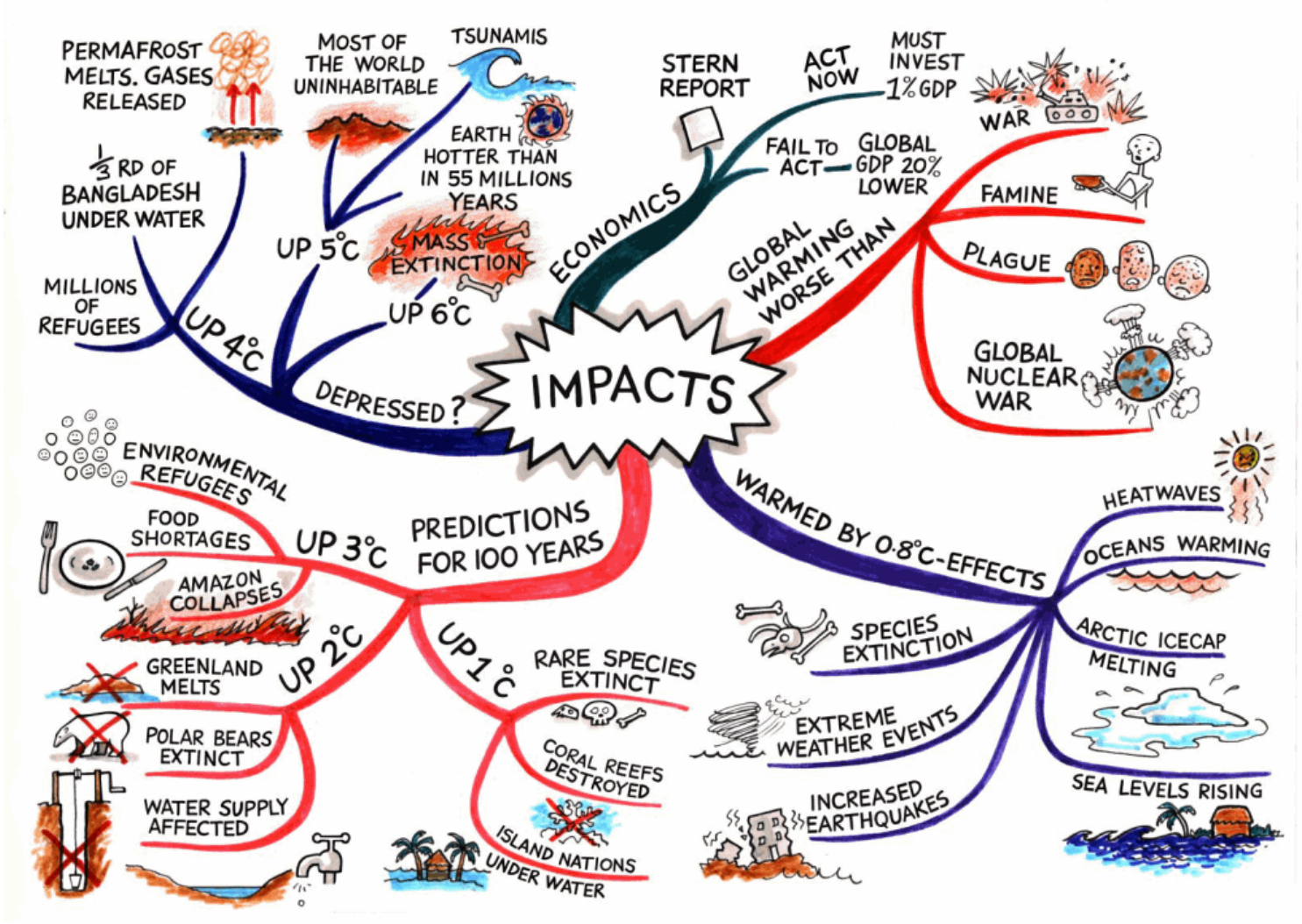
Anglia Ruskin University

Global Sustainability Institute

Social and economic impacts from the climate emergency

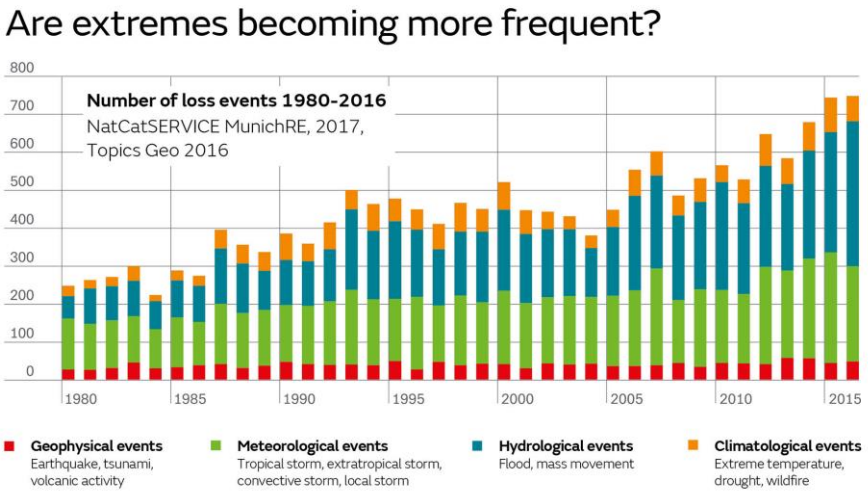
Climate impacts

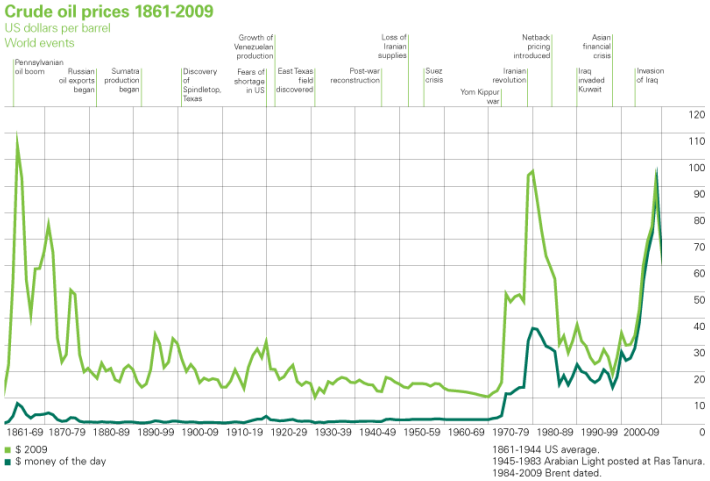


This presentation: Two sources of impact

- Climate change impacts
  - Focus on the short term impacts already likely
- Impacts from responding to climate change
  - Impacts from the transition

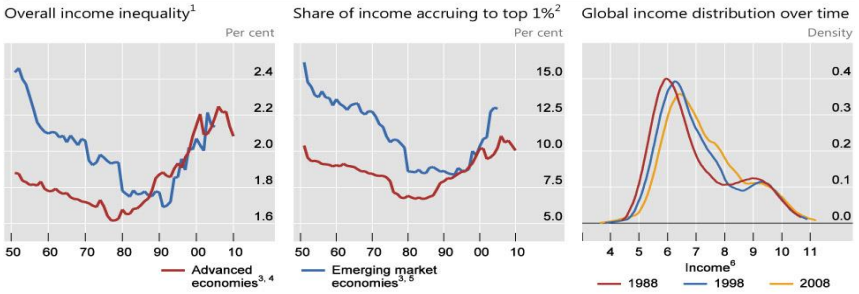
The climate-resource-social system





Income inequality has been increasing within countries but decreasing across countries

