International Growth Centre public lecture

# The Age of Sustainable Development


## Professor Jeffrey D. Sachs

*Director of The Earth Institute, Quetelet Professor of Sustainable Development,*
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*Special Advisor to United Nations Secretary-General on Millennium Development Goals*

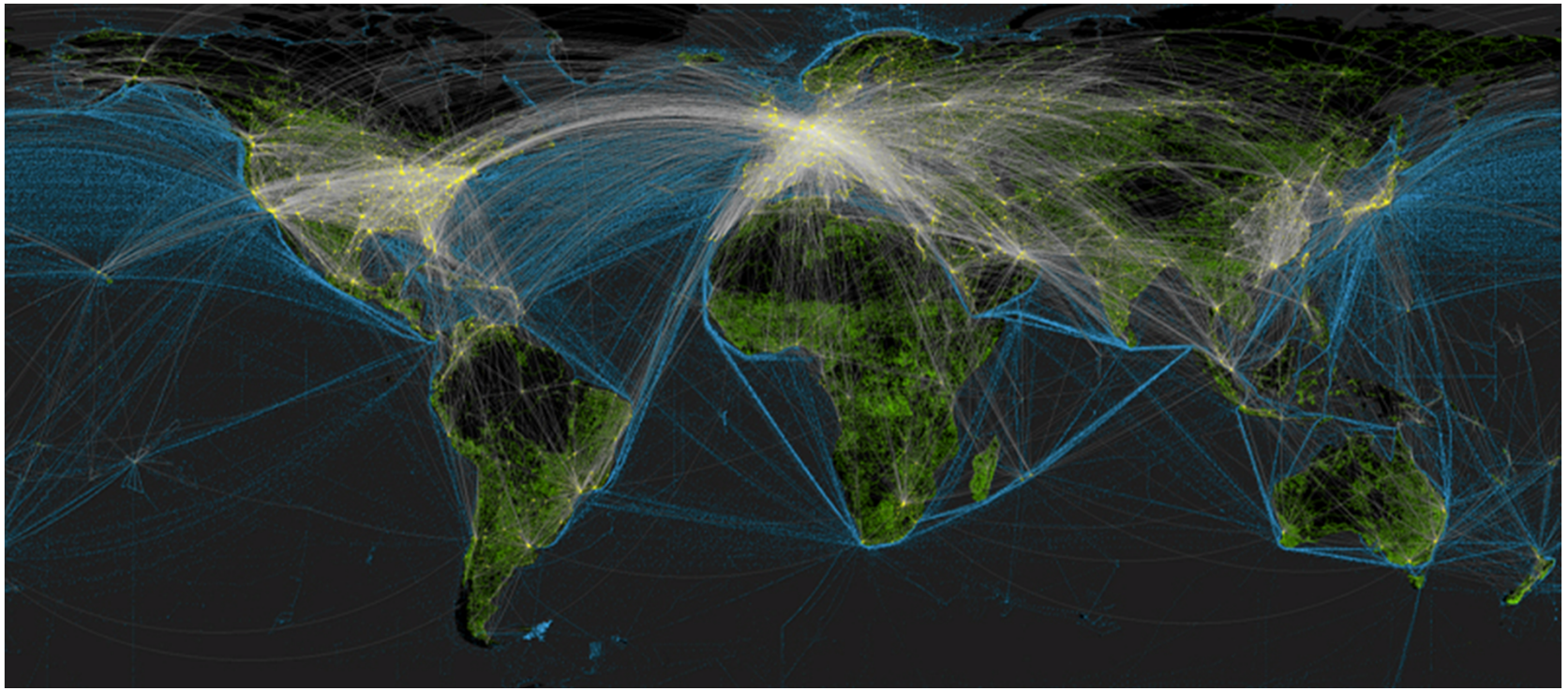
## Dr Jonathan Leape

*Chair, LSE*


Suggested hashtag for Twitter users: **#LSESachs**

# *THE AGE OF SUSTAINABLE DEVELOPMENT*

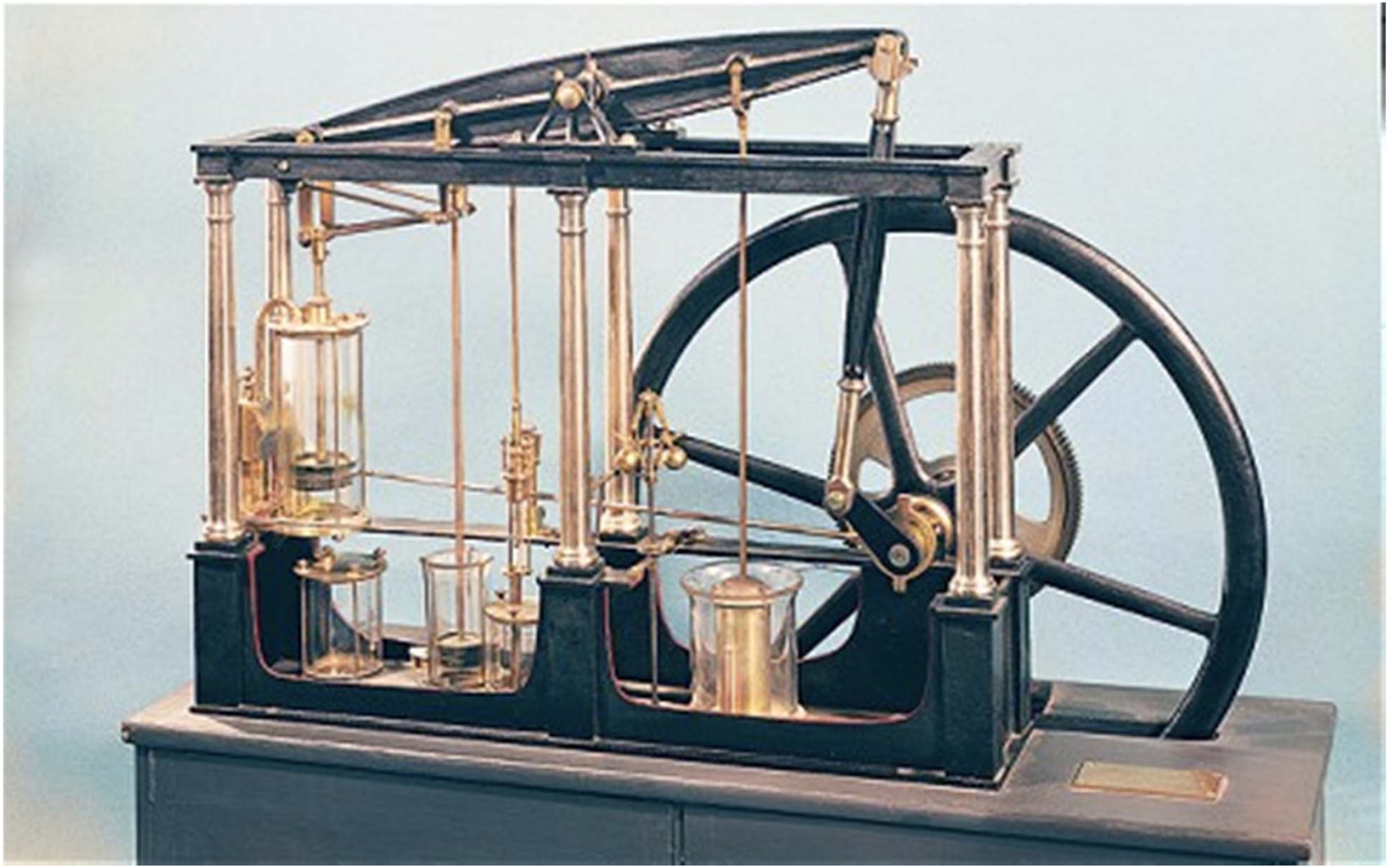
JEFFREY D. SACHS
International Growth Centre
London School of Economics
4 February 2015



