



Centre for  
Climate Change  
Economics and Policy



Grantham Research Institute on  
Climate Change and  
the Environment

# WHY ARE WE WAITING? THE LOGIC, URGENCY, AND PROMISE OF TACKLING CLIMATE CHANGE

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THE LONDON SCHOOL  
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POLITICAL SCIENCE ■

# Preface: What has changed since the Stern Review

- Science suggests inaction still more risky
- Technology more promising
- Air pollution
- Political will: Curate's Egg
- Fundamental change in China
- Context of structural transformation

# Structure

1. **Science: scale, risks and urgency**
2. Public policy for transformation
3. Attraction of the transition to a low-carbon economy
4. Ethics: why and how we ought to act
5. Psychology and politics: will we act in time?
6. A note on Paris 2015

# Climate change starts and ends with humans

- Understanding the relevant processes:
  - Human activity to emissions of greenhouse gases (GHGs);
  - Emissions (**'flows'**) to increased concentrations (**'stocks'**). Ratchet effect because CO<sub>2</sub> long-lived and difficult to extract;
  - Increased concentrations to increased temperatures and climate change;
  - Climate change to human impacts.
- All links in the chain subject to uncertainty.

# The science shapes economics, ethics, politics

- The structure of the science embodies four major difficulties for understanding, analysing and setting public policy:
  - **Immense scale,**
  - **Large risk/uncertainty,**
  - **Long lags,**
  - **‘Publicness’ of the causes and effects**
- Key implications for economics and analysis: about management of immense risk.
- Ethics: responsibilities to future generations and inequities of origins and impacts of problem.

# GHG concentrations rising rapidly

**CO<sub>2</sub> risen from 280 ppm in 1800s to 400ppm today. CO<sub>2</sub>e now around 445ppm (Kyoto gases).**

- We are **adding CO<sub>2</sub>e at a rate of over 2.5ppm per year** (likely to accelerate with little or weak action).
- This is up from 0.5ppm per year 1930-1950, 1ppm 1950-1970 and 2ppm 1970-1990.

**Inaction could take us to 750ppm CO<sub>2</sub>e over a century.**

- This level of concentration could result in a large probability, perhaps more than 50%, of an **eventual temperature increase of more than 4°C** compared with the pre-industrial era, and substantial probabilities of more than 5°C.

# The risks are unprecedented for homo sapiens

## Damage from climate change intensifies as the world gets warmer:

- Already at 0.8°C at edge of experience of Holocene and civilisation of last few thousand years. Seeing strong effects but small relative to what we risk.

Temperature increase of 4 or 5°C or more not seen for tens of millions of years (homo sapiens, 250,000 years):

- Likely be **enormously destructive**, including much more intense extreme events.
- Deserts, coastlines, rivers, rainfall patterns: the **reasons we live where we do, would be redrawn**.
- Potential cause of migration of hundreds of millions, perhaps billions, of people around the world: **likelihood of severe and sustained conflict**.

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## Casting the economic policy responses: the dangers of delay

- Uncertainty and ‘publicness’ of the causes might suggest delay to **learn more. That would be a profound mistake for two reasons:**
  - “Ratchet effect” from flows of GHGs to concentrations.
  - Much of infrastructure and capital investment results in technological “lock-in”. High-carbon infrastructure and network investment could **imply that the lock-in lasts for decades.**
- Delay increases the risk and cost. Would need to undertake radical, rapid and expensive decarbonisation in 2 or 3 decades time, **resulting in the scrapping of vast amounts of ‘locked-in’ capital.** Politically feasible?

## Casting the economic policy responses

- Science/ethics suggest narrow CBA based on one-good model of underlying growth can provide only part of the story.
- An attempt to fine-tune such a CBA, e.g. to identify a formal “optimum emissions path” based on formal modelling that is inevitably narrow, may obscure and distract from a broad risk management approach, which is based on sound economics and transparent ethics, rather than give it more precision.
- How big a risk of 3°C (not seen for 3 million years) or of 4/5°C (not seen for tens of million of years) are we willing to take?
- How can we invest, innovate and learn to keep costs of and investments for risk management efficient and equitable and what are the appropriate policies?

