

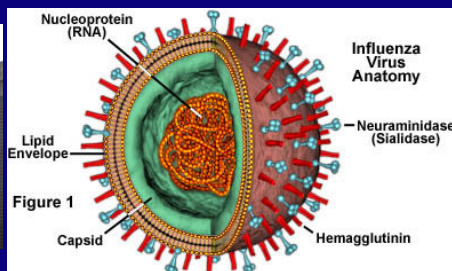
# The Challenge of Sustainability

Peter C. Doherty,

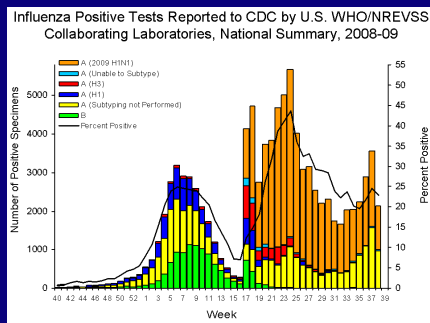
Dept of Microbiology and Immunology

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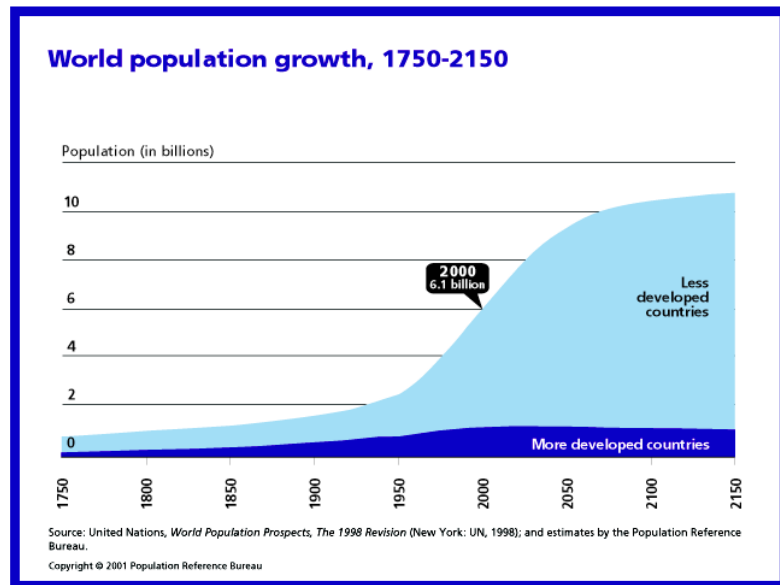


Science identifies problems and, with technology, can provide some solutions.



But, without cultural adaptation, and a commitment to long-term planning those solutions can create new problems.

# The global challenge: Human Population Size



The 6-fold rise in numbers can be attributed in part to science...sanitary science gives cleaner water and food...vaccines limit childhood mortality and increase animal production... antibiotics ...the “green revolution”

Some of this is coming unstuck: mechanised farming has depleted aquifers and degraded soils....problems of eg antibiotic resistant TB are of real concern...

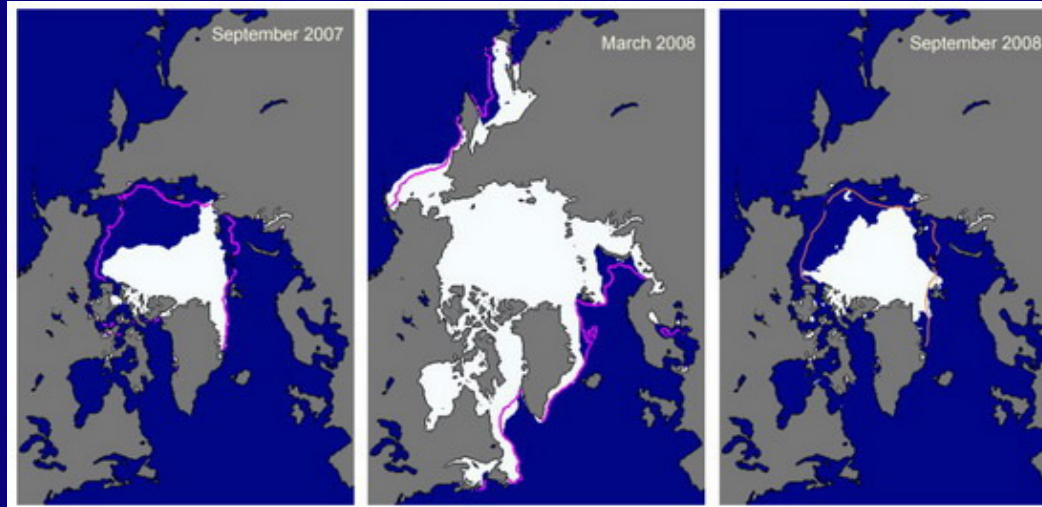
# Population size for Australia

Though it might indeed be wise to stabilize population size, I don't think this is going to happen anytime soon.

