The Evolution of Knowledge on Climate Change: The Creativity and Innovation Challenge

By

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Dubrovnik Roundtable on Mind, Thinking and Creativity
Dubrovnik

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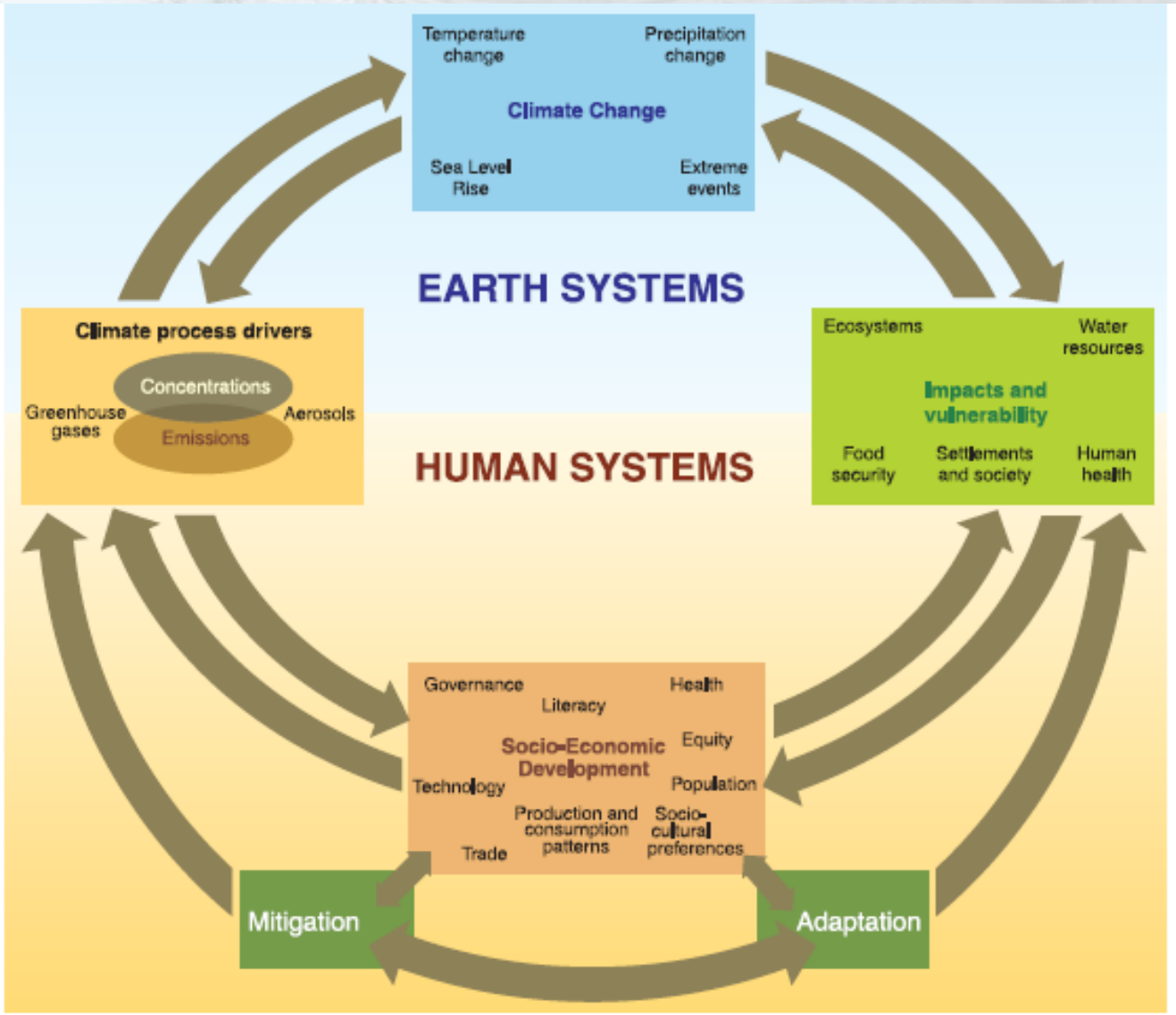
Schematic framework of anthropogenic climate change drivers, impacts and responses



IPCC AR4 SYR

The evolution of scientific knowledge on climate change

- Svante Arrhenius
- Subsequent work by other scientists including William Herschel, Hans Suess, Roger Revelle, Charles Keeling, James Hansen
- 1988 Congressional hearings
- Establishment of IPCC in 1988

Social responsibility of stakeholders – Why?