## Policy and market failures (I)

- Dynamic public policy analysis required to deal with the issues of fostering a transition on this scale. Much market failure analysis à la Pigou is comparative statics, but nevertheless basic to policy.
- When we emit GHGs we damage the prospects of others. Unless appropriate policy is in place we do not bear the costs of the damage.
- GHGs are the biggest externality the world has seen: all are involved; the potential effects are global and very large.
  - Correcting the GHG externality will involve carbon taxes / cap-and-trade / regulation. A combination of all three likely to be needed.
- Important additional market failures are relevant: public policy must be examined in the context of a collection of market failures.

## Policy and market failures (II)

- Different failures point to different instruments, but the collection is mutually reinforcing:
  - **Greenhouse gases:** carbon taxes / cap-and-trade / regulation;
  - **RD&D (research, development and deployment):** tax breaks, feed-in tariffs (FIT) for deployment;
  - **Imperfection in risk/capital markets:** risk sharing/reduction through guarantees, equity, feed-in tariffs, floors on carbon prices, green investment banks.
  - **Networks:** electricity grids, public transport, broadband, community-based insulation schemes. Government frameworks needed;
  - **Information:** “labelling” requirements on cars, domestic appliance, products more generally. Awareness of options for production and consumption;
  - **Co-benefits:** local and regional air pollution from burning hydrocarbons very damaging, valuing ecosystems and biodiversity, valuing energy security.

## Policy and the dynamics of learning and change

- As we learn about technologies (see next section), organization, and design along the way, **so too will we learn about policies.**
- Transparent, long lasting and stable policies: **provide investors and entrepreneurs with long-term confidence.**
- The **right climate policies will likely trigger exciting new waves of global investment, innovation, and discovery.**
- Should design policy to foster learning and **flexibility** – new opportunities will arise.
- Invest strongly in **research and innovation**, e.g. **Apollo Programme.**