Graph A



[1] Pareto coefficients; a higher coefficient means higher inequality. [2] Excluding capital gains. [3] Simple average of the economies listed. [4] Australia, Canada, France, Germany, Ireland, Italy, Japan, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States. [5] Argentina, India, Korea, Malaysia, Singapore and South Africa. [6] Annual income, in PPP-adjusted 2005 US dollars and in natural logarithms.

Sources: Alvaredo et al (2015); Lakner and Milanovic (2013).

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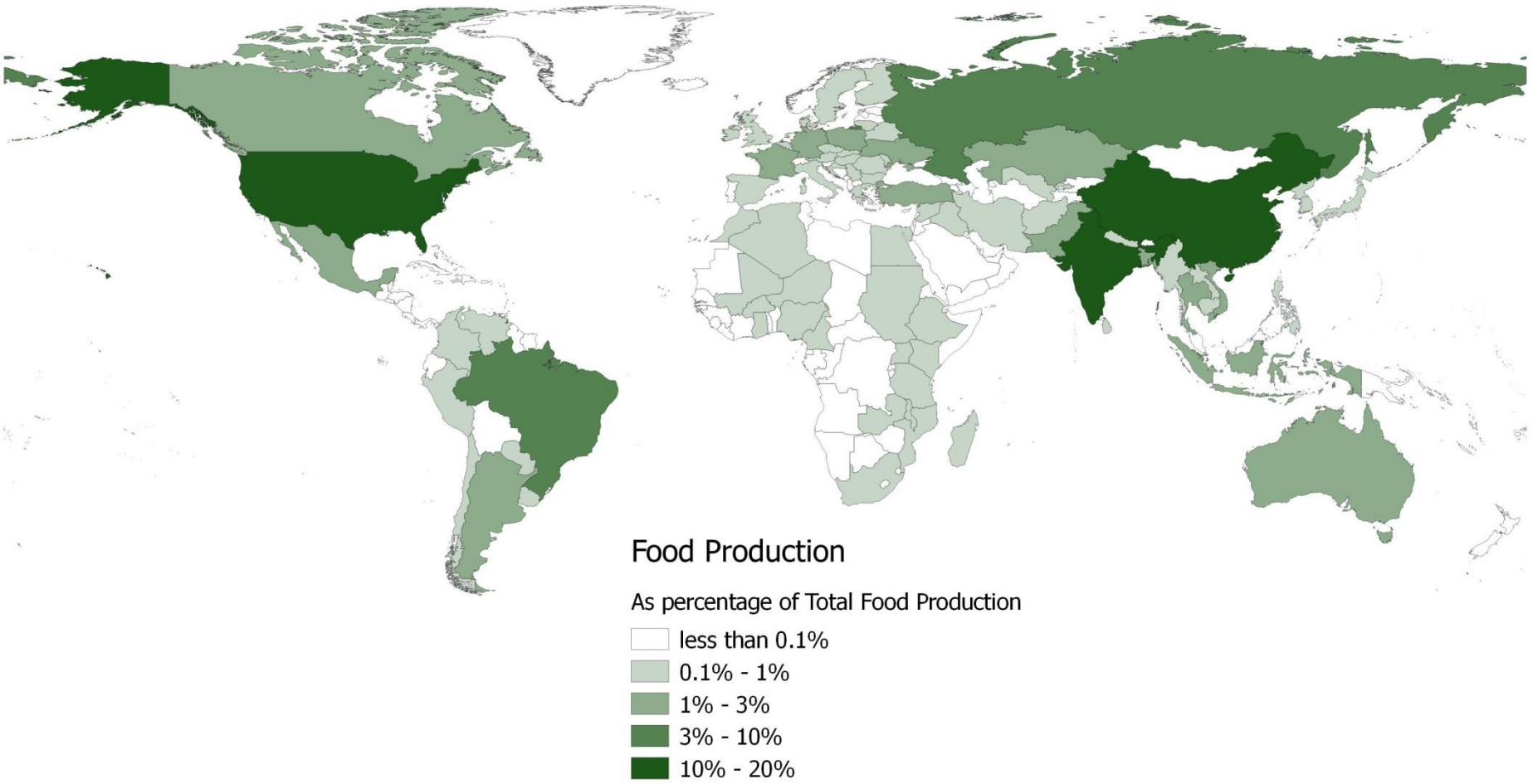
Systems implications for society

