

10th Asia Clean Energy Forum
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Expanding Our

Clean Energy Boundaries

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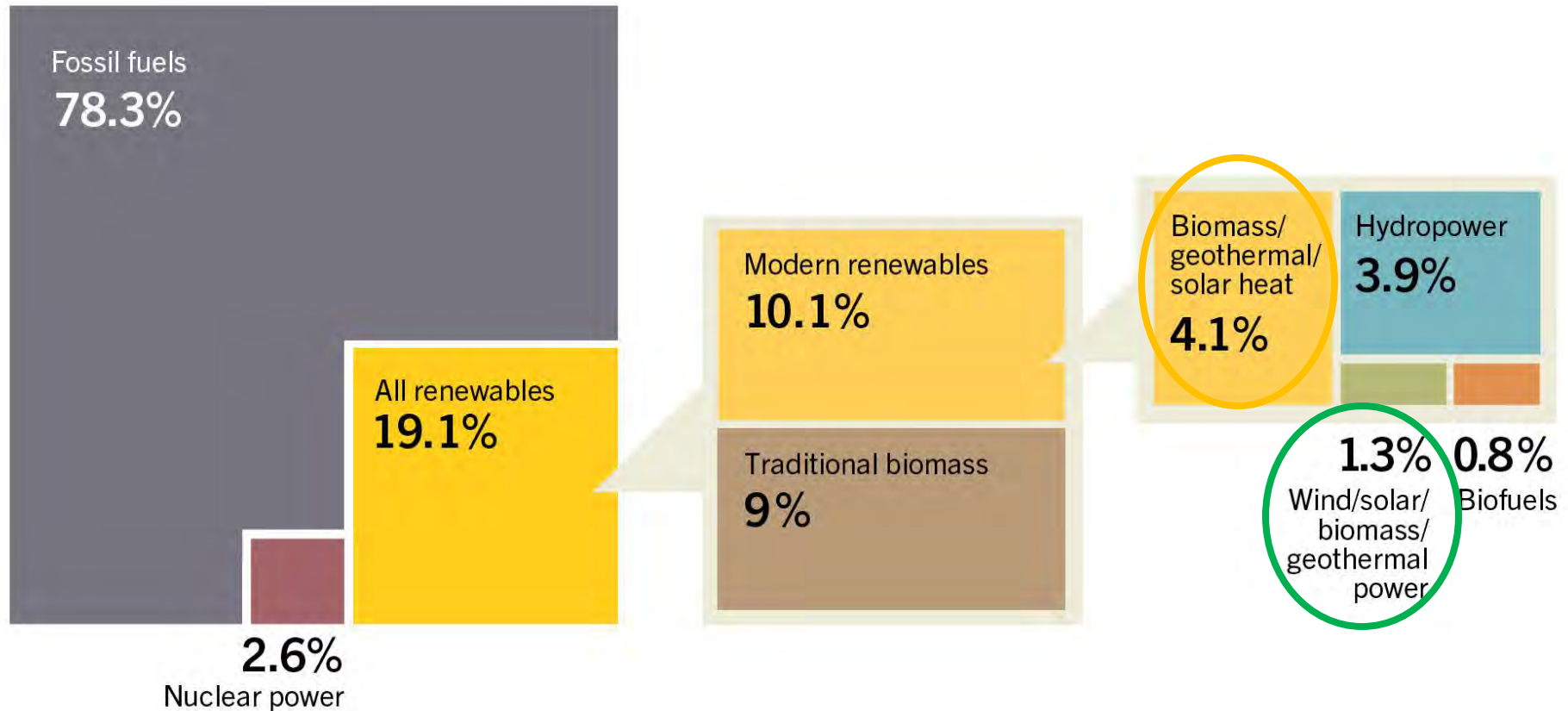
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Objectives:

- To extend the visionary thinking of the ACEF community;
- To show the links between energy, water, food, land and climate; and
- To stimulate innovative ideas and solutions as needed urgently to deliver the transition towards sustainable development and a *Clean Energy* future.

Where we're at. Where we're going!

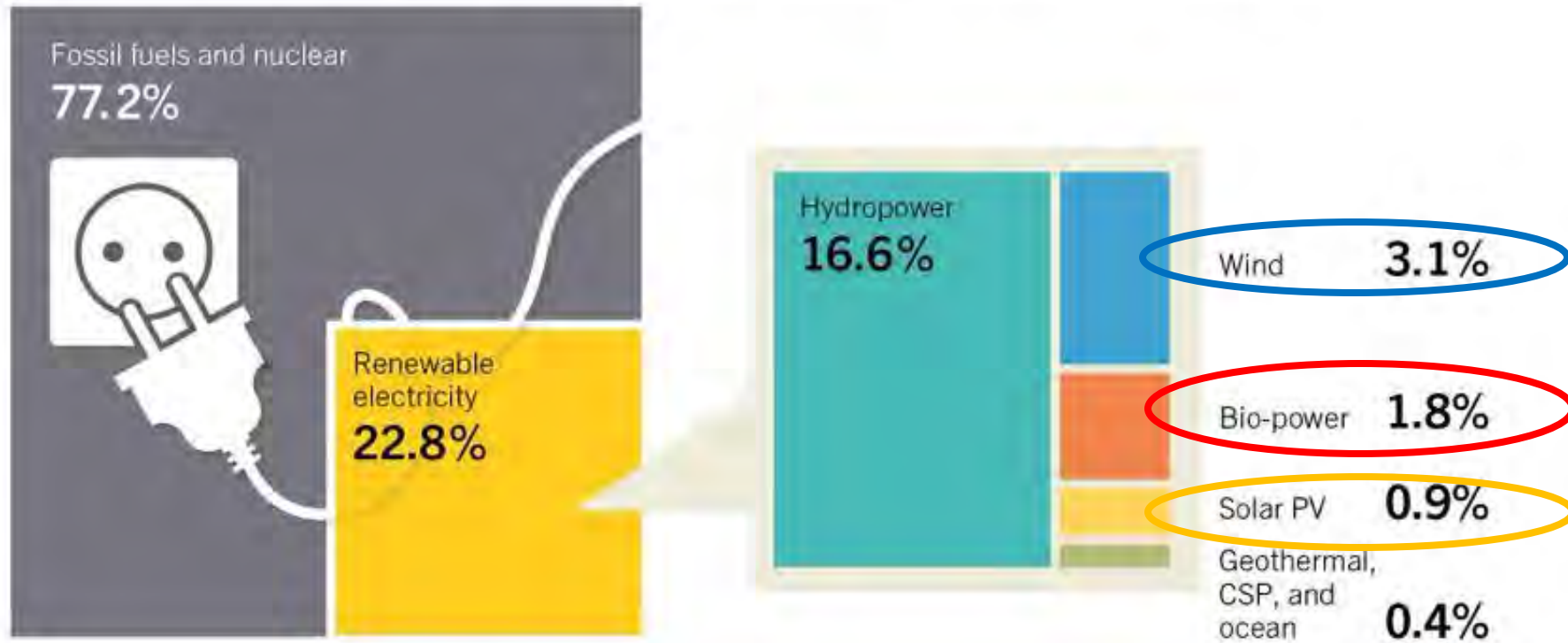
1) Renewable energy share of global final energy consumption in 2013.



REN21 *Renewables 2015 Global Status Report*

Little in the ACEF programme on renewable heat

Renewable energy share of global electricity generation at end of 2014



Based on renewable generating capacity in operation at year-end 2014.

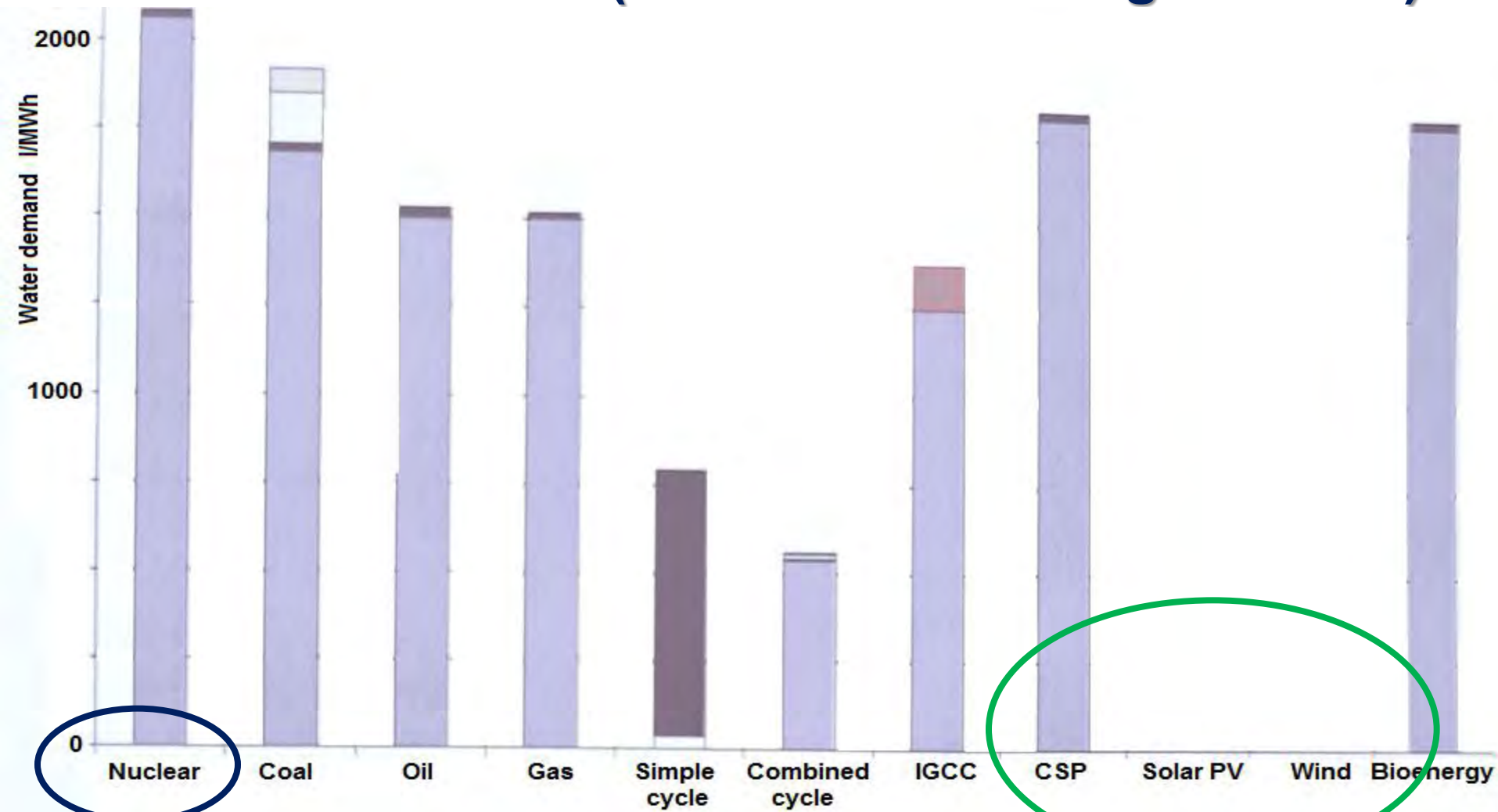
REN21 *Renewables 2015 Global Status Report*