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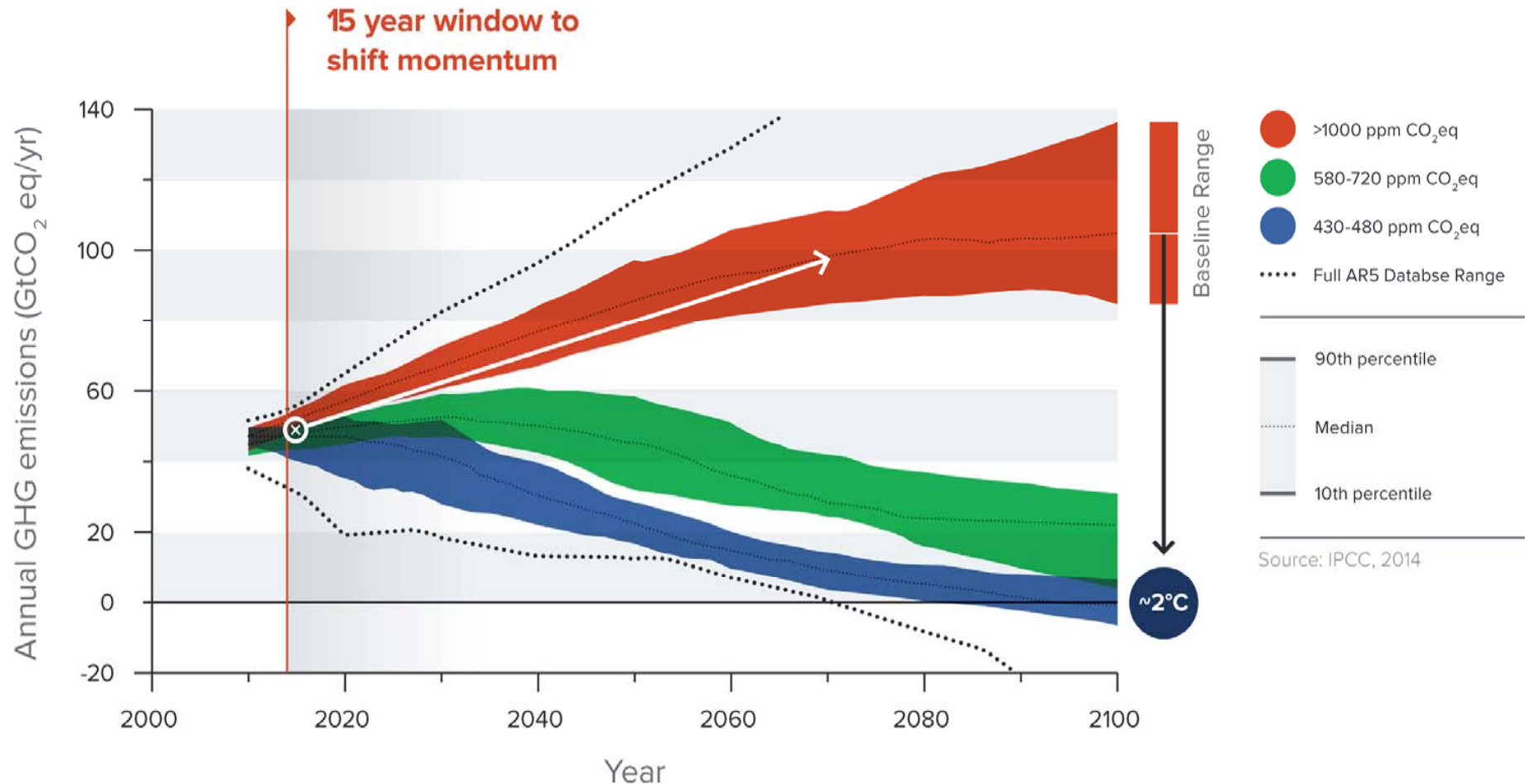
# What to do to hold warming below 2°C

- Necessary emissions path for 50-50 chance of 2°C:
  - **under 35Gt** in 2030; **under 20Gt** in 2050; zero by end century.
- Can do a little less earlier and a little more later and vice versa but shape of feasible paths similar. Some studies use low forties (GtCO<sub>2</sub>e p.a.) for 2030 for 2°C but requires very strong action later.
- Necessary path likely to require:
  - **zero emissions from electricity** around mid-century.
  - **zero total emissions by the end of century.**
  - **Negative** in **major sectors** well before **end of century.**
- Can burn less than half of established hydrocarbon reserves and retain a reasonable chance of holding to 2°C.

