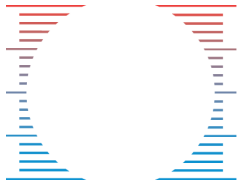

Centre for
Climate Change
Economics and Policy

Grantham Research Institute on
Climate Change and
the Environment

THE LOGIC, URGENCY, AND PROMISE IN TACKLING CLIMATE CHANGE

Nicholas Stern

Chair of the Grantham Research Institute on Climate Change and the Environment,
Chair of the Centre for Climate Change Economics and Policy,
IG Patel Professor of Economics & Government,
President of the British Academy

London School of Economics and Political Science

Vienna
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Structure

1. **Logic: climate science and the need to act**
2. Urgency: the scale of change, risks, and dangers of delay
3. Promise: attraction of transition to low-carbon path
4. Road to Paris: a new approach for 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_2 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 and 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.

The science is robust and GHG concentration rising rapidly

Climate science is built on two centuries' of theory and evidence

- 1820s: **Joseph Fourier** recognized the atmosphere was trapping heat.
- 1860s: **John Tyndall** discovered the gases that were doing so – the GHGs.
- End of 19th century: **Svante Arrhenius** provided calculations to the effect.
- 1940s: **Walter Elsasser** explained that GHG molecules oscillate at a frequency that interferes with the escape of infrared radiation.

CO_2e concentrations now around 450ppm (Kyoto gases).

- **Adding CO_2e 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_2e over a century. Strong possibility of **eventual temperature increase of more than 4°C (or 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.

Temp 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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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?
- **Around 80%** of energy-related CO_2 emissions permitted to 2035, by 450ppm CO_2 target, are already **locked-in** by existing capital stock. IEA, WEO, 2011.

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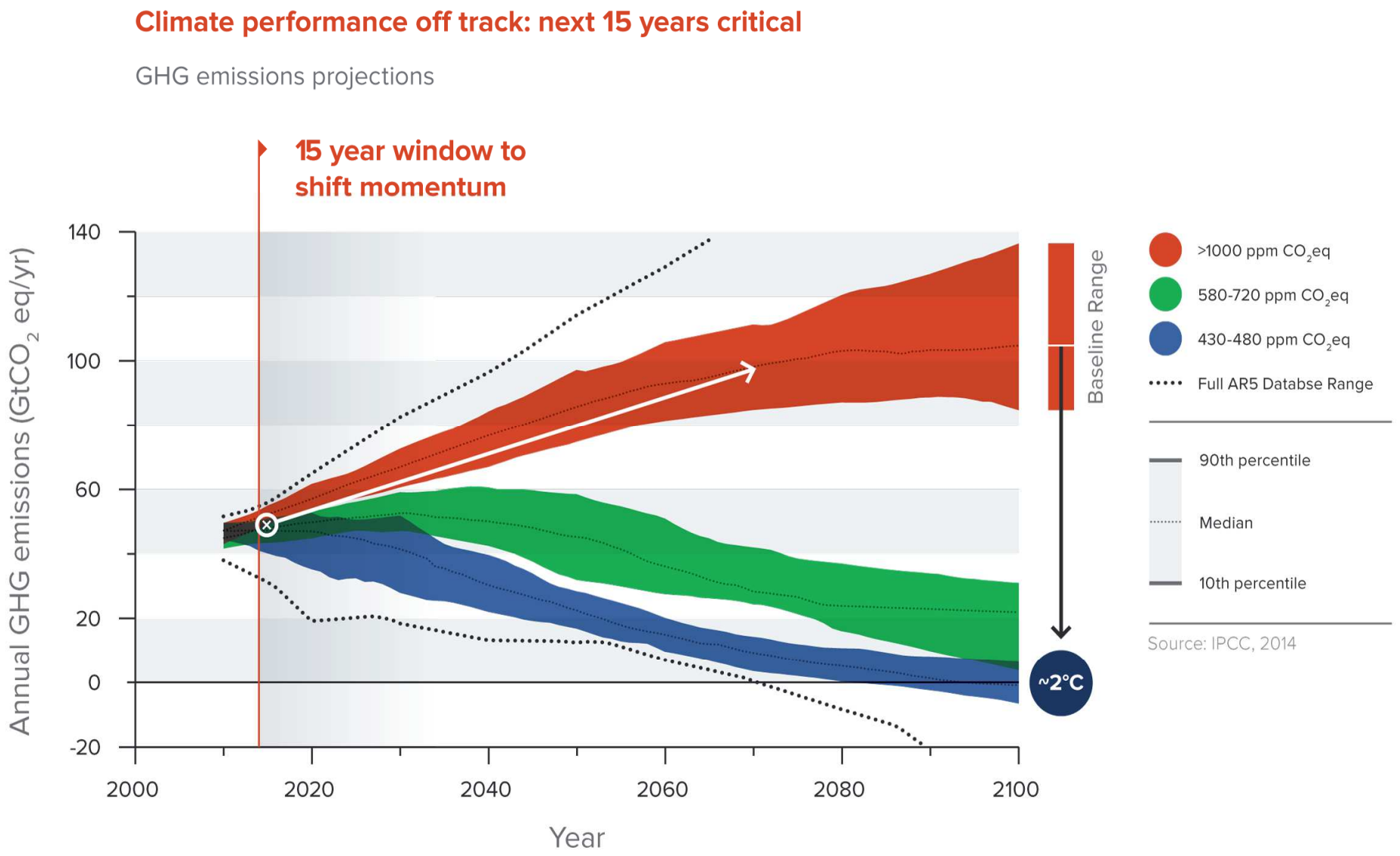
What to do to hold warming below 2°C