ACEF programme was mainly solar and wind, yet in Asia there are large resources of sustainable biomass that could be utilised.

The Energy-Water nexus.

Comparing power generation options should not just be costs and GHG mitigation potential, but water demands too (litres water /MWh generated).



The US National Academies, 2014

2) Is nuclear power “clean energy”?

**IPCC 4th Assessment Report, Mitigation 2007.
Summary for Policy Makers:**

“Given costs relative to other supply options, nuclear power, which accounted for 16% of the electricity supply in 2005, can have an 18% share of the total electricity supply in 2030 at carbon prices up to 50 US\$/tCO₂-eq, but safety, weapons proliferation and waste remain as constraints.”

This sentence was very controversial and took 6 hours to negotiate.

Nuclear power plant development is not easy!

- AREVA – EUR 4.9bn loss (~\$5.4bn) in 2014 after 3 previous years of losses.**
- Merger planned with EDF to design, build and service reactors.**
- EPR reactor in Finland is 10 years behind schedule with EUR 3.9bn impairment charges for AREVA and pending court hearings.**
- Similar EPR reactor at Hinkley in UK under construction, but now with some uncertainty.**
- EPR reactor in Flammaville, France being built by EDF is 6 years behind schedule and is EUR 6bn (~\$6.6 bn) over budget.**
- Two EPR reactors in Taishan, China being built by China General Nuclear on time and within budget.**

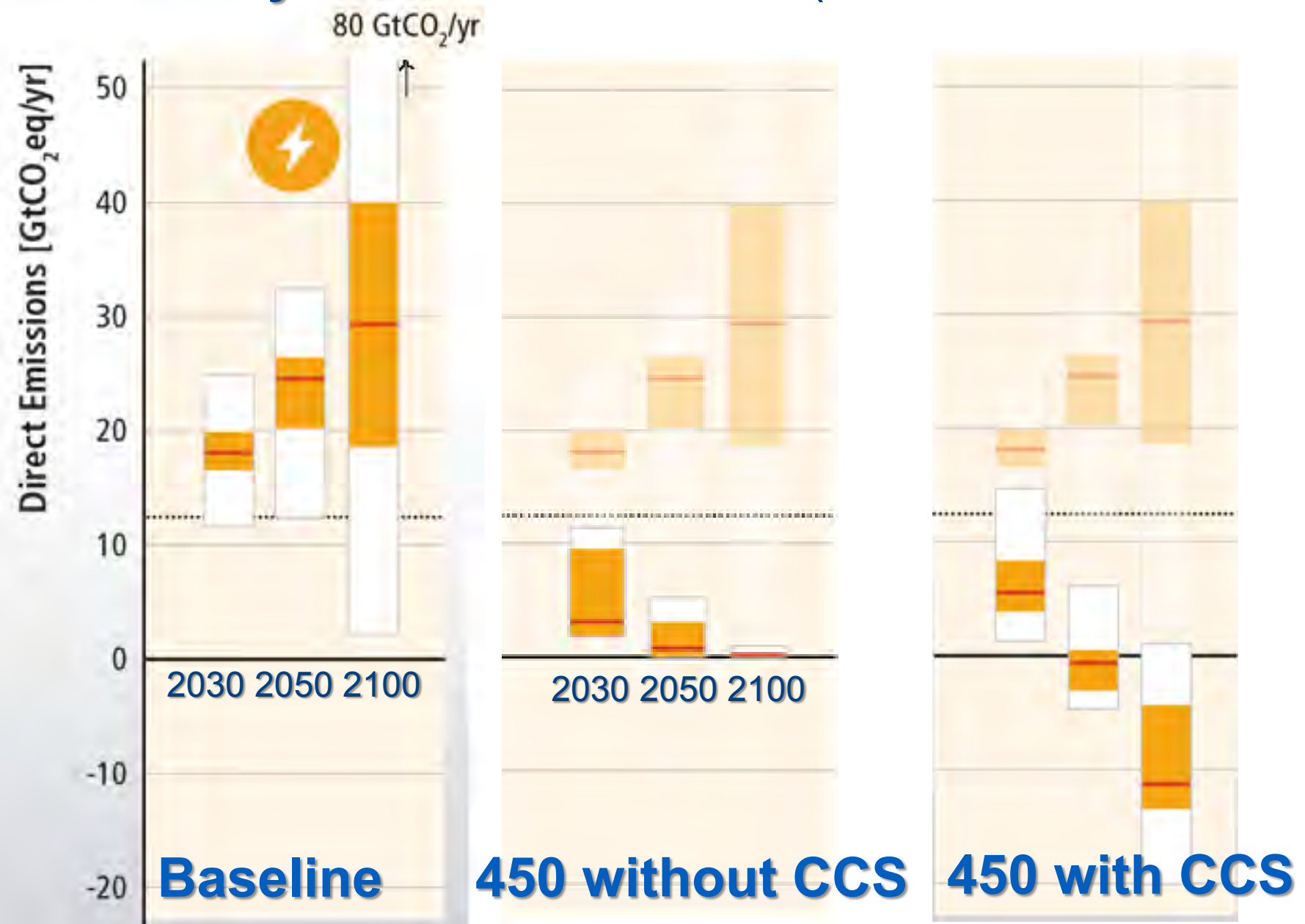
3) What about CO₂ Capture and Storage?

Also not looking too bright at this stage.

- Costs of Future-Gen 2.0 CCS coal power project in Illinois, USA, rose to \$1.62 bn - for only 166MW export capacity. So USDoE has pulled its \$1.1bn share.
- Boundary Dam plant in Canada is exceeding expectations after 130 days operating, but it cost \$1.3bn for this 110 MW export plant.
- Australian government cut CCS RD&D funds.
- 4 utilities quit European Zero Emission Platform –

“We do not have the necessary economic framework conditions in Europe to make CCS an attractive technology to invest in.”

Electricity sector emissions – (from ~1200 scenarios)



4) What role for Ocean energy?