1. Milton Friedman's view
2. Kenneth Boulding & Spaceship Earth–Entropy
3. "Business cannot succeed in a society that fails."
4. Negative & positive externalities
5. Tragedy of the commons
   - climate change
   - biodiversity loss
6. bridging the gap between private vs. social

The IPCC Fifth Assessment Report

A clear and up to date view of the current state of scientific knowledge relevant to climate change.

Working group I

The Physical Science Basis

- ✓ 259 authors
- ✓ 39 countries
- ✓ 54,677 comments
- ✓ 2 million gigabytes of numerical data from climate model simulations
- ✓ Over 9200 scientific publications cited

Working Group II

Impacts, Adaptation and Vulnerability

- ✓ 309 authors
- ✓ 70 countries
- ✓ 50,444 comments
- ✓ Over 12,000 scientific references cited

Working Group III

Mitigation of Climate Change

- ✓ 235 authors
- ✓ 57 countries
- ✓ 38,315 comments
- ✓ Close to 1200 scenarios of socioeconomic development analyzed
- ✓ Close to 10,000 references to literature

The IPCC Synthesis Report

Integration of three Working Group Reports of the 5th Assessment, 2013-2014

- ✓ WGI: The Physical Science Basis
- ✓ WGII: Impacts, Adaptation and Vulnerability
- ✓ WGIII: Climate Change Mitigation

- ✓ 51 members of the Core Writing Team
- ✓ 18 members of the Extended Writing Team
- ✓ 18 countries
- ✓ 8105 comments

→ **Chaired by the IPCC Chair R.K. Pachauri**

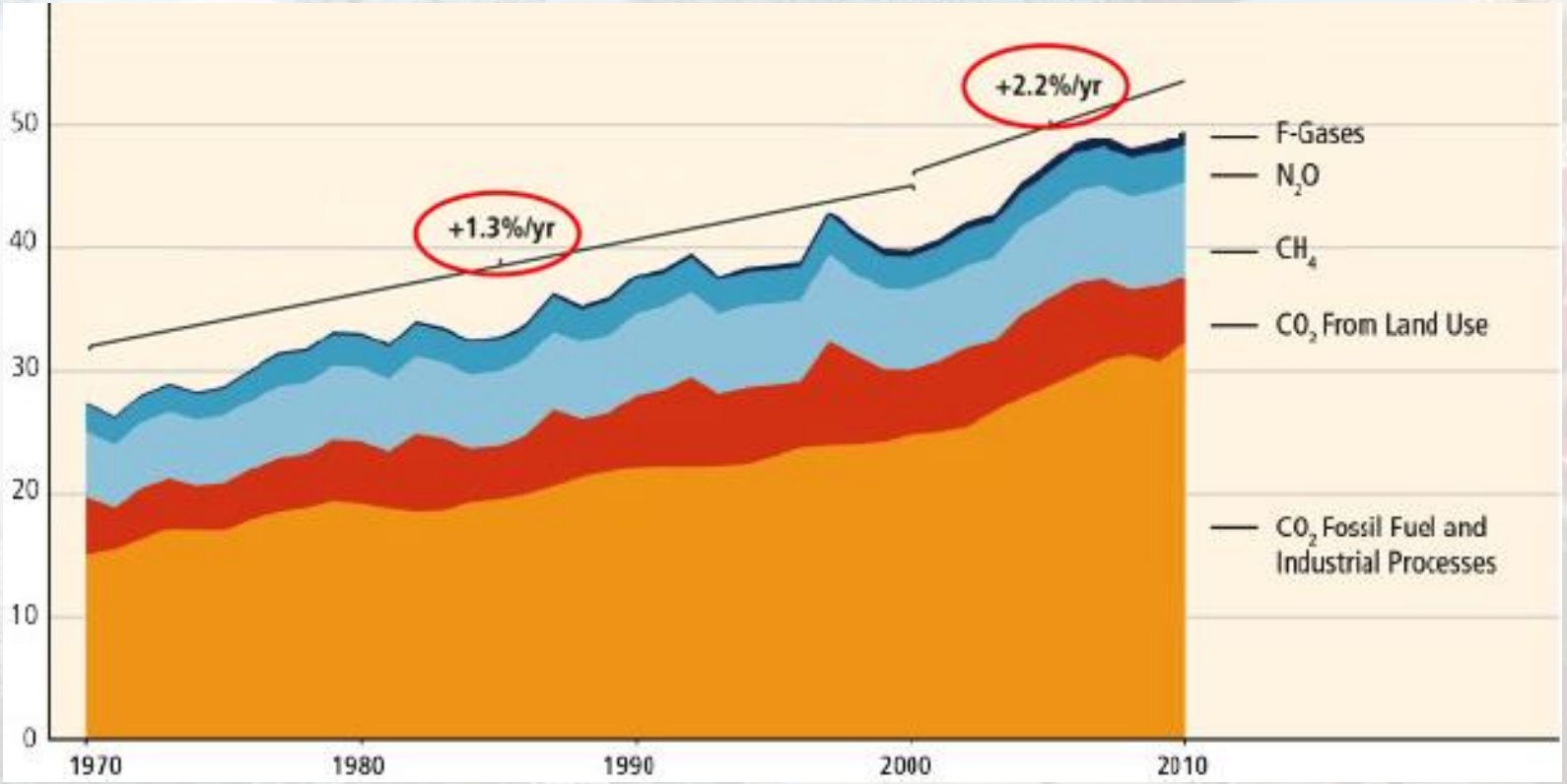
→ **Member governments approved the SPM on 1 November 2014 (total membership of IPCC is 195 government)**