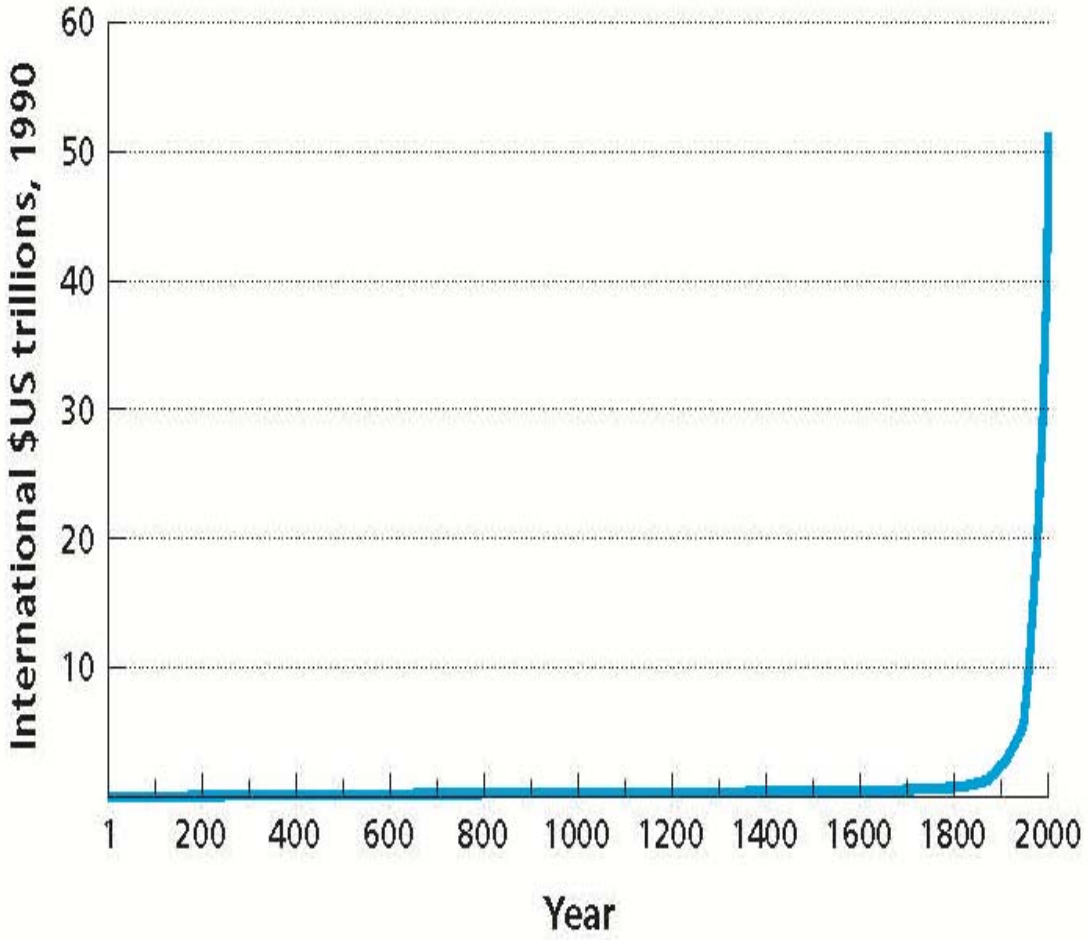
# *The Anthropocene:*

# It’s All About Scale

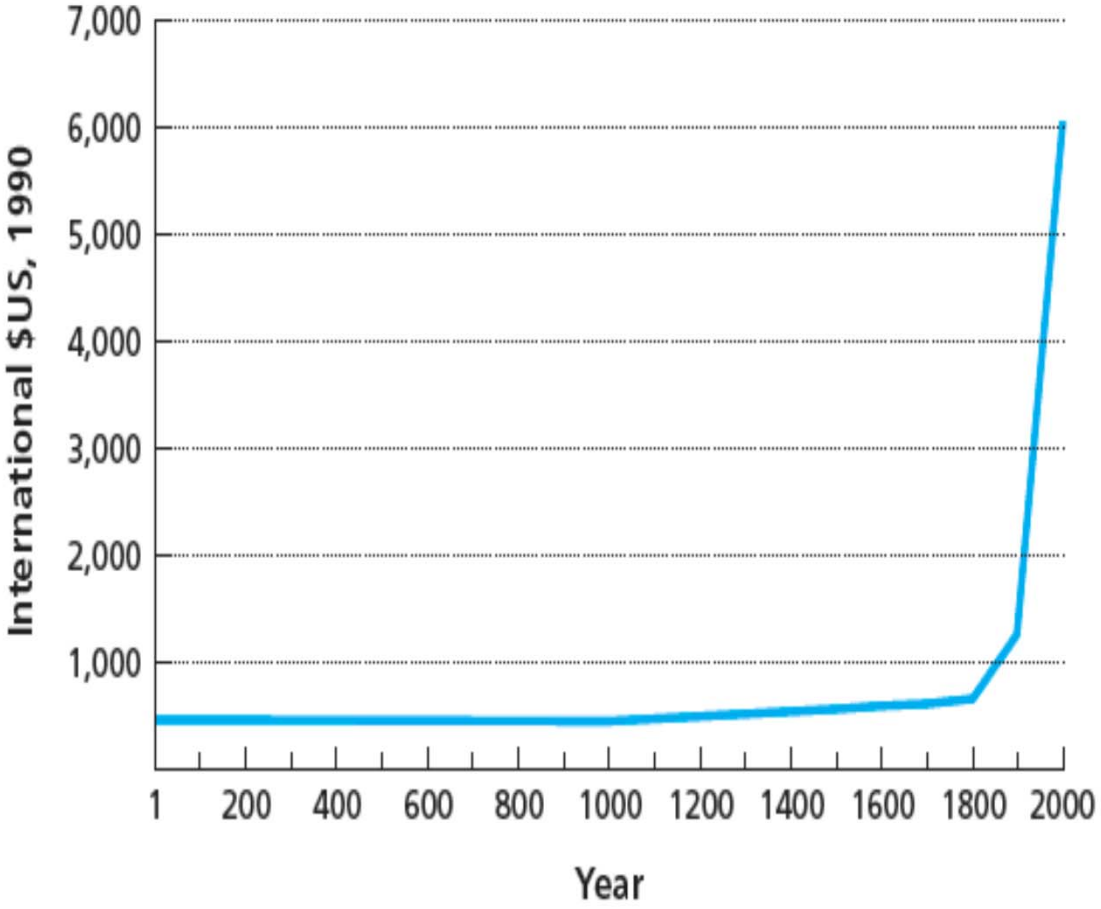
# James Watt's Engine:
# Most Significant Invention of Modern History



