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Climate Change: Implications for the Built Environment

Dr Geoff O'Brien (Former Lord Mayor of Newcastle upon Tyne)



The 1st international Conference on Sustainable Buildings and Structures &
The 2nd Low Carbon Construction Industrialization Forum 30th-31st October 2015
@Xi'an Jiaotong-Liverpool University, Suzhou

Climate Change and the Built Environment

Accelerated climate change and increasing variability is the single greatest threat to Sustainable Development and the Millennium Development Goals.

Two recent reports (IPCC “AR5” and Royal Society “Resilience to Extreme Weather”) highlight huge threat of climate change to people and built environment.

Over half of the global population live in cities – this trend will continue to rise .

Many cities are located in vulnerable areas such as coastal and estuarine locations.

There are huge uncertainties:-

Will there be a global agreement to mitigate GHGs?

Will we be able to avoid “Dangerous Climate Change”?

What conditions will we need to adapt to?

Climate Change and the Built Environment

Even if there is agreement AR5 fearful of overshoot! May require use of largely unproved Carbon Reduction Technologies (CRTs) such as Bio-Energy With Carbon Capture and Storage (BECCS)!

Broad categorises of threats:-

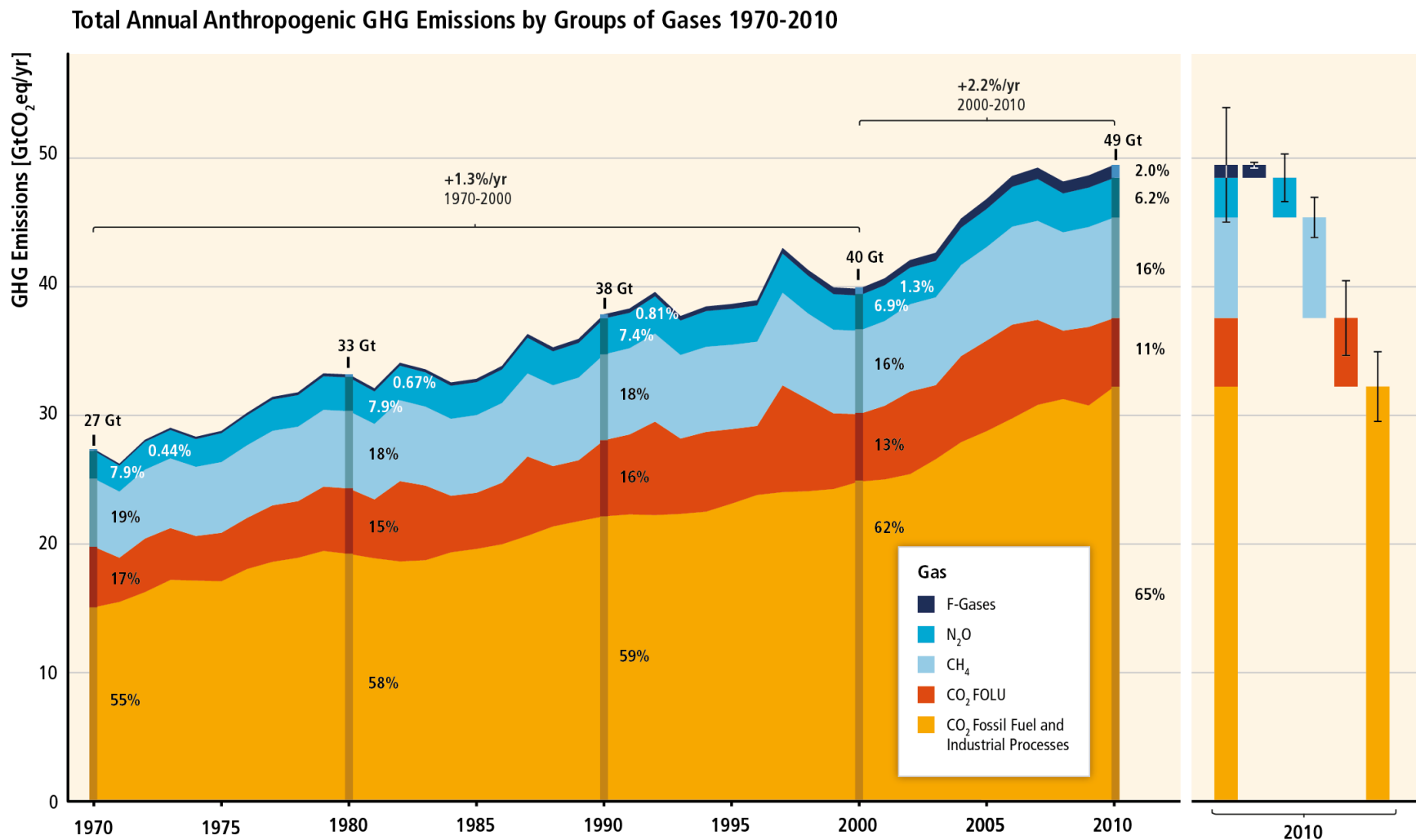
Rapid onset - storms, floods, wild fires, heat waves, epidemics