- Necessary emissions path for 50-50 chance of 2°C:
  - **under 36Gt** in 2030; **under 20Gt** in 2050; zero by end century.
- Can do a little more earlier and a little less later and vice versa but shape of feasible paths similar, and **costly to catch up if postpone action**.
- 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.**

Why the next 15 years are critical



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

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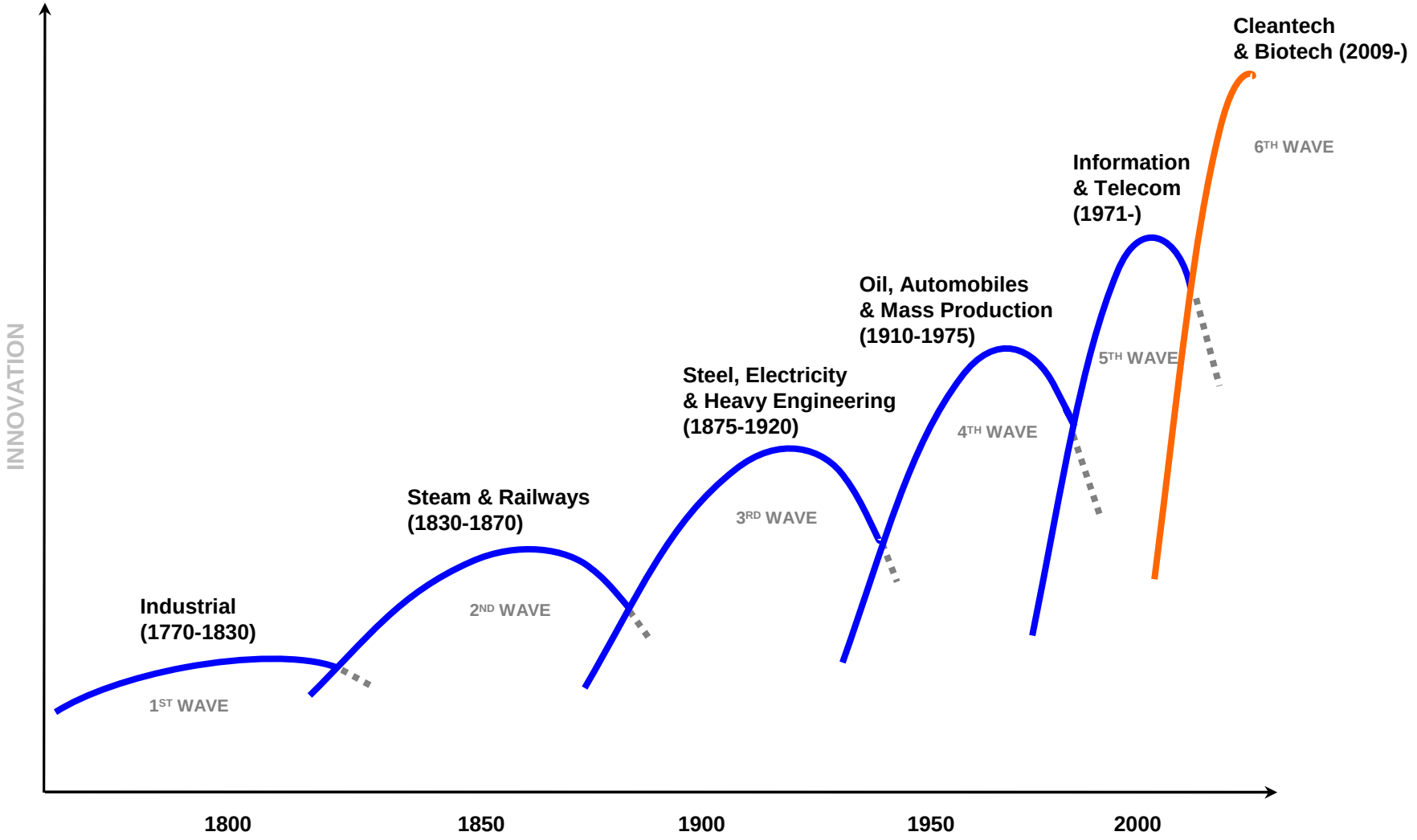
Scale and nature of response needs to be rapid and strong