**Example:
8m tidal range
250 MW, plant,
Sihwa, S Korea.**

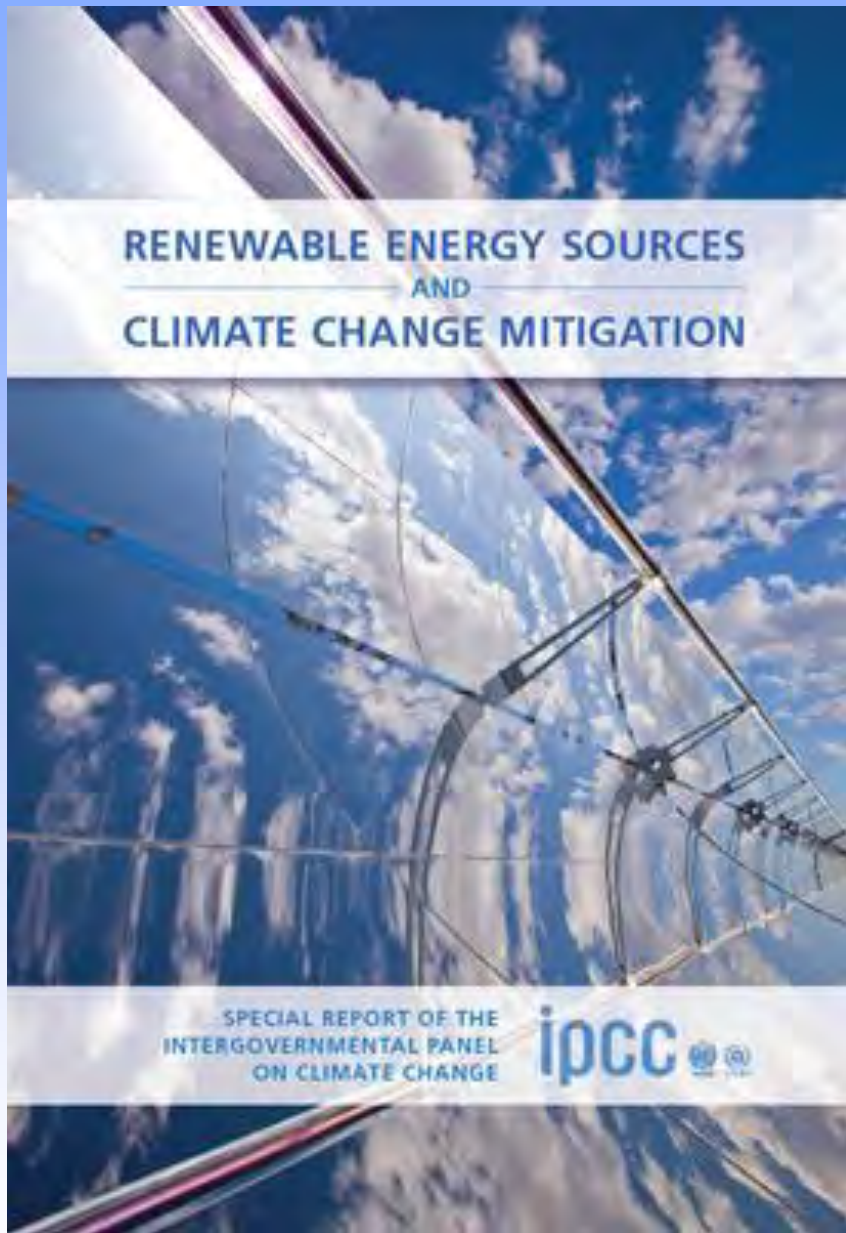


5) Is energy efficiency winning?

Global energy intensity (GJ /\$ GDP) has declined by around 1.25% annually since 1990.



But total global energy demand continues to increase



**A key message:
Maximising renewable
energy uptake needs
energy efficiency in
place too
– we're all on the same
side!**

**Technology change
easier than
behavioural change.**

**IPCC Special Report on Renewable Energy Sources
and Climate Change Mitigation (SRREN)**

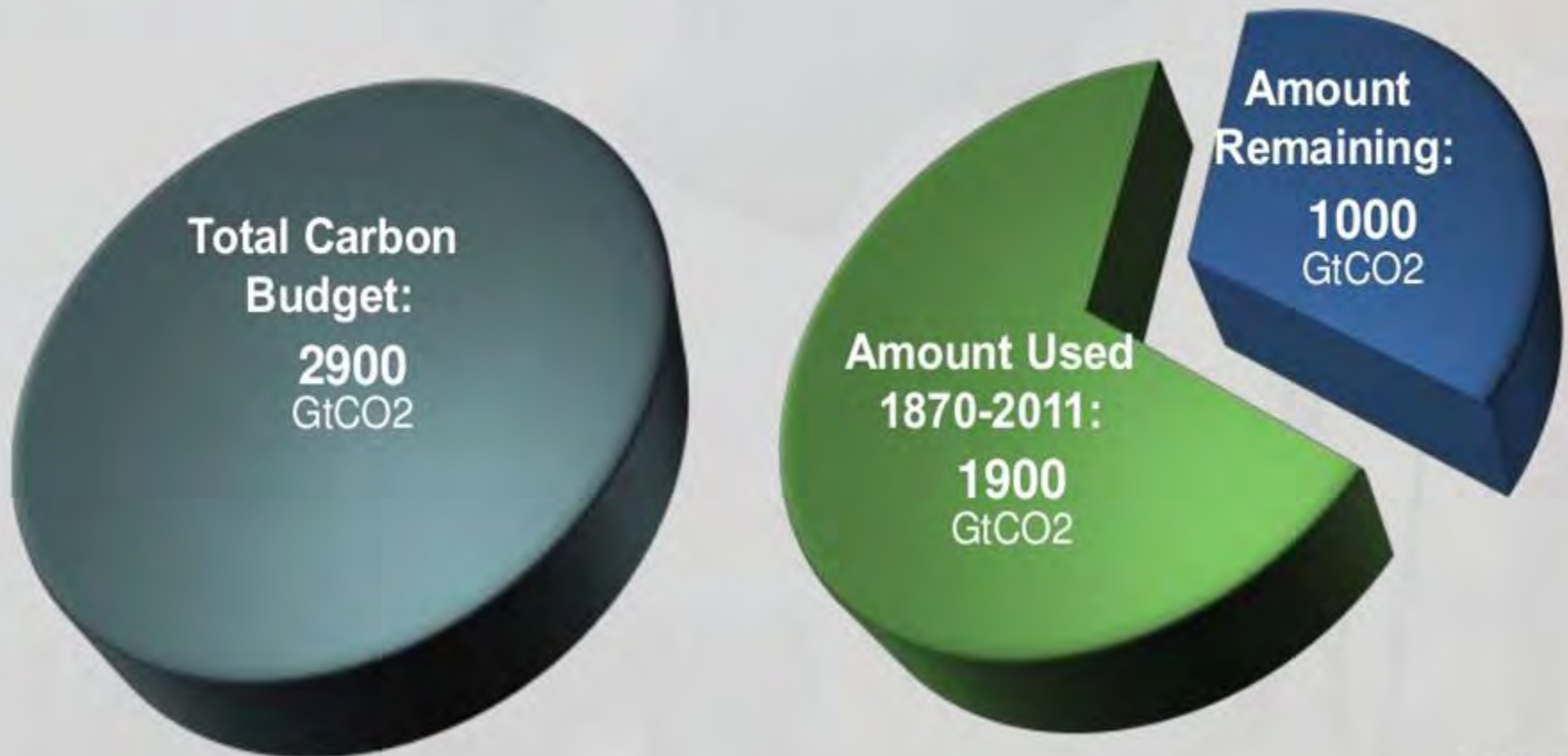
July, 2011.

<http://srren.ipcc-wg3.de>

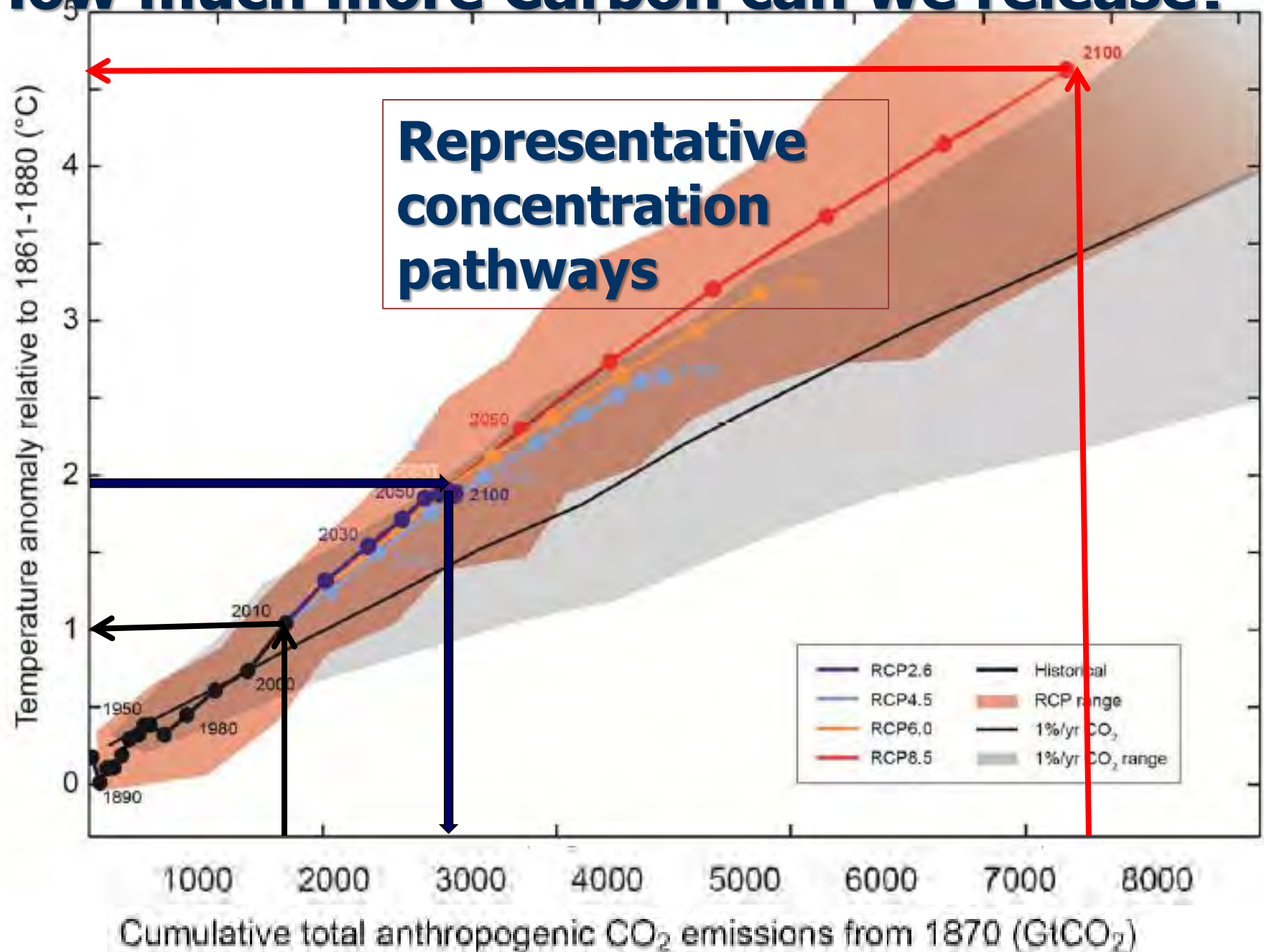
Market penetration of clean energy systems is increasing - but the rate remains far too slow.