Slow onset – sea level rise, drought, loss of biodiversity

The success of any international climate agreement will depend on cities!

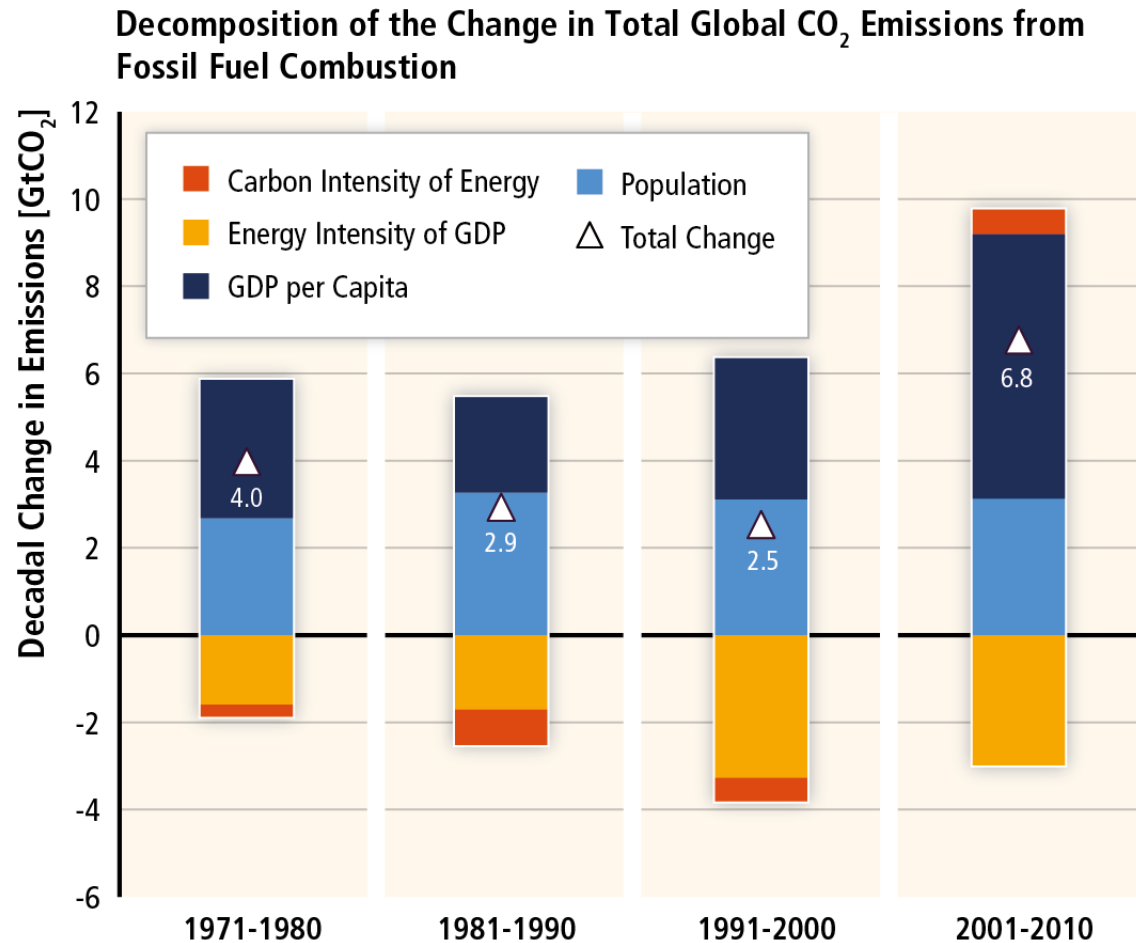
The scale of the problem is huge!