- An increase in the number of extreme climatic events leading to economic and social disruption and displacement of populations.
- Environmental degradation with stress on key natural resources leading to price increases and social conflict.
- A reduction in economic growth as a consequence of population growth, and limited natural resources.
- A reduction in the share of GDP made up by labour, reflected in a fall in real wages and increasing inequality in employment status.
- Changes in mortality and morbidity with degradation in the health status in many regions.

Megatrends and Social Security: climate change and natural resource scarcity", 2014, International Social Security Assoication (ISSA)

Food production globally



UK-US Taskforce

EXTREME WEATHER AND RESILIENCE OF THE GLOBAL FOOD SYSTEM

- Isolated crises have occurred before: for example, in 1988/89 there was a significant drought related impact on the yields of maize and soybean, and in 2002/03 drought impacted wheat in Europe, Russia, India, and China; rice in India.
- The level of risk is growing: evidence suggests that the risk of a 1-in-100 year production shock event from extreme weather, could increase to 1-in-30 year or more in the next few decades.
- Extremes are where the greatest impacts from climate change will be felt, but predicting the frequency and intensity of extreme events is extremely challenging.

OPERATING CONTEXT | **2016…**

- Escalating demand for food
- Trade volume and interdependencies amplify shocks
- Crop production concentrated in global regions, increasing exposure to extreme weather risks
- Reduced self sufficiency in China for cereals
- Increasingly inelastic demand

…by 2026 ?

- Key Food import states, economically and politically unstable
- Greater interdependencies
- Production struggles to keep pace with demand
- Underinvestment in exporting region infrastructure
- Recovery of oil prices

MULTIPLE BREADBASKET FAILURE

EXTREME WEATHER disrupts production

- Poor Indian monsoon, reduces wheat crop in India and China
- Early Spring thaw-freeze in Black sea area affects wheat crop
- Summer drought in N. America affects maize and wheat forecasts
- Heat wave and drought in Europe affects wheat crop
- Indian monsoon second failure, causes rice harvest concerns

ESCALATING PANIC exacerbates crisis

- As cereal prices climb, export bans are imposed
- Countries impose tariff reductions or consumption subsidies
- China and Argentina raise export taxes on Soybean and Maize
- The US does not waive the ethanol mandate
- Hoarding and further export restrictions in SE Asia
- Further export bans are imposed
- Low stock to use ratio raises concerns of availability

PRICE volatility
EXPORT bans
Import Restrictions

POLITICAL

- Social unrest experienced; Middle East and North Africa particularly vulnerable.

IMPACTS: the hardest economic, social and political impacts are likely to be felt by import dependent countries, particularly in Sub-Saharan Africa. Major economy impacts would likely be muted.

ECONOMIC

- FAO food prices hit 250 and prices of affected grains go up 3x.
- Country level budgetary pressures experienced
- Poverty rates increase
- Inflation and deterioration in the balance of payments

SOCIAL

- Deterioration in nutritional security
- Government intervention (e.g. in China) may protect some poor food consumers

