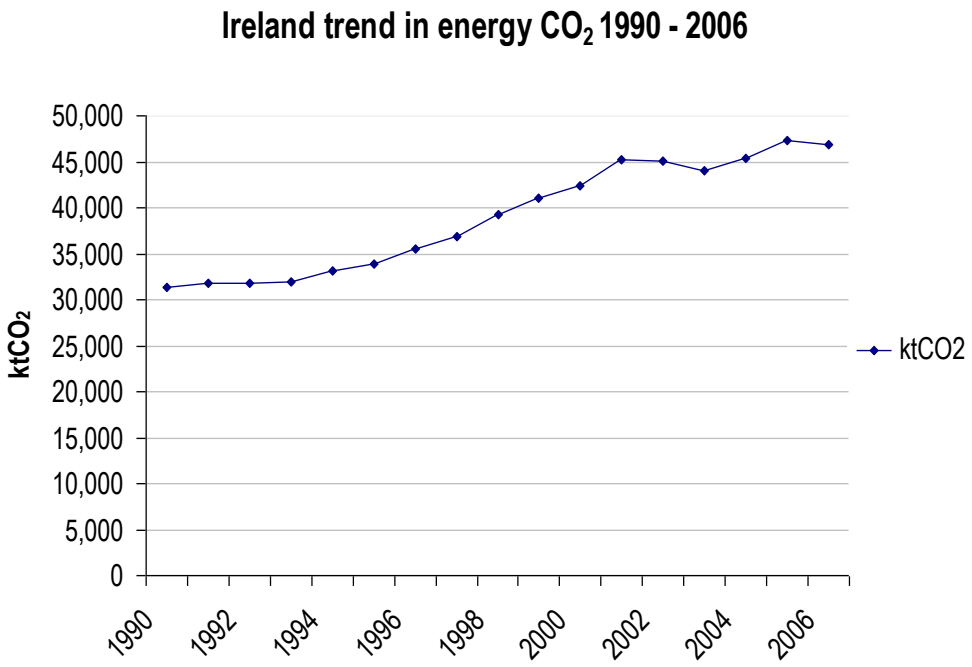
Results



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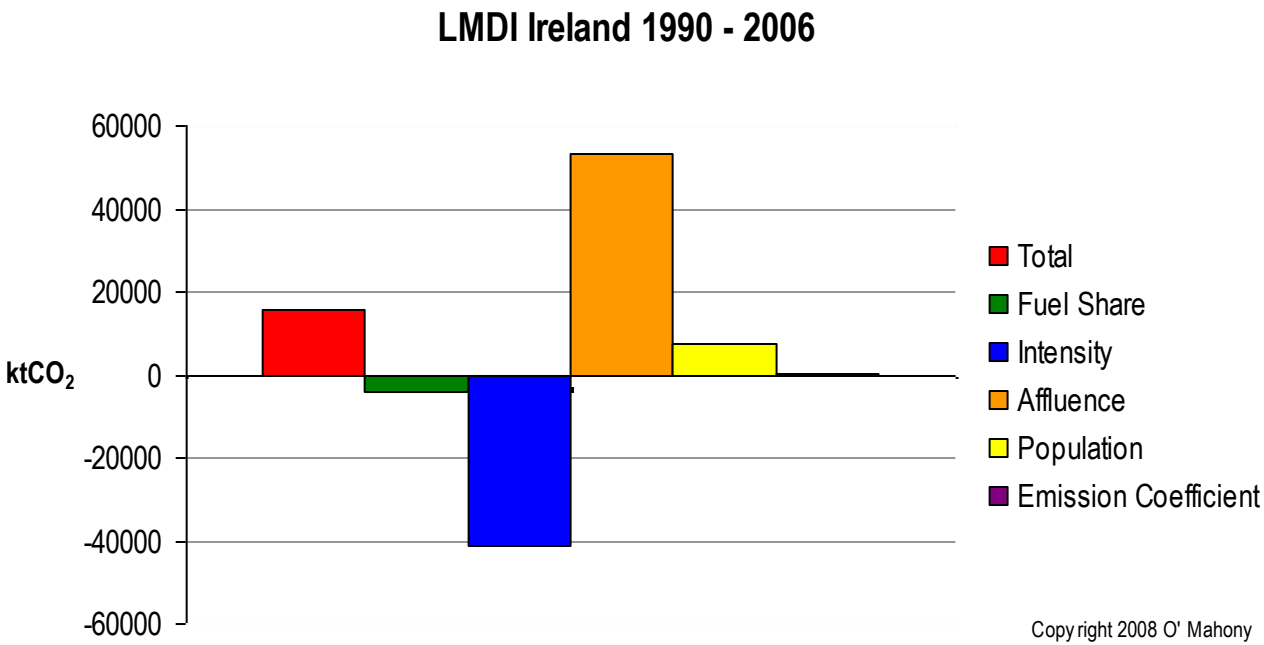
Results