Key Messages

- Human influence on the climate system is clear
- The more we disrupt our climate, the more we risk severe, pervasive and irreversible impacts
- We have the means to limit climate change and build a more prosperous, sustainable future

AR5 WGI SPM, AR5 WGII SPM, AR5 WGIII SPM

GHG emissions growth between 2000 and 2010 has been larger than in the previous three decades



AR5 WGIII SPM

Sources of emissions

Energy production remains the primary driver of GHG emissions

2010 GHG emissions

AR5 WGIII SPM

Potential Impacts of Climate Change

Food and water shortages

Increased displacement of people

Increased poverty

Coastal flooding

AR5 WGII SPM

Hurricane Harvey, Texas 2017

An increase in extreme high sea levels

Floods caused widespread damage in Turkey, one of many costly weather events last year.

As Oceans Rise, Insurers Flee

Natural disasters, increasingly common, are causing economic ones too.

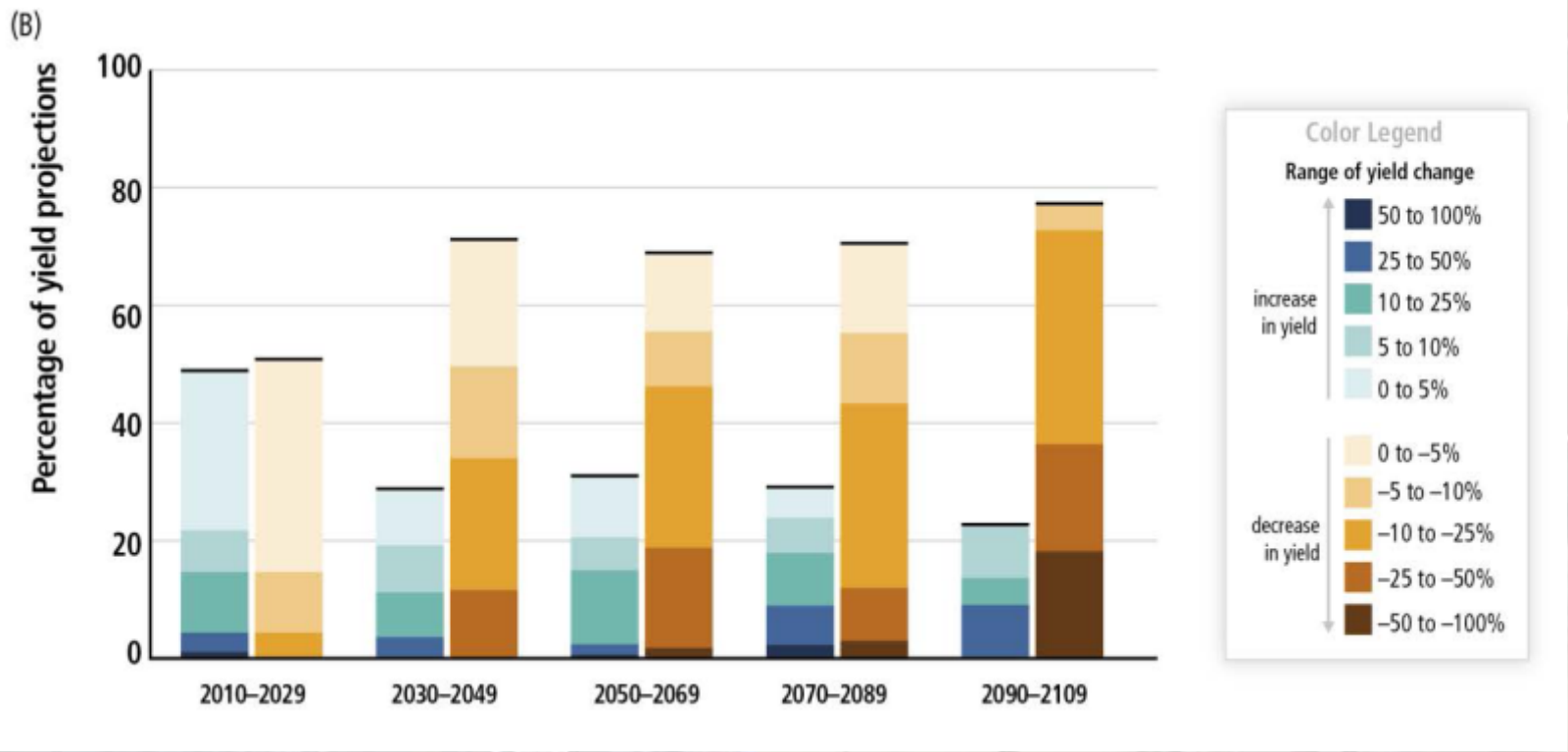
By Beth Kowitt

Source: Fortune, August 1, 2017

Ice deposit in a desert

Climate Change Poses Risk for Food Production

Percentage of yield projections



AR5 SYR SPM

Limiting Temperature Increase to 2˚C

Global GHG emissions reduction of 40-70 % in 2050 compared to 2010

Net zero or negative GHG emissions in 2100

Global emissions to curb within next 5-15 years

Source: IPCC AR5 WGIII SPM

Mitigation Measures

More efficient use of energy

Greater use of low-carbon and no-carbon energy

- Many of these technologies exist today

Improved carbon sinks

- Reduced deforestation and improved forest management and planting of new forests
- Bio-energy with carbon capture and storage

Lifestyle and behavioural changes

AR5 WGIII SPM

This region of China just ran on renewable energy for an entire week

Nationwide, China hopes to produce 20% of its electricity from clean sources by 2030. Image: REUTERS/Stringer

This article is published in collaboration with
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29 Jun 2017

Lenna Garfield
Innovation Reporter, Tech Insider

From Pittsburgh to Frankfurt, cities around the world are pledging to stop burning fossil fuels for electricity by 2050 or sooner.

But the Chinese province of Qinghai has already reached that goal, according to news outlet Xinhua. For seven days — from June 17 to 23 — the region ran on 100% renewable energy, including solar, wind, and hydropower.