Reduced Resilience

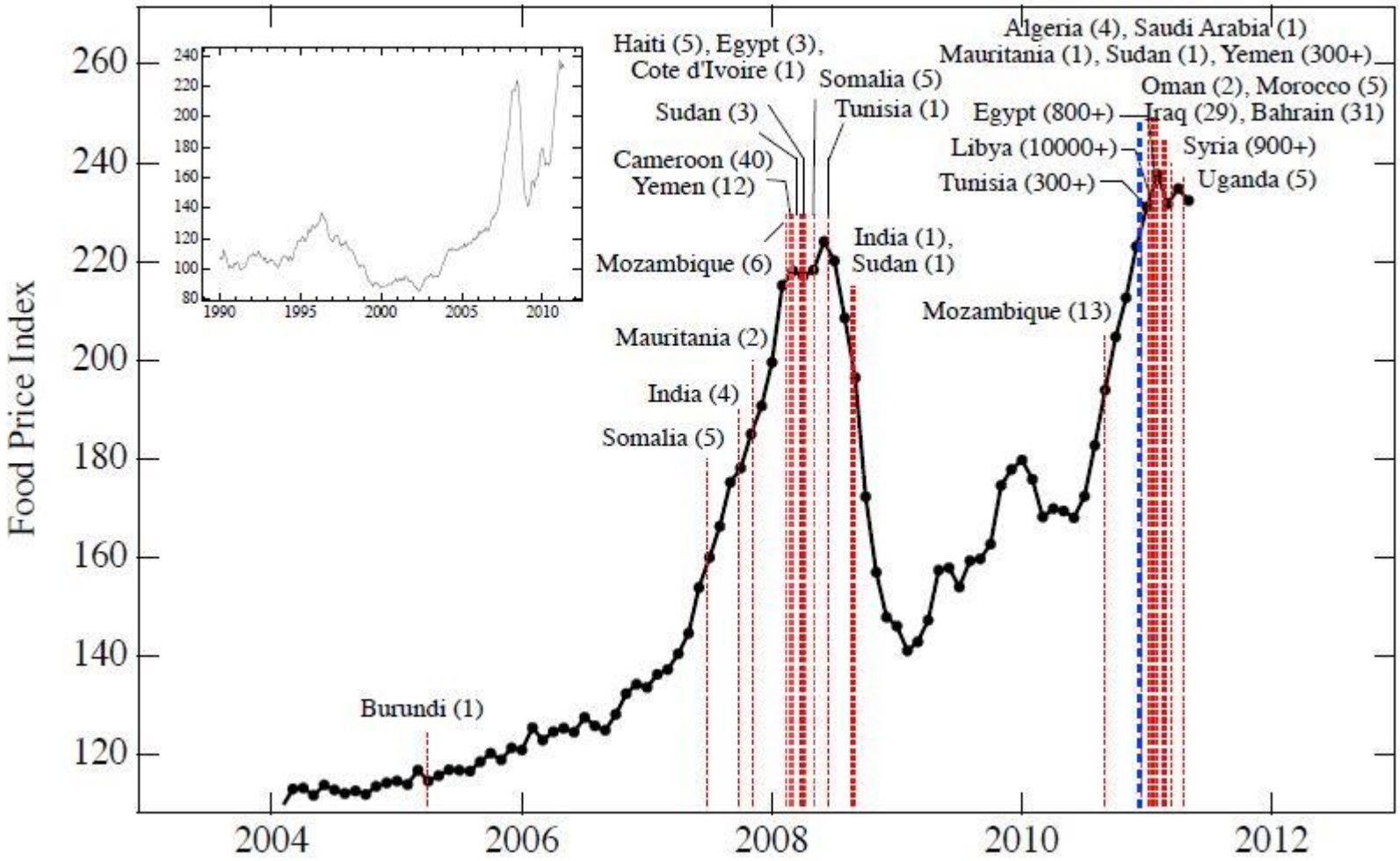
- Intensification and extensification of agriculture
- Degradation of biodiversity, soil and water resources
- Increase in GHG emissions and degradation of landscape carbon
- Destabilisation of governments
- Increase in regional migration (internal and external)
- Reduction in global stocks

Increased Vulnerability

KEY RECOMMENDATIONS

- Adapt agriculture to account for climate extremes
- Better understand the risks by improving climate, economic and crop modelling tools
- Better coordinate risk management
- Do not impose export restrictions
- Better understand how responses can amplify shocks
- Improve function of international markets
- Bolster national resilience to market shocks
- Make biofuel mandates more flexible
- Implement mechanisms to protect low income, fragile countries

- The above visualisation represents a fictional, but plausible 2016 scenario outlined in the Resilience Taskforce summary report.
- Text in red indicates how the scenario could develop further in a 2026 situation.
- The scenario originated from the isolated crises outlined above in 1988/89 and 2002/03, occurring simultaneously.


Food Price Index
260
240
220
200
180
160
140
120
2004
2006
2008
2010
2012
Burundi (1)
Haiti (5), Egypt (3),
Cote d'Ivoire (1)
Somalia (5)
Tunisia (1)
Sudan (3)
Cameroon (40)
Yemen (12)
Mozambique (6)
India (1),
Sudan (1)
Mauritania (2)
India (4)
Somalia (5)
Algeria (4), Saudi Arabia (1)
Mauritania (1), Sudan (1), Yemen (300+)
Oman (2), Morocco (5)
Egypt (800+)
Iraq (29), Bahrain (31)
Libya (10000+)
Syria (900+)
Tunisia (300+)
Uganda (5)
Mozambique (13)
240
220
200
180
160
140
120
100
80
1990
1995
2000
2005
2010

Lloyds scenario

- *Food production shock (developed by Molly Jahn, University of Wisconsin)*
  - *Maize: 10% production shock*
  - *Soy: 11% production shock*
  - *Wheat: 7% production shock*
  - *Rice: 7% production shock*

From left to right: Sophie Abraham (Willis), Lucy Stanbrough (Lloyd's), Dr John Alarcon (Willis), Oliver Bettis (Munich Re), Nigel Ralph (Lloyd's), Tom Hoad (Tokio Marine Kiln), Trevor Maynard (Lloyd's), Mike Maran (Catlin), Will Steeds (Catlin), Kenneth Donaldson (Munich Re), Dr Aled Jones (Anglia Ruskin University), Prof Molly Jahn (University of Wisconsin-Madison)

Attendees not pictured: Nick Beecroft (Lloyd's), Andrew Hitchcox (Tokio Marine Kiln), Falk Niehörster (RMS)

Possible responses:
Nigeria civil war and terrorism in India

- Food riots break out in urban areas across the Middle East, North Africa and Latin America.
- Nigeria civil war following major offensive by Boko Haram. Onshore and shallow offshore oil rigs attacked.
- Pakistan terrorist group targets major cricket tournament. India cricket cancellations.
- Europe has an increasingly militarized border with Russia as political tensions continue.
- The Euro weakens and the main European stock markets lose 10%; US stock markets follow and lose 5% of their value.
- Public agriculture commodity stocks increase 100% in share value, agriculture chemical stocks rise 500% and agriculture engineering supply chain rise 150%

Possible responses 2: Greek Euro Exit

- Europe has an increasingly militarized border with Russia as political tensions continue.
- In addition following the Greek exit from the Euro in late 2015 inflation within the country rapidly increases and food imports becoming increasingly difficult as international exporters are reluctant to sell to Greece.
- Following food riots in Athens Greece re-elected Syriza and held a popular referendum which saw Greece leave the European Union and vote for closer ties with Russia.

