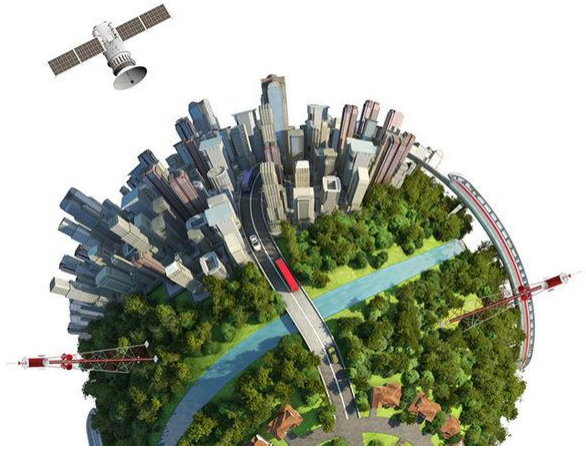

Mitigating for Climate Change: The need for 'climate smart' cities

Rowan Fealy & Gerald Mills

Maynooth University &
University College Dublin

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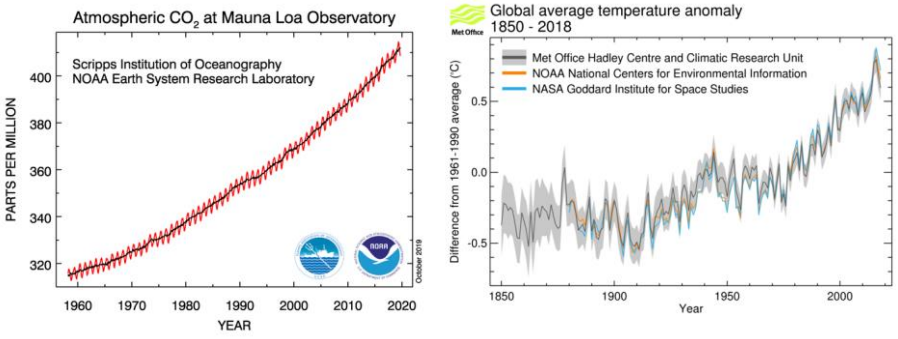
1. Global climate change science



- *Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.*
- *Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia.*

IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp

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Projected Global Climate Changes

Phenomenon	Direction of trend
Temperature	Warmer and/or fewer cold days and nights over most land areas.
Precipitation	Increased seasonality of precipitation. Increase in the frequency, intensity and/or amount of heavy precipitation.
Sea level	Increase in sea level. Increased incidence and/or magnitude of extreme high sea level.

Climate models are used to make projections about the global climate of the future. These models cannot provide detailed projections at local scales but they do simulate the regional climates.

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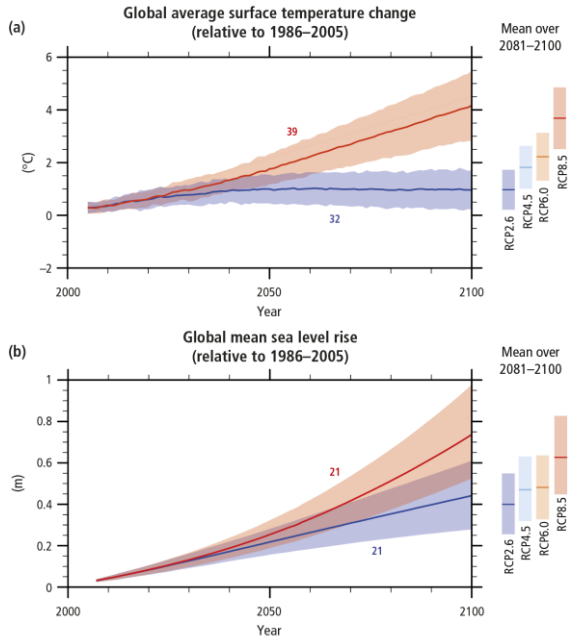

Climate Projections

Global models are used to estimate the future climate system based on emission 'scenarios' that describe different pathways resulting in different levels of greenhouse gas (GHG) emissions.