My personal guess is that with inundation, at first for some of the Pacific Islands then, perhaps, Bangladesh, this land mass is going to end up accommodating a lot more people

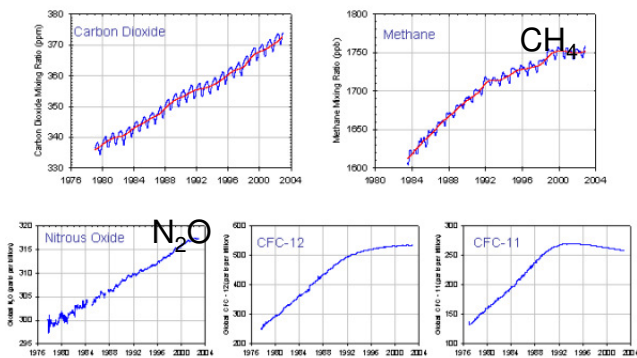
We need to design our cities to cope with that, without ever-increasing urban sprawl and chewing up arable land. Food availability may be our biggest challenge for the future.

# Green house gas emissions and climate change



<http://www.arctic.noaa.gov/reportcard/seaice.html>

## Global Trends in Major Greenhouse Gases to 1/2003



Global trends in major long-lived greenhouse gases through the year 2002. These five gases account for about 97% of the direct climate forcing by long-lived greenhouse gas increases since 1750. The remaining 3% is contributed by an assortment of 10 minor halogen gases, mainly HCFC-22, CFC-113 and CCl<sub>4</sub>.

## Carbon dioxide emissions - 2002

**Description** : Carbon dioxide emissions: Anthropogenic carbon dioxide emissions stemming out from the burning of fossil fuels, gas flaring and the production of cement

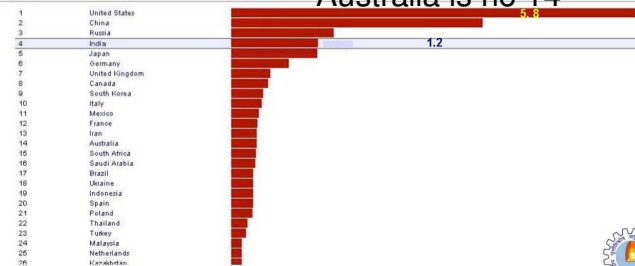
**Source** : UN Common Database (CDIAC)

**Category** : Environment

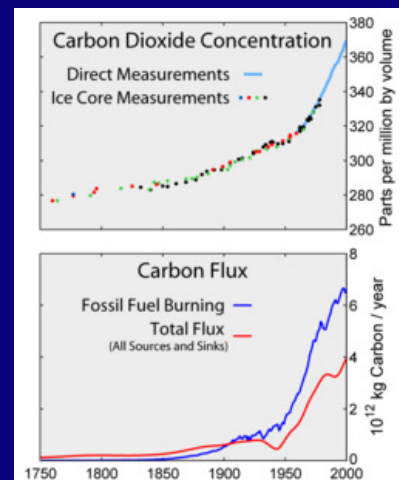
**Year** : 2002

**Units** : Giga Metric Tons

Bar chart



Australia is no 14





## The Thames Flood Barrier

In the 1980s there were 4 closures, 35 in the 1990s, and 75 in the first decade of the 21<sup>st</sup> century

**NOAA, NASA & UAH Agree: 2010 tied (with 2005) for (globally) the hottest year on record. According to NOAA, the past decade was the warmest on record. Much of the heat is going into the oceans.**

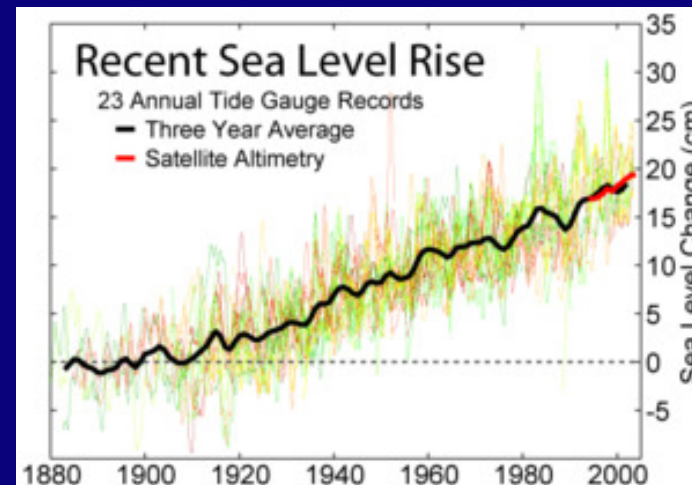


The Whitechuck glacier has retreated 1.9 km since 1973

We may find ourselves living on a much wetter planet

Predictions concerning sea-level rise through the 21<sup>st</sup> century: IPCC..maximum of 0.66 metres, based on temperature induced expansion of the oceans, but not taking ice-melt into account.

Other estimates range from 0.09 0.88 metres. Storm surge is a factor when considering these figures



Human beings have been around for at least 200,000 Years. Hopefully, we will continue beyond the end of 21<sup>st</sup> century.