Possible responses 3: Unrest in Middle East and North Africa

- Food riots across the Middle East, Saudi Arabia announces a cut in oil production, oil to jump to $100 - $110 per barrel within a month.
- Oil exporting countries in the Middle East raise the capital needed to secure food imports and subsidize food distribution within their countries to avoided a repeat of the Arab Spring.
- These countries agree to pay high prices to guarantee rapid access to grains causing several contract defaults with other countries including India.
- Russia refuses to honour contracts with one of the largest commodity traders and instead sells directly to Saudi Arabia.
- Non-oil exporting countries across the Middle East and North Africa see an increase in terrorism, civil unrest and internal migration into urban centres.
- Rolling energy blackouts are seen across several of these countries and riots are common.

Possible responses 4: NATO/Russian tensions

- Russia invades eastern Ukraine. It declares in the UN that the Ukraine has been slow to respond to the global food crisis and it must intervene to stabilize that part of the country to deliver immediate food aid locally and internationally.
- Pro-Russian riots break out in Lithuania leading to deployment of the military in the east of the country. Russia is seen to build up its military presence near the Lithuanian border.
- NATO responds by sending troops into Ukraine however by the end of the year they had not engaged with Russian troops as yet.
- Countries that are now recipients of food from Russia vocally support Russian action at the UN General Assembly.
- Resulting political tensions and sanctions effectively cuts off the Black Sea from global exports causing significant disruptions to supply chains.

Possible responses 5: Argentinean crisis

- Following recent political and civil unrest in Argentina the Justicialist Party takes a more interventionist approach to food and at the start of the year nationalizes Bunge Ltd triggering calls in the US for anti-Argentina sanctions.
- Argentina increases export tariffs to protect internal food supplies. However, farmers divert production toward the internal black market and support a strike at the ports, leading to acessation of all exports.
- After a decade of increasing political turmoil, the effective shutdown of Argentina causes S&P to downgrade Argentinian debt (government and corporate) to junk status. This results in a sharp rise in inflation.
- Some of the strikes turn violent. The military are deployed into cities and ports. In mid-December, a small group of Argentinian farmers use a fertilizer bomb and blow up the headquarters of a major hedge fund that had aggressively gone after Argentinian debt over the last decade in New York as they blame them for their loss of stability in their country.
- The headquarters are located on Wall Street and the building is entirely levelled. An already nervous stock market following political tensions in India and Russia leads to US stock markets dropping 10% (with European stock markets dropping 20% from the start of the year), US Treasuries to go from 3% to 5% and corporate bonds for high yield to increase to 8%.
- Gold increases 20%. These do not recover by the end of the year as the US contemplates a response in Latin America and Europe contemplates its response in Ukraine.

Insurance impacts

- Political risk insurance
  - Contract frustration (e.g. China-Brazil)
  - Cargo/marine hull (e.g. Liberia)
  - Trade credit
- Political violence and terrorism
  - Strikes, riots & civil commotion (e.g. Egypt)
  - Contingent business interruption
  - Terrorism
  - War on land
- Crop insurance
- Liability insurance (directors & officers, errors & omissions)

Key areas of risk for investments

- Physical
  - flooding, drought, extreme weather
- Policy
  - carbon pricing, energy regulation, subsidies
- Market
  - substitution, scale, experience, deal flow, currency
- Security
  - resource scarcity issues
- Fiduciary risk
  - community action, public nuisance and expectations

Impacts of a climate response

- If society does nothing (business as usual) impacts are potentially catastrophic (*for a large portion of society – all if you have morals*)
- Tackling climate change is easy…. if you start in 1992
- Tackling climate change now will have massive impacts on society

The future: driving change

Managing/creating a new ‘green’ industrial revolution

- In the past never managed – usually technology led
- Always started in one country then exported
- Who owns the technology revolution?

Job market changes

- Jobs will be created in a number of sectors and lost in others.
  - Need re-skilling of labour markets.
  - Skill shortages are already reported in a number of sectors including the biofuels industry in Brazil, the renewable energy and environment industry in Bangladesh, Germany, and the United States and in the construction sector in Australia, China, Europe and South Africa.
  - B*usiness interruption* may effect redundancies (even on a temporary basis).
- Calamity and emergency loans to meet rehabilitation needs following major events likely to increase.
- The economic effect on businesses could also mean that *the payment of contributions* to social security may be difficult requiring flexibility from social security in respect of payment terms.