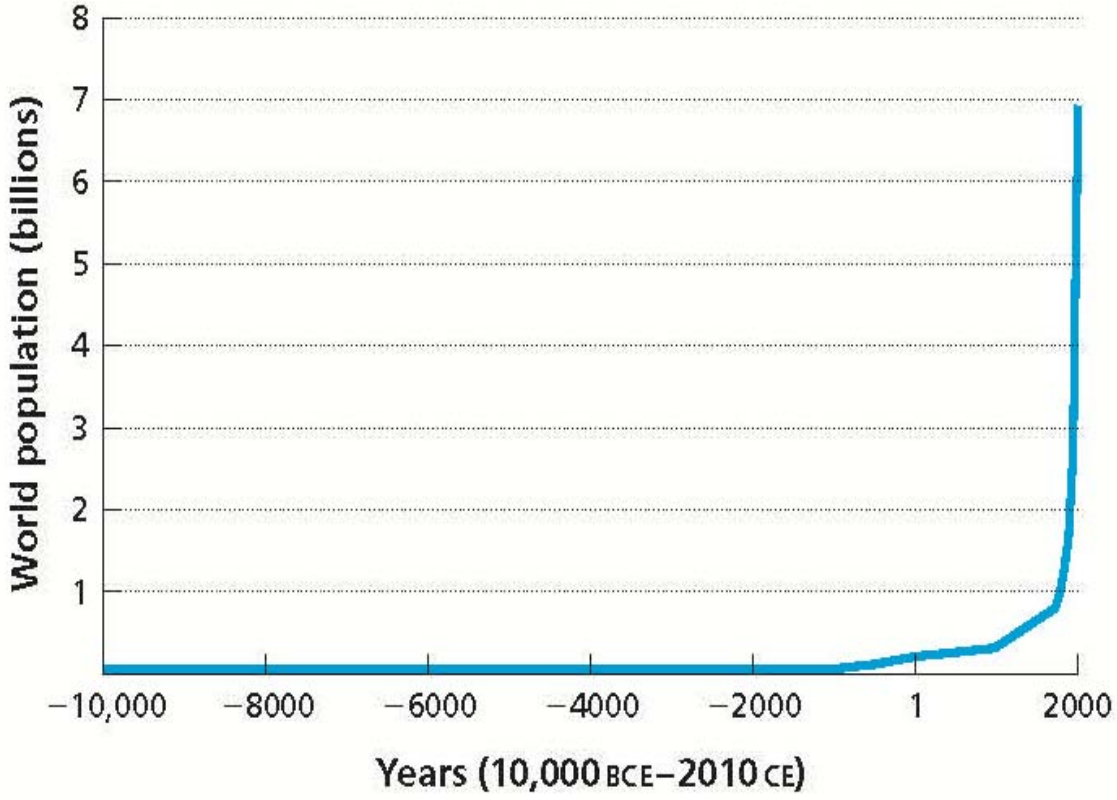
# Gross World Output

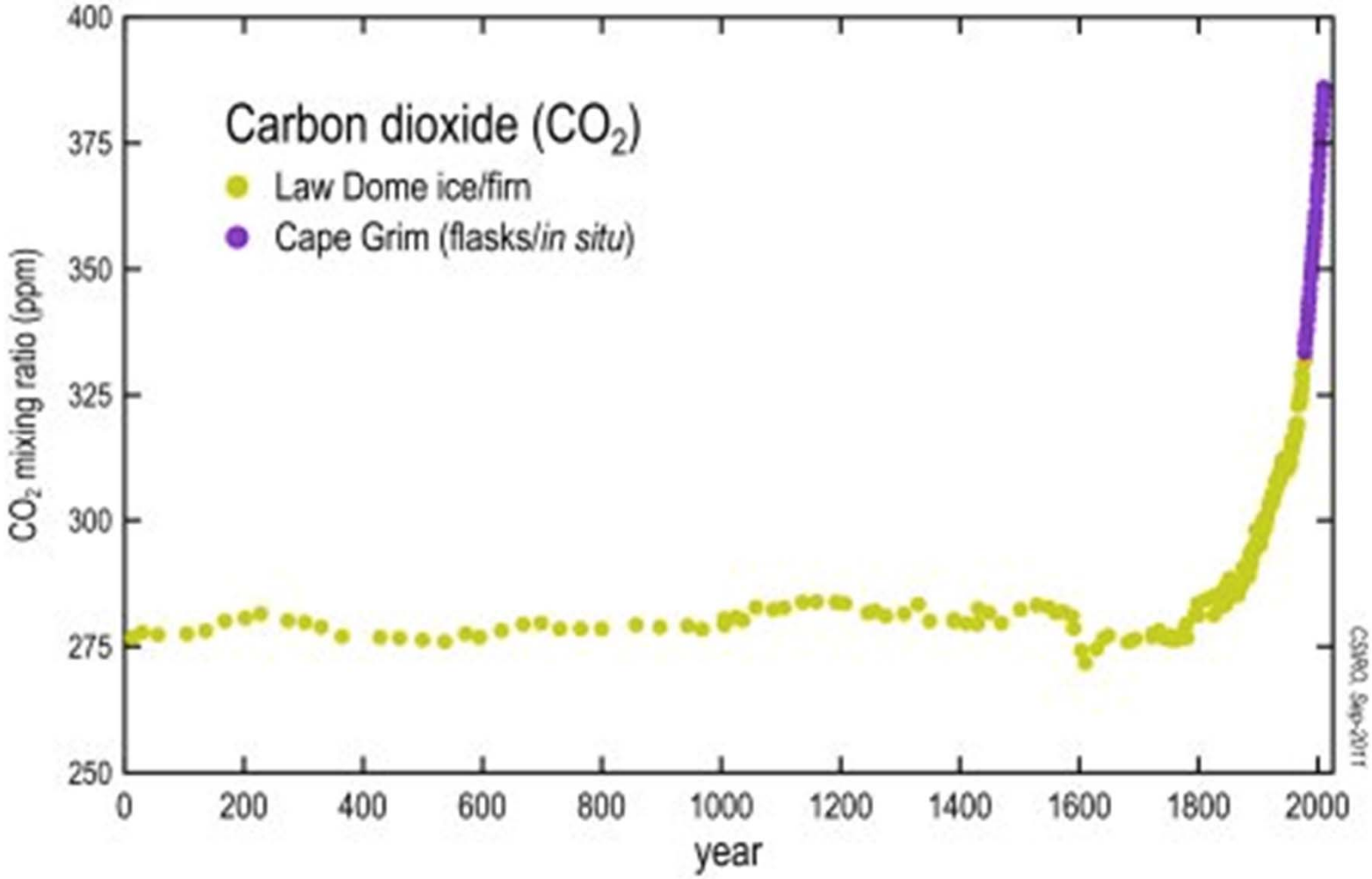


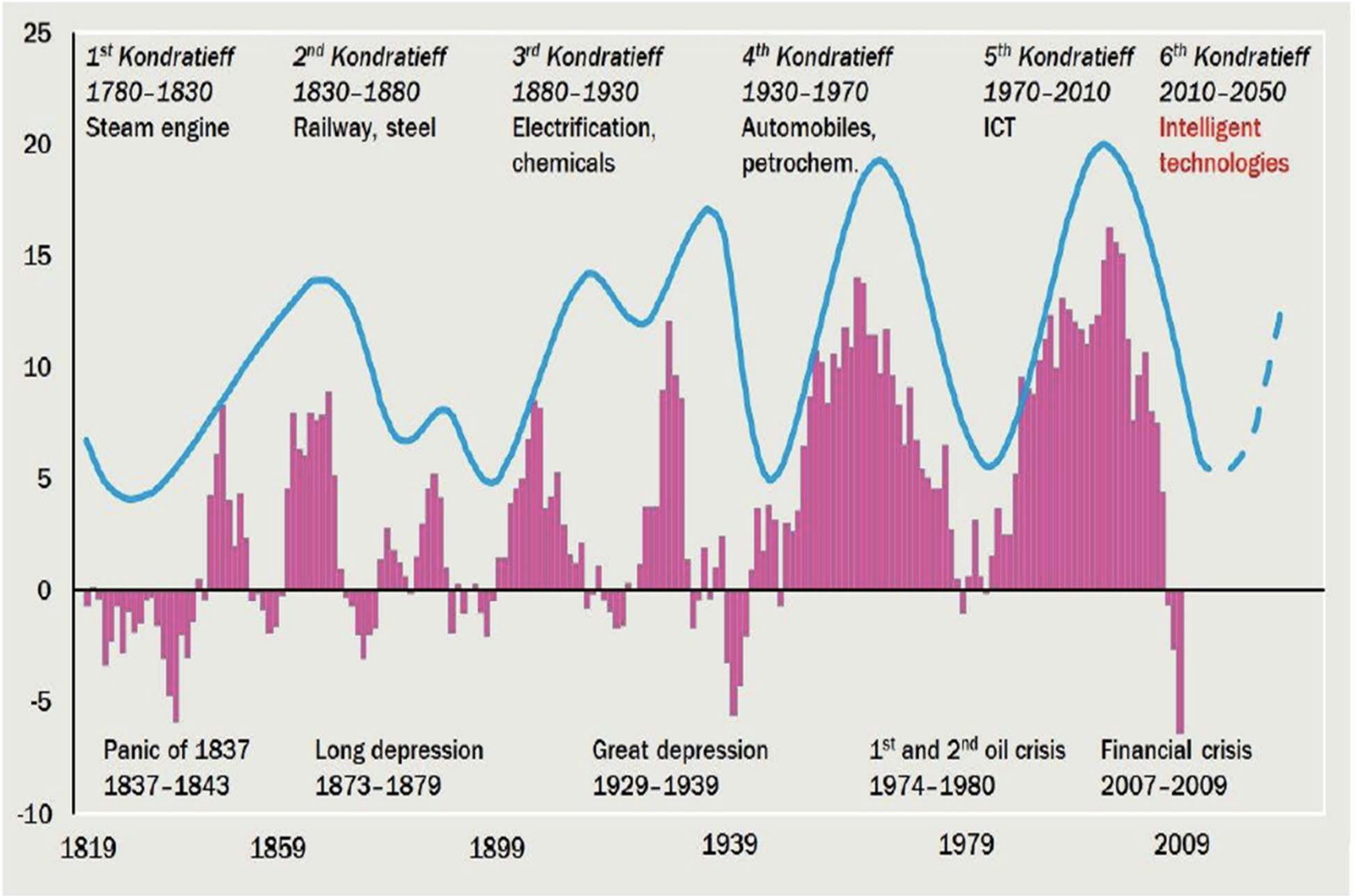
# Gross World Product per Capita



# Human Population in the Holocene



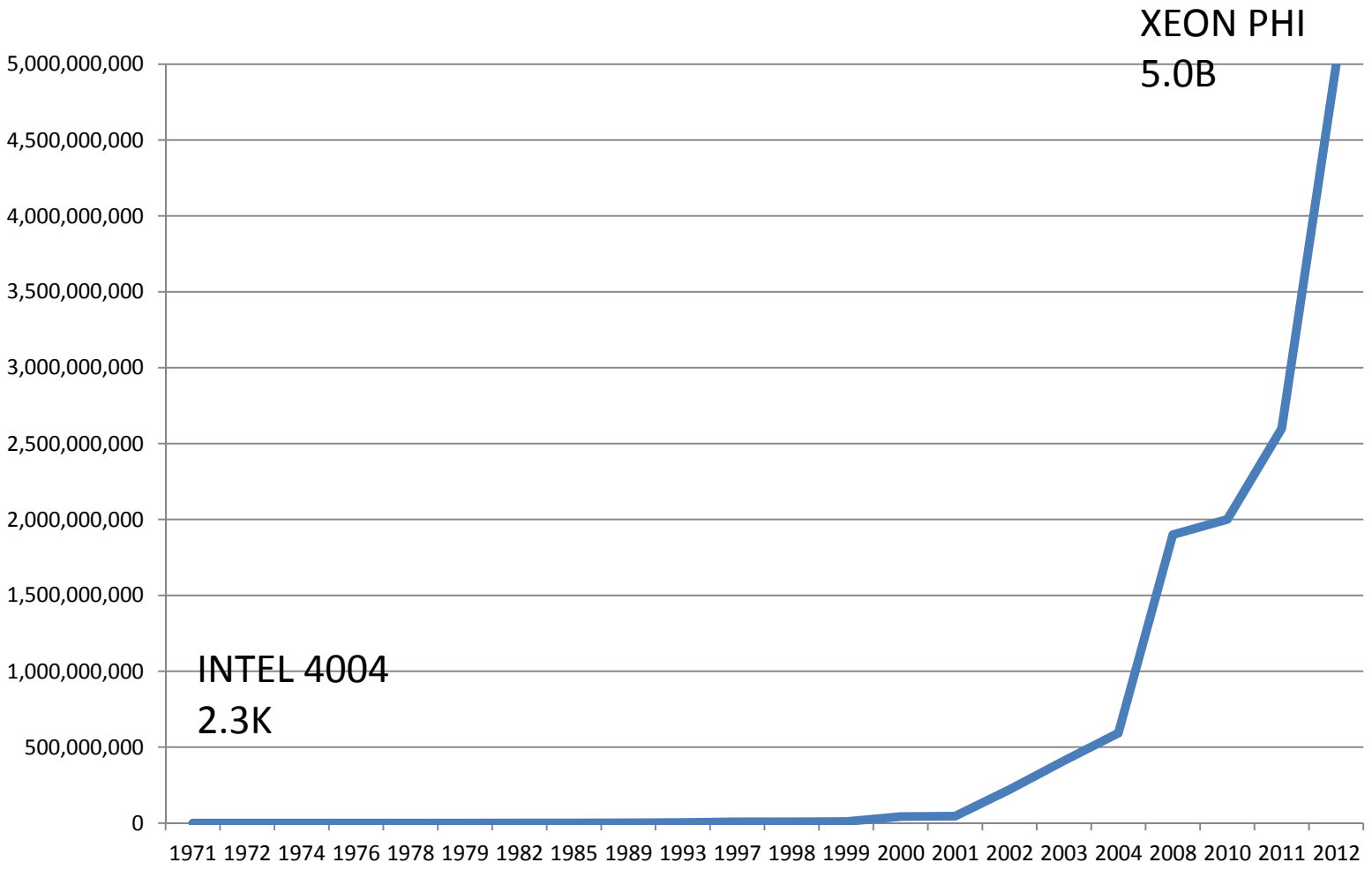

Carbon dioxide ($CO_2$)
Law Dome ice/firn
Cape Grim (flasks/*in situ*)
$CO_2$ mixing ratio (ppm)
400
375
350
325
300
275
250
0
200
400
600
800
1000
1200
1400
1600
1800
2000
year
CSIRO Sep-2011