Source: www.weforum.org

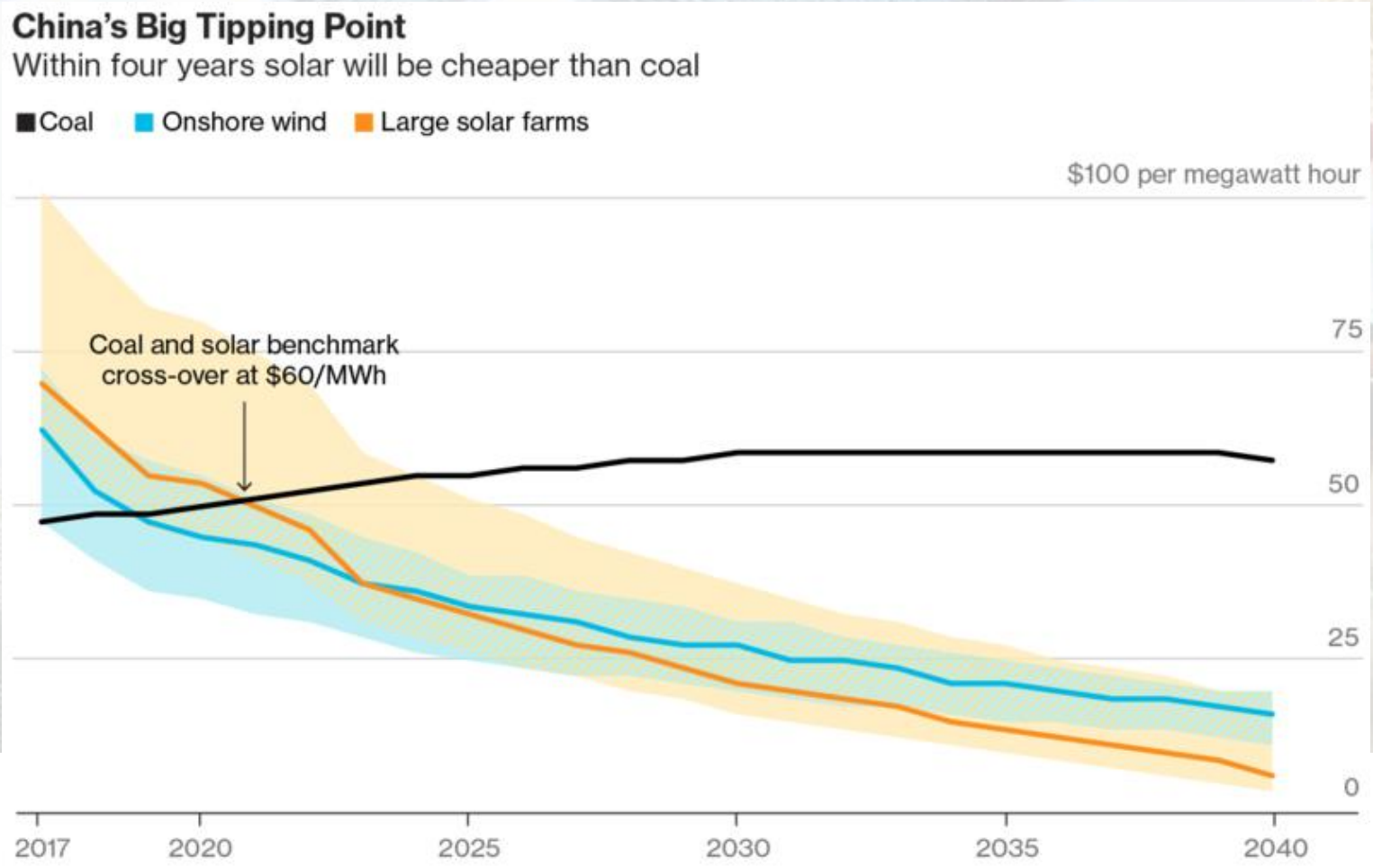
Carbon free Palo Alto

Palo Alto now has 100% carbon neutral electricity and natural gas!