GHG emissions accelerate despite reduction efforts. Most emission growth is CO₂ from fossil fuel combustion and industrial processes.



Source: IPCC AR5 WG 3, 2014

GHG emissions rise with growth in GDP and population; long-standing trend of decarbonisation of energy reversed.



Source: IPCC AR5 WG 3, 2014

Cities

We love living in cities

They meet many of our needs – cultural, spiritual, intellectual, economic, leisure, etc ... but according to UNEP

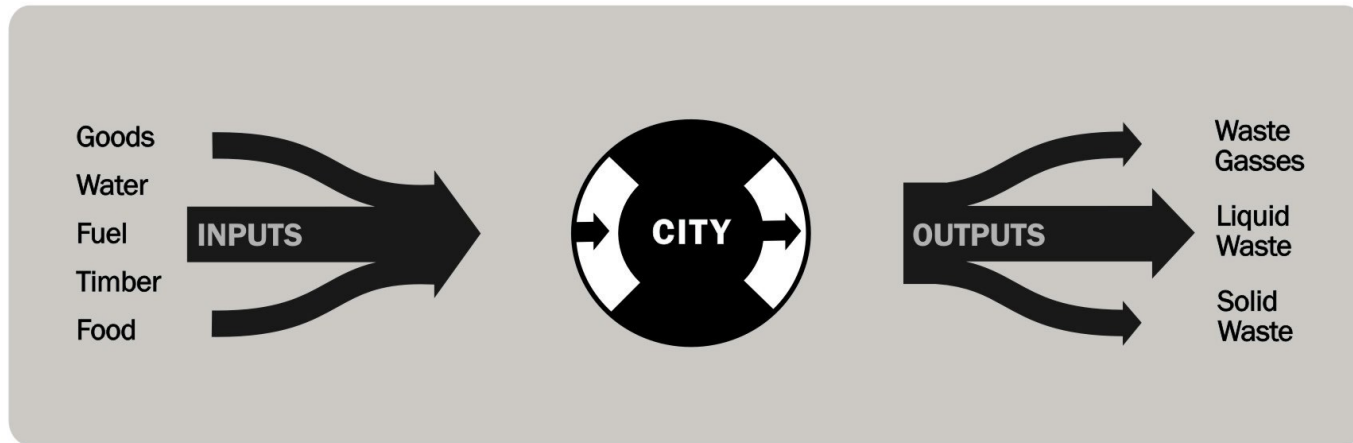
Cities occupy **3%** of land surface , produce **50%** of global waste, account or **60- 80%** of global GHG emissions, consume **75%** of natural resources and produce **80%** of global GDP.

Cities are very demanding and shape their environs – globalisation is re-shaping the planet!

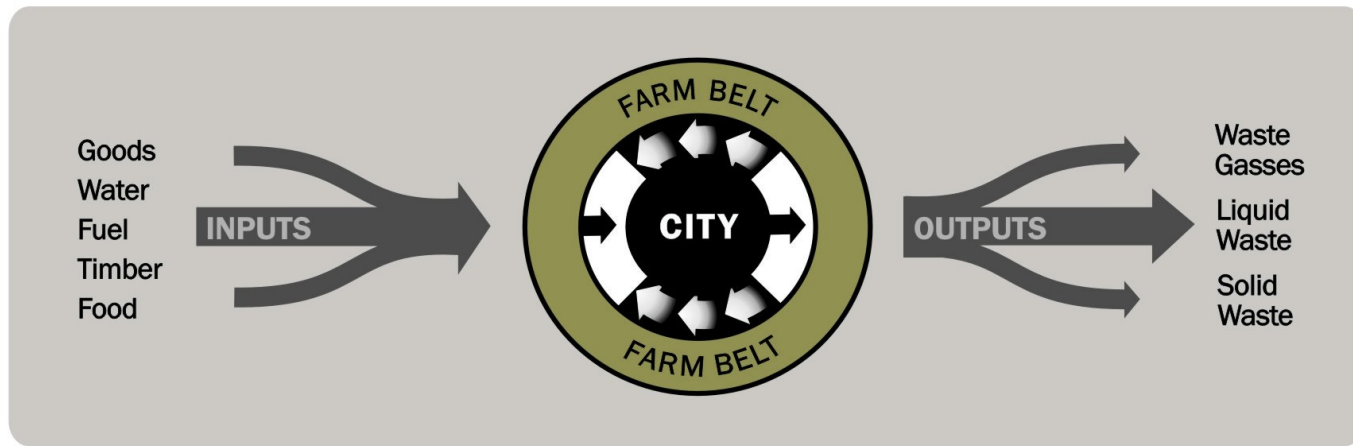
There has been efforts made in reducing the eco-footprint of cities by moving from a linear to a more circular metabolism – recycling, re-using, more efficient use of resources and so on