Anthropogenic climate change: My reading of this situation is that >95% of active, publishing climate scientists believe that we are heading into dangerous waters.

But, even if you don't agree with that:

The precautionary principle applies

This states that: if an action or policy has a suspected risk of causing harm to the **public** or to the **environment**, in the absence of **scientific consensus** that the action or policy is harmful, the **burden of proof** that it is *not* harmful falls on those taking the action. **The application of this principle is a statutory requirement in the EEC**

The global challenge is to **build a sustainable world**, but this is an issue of enormous complexity as it involves many different cultures and threatens a myriad of powerful, vested interests.

This is a big enough problem when we narrow that  
To ask: How do we plan for and implement **a sustainable Australia?**

The cities are a big part of that, nationally and internationally.

As stated by microbiologist Rene Dubos:  
**THINK GLOBALLY ACT LOCALLY**

# Megacities versus decentralization?

For the very long term, should we be thinking about putting as much urban development as possible at least 20 metres, and maybe 100 metres, above sea level.

With modern communications technology, including fibre networks and enhanced wireless, the main obstacle to decentralization would seem to be access.



Links between cities by high speed rail

## Decentralization 2: Water.

Victoria could think in terms of the substantial expansion of, say, areas of Geelong, Warnambool and Portland. All could have local desalination plants.

Once we move inland, though, there could be long-term issues with water availability

As Toowoomba showed us, if we are indeed moving into an era of increasing severe, and unpredictable climate events, even cities at high altitude can be flooded if the design compromises floodplains

## Sewage

In the latest flooding, many sewage plants were inundated and ceased to function.

If we are not going to drink recycled sewage, then all new developments need to have a third pipe system.

Big cities set high can get into a disastrous situation with sewage disposal. Consider what is happening in Mexico City

# Energy

We lost sight of the fact that energy generation is massively polluting when we stopped burning coal in the cities and relied on rural power-plants

Can we design our cities so that they produce more of their own power?

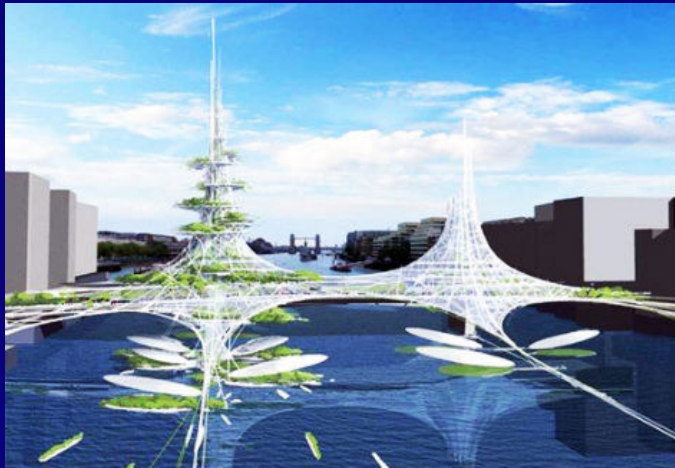
Burning waste to generate power is still less polluting than putting it in landfills, unless we harvest the  $\text{CH}_4$  from these sites.

Waste to  $\text{C}_2\text{H}_6\text{O}$  (ethanol)...



Solar Tower  
Chicago

Greening our cities: if we are going to have people living at higher density, we need to provide safe (especially for children) pleasant, public spaces, without losing the heritage charm of our older cities



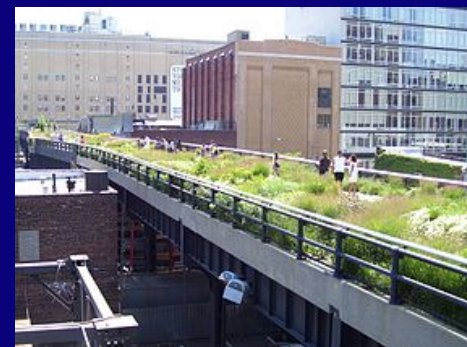
London Bridge

Notional urban farms that use solar to supply much of their energy



Singapore

Create parks across the tops of skyscrapers, or running above roadways



Building ecologically sustainable cities will draw on our creativity, provide opportunities for investment and require both skilled and unskilled labour.

Nonetheless, those who have no imagination and benefit from staying with old ways of operating will feel threatened and, as such established operations can control great wealth, may constitute a major barrier to progress.

As we move forward to create sustainable cities, we must work at building and maintaining community (ie political) support. We cannot assume that simply doing the right thing will lead to immediate acceptance.

**Involve the young from the outset, and build  
on the issue of:  
INTERGENERATIONAL EQUITY**



**This was first raised in 1916 by former  
Republican President Theodore Roosevelt**

The 'greatest good for the greatest number' applies to the number within the womb of time, compared to which those now alive form but an insignificant fraction.

**Our duty to the whole, including the unborn generations, bids us restrain an unprincipled present-day minority from wasting the heritage of these unborn generations.**