# Why the next 15 years are critical

## Climate performance off track: next 15 years critical

GHG emissions projections



Source: *New Climate Economy*  
<http://newclimateeconomy.report/overview/>



# Scale and nature of response needs to be rapid and strong (I)

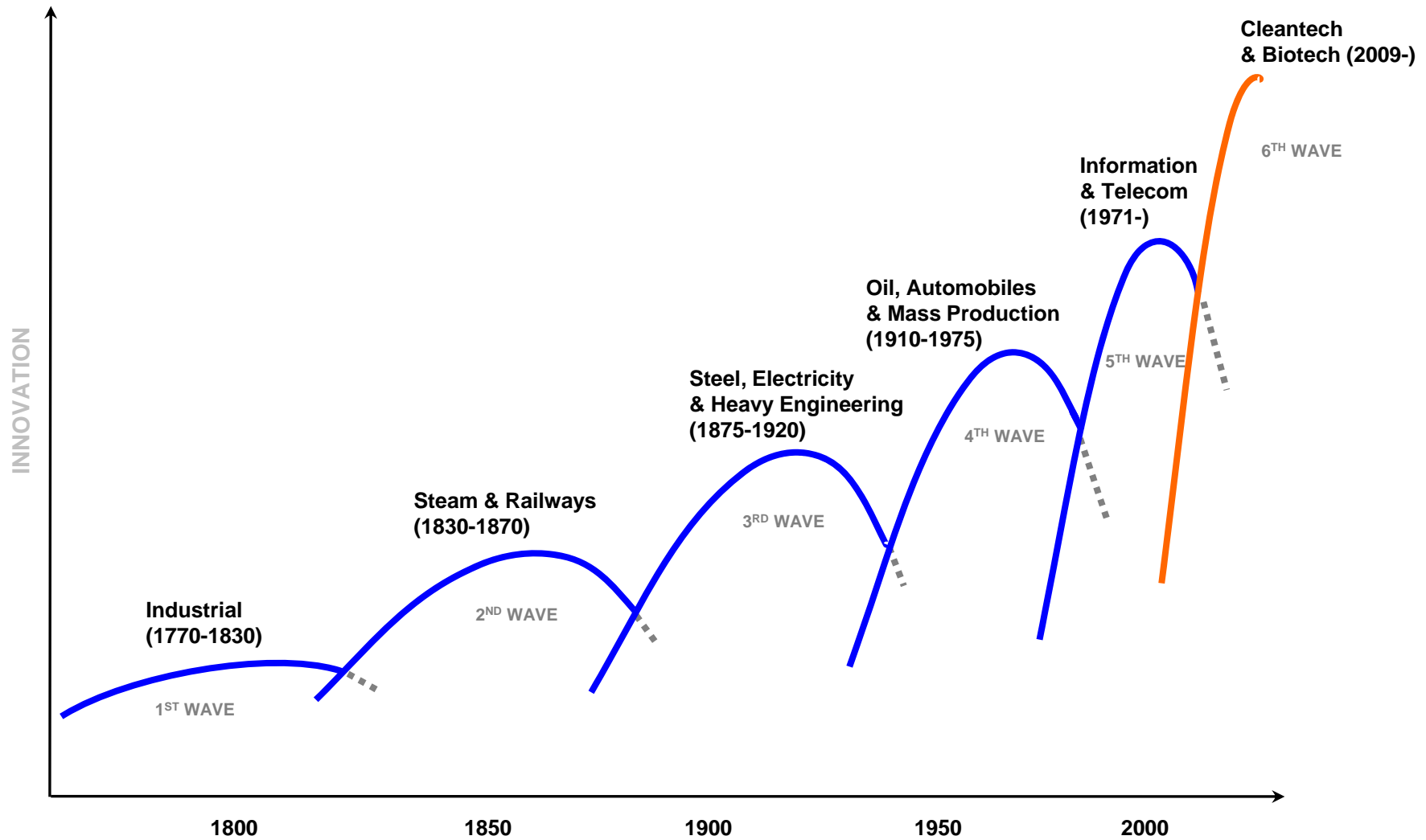
If world **emissions are to be cut by factor of 2.5** (50 Gt (2014) → below 20 (2050)) and world **output grows by a factor of 3** (3% growth p.a. to 2050), then **emissions/output must be cut by a factor of 7 or 8.**

- Requires strong action **in all regions** of world, **in all economic sectors.**
- Will need **substantial investments** and will involve some **dislocation.**
- A new **energy-industrial revolution.**