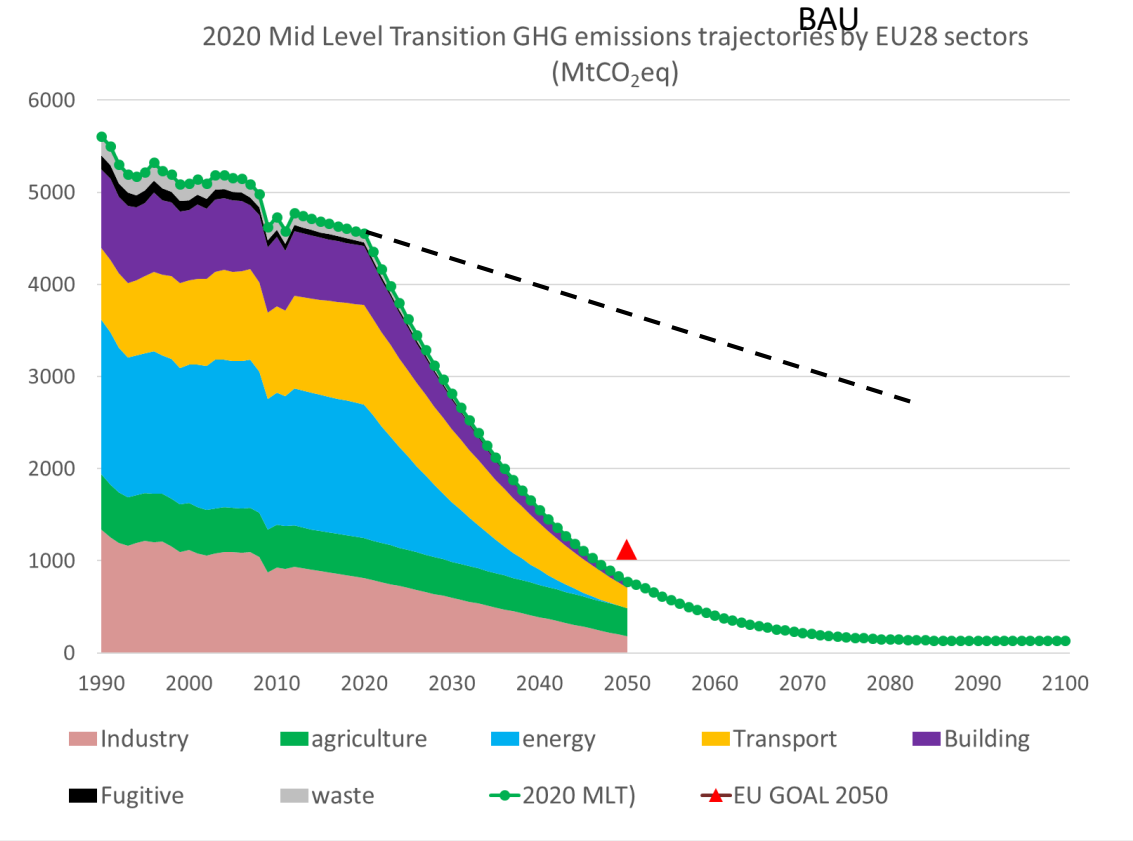
MEDEAS

MODELING THE RENEWABLE ENERGY TRANSITION IN EUROPE

EU scenarios

OT 2020

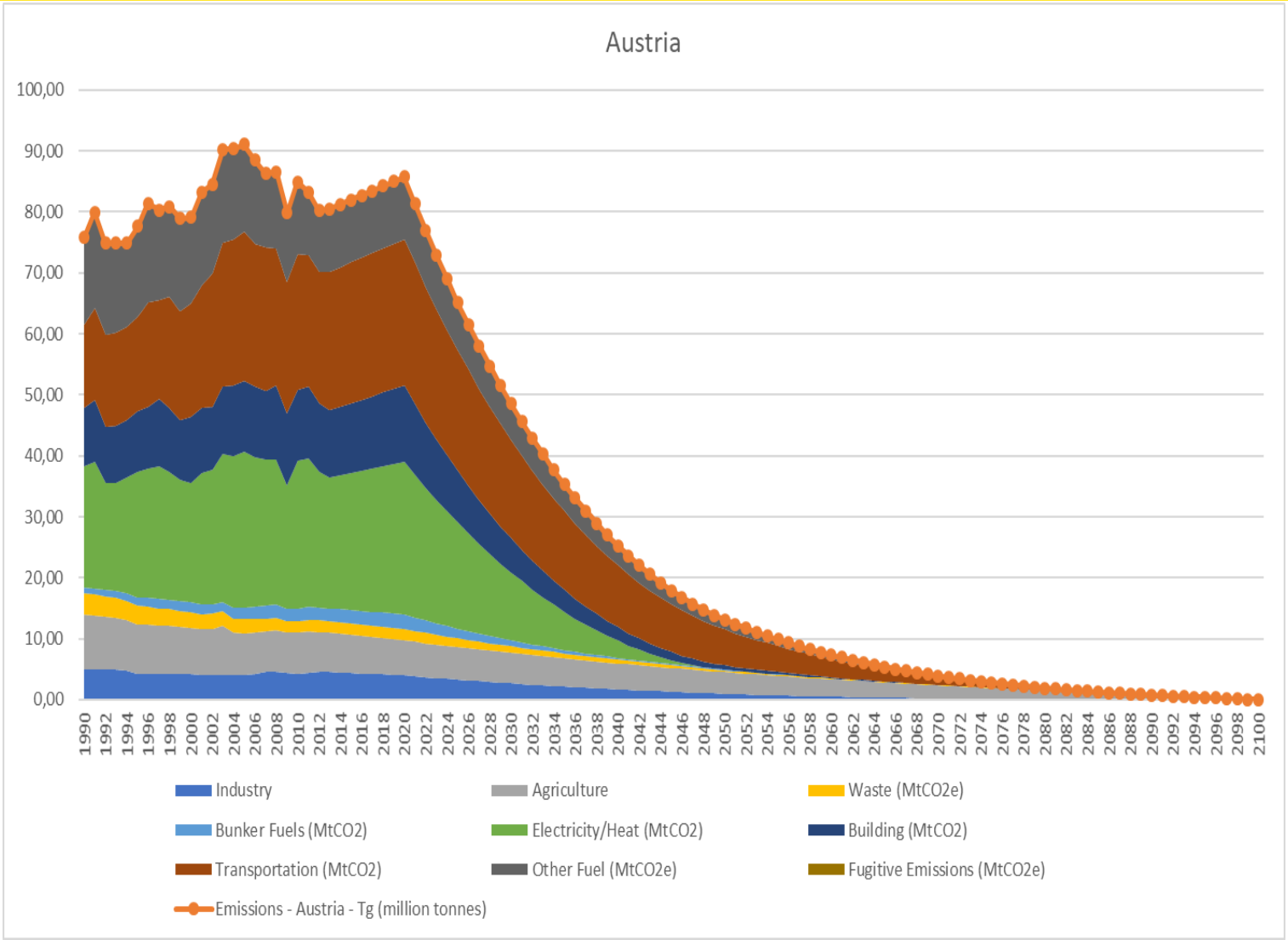
Goal: -80% GHG's 1990 in 2050



MEDEAS

MODELING THE RENEWABLE ENERGY TRANSITION IN EUROPE

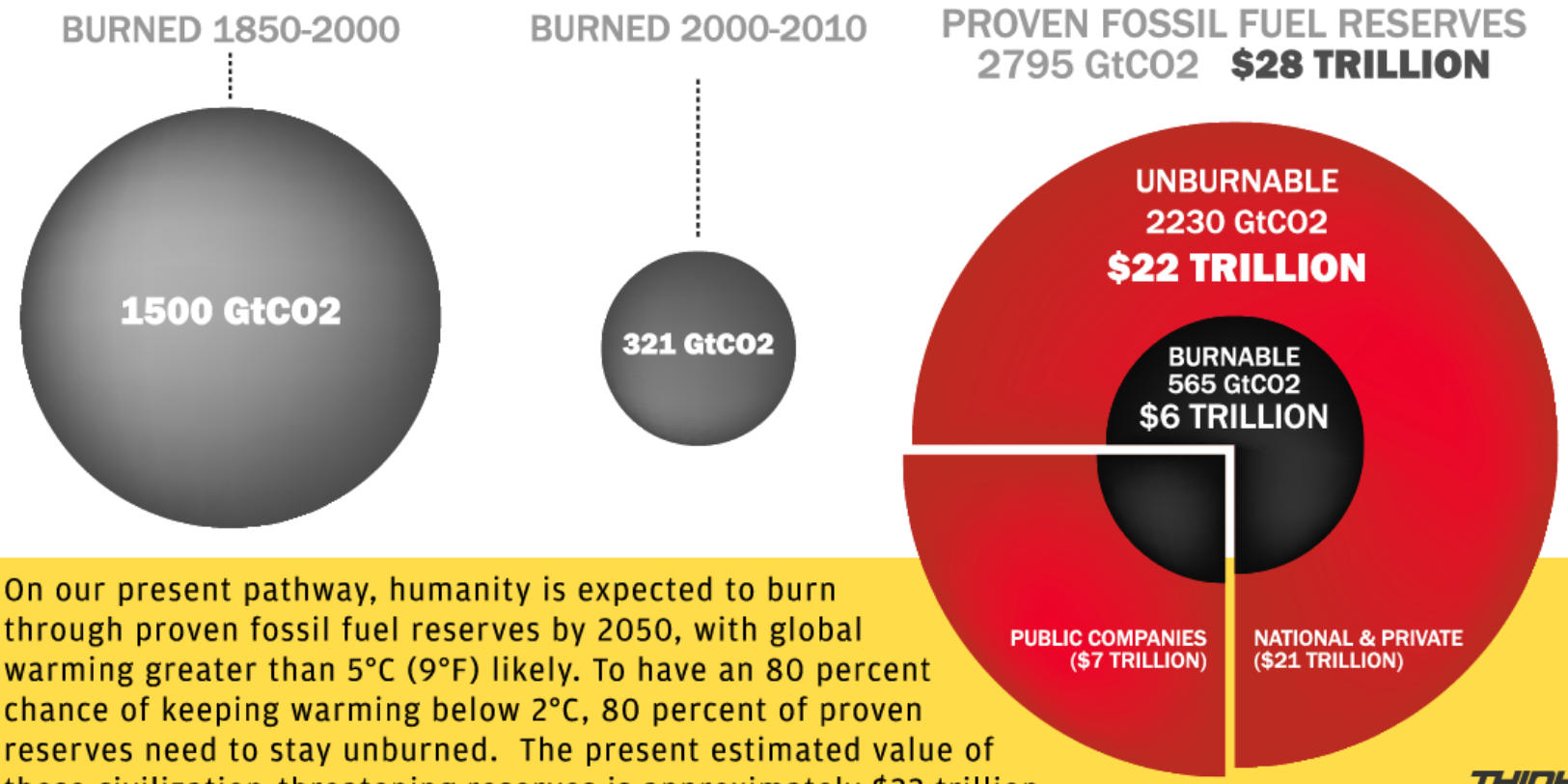
Austria



Technology ownership

- Carbon ownership
  - National governments (Latin America and Middle East)
  - Pension funds
  - EU/USA economic ‘rents’
- Renewable ownership
  - High tech companies
  - China

THE $22 TRILLION CARBON BUBBLE



On our present pathway, humanity is expected to burn through proven fossil fuel reserves by 2050, with global warming greater than 5°C (9°F) likely. To have an 80 percent chance of keeping warming below 2°C, 80 percent of proven reserves need to stay unburned. The present estimated value of these civilization-threatening reserves is approximately $22 trillion.