The lowest pathway (RCP2.6) stabilizes the expected global temperature increase and limits the sea-level rise. The highest pathway (RCP8.5) results in a global temperature increase of 4°C and a sea-level rise of 0.7 m.

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International Policy response

United Nations
Framework Convention on
Climate Change

Article 2 - UNFCCC (1992)
"The ultimate objective […] is to achieve […] ***stabilisation of greenhouse gas concentrations*** *in the atmosphere at a level that would* ***prevent dangerous anthropogenic interference*** *with the climate system"*

Article 2 – Paris Agreement (2015)
"Holding the increase in the global average temperature ***to well below 2ºC above pre-industrial levels*** *and pursuing* ***efforts to limit to limit the temperature increase to 1.5 degrees Celsius above pre-industrial level****, recognising that this would significantly reduce the risks and impacts of climate change"*

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

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2. Climate Change & Cities

The IPCC fifth assessment (AR5) reported that urban climate change risks are increasing, and identified that "*much of the key and emerging global climate risks are concentrated in urban centres*"

For historical reasons, cities globally have a pre-existing exposure to weather and climate related hazards due to the their low lying location, along rivers and adjacent to the sea

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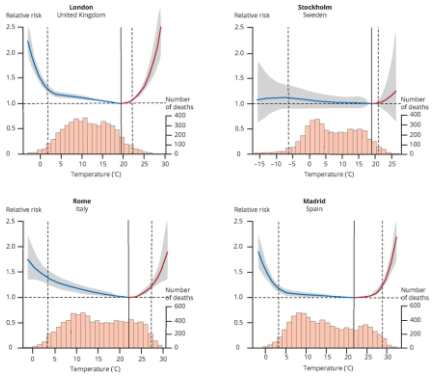
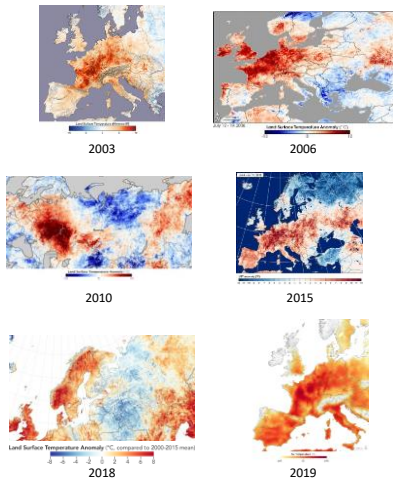
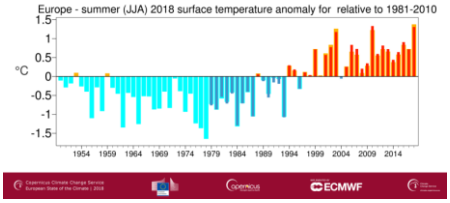


Relationship between temperature and mortality for a selection of European cities





Changes in extremes have a disproportionate effect compared to changes in the mean

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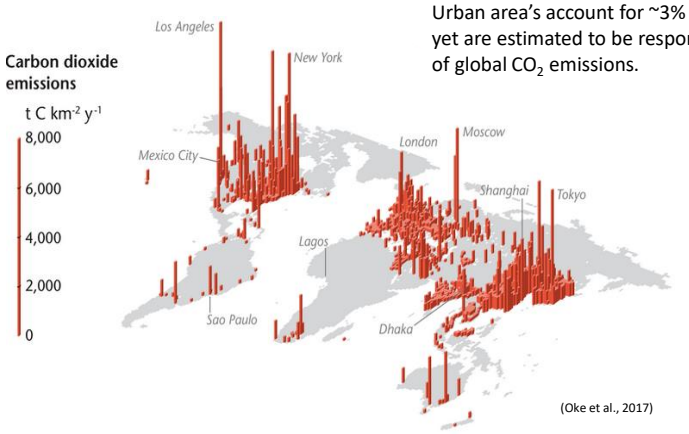

Urban area's account for ~3% of the Earth's land area yet are estimated to be responsible for more than 70% of global CO_2 emissions.