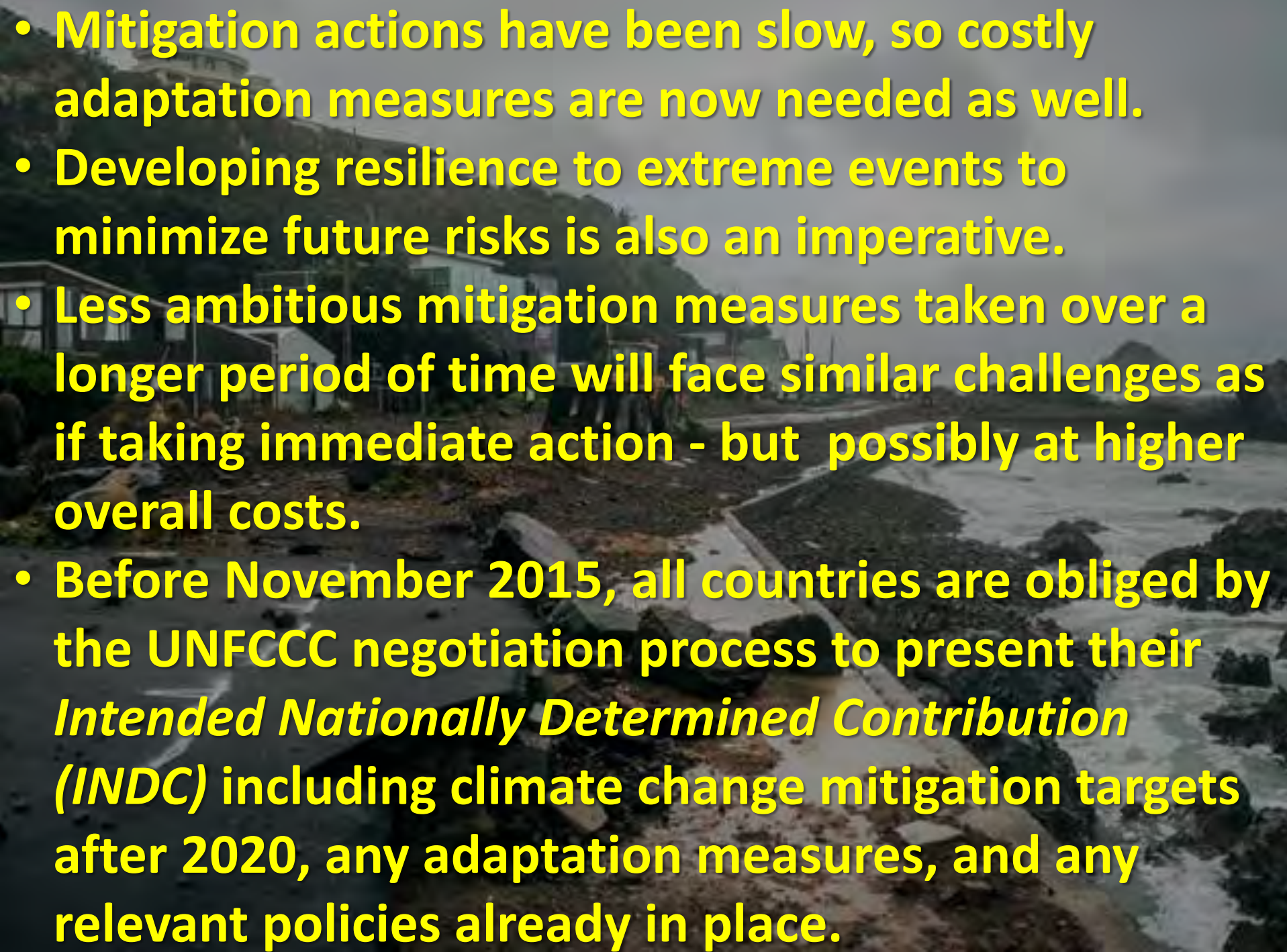
The window for action is rapidly closing

65% of our carbon budget compatible with a 2° C goal is already used

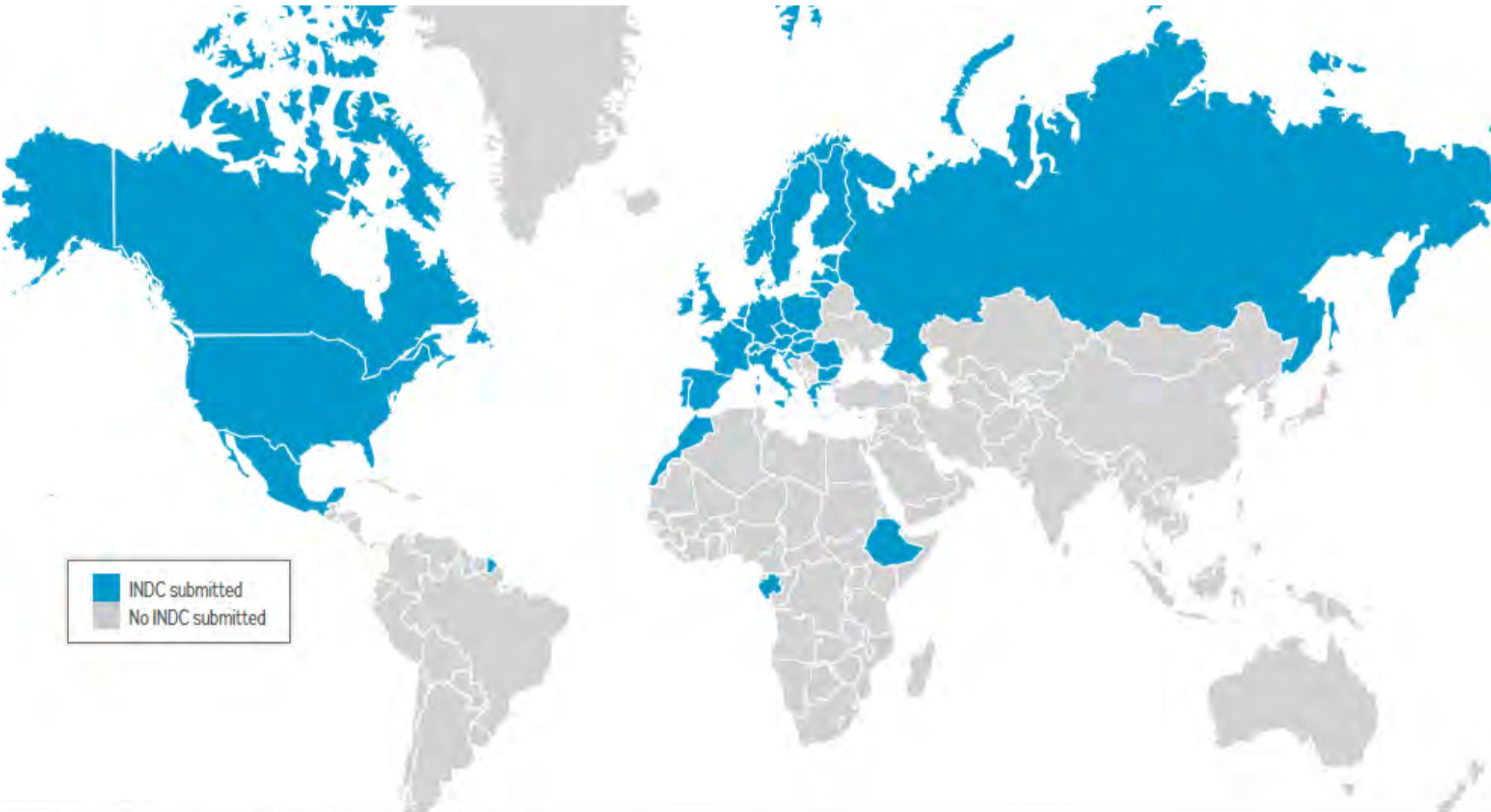


How much more Carbon can we release?



- 
- Mitigation actions have been slow, so costly adaptation measures are now needed as well.
 - Developing resilience to extreme events to minimize future risks is also an imperative.
 - Less ambitious mitigation measures taken over a longer period of time will face similar challenges as if taking immediate action - but possibly at higher overall costs.
 - Before November 2015, all countries are obliged by the UNFCCC negotiation process to present their *Intended Nationally Determined Contribution (INDC)* including climate change mitigation targets after 2020, any adaptation measures, and any relevant policies already in place.

Intended Nationally Determined Contributions to date



Countries that have submitted their INDCs so far equate to around one third of total global GHG emissions.

Intended Nationally Determined Contributions received to date (19 June)

Switzerland	50% below 1990 by 2030
EU (28)	40% below 1990 by 2030
Norway	40% below 1990 by 2030
Mexico	22% GHG and 51% black carbon by 2030
USA	26-28% below 2005 by 2025
Russia	25-30% below 1990 by 2030
Gabon	50% below BAU baseline by 2025
Liechtenstein	40% below 1990 by 2030
Andorra	37% below BAU scenario by 2030
Canada	30% below 2005 by 2030
Morocco	32% below BAU scenario by 2030
Ethiopia	64% below BAU scenario by 2030

Note: Morocco stated mitigation will cost \$45 bn and they can only proceed if \$35 bn comes from the GCF

China is aiming to peak GHG emissions before 2030 when >20% primary energy will come from non-fossil fuels.