THINK PROGRESS

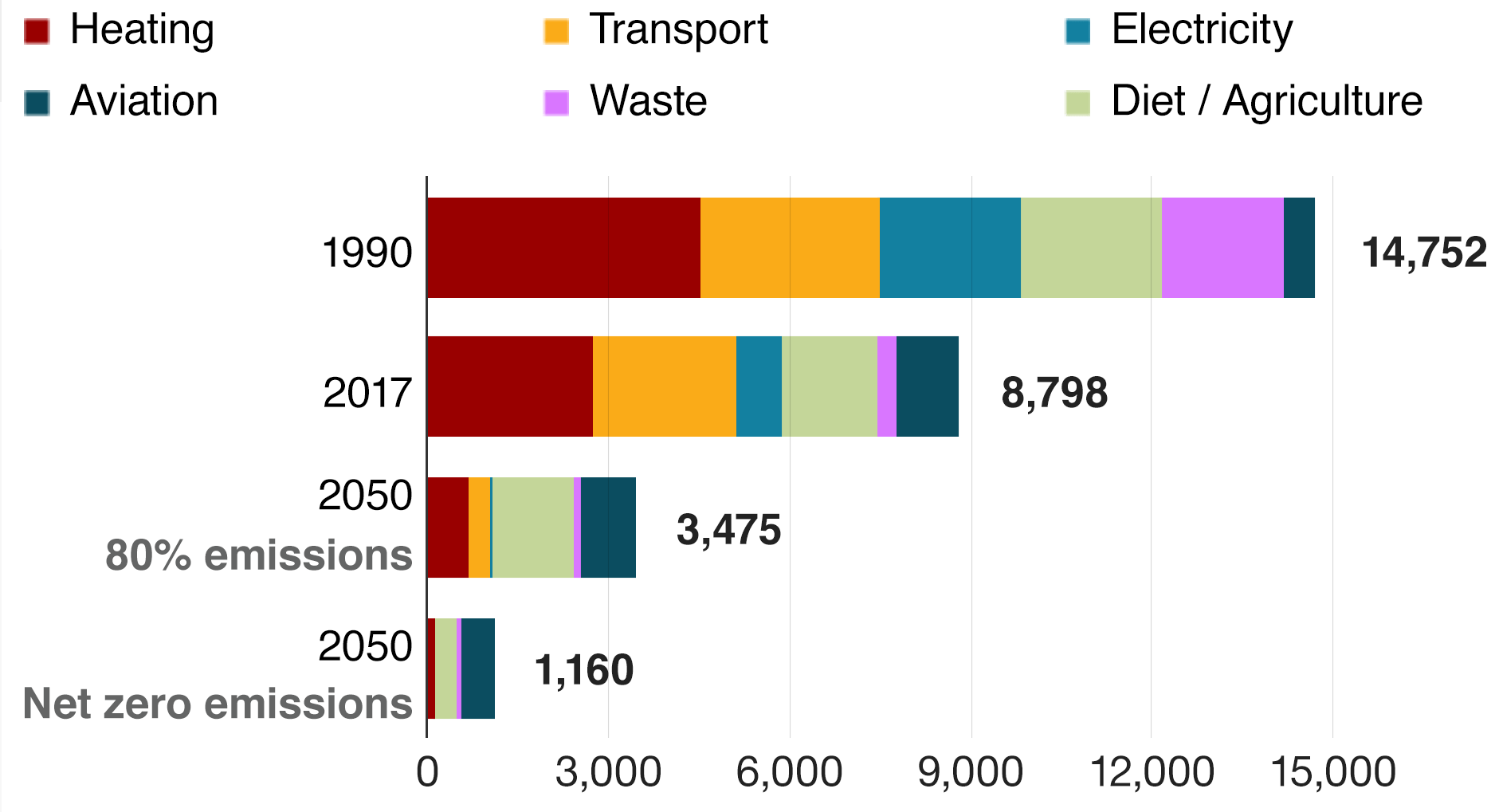
Sources: Meinshausen et al. 2009; Allen et al. 2009; Sokolov et al. 2009; Carbon Tracker Initiative 2011. Carbon reserves as of the start of 2011; since then approximately 50 gigatons of carbon dioxide have been burned. Total fossil reserves are projected to be four times larger than proven reserves, and exploration for new reserves continues.

UK Zero Carbon Target

- UK Government has now adopted a zero net carbon target for 2050 (ie the UK will no longer 'contribute' to climate change)
- National Grid estimates the UK will require 263GW of installed power capacity to meet this goal by 2050, up from 108GW in 2018
- Chancellor Philip Hammond has warned of a potential cost of £1 trillion by 2050

Household emissions in 1990,2017 and 2050

Annual emissions, kilogrammes of CO2



Source: Climate Change Committee/BEIS (2019)

BBC

Energy Transition

- Decarbonisation of whole energy system
  - Some carbon in transport, industry & agriculture
- Massive investment, behaviour & policy challenges remain
- Need to do it quickly, but well

The future: who is in charge?

A breakdown of multilateralism or a breakdown in national political leadership (using the UN as a convenient cover)?

Economic and political power

- Sovereign Wealth Funds
- Multinationals
- National governments
- Loss of sovereignty to international coordination

Something else?

Thanks!

- Any questions?