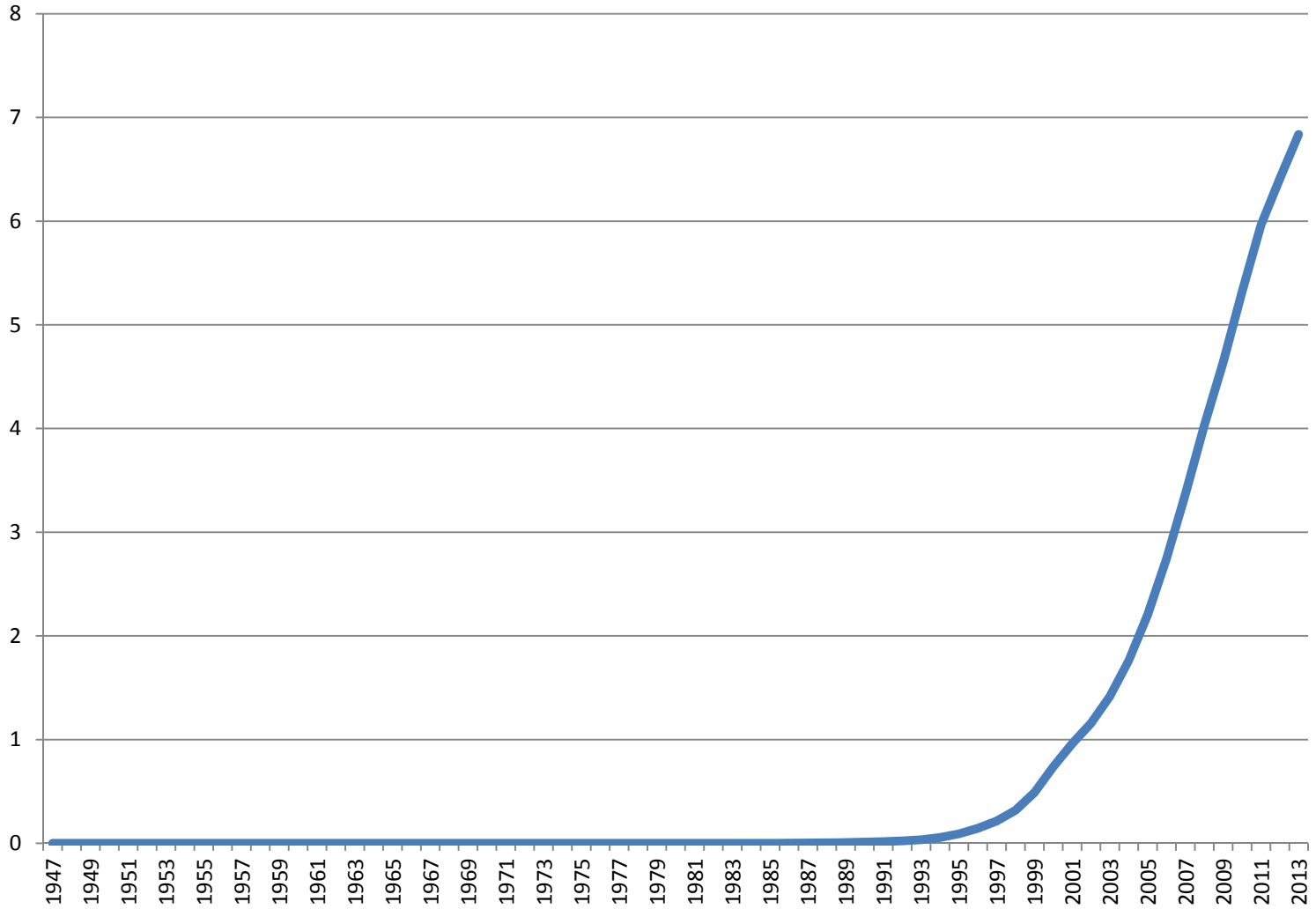

SIXTH WAVE SHOULD BE SUSTAINBLE GROWTH BUILT ON DIGITAL REVOLUTION

# THE INFORMATION AGE

## (TRANSISTOR COUNT ON INTEL MICROPROCESSORS)



# Mobile Subscribers Worldwide, Billions



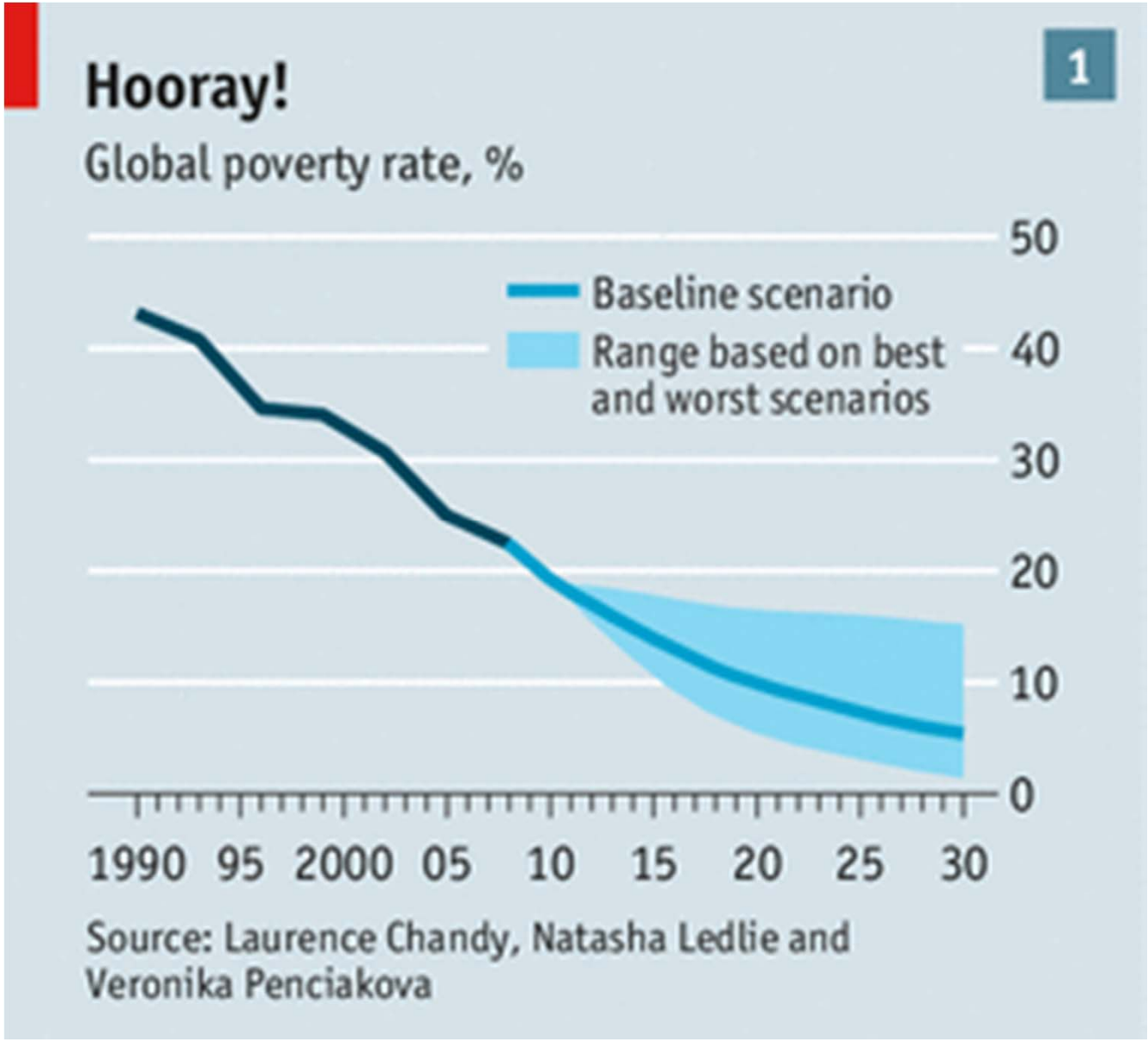
# Shenzhen, 1980

# Shenzhen, 2013

# A WORLD IN FLUX

1. GLOBAL-SCALE PRODUCTION SYSTEMS
2. RAPID ICT-ENABLED TECHNOLOGICAL CHANGE
3. RAPID POPULATION GROWTH IN AFRICA AND SOUTH ASIA AND AGING IN THE HIGH-INCOME COUNTRIES
4. WORLDWIDE DECLINE OF MIDDLE-SKILLED JOBS
5. EXTREME ENVIRONMENTAL CRISES
6. ECONOMIC AND GEOPOLITICAL MULTI-POLARITY