Premier Li Keqiang:

“China's energy consumption per unit of GDP in 2014 dropped by 29.9% below 2005 levels.”

“China will enhance energy efficiency measures and projects to reduce the level of CO₂ per unit of GDP.”

“Increasing the share of clean energy in China's energy mix and expanding forest areas in the country are also priorities.”

Who agreed this just last week?

“Countries around the world should hold to the upper end of a U.N. recommendation calling for 40% to 70% reductions in greenhouse gas emissions by 2050 compared with 2010.”

“We will raise the overall coordination and transparency of clean energy R,D &D highlighting the importance of renewable energy and other low-carbon technologies.”

“The world today has no binding rules. That is why it must be the goal of the Paris agreement.”

The G-7 leaders at their meeting in Bavaria.

Who wrote this just last week?

“Together with renewable energies, it is important to promote the use of gas to replace coal.”

“These would contribute at low costs to meet carbon-emissions targets.”

“We need governments across the world to provide us with clear, stable, long-term, ambitious policy frameworks.”

Executives from Shell, BP, Total, ENI, Statoil, and Repsol in a joint letter to the UNFCCC.

Who said this just last week?

"Inaction on climate change now will cost us all in the future."

"There is much potential for more and better jobs if we work towards sustainable development."

"Young people expect us to leave behind a viable planet where they can enjoy a decent life and decent work."

"Up to 60 million jobs can be created in a greener, low carbon economy if the right policies are adopted."

Guy Ryder, Director-General, International Labour Organisation.

Who said this on his way to the Philippines?

"The climate meetings in Peru were nothing much, I was disappointed. There was a lack of courage. They stopped at a certain point. We hope that in Paris the representatives will be more courageous going forward."

"Mostly, in great part, it is man who has slapped nature in the face."

"We have in a sense taken over nature and have exploited nature too much."

"Thanks be to God that today there are voices, so many people, who are speaking out about it."

Pope Francis - who is due to deliver his upcoming encyclical on the environment.

HOT OFF THE PRESS

Yesterday Pope Francis released an unprecedented and universal call to action on climate change in his encyclical letter to over 5000 bishops and 1.2 billion Catholics worldwide.

"Humanity is called to create awareness of the need to change styles of life, production and consumption, to combat this warming or, at least, the human causes that produce or accentuate it."

So the Vatican's stance is clear:

Climate change will impact on us all, especially the poor.

To prevent its catastrophic consequences we need an ethical and economic shift, a revolution in hearts and minds.

The link between climate change and human activity is now centre stage at a crucial moment before the Paris climate negotiations.

**Who said this just last week in a radio
interview?**

**"When I've been up close to these wind farms,
there's no doubt, not only are they visually awful,
they make a lot of noise."**

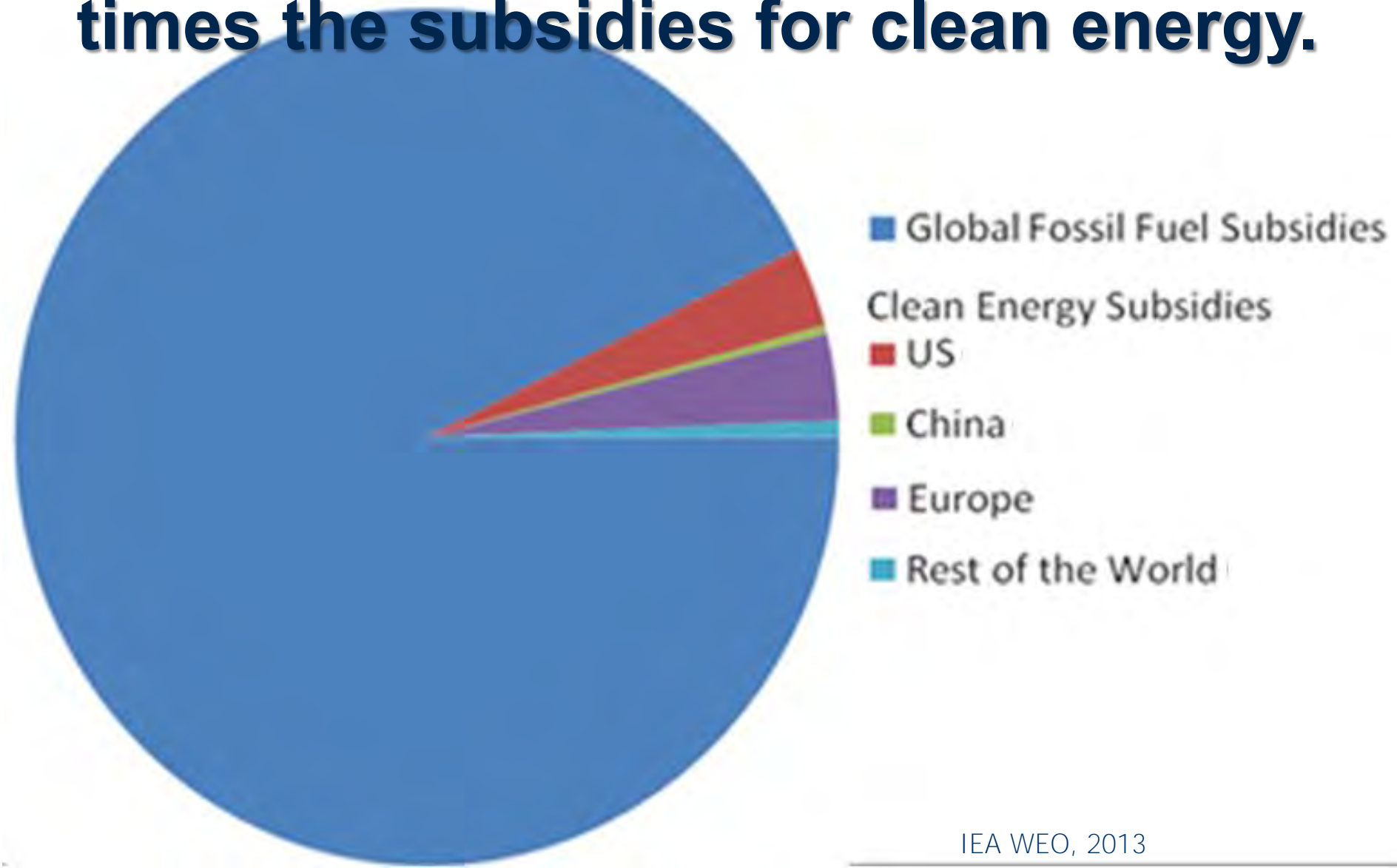
**"I fully take your point about the potential adverse
human health impact of these things."**

**"What we did recently in the Senate was reduce
the number of these things that we are going to
get in the future."**

**"Now frankly I would have liked to have reduced
the number a lot more ... but we got the best deal
we could."**

Mr Tony Abbott, Prime Minister of Australia

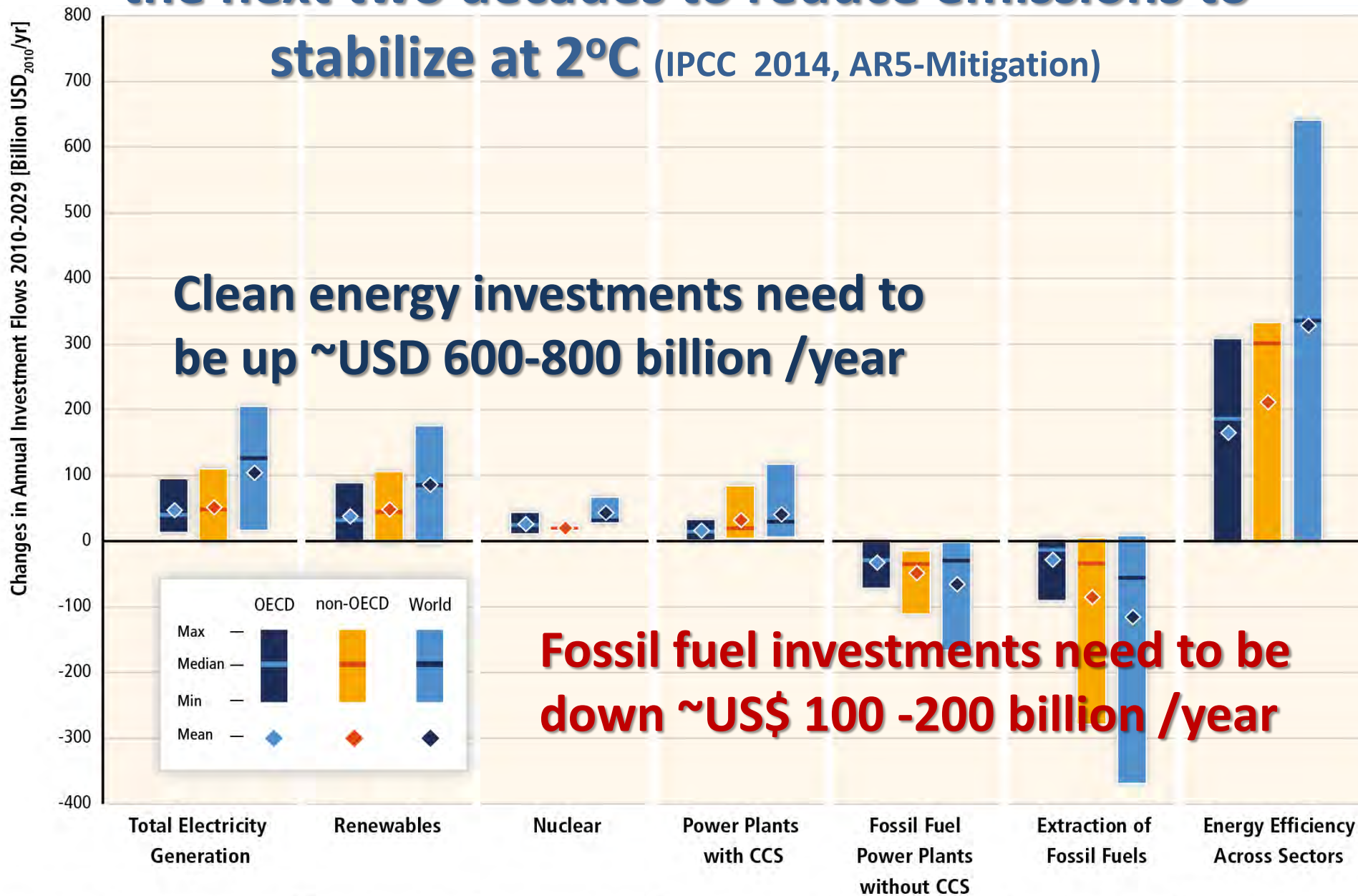
Global subsidies for fossil fuels remain around \$500 billion/yr, around 10-12 times the subsidies for clean energy.



