From rhetoric to reality
Facing the challenges of climate change

Professor Kevin Anderson
Tyndall Centre for Climate Change Research
“Greater Manchester intends to make its contribution to the targets set in the ... UK Low Carbon Transition Plan ... [t]his is the right thing to do as part of the global effort to combat climate change ...”

“Radical action on carbon emissions is needed in order to pass a viable and safe climate onto future generations ...”
But what do we mean by “viable and safe”? 
Copenhagen Accord (2009)

‘To hold the increase in global temperature below 2 degrees Celsius, and take action to meet this objective consistent with science and on the basis of equity’
The UK Low Carbon Transition Plan states ...

“to avoid the most dangerous impacts of climate change, average global temperatures must rise no more than 2°C”
So for Manchester’s Climate Change Strategy the **mitigation** question is clear

What **emission reductions** give a good chance of staying below 2°C?

... and for **adaptation**, in case the global community fails to mitigate ...

What **temperatures**/climate should Manchester prepare for?
... but why 2°C?
2001

Risks to
Many

Risks to
Unique
and
Threatened
Systems

Large
Increase

Risk of
Extreme
Weather
Events

Negative
for Most
Regions

Distribution
of Impacts

Net Negative
in All
Metrics

Positive or
Negative
Market
Impacts;
Majority
of People
Adversely
Affected

Higher

Very
Low

-0.6

Risks of Large
Scale Discontinuities

Dangerous

2ºC ‘Guardrail’

Acceptable
Is 2°C – dangerous or extremely dangerous?

Is 1°C the new 2°C?
... sticking with 2°C?
Emission-reduction targets

• UK, EU & Global - long term reduction targets
  
  UK’s **80%** reduction in CO$_2$e by **2050**
  
  EU **60%-80%** “ **2050**
  
  Bali **50%** “ **2050**

• CO$_2$ stays in atmosphere for 100+ years

• 2050 reduction unrelated to avoiding dangerous climate change (2°C)

• **Cumulative** emissions that matter (i.e. carbon budget)

• This fundamentally rewrites the chronology of climate change
  - from long term gradual reductions
  - to urgent & radical reductions
factor in...

the latest emissions data

what is the scale of the global ‘problem’ we now face?
Things are getting worse!
Global CO2 emission trends?

- ~2.7% p.a. last 100yrs
- ~3.5% p.a. 2000-2007
- ~5.9% p.a. 2009-2010
(A1FI has mean growth of 2.2% p.a. to 2020)
What does:

• This failure to reduce emissions &

• The latest science on cumulative emissions

• **Say about a 2°C emissions reduction pathway?**
Early emissions peak = lower emissions reduction/year
Total greenhouse gas emission pathways

2015 peak

2020 peak

2025 peak

... and for energy emissions? (with 2020 peak)

13 of 18 scenarios ‘impossible’

Even then total decarbonisation by ~2035-45 necessary

10-20% annual reductions – even for a high probability of exceeding 2°C

No emission space for coal, gas, or shale gas – even with CCS!
If this all looks too difficult

... what about a 4°C future?
For 4°C & emissions peaking by 2020 a ~ 3.5% p.a. reduction in CO2 from energy is necessary

... & such a reduction rate is achievable

so is aiming for 4°C more realistic?
For $4^\circ$C global mean surface temperature

$5^\circ$C - $6^\circ$C global land mean

... & increase $\circ$C on the hottest days of:

$6^\circ$C - $8^\circ$C in China

$8^\circ$C - $10^\circ$C in Central Europe

$10^\circ$C - $12^\circ$C in New York

In low latitudes $4^\circ$C gives

up to 40% reduction in maize & rice

as population heads towards 9 billion by 2050
There is a widespread view that 4°C is:

- incompatible with an organised global community
- beyond ‘adaptation’
- devastating to eco-systems
- highly unlikely to be stable (‘tipping points’)

Consequently ...

4°C should be avoided at ‘all’ costs
Before despairing ...

Have we got the *agency* to achieve the unprecedented reductions rates linked to an outside chance of $2^\circ$C?
To put some numbers on this non-marginal challenge for energy

• 10% reduction in emissions year on year
  • 40% reduction by 2015
  • 70% 2020
  • 90+% 2030

Impossible?

... is living with a 4°C global temperature rise by 2050-70 less impossible?
Agency

- Equity – a message of hope – perhaps?
- Technology – how far, how fast & how soon?
Little chance of changing polices aimed at 7 billion

... but how many people need to make the necessary changes?
Pareto’s 80:20 rule

80% of something relates to ... 20% of those involved

~80% of emissions from ~20% of population

run this 3 times

~50% of emissions from ~1% of population

Or more realistically:

~40% to 60% from ~1% to 5%
- who’s in the 1% to 5%?

- Climate scientists
- Climate journalists & pontificators
- OECD (& other) academics
- Anyone who gets on a plane
- For the UK anyone earning over £30k
Are we sufficiently concerned to

... make or have enforced substantial personal sacrifices/changes to our lifestyles

NOW?
Technical AGENCY – another message of hope
The Electricity system

Demand opportunities dwarf those from supply in short-term
Car efficiency (without rebound)

- UK mean car emissions ~175g/km (new ~150g/km)
- EU 2015 plan 130g/km (fleet mean with buy out)
- 2008 BMW 109g/km, VW, 85-99g/km; 1998 Audi A2 ~ 75g/km
- ~8 year penetration of new cars ... ~90% of vehicle-km
  ~50% CO2 reduction by 2020 with no new technology
- Reverse recent trends in occupancy ~70% by 2020
To conclude ...
Uncomfortable implications of conservative assumptions

If ...

• Link between cumulative emissions & temp’ is broadly correct
• Industrialising (non-OECD) nations peak emissions by 2025/30
• There are rapid reductions in deforestation and food emissions
• No ‘discontinuities’ (tipping points) occur
  & Stern/CCC/IEA’s “feasible” reductions of 3-4% p.a. is achieved

2°C stabilisation is virtually impossible

4°C by 2050-2070 looks ‘likely’ (could be earlier & on the way to 6°C+)
However,

“... this is not a message of futility, but a wake-up call of where our rose-tinted spectacles have brought us. Real hope, if it is to arise at all, will do so from a bare assessment of the scale of the challenge we now face.”

Anderson & Bows
Beyond ‘dangerous climate change
Philosophical Transactions of the Royal Society
Jan 2011
... & for Manchester, the challenge is:

**Mitigation** - a 70% reduction in ‘total’ emissions by 2020

**Adaptation** - plan for impacts around 4C or more by 2050-70
Thank you