# PROGRESS DURING THE MDG ERA



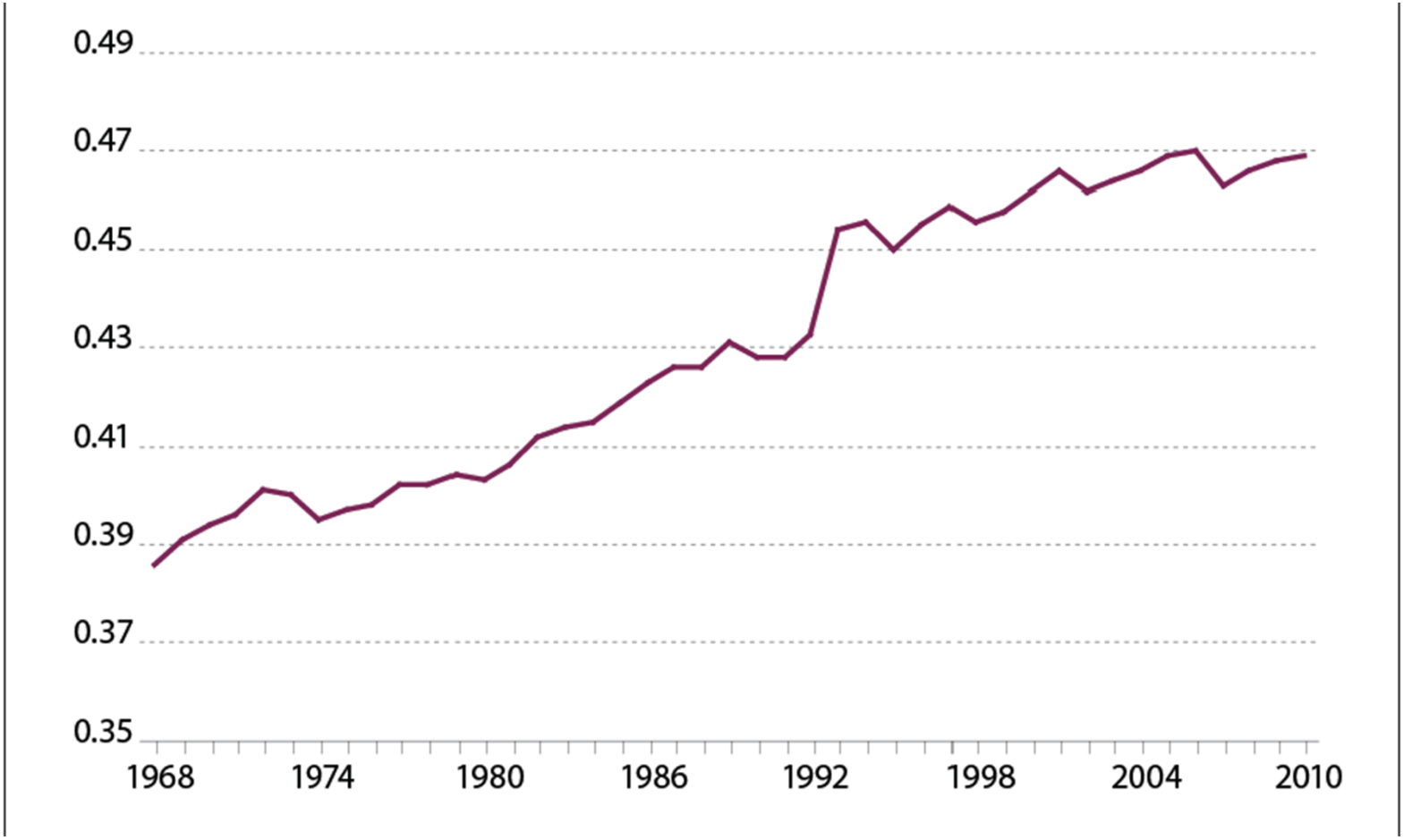
YET ECONOMIC GROWTH AND POVERTY REDUCTION ARE HAMPERED BY THREE LARGE HURDLES:

GROWING INCOME INEQUALITY AND SOCIAL EXCLUSION

CONTINUED RAPID POPULATION GROWTH

GROWING ENVIRONMENTAL CRISES

# GINI COEFFICIENT IN US, 1968-2010




SOURCE: US CONGRESSIONAL RESEARCH SERVICE 2012

# GINI COEFFICIENT IN CHINA, 1981-2012


*Sources*: Gini coefficients for the years 1986–2001 are from Ravallion and Chen (2007), 2002 from Gustafsson et al. (2008), 2003–2012 from the National Bureau of Statistics.