Large changes in energy investment are required in the next two decades to reduce emissions to stabilize at 2°C (IPCC 2014, AR5-Mitigation)

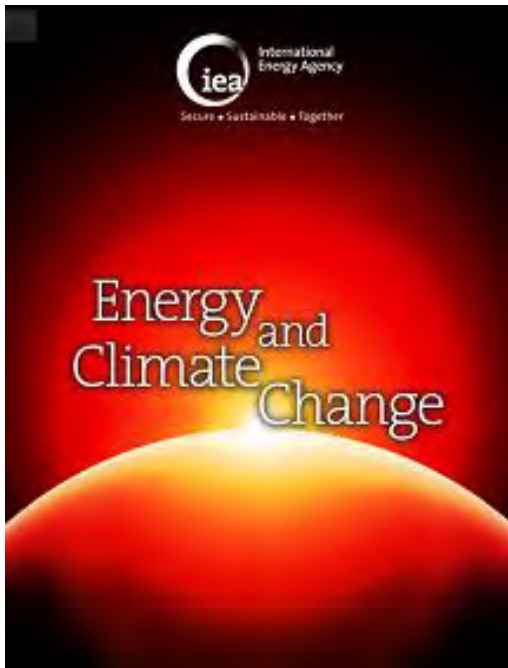
Clean energy investments need to be up ~USD 600-800 billion /year

Fossil fuel investments need to be down ~US\$ 100 -200 billion /year



World Energy Outlook 2015 -

Special Report on Energy and Climate, IEA. (released this week)



- Emissions from the energy sector are double the level of all other sources combined.
- Economic growth has been decoupled from CO₂ emissions - but there is still a long way to go.
- We will have to be very ambitious in Paris if we are to meet the target of a 40% emission cut by 2030 that we committed to ahead of COP21.
- Investments in renewable energy sources are still disproportionately lower than the annual investment in oil, natural gas and coal.
- EUR 243bn investments in RE remain only around one quarter of the EUR 883bn investment dedicated to bringing oil, natural gas, and coal to consumers.
- An integrated approach to energy and climate change is needed.