# Scale and nature of response needs to be rapid and strong (II)

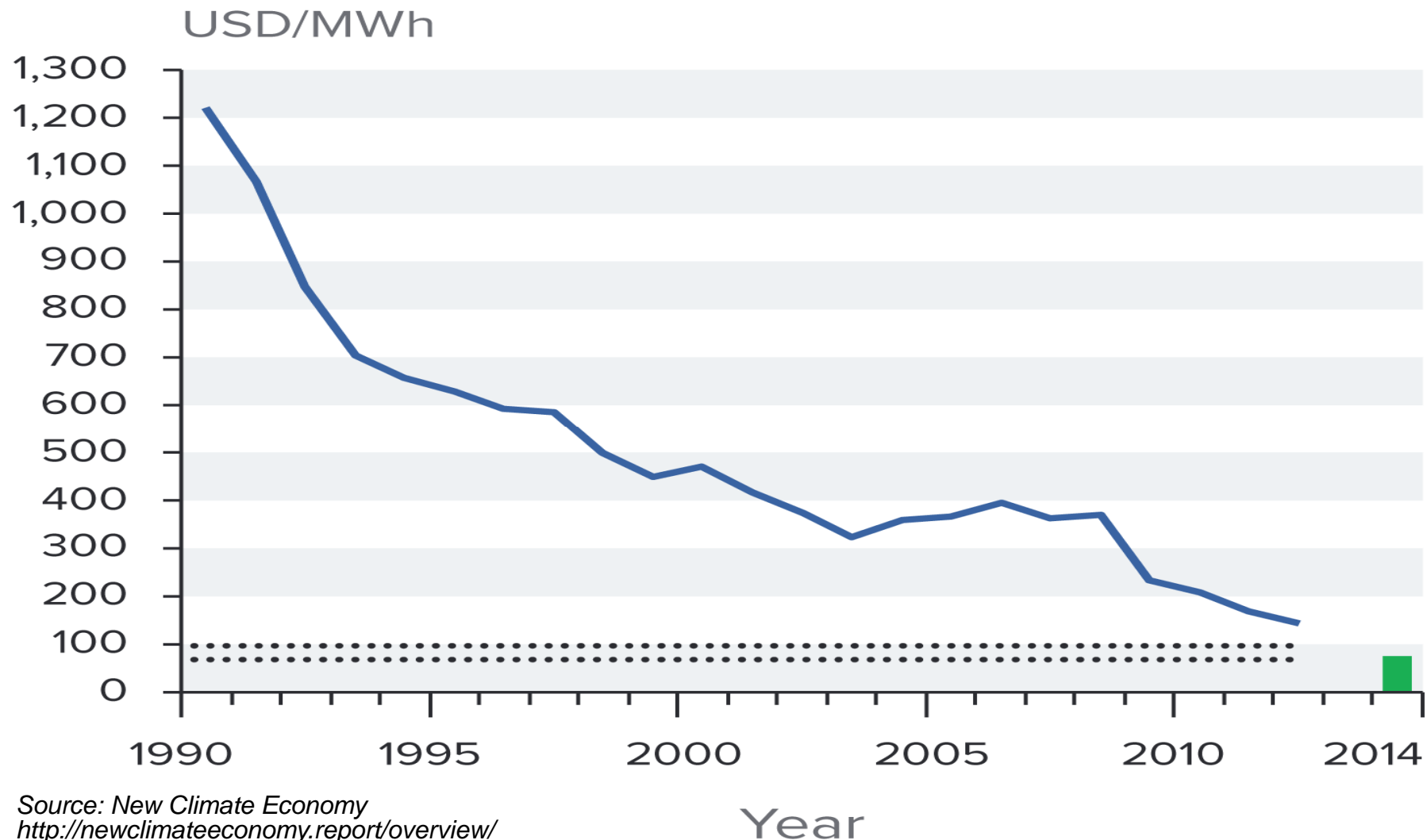
- The transition to **low-carbon growth** represents a **very attractive path**: could, if economic history is a guide, stimulate dynamic, innovative and creative growth.
- **Structural transformation** – 3.5bn in cities now, 6.5bn in 2050; **growth led by developing world** creates great opportunities for transformational investment.
- But also, dangers of lock-in of high-carbon capital and infrastructure.
- Great opportunities from most rapid technological change the world has seen: digital, materials, bio...
- Can invest well (more efficient, less polluting, less congested, protecting forests...) and do much of what is necessary for emissions reductions.
- Next two decades very special period in history. Decisions will shape rest of century and beyond. Can use it or lose it.