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**.
- The transition to **low-carbon growth represents a very attractive path**: could, if economic history is a guide, stimulate dynamic, innovative and creative growth.
- Will need **substantial investments** and will involve some **dislocation**.
- A new **energy-industrial revolution**.

Waves of innovation



Source: DONG Energy (2009); diagram based on Merrill Lynch (2008) drawing on Perez (2002) (schematic not precise quantitative vertical axis).

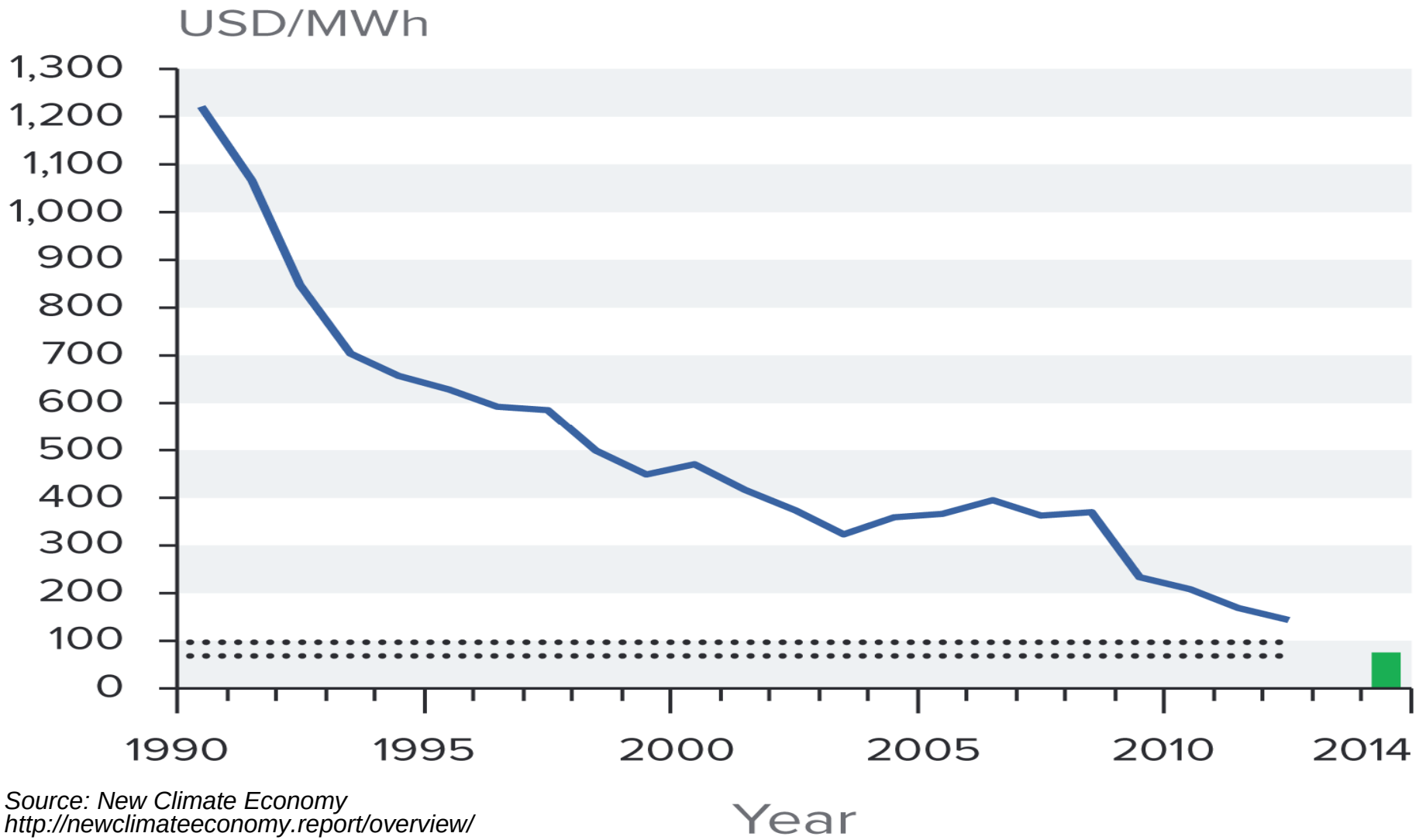
"Better Growth, Better Climate": report of Global Commission, September 2014