(Oke et al., 2017)

Carbon emissions in metric tonnes 2010

Cities have a key role to play in managing global climate change. They are significant sources of (current and potential future) GHG emissions (mitigate) and they are especially exposed to the projected changes in the climate, associated with increased flooding, sea level rise, temperature extremes etc. (adapt).

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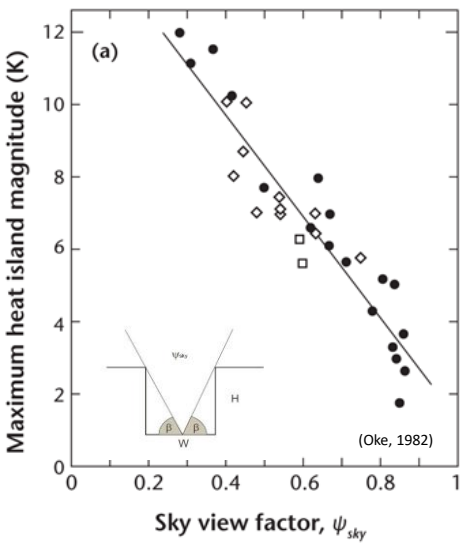
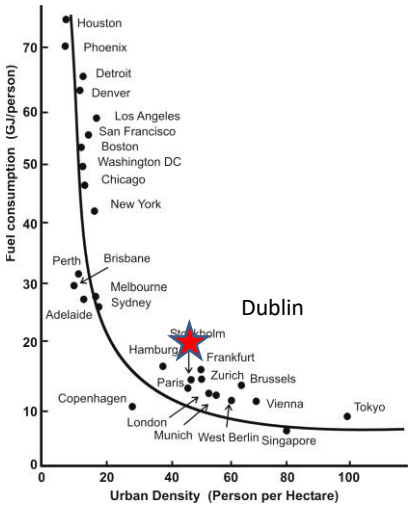
Mitigation





Source: Newman PG, Kenworthy JR (1989) Cities and Automobile Dependence: an International Sourcebook, Gower Technical, Aldershot

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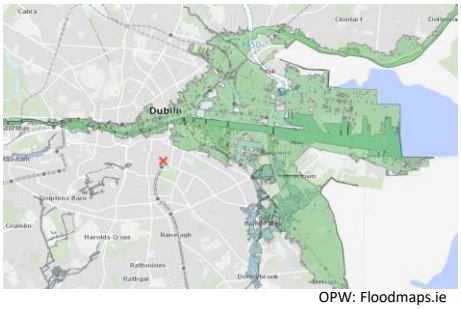
Adaptation



OPW: Floodmaps.ie

Clonmel: engineersjournal.ie

The simplest strategy is to limit exposure to natural hazards through land use management that employs 'natural' services. For example, not building in floodplains.

Once built, adaptation is more difficult. It could include 'strategic withdrawal' from places or investing in protective infrastructure.

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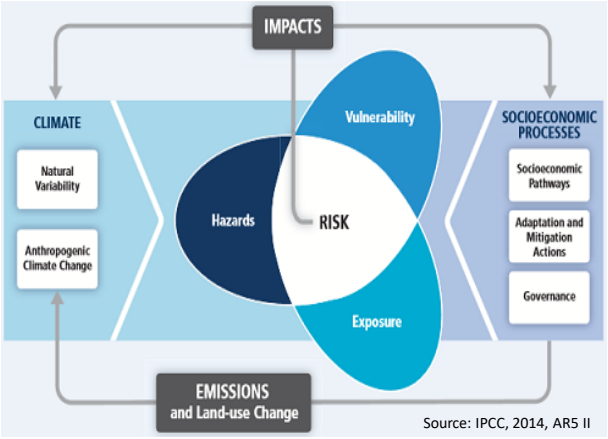
3. Integrated Climate Risk Management



Much of climate change impacts are discussed in the framework of disaster risk management. Risk lies at the intersection of hazards, exposure and vulnerability. Assessing the risk (what/where) should guide responses.