# Waves of innovation



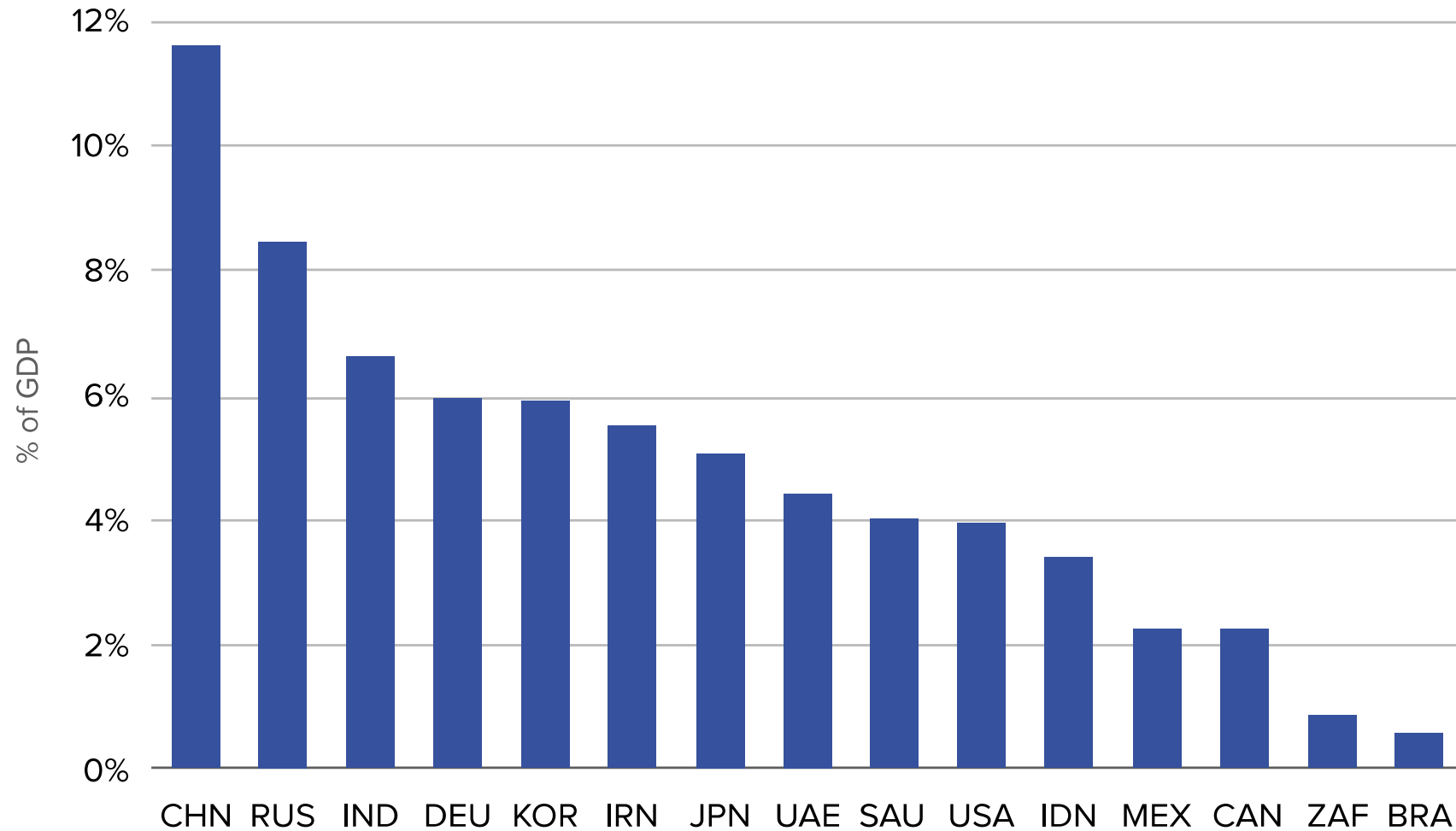
# Technical progress – a focus on solar

- **Delivered prices of energy now competitive generation in 79 countries.**
- PV module costs fallen around 50% since 2010: currently well below \$1/watt