- Commission chaired by President Felipe Calderon (co chaired by Nicholas Stern): 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**.
- 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 (see next 2 slides).

Technical progress – a focus on solar

Solar PV module installed costs have fallen around 50% since 2010: currently well below $1/watt.

Delivered prices of energy now competitive generation in 79 countries.



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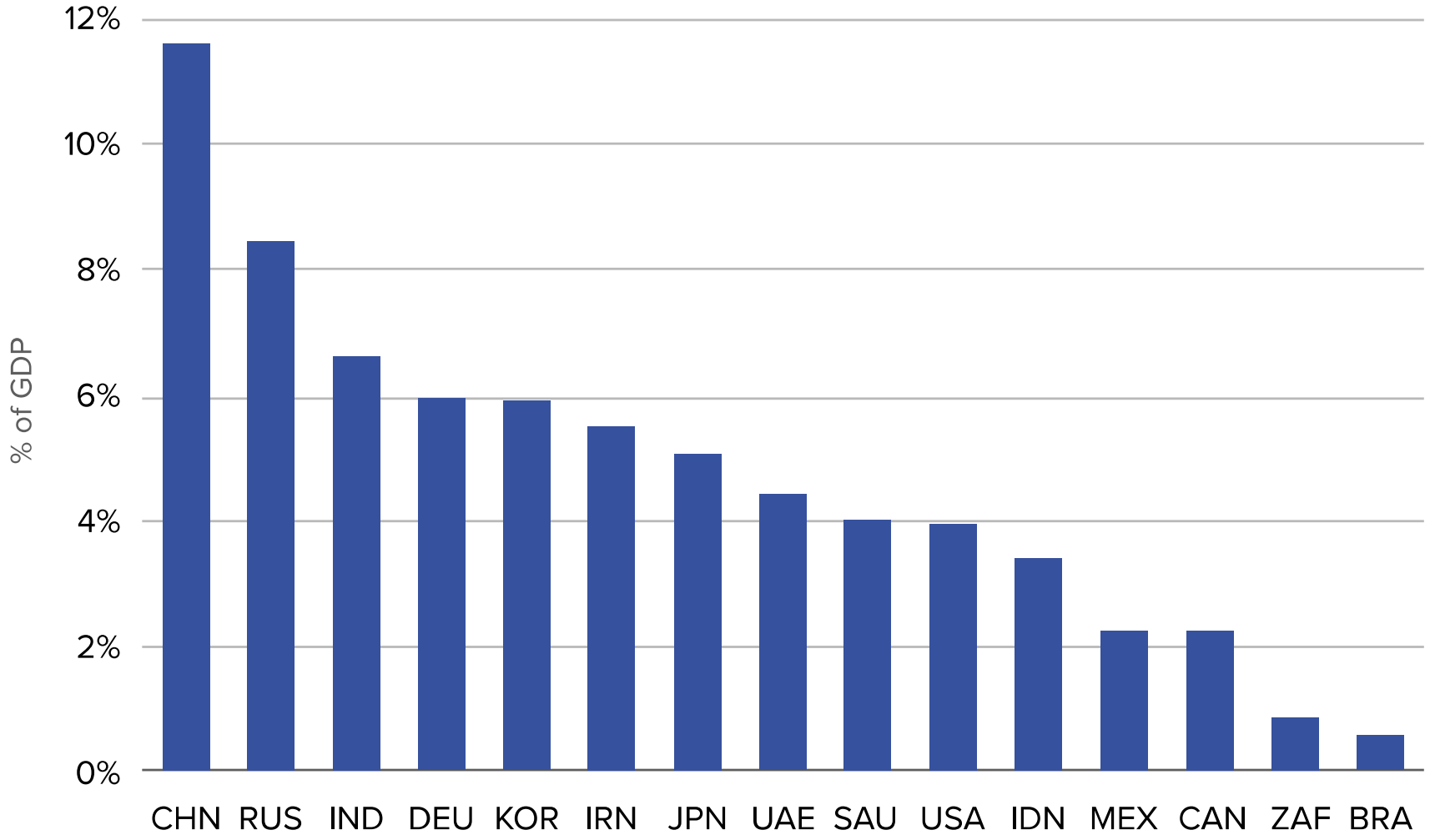
Value of the premature deaths from PM2.5 air pollution