Energy CO_2 Scenarios for Ireland 2020

- Scenarios are neutral, exploratory and baseline
- No new policy developments post 2006
- Pivotal uncertainties economic growth and ‘development path’
- Related to but not identical to SRES
- Tables of change in key drivers
- Change in model inputs
- Scenario matrix…

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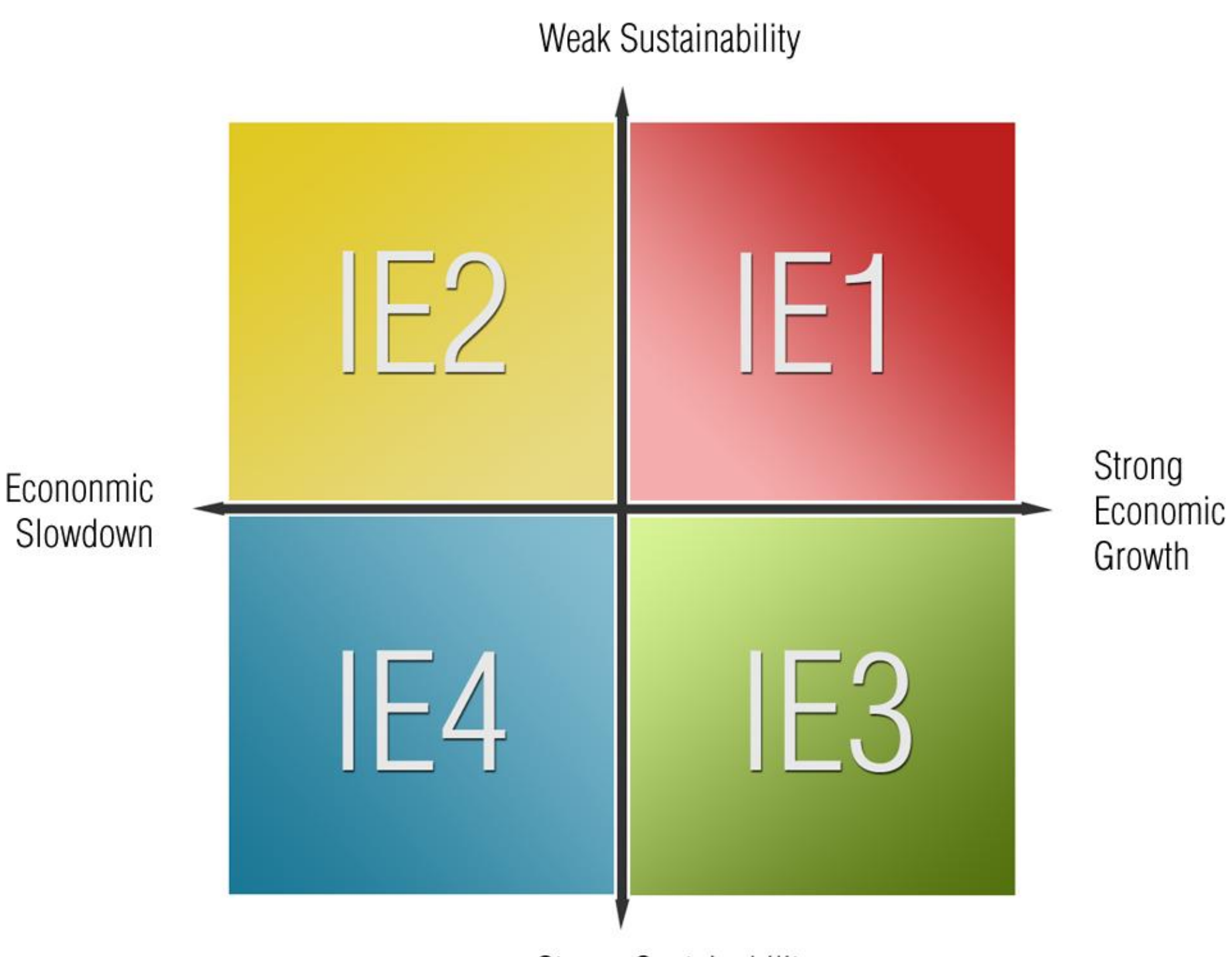
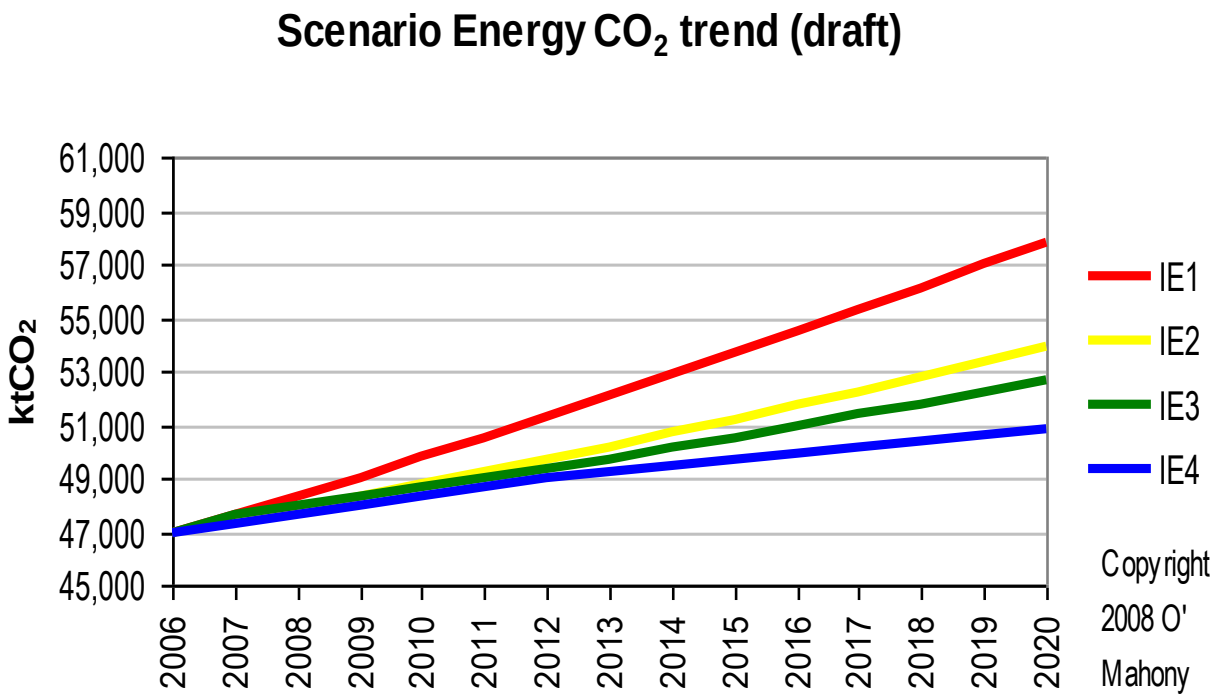
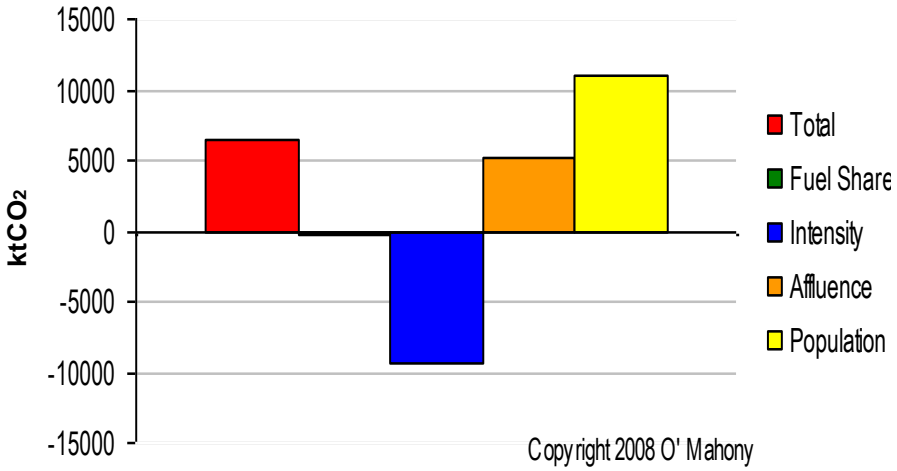