Source: New Climate Economy  
<http://newclimateeconomy.report/overview/>

# Value of the premature deaths from PM2.5 air pollution: 15 largest emitters – average 4% of GDP per year



Source: NCE estimate, based on WHO mortality data

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# Ethics of climate change (I)

- Climate change gives rise to important & complex normative questions.
- All major approaches to moral philosophy seem to point in same general direction: strong action to reduce emissions is morally required. Book examines number of approaches beyond the standard economics: Kantian, virtue ethics, social contracts, rights/liberty...
- The details are challenging: *who, when and how much?*
- I examine here two sub-topics in the ethics of climate change:
  - Inter-generational ethics: inter-temporal values; discounting.
  - Intra-generational ethics applied to real-world international cooperation: a new approach for Paris 2015.

# Ethics of climate change (II): Inter-generational issues

- How can we compare the value of something to people today vs its value to future people?
- Discounting future *goods*
  - How do we value (today) goods consumed in the future? Should we discount the value of future goods because “people in the future will be richer”? It matters *which* goods. And which people.
  - Discount rates cannot simply be “read off” from markets.
- Discounting future *welfare or lives*
  - Weights the *welfare or lives* of future people lower (irrespective of consumption/income) purely because parts of their lives lie in the future.
  - It is discrimination by date of birth.



# Ethics of climate change (III): Intra-generational issues

- Equity question for international cooperation – which countries should do what and when?
- Context
  - World must be at 2 tonnes CO<sub>2</sub>e per capita by 2050 globally for 2°C.
  - **Developed countries:** 1 billion in 7 billion population; Responsible for around half of global emissions since 1850; Average per capita emissions still >15tCO<sub>2</sub>e per year.
  - **Developing countries:** Responsible for around 2/3 of current emissions; will be responsible for most of future emissions; but per capita emissions still 1/3 to 1/2 of rich countries.
- Arithmetic implies faster cuts for rich countries. And if few people below 2 tonnes there can be few above.
- Double inequity – rich countries major responsibility for past emissions, poor people hit earliest and hardest.

# Ethics of climate change (IV): Intra-generational issues

- A proposal: Equitable Access to Sustainable Development. Language of COP16 in Cancun, 2010.
  - All are entitled to **sustainable development** as part of **dynamic** and **collaborative** transformation to a zero-carbon world.
  - **Choice of sustainable development** path is determined by nations; for developing countries that path **supported by rich countries**.
- Common actions; but rich countries cut faster and generate strong examples; promote flows of finance and technology.
- Contrast with “burden-sharing”, “others should pay incremental cost”, zero-sum games; “common but differentiated responsibility” (CBDR).
- EASD language and concept contain ideas of CBDR but are more dynamic and collaborative.

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# Psychology (I)

**Perceptions of or concern about climate risks have complex and not necessarily rational foundations.**

- People assess frequency or probability of an event by the ease with which instances come to mind.
- Frequency and nature of media reporting affects public concern about climate change.
- Concern about climate change also affected by:
  - “Elite cues” (→ importance of trusted elites as “messengers”)
  - Prominence of other issues (economy, security etc.).
  - Situational influences. e.g. local temperature.
  - The person’s pre-existing worldview (e.g. communitarian/egalitarian vs individualistic/hierarchical).