Source: NCE estimate, based on WHO mortality data

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From Kyoto to Paris: a new approach (I)

- Shift **away** from attempt at comprehensive, legalistic, formal enforcement of "**burden-sharing**".
- Toward **dynamic, collaborative**, transitions to zero carbon embodying growth and poverty reduction & EASD.
- "**Collaborative**" – implications for structure of agreement.
  - Emissions reductions ("contributions") are "nationally determined"/ non-binding; enables participation of US and BASIC countries.
  - Conduct/processes are **obligations**: to 'submit', 'revise' etc. under structured processes.
  - *Ex ante* review of contributions to build understanding.
  - Transparent MRV and ex post review (to facilitate improvement and understanding).

From Kyoto to Paris: a new approach (II)

- *"Dynamic"* – implications for structure of agreement.
  - Recognition of "**emissions gap**" and need to build ambition over time in dynamic way (as technologies, prices, politics change).
  - Structure for **upward flexibility**, e.g.:
    - Rolling 5-10 year targets and commitments, revised every 5 years.
    - Lower and upper "range" of commitments.
  - Commitments should include not just targets, but also **policies and measures**, and local institutions to implement.
  - Strong focus on MRV, examples, good practice.
  - Strong focus on **innovation and technology.**

→ A "hybrid" agreement: mix of 'ends' and 'means', binding/ centralised and non-binding/decentralised.

The road to Paris

- 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.

Conclusion

- IF NEEDED

OPTIONAL SLIDES

The challenges of equity

- Developed countries (1 billion in 7 billion population)
  - Responsible for around **half of global emissions** since 1850.
  - Average per capita emissions still >15tCO_2e per year.
- Developing countries
  - Responsible for around **two-thirds** of current emissions.
  - Will be responsible for big majority of future emissions.
  - But per capita emissions still **1/3 to 1/2 of rich countries.**
- World must be at 2tCO_2e per capita by 2050 globally for 2°C. Will not be many below so cannot be many above: basic policy arithmetic, not an ethical statement, Arithmetic implies faster cuts for rich countries.
- But ethics matters: a **double inequity** in climate change – rich countries major responsibility for past emissions, poor people hit earliest and hardest.

Equitable access to sustainable development (I)

- UNFCCC Cancun 2010 language: an attractive way of framing the issues.
- Broad connotations of EASD:
  - 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** (providing strong examples, technology and finance).
- 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.

Equitable access to sustainable development (II)

- Some specifics:
  - Embrace shared understandings of issues described here and **shared goals**: 2°C; zero emissions in 2nd half of century.
  - Accelerate shift away from **fossil fuels (especially coal).**
  - Halt **deforestation**; restore **degraded forests**.
  - Strong developed to developing **financial flows**; expand international/regional/national (green) development banks.
  - Collaborate on **innovation and technology** transfer.
  - Combine mitigation, adaptation, growth and poverty reduction in investment and planning.
- Common actions; but rich countries cut faster and generate strong examples; promote flows of finance and technology.