Since 2013, Palo Alto has provided 100% carbon neutral electricity and as of July 1, 2017 we will also provide 100% carbon neutral natural gas. Carbon neutral means no net emissions of greenhouse gases (GHGs) into the atmosphere. (Note: GHGs are emitted as part of the process of constructing energy generation facilities. When we refer to 100% carbon neutral, we are referring to the energy output from these generation facilities.)

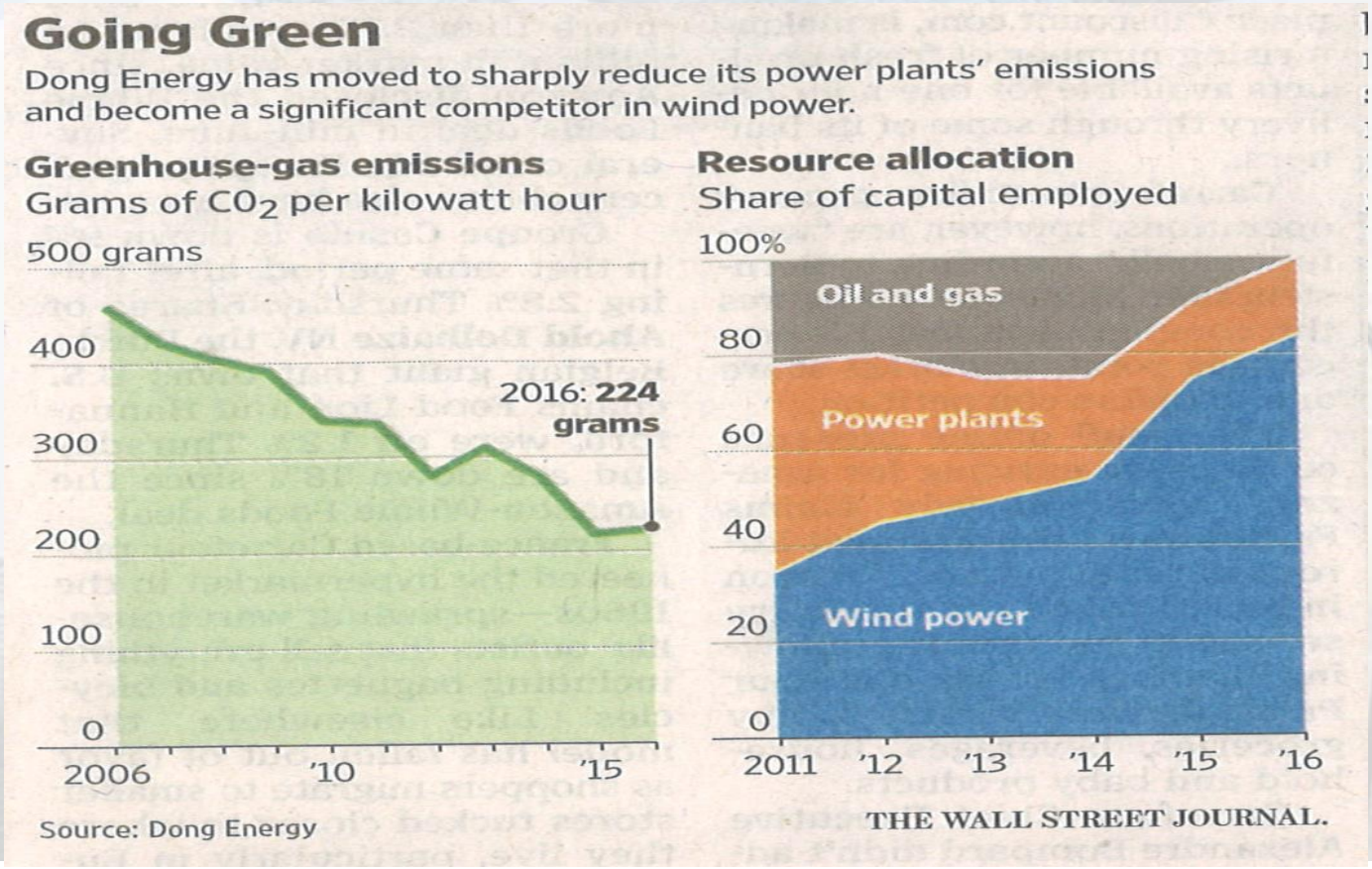
Source: www.cityofpaloalto.org

Levelized cost of energy based on realized load factors



Source: https://bloom.bg/2rl3pvQ

Renewables Freshen Dong Energy



Ambitious Mitigation Is Affordable

- Economic growth reduced by ~ 0.06%

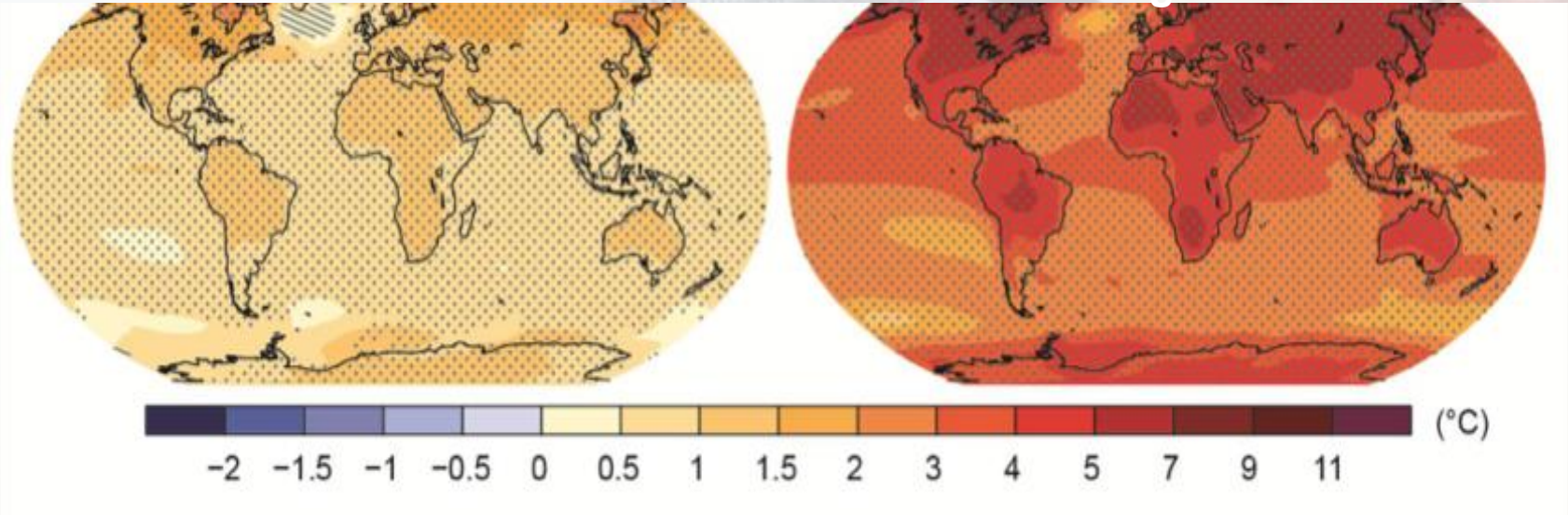
  (BAU growth 1.6 - 3%)
- This translates into delayed and not forgone growth
- Estimated cost does not account for the benefits of reduced climate change
- Unmitigated climate change would create increasing risks to economic growth

AR5 WGI SPM, AR5 WGII SPM

The Choices We Make Will Create Different Outcomes

With substantial mitigation

Without additional mitigation



Change in average surface temperature (1986–2005 to 2081–2100)

AR5 WGI SPM

Knowledge and innovation

Knowledge and climate change needs to drive innovation in

- Policies including explicit consideration of externalities
- Business practices
- Consumer education
- Lifestyle changes
- Leadership by youth

"A technological society has two choices.

First it can wait until catastrophic failures expose systemic deficiencies, distortion and self deceptions...

Secondly, a culture can provide social checks and balances to correct for systemic distortion prior to catastrophic failures"

- Mahatma Gandhi