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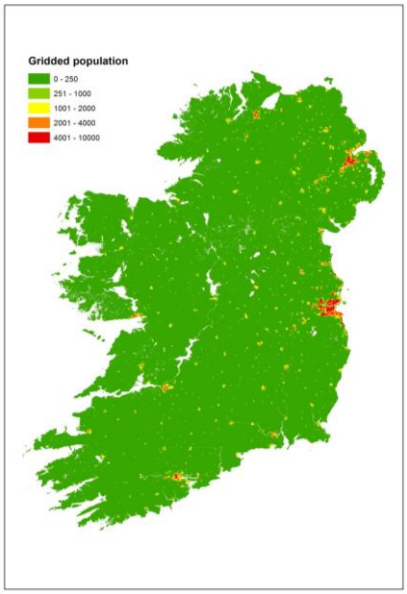
The population of Ireland is highly concentrated in and around a few urban areas, most of which are located close to the coast.

These places are ideally suited to *spatially focussed* policies that address climate change, which would yield other economic, social and environmental benefits.



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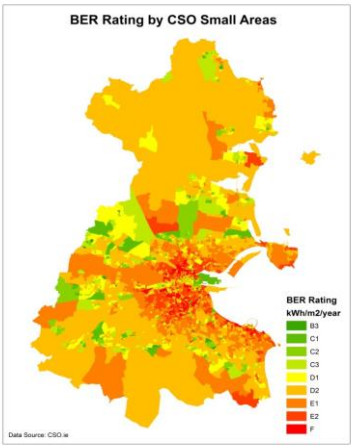
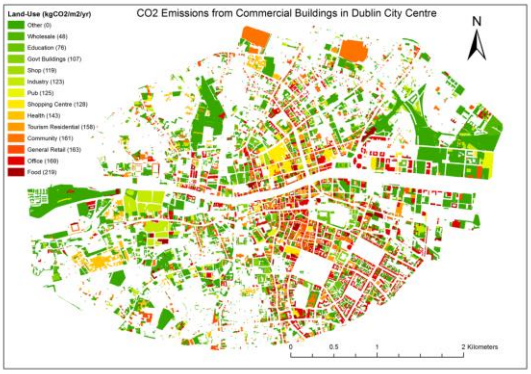
Mitigation
Geographic GHG inventory





(Flattery, 2014)

The largest sources of GHG emissions in Dublin (both directly and indirectly) are associated with building energy use (35%) and the commercial (33%) and transport (25%) sectors. Each has distinctive geographies that should direct actions.

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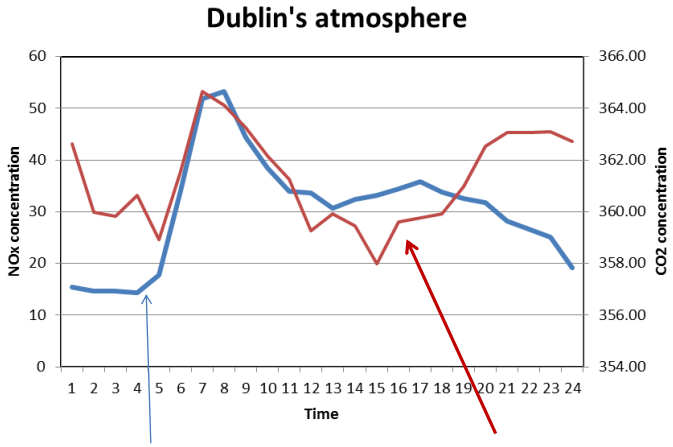
Co-Benefits



NOx is a pollutant generated by traffic. Its diurnal pattern shows the flow of traffic into and out of the city centre.

CO_2 is emitted from traffic, buildings and industry. It is also consumed by vegetation.

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Conclusions

- Addressing mitigation and adaptation within the context of climate change will become a normal part of the planning process.
- Many of the mitigation strategies can yield significant co-benefits to other areas (e.g. air quality, greener communities).
- An essential part of any strategy is to develop an inventory of GHG emissions at an appropriate scale to guide intervention.
- Identifying policies that can both mitigate and adapt should be prioritised.
- Local authorities have greatest influence in the area of land use management.

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