## Psychology (II)

**People's support for climate change mitigation policies have complex and not necessarily rational foundations.**

- People weight negative effects higher than positive ones, are “loss-averse”, and have “status quo bias”.
  - People discount *future* costs and benefits of policies – main reason appears to be perceived *uncertainty* about whether these will eventuate.
  - Most costs associated with climate policy are more immediate and less uncertain; climate benefits are long-term, and co-benefits are medium-long term and less certain and less directly “individual”.
- Low willingness to accept perceived short-term costs of policy for (larger) medium or long-term climate benefits and co-benefits.

# Politics (I)

- Political incentive structures are biased toward short-term electoral cycles / terms of government.
  - not conducive to a politics of structural change with short-term costs for (very large) medium and long-term benefits.
- Structural issues and political economy:
  - Vested interests are powerful.
  - Short-term incentive structures in business and finance direct capital away from long-term value creation.
  - Structure and operation of the media is often poorly serving the polity.
  - Existing inequalities make it harder to tackle collective challenges like climate change. More equal societies tend to be more socially cohesive and have higher environmental consciousness.
- A better understanding of national interest could help...

## Politics (II): “Better Growth, Better Climate”: report of Global Commission, September 2014

- Commission chaired by President Felipe Calderon (I was co chair): business leaders; former Finance Ministers, Prime Ministers, Presidents; leaders of IFIs; and mayors. **Economic decision-makers.**
- Next decades embody **remarkable coincidence** of (i) profound global **structural transformation** (including urbanisation, energy systems, and land use) and (ii) need for **transition to low-carbon.**
- Additional advantage of very rapid technical progress (digital, materials, bio). Also currently low interest rates.
- If conduct **structural transformation well** (relative to congestion, pollution, resource efficiency, land use) then **much of what is necessary** for low-carbon transition will be achieved.
- Structural transformation will happen anyway and need around \$90 trillion of infrastructure investment in next 15 years. Doing it well would cost only a few trillion more.
- Most of necessary investment in **national interest**, even without valuing emissions reductions. ***Better growth, better climate.***

## Politics (III)

- Slow progress around the world and at international level.
- Some positive signs from key players: China; US; EU.
- But politics not moving far and fast enough.
- National leadership is critical.
- Also international cooperation.
  - Not dominated by incentives to “free-ride” given the attractiveness of the transition for each country, and “environmental responsibility” is taken seriously;
  - Yet international cooperation remains challenging;
  - But it can help give clear goals and signals, coordinate national efforts, provide financial, technology and capacity building support



## Politics (IV)

- Business, cities, young people, social movements, can and are bringing pressure.
- Public pressure on investors, firms governments: e.g. “keep it in the ground”.
- Some leadership: AP4 (finance); Unilever, etc. on palm oil...
- Cities: C40, NYC, Bogota...
- Religious leaders.

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## Paris climate conference (I)

- Current 'intended nationally-determined contributions' (INDCs) look like 55-60GTCO<sub>2</sub>e per annum in 2030, when low 40s looks like maximum for a reasonable chance for 2°C.
- Thus strong efforts necessary to ramp up before Paris.
- Even more important: process for review and increasing ambition after Paris.
- Must now recognise that zero carbon by end of this century looks necessary.

## Paris climate conference (II)

- More broadly, Paris is a chance to build understanding not only of threats and **risks** but of the great **opportunities** that lie in the transition to the low-carbon economy. **Equity** must be centre stage.
- The **next two decades** will see rapid structural transformation of the world economy; this transformation coinciding with a decisive period for the transition to the low-carbon economy represent a crucial moment. We can **use it or lose it**.
- If we take it we lay the **foundations** for the future and **accelerate** the dynamism for the rest of the century.
- These understandings plus the construction of a **collaborative and dynamic** approach can bring **success in Paris in 2015**.
- It is possible to rise to the two defining challenges of our century – **overcoming poverty** and **managing climate change**. If we fail on one, we fail on the other.