GEF Integrated Approaches



Taking
Deforestation
out of the
Commodities
Supply Chain

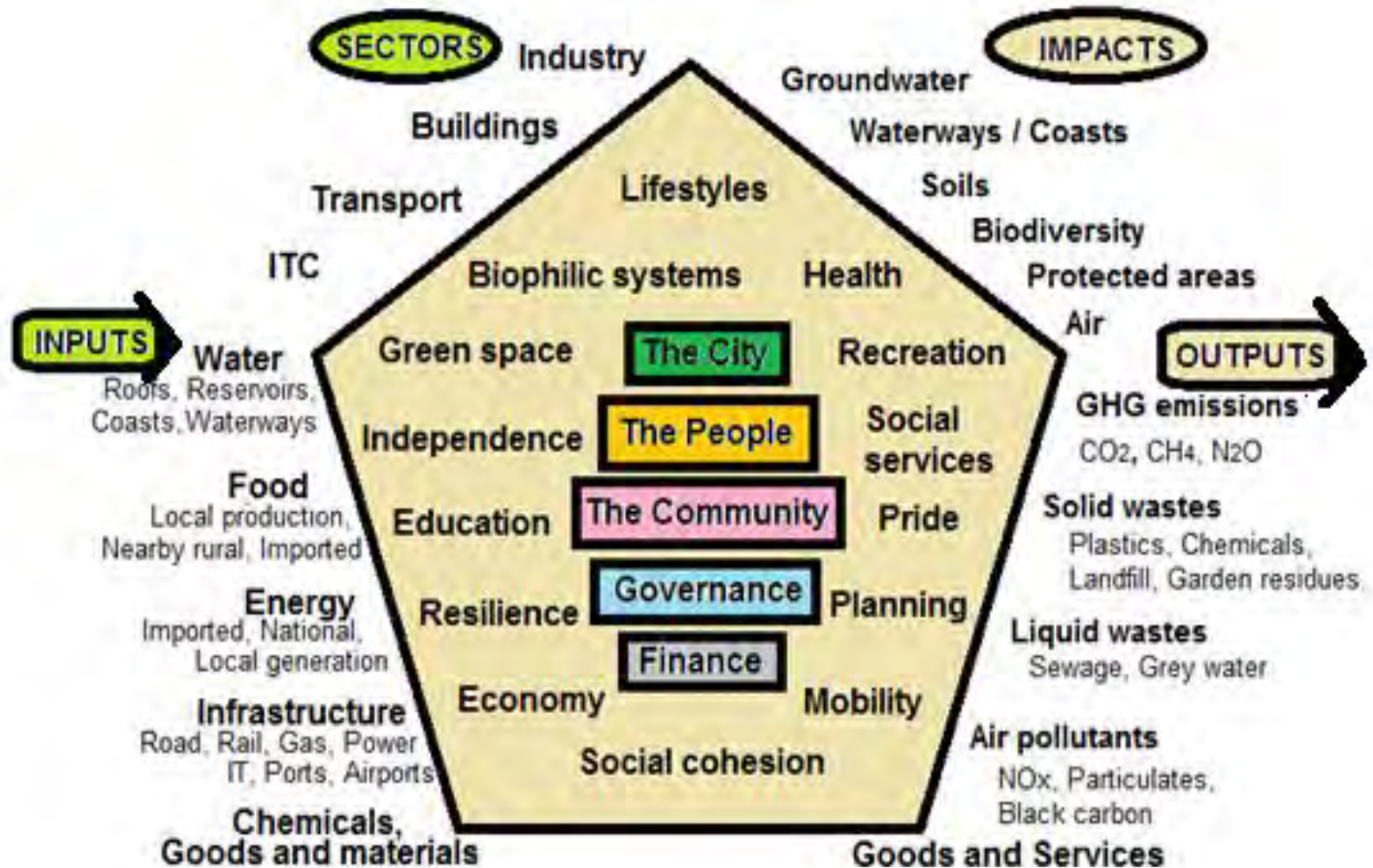


Sustainable
Cities –
Harnessing
Local Action
for Global
Commons



Fostering
Sustainability
and
Resilience for
Food Security

Every city has a unique but complex metabolism



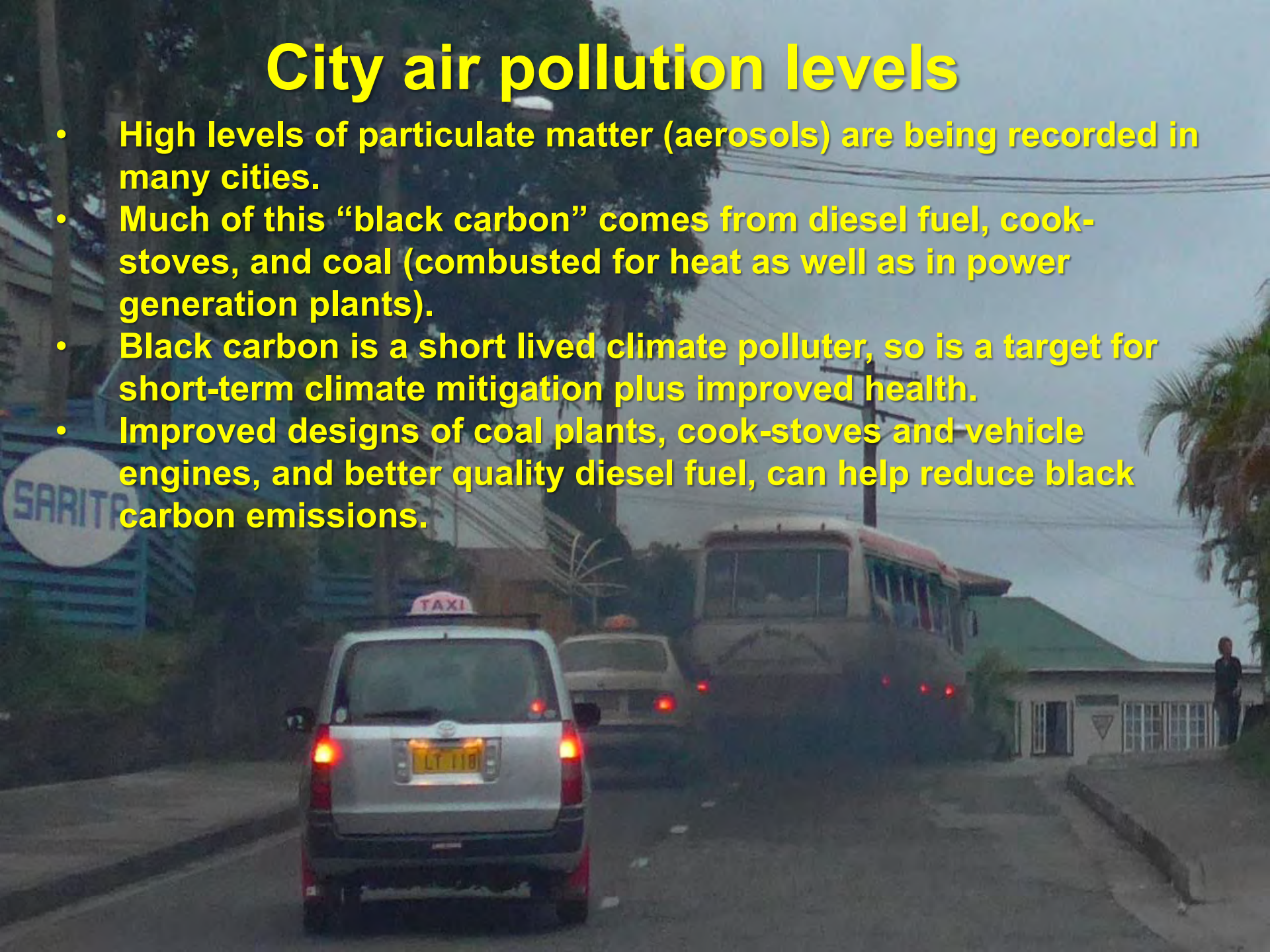
Energy is but one input; GHG emissions one output.

The sustainability of a city cuts across planning, health, society, transport, recreation, water, energy – so how best to measure it?

- **Energy intensity / unit GDP.**
- **Renewable energy shares of heat and power.**
- **Carbon emissions per capita.**
- **Number of accredited “green buildings”.**
- **Green space share of total land area.**
- **Daily water consumption per capita.**
- **Waste treatment system efficiency.**
- **Local air quality ($\text{PM}_{2.5}$ SO_2 NO_x black carbon).**
- **Share of land area for roads and car parks.**
- **Citizen satisfaction and quality of life.**
- **Low-carbon transport share of total journeys.**

City air pollution levels

- High levels of particulate matter (aerosols) are being recorded in many cities.
- Much of this “black carbon” comes from diesel fuel, cook-stoves, and coal (combusted for heat as well as in power generation plants).
- Black carbon is a short lived climate polluter, so is a target for short-term climate mitigation plus improved health.
- Improved designs of coal plants, cook-stoves and vehicle engines, and better quality diesel fuel, can help reduce black carbon emissions.



Climate-Smart equals Energy-Food-Water Smart

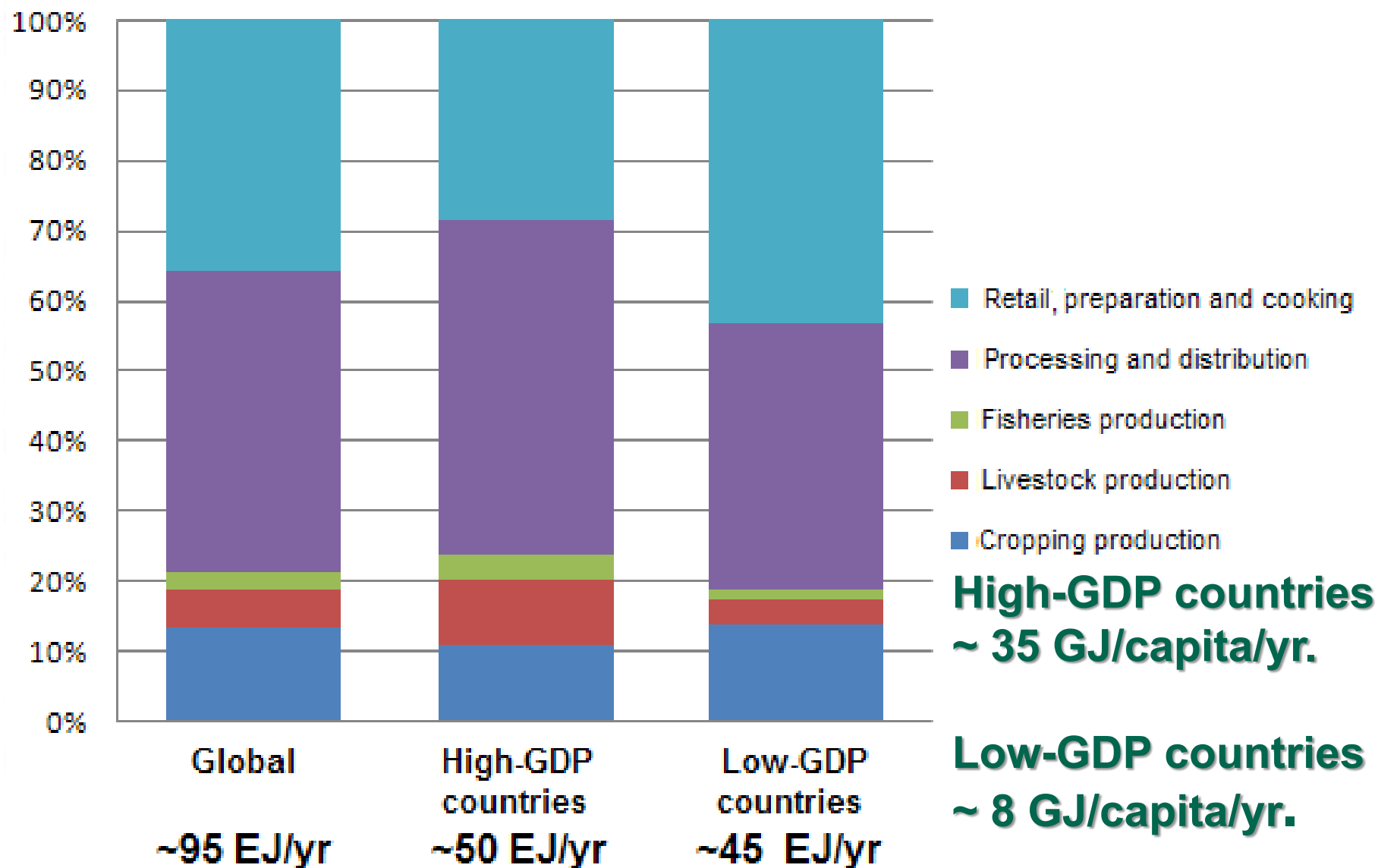


A man in a light brown shirt and dark trousers is operating a manual tillage machine in a muddy rice field. The machine has a red engine and a blue frame. The background shows a vast green rice field under a clear sky.

The Food Security challenge

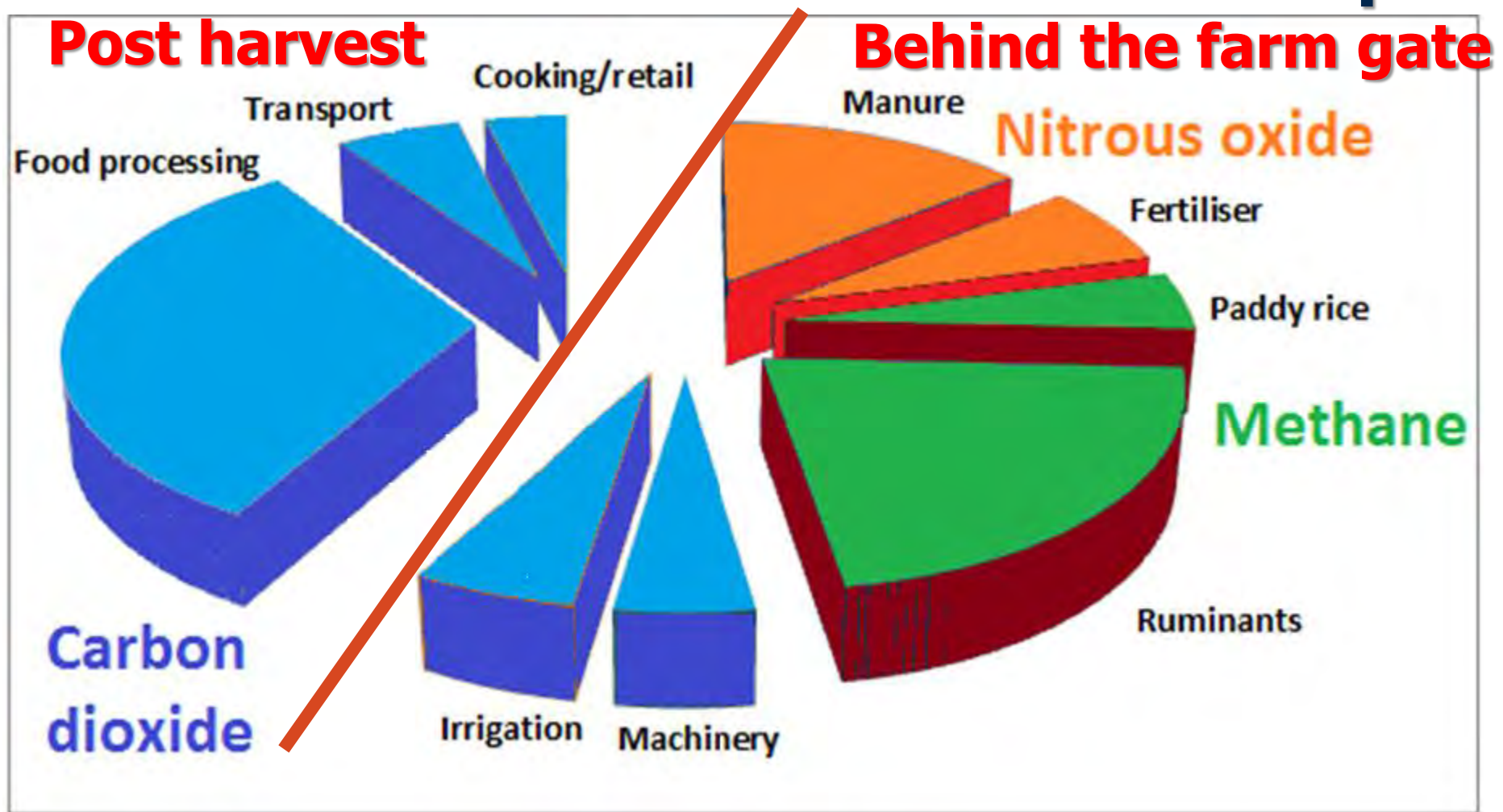
The agri-food sector has been tasked with increasing production to meet the ever growing demand for food and protein. But it must also reduce its dependence on fossil fuels, improve land use and water efficiency, and reduce GHG emissions.