There have been attempts to reduce the eco-footprints of cities but

NOW: LINEAR METABOLISM



FUTURE: CIRCULAR METABOLISM



But is this sufficient?

Despite some progress the eco-footprint of OECD cities remains high.

IPCC AR5 posits increasing population and GDP has halted downward trend in energy use/intensity - a rapid shift to a low carbon economy is an urgent need if we are to remain below 2C average rise.

Cities will have to play a major role in mitigation and adaptation.

Circular metabolism approach is laudable but insufficient.

Cities need to be transformative!

In short they need to be producers as opposed to users!

What does transformation mean?

Cities have been described as humanity's "greatest work of art" (Mumford) and as "the human invention par excellence" (Levi Strauss)

Soja (2000) identifies three urban revolutions:

First about 8,000 years ago - origins of urbanization represented by Jericho and Catalhöyük;

Second about 5,000 years ago - the familiar Mesopotamian urban revolution (traditionally 'the first cities');

Third - the massive urbanization of the last 200 years associated with industrialization.

In my view we need a fourth revolution in order to effectively address climate change!!!
We need to re-think what we mean by the term "cities."

Defining Future Cities

There are many terms for defining future cities:-

Eco, Green, Environmentally Friendly, Smart, Sustainable and so on

None of these terms fully captures what is needed. Cities are about people. They need to address human well-being.

Cities need to meet human physical and psychological needs.

Terms like sustainability are vague and often misused and sometimes abused!

Cities need to serve us – not we serve them!

What does this mean?

In essence it means radically reducing city eco-footprint and urban sprawl and re-wilding.

Buildings need to be very energy efficient as well as energy producers.

Multi-use buildings.

Design needs to take climate risks into account (Dutch floating homes).

Relocation from dangerous areas.

Public transport and connectivity (do we need to travel as much?)

Encouraging biodiversity by freeing up as much land as possible (a healthy global ecosystem provides many services we need and meets many of our spiritual and aesthetic needs)



Areas we need to focus on:

Vertical farming

A 30 storey building with a 2 hectare base base would yield an annual crop equivalent to that of 1000 hectares of conventional farming!

Lifestyles – Chatham House research into beef claims the industry emits the same amount of GHGs as the transport sector!

Should we all become vegetarians?

Cities are likely to look very different - Tiajin Eco-City



Transport is likely to be very different



The Challenge

Cities have become places of conspicuous consumption.

It seems that we value things more than each other or our planet!

We are both a very destructive and a very creative species.

We need to harness our creative talents to build cities that meet human well-being.

Cities are processes and our fourth urban revolution is developing a networks of cities that focus on well-being.

We need social and political innovations that can be diffused through city networks to curtail material growth by largely substituting today's myriad economic developments by myriad social developments.

This is a post-normal vision of a steady-state commercial economy with a vibrant creative society, operating through social-growing cities in dynamic well-being networks.

Climate change is a post normal problem and paraphrasing Einstein we cannot solve this with the same mind-set that created it!!!

In summary

Without transformative approaches to city development it is likely that we will not meet climate targets – the future could be very nasty!

Cities need to have a small eco-footprint!

We need to make space to increase biodiversity

Care will be needed when assessing risk – design should take this into account!
No standard design!

Should not be afraid to take hard decisions – relocation!

Lifestyles are crucial – we need to think and do differently!

My challenge to architects and planners – do not be afraid
of being different!

Thank You!!