Weak Sustainability
IE2
IE1
Econonmic
Slowdown
Strong
Economic
Growth
IE4
IE3

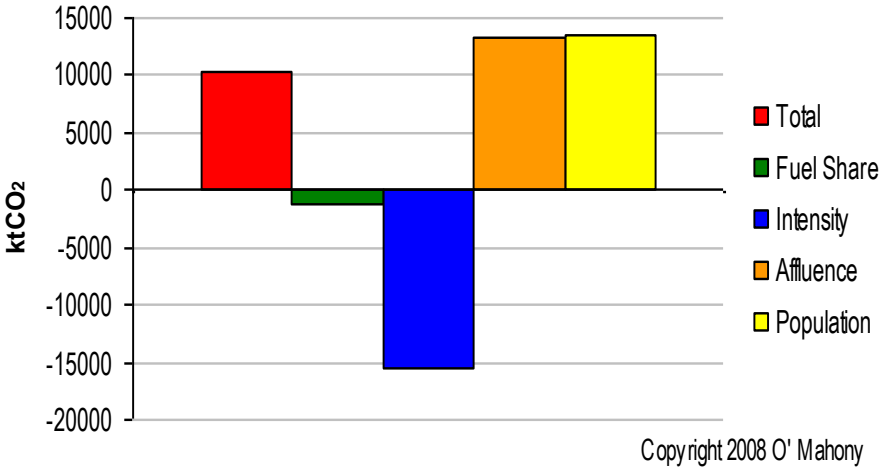
Energy CO_2 Scenarios for Ireland 2020



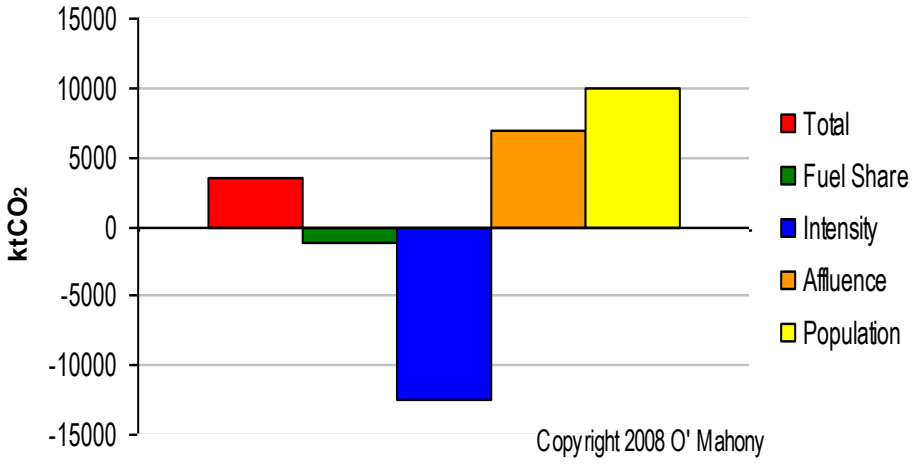
Scenario IE2 2007-2020 (draft)



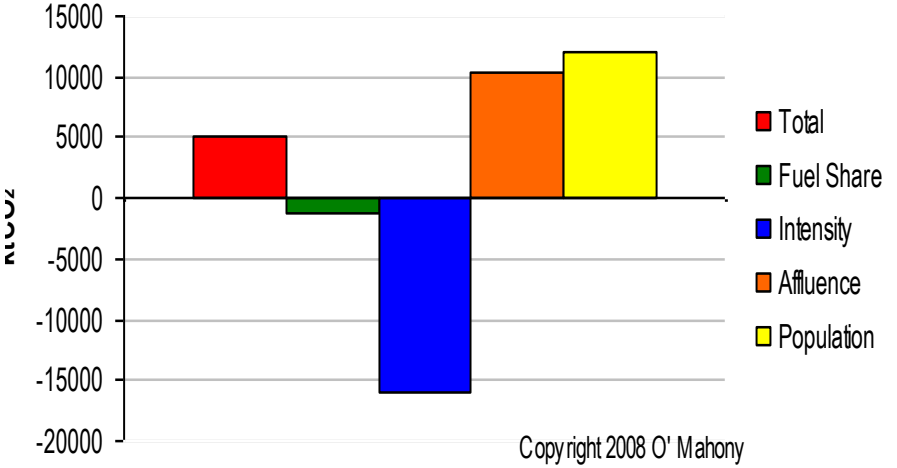
Scenario IE1 2007 - 2020 (draft)



Scenario IE4 2007 - 2020 (draft)



Scenario IE3 2007 - 2020 (draft)



Results

- Different paths can yield similar results as proposed by SRES
- The influence of different effects changes considerably
- Ireland's future development path considerably different from the historical pattern
- Energy demand and CO_2 emissions rise under all scenarios
- Significant difference in emissions in scenarios growth of 9% to 21%
- Policy must be prepared for alternative futures

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Additional Work

- Scenarios (expert workshop feedback, strategic conversations etc.)
- Refining drivers and interactions
- CO_2 data
- Extend model to sectors
- Policy effects
- Modify model results
- Expand to other GHG's
- Mitigation analysis

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Conclusion

- Medium-term projections have significant potential for uncertainty in both totals and underlying effects
- Strong case for exploratory scenarios for medium-term national projections
- Illustrated by variation in results
- Innovation in the field, national scenarios and decomposition analysis
- Complex elements explored by scenario narrative
- May have advantages over more complex modelling
- Explicit ‘assumptions’
- LMDI yields strategic insights as projection model
- Ease of use and understanding
- Good scenarios and simple model more useful than bad assumptions and a complex model?

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Thank you to supervisors Dr. Kirk Shanks, Prof. John Ratcliffe and Prof. John Sweeney.

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Thank you for listening! Questions and comments welcome…

Tadhg O' Mahony
The Futures Academy,
Research Room C32,
Zhivago Building,
Dublin Institute of Technology,
69-73 Capel Street,
Dublin 1,
Republic of Ireland.

Tele: +353 1 402 2992
Fax: +353 1 402 3699
Web: www. Thefuturesacademy.ie
Email: tadhg.omahony@dit.ie