Shares of energy in Agri-food supply chain



Around 32% of the total global end-use energy demand (~300 EJ/yr) is used for providing food.

Annual GHG emissions from the global agri-food sector are around 9.7 Gt CO₂-eq.



Sources: **IPCC 5th Assessment Report- Mitigation, 2014.**

Chapter 11, Agriculture forestry and other land use;
Chapter 10, Industry; Chapter 8, Transport

FAO, 2011. Energy-smart food for people and climate

Energy efficiency measures are possible at all points along the food-supply chain.

Renewable energy systems can be linked closely with food production and land use throughout the agri-food sector and at all scales.

Future food security is closely linked to the availability of affordable clean energy, avoidance of land degradation, fertile soils, and reliable water supplies.



**"ENERGY-SMART" FOOD
FOR PEOPLE AND CLIMATE**
ISSUE PAPER

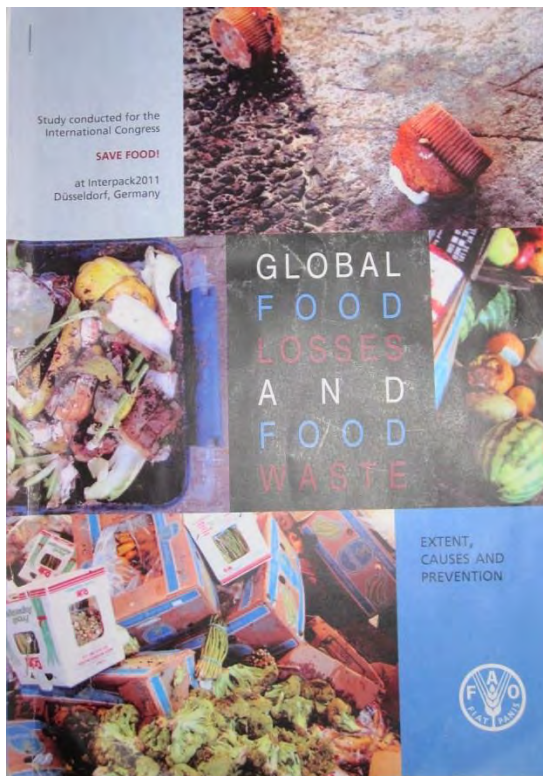
Energy = Meals * Climate Change

Ralph E H Sims



But we fail to consume around one third of all the food we produce.

This is a total waste of scarce fertile land, valuable fresh water, and energy resources.



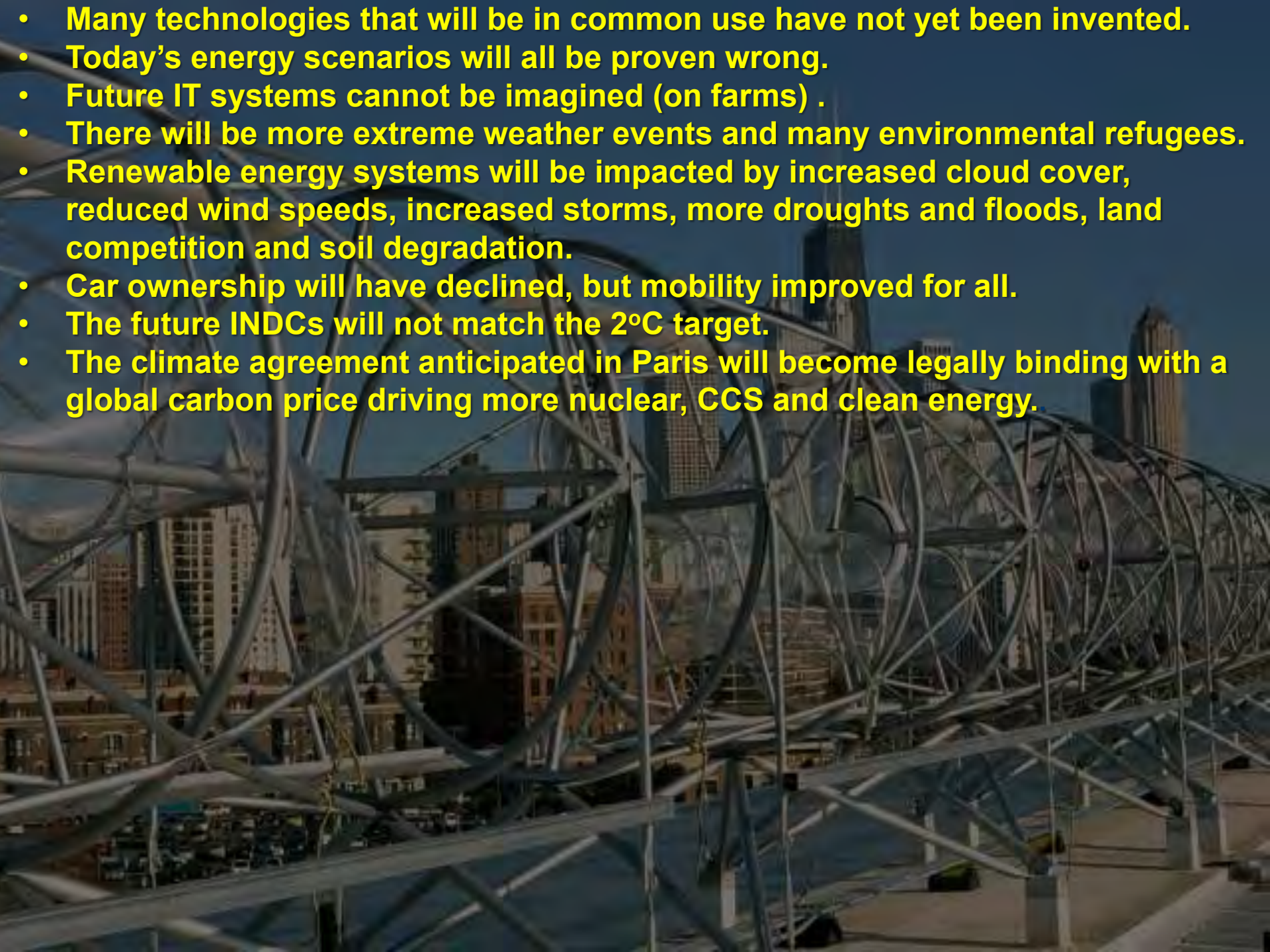
The provision of clean energy for improved post-harvest storage, processing, and access to markets is part of the solution.

**1 in 8 people are hungry;
1 in 5 are grossly overweight.**



**What will our world
be like leading up to
2030 and beyond?**

- Many technologies that will be in common use have not yet been invented.
- Today's energy scenarios will all be proven wrong.
- Future IT systems cannot be imagined (on farms) .
- There will be more extreme weather events and many environmental refugees.
- Renewable energy systems will be impacted by increased cloud cover, reduced wind speeds, increased storms, more droughts and floods, land competition and soil degradation.
- Car ownership will have declined, but mobility improved for all.
- The future INDCs will not match the 2°C target.
- The climate agreement anticipated in Paris will become legally binding with a global carbon price driving more nuclear, CCS and clean energy.



Overall messages for our future generations:....



Deep cuts in GHG emissions to limit warming to 2°C relative to pre-industrial levels remain possible if strong policy measures are introduced now to support the greater uptake of Clean Energy.

Cities, towns and communities can make major contributions to GHG mitigation.

Co-benefits such as improved health, air quality, reduced congestion, food and water security and better lifestyles are evident, but often under-valued.

Climate change impacts and extreme events are already becoming evident.....

BUT WE ARE RUNNING OUT OF TIME!

MEN AND NATURE MUST WORK
HAND IN HAND. THE THROWING
OUT OF BALANCE OF THE RESOURCES
OF NATURE THROWS OUT OF
BALANCE ALSO THE LIVES OF MEN.

President Franklin D. Roosevelt