Tunis, January 2011


Cairo, January 2011


Athens July 2011

Tel Aviv, August 2011

Chile, August 2011


New York City, November 2011

Madrid, September 2012

Istanbul, June 2013

Rio de Janeiro, June 2013

# PERSISTENCE OF HIGH FERTILITY IN AFRICA

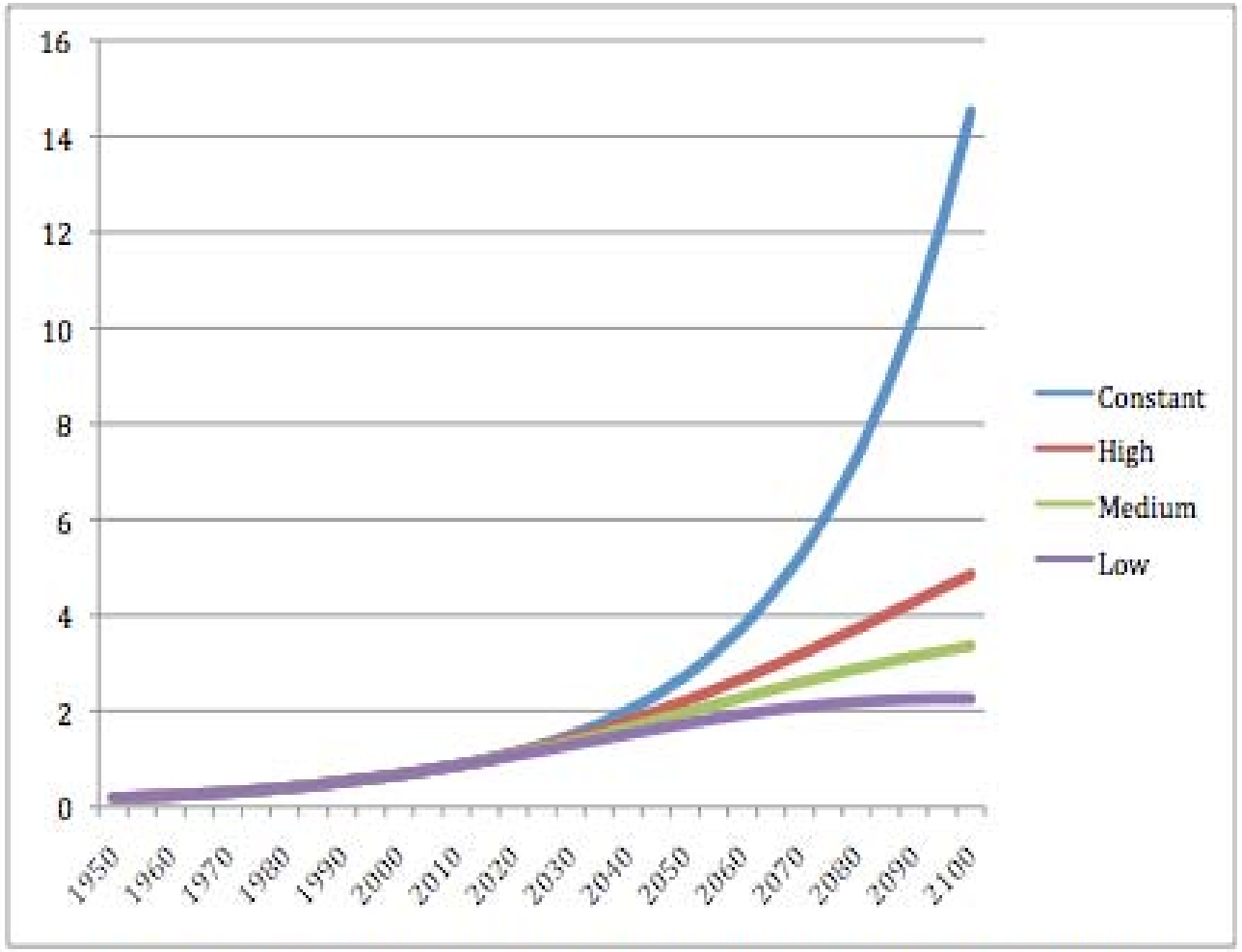
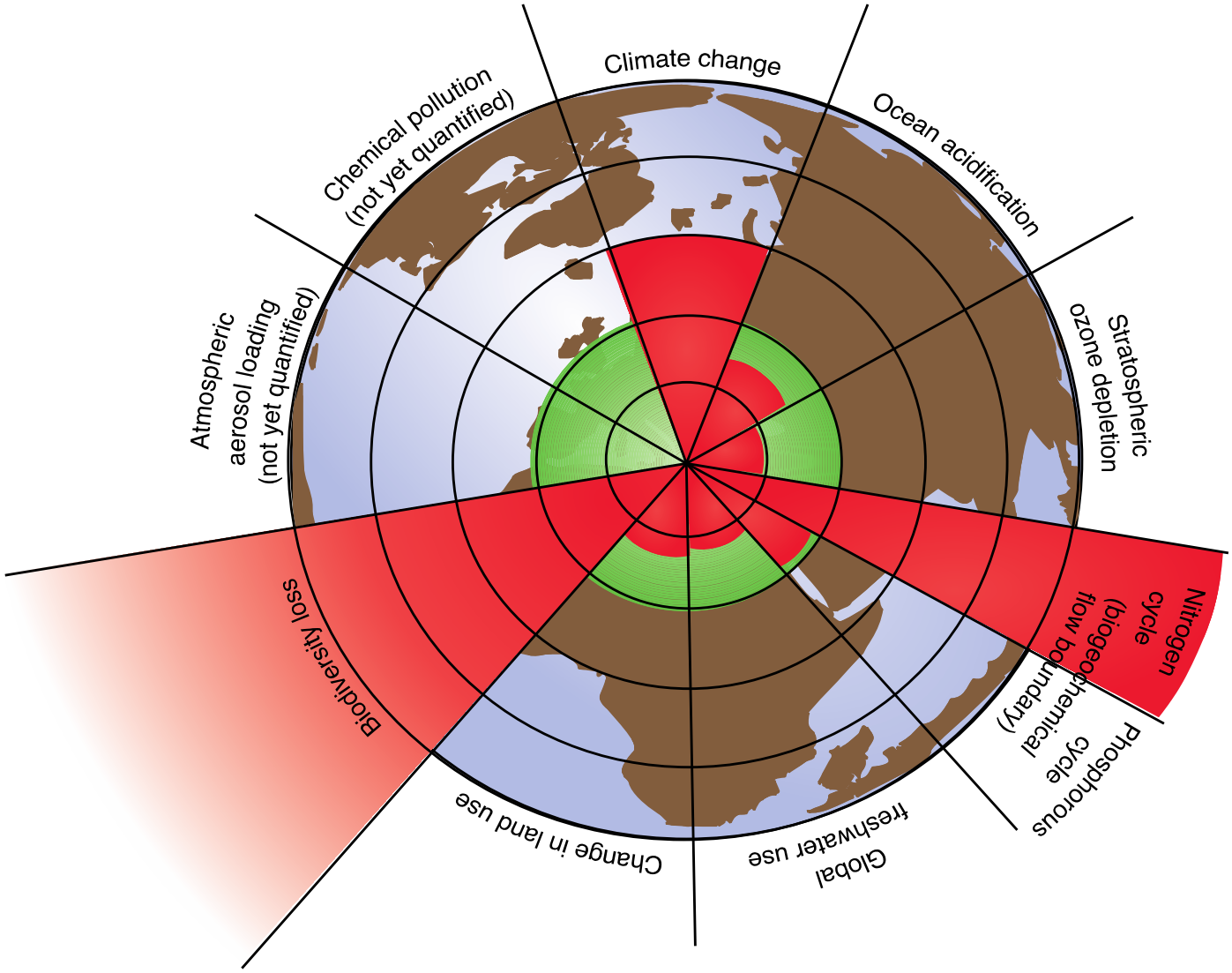



Figure 5.15: UN SCENARIOS FOR POPULATION IN SUB-SAHARAN AFRICA, 1950-2100

# “PLANETARY BOUNDARIES”




**Source: Rockström et al 2009a)**

JAGUARY DAM, SAO PAULO STATE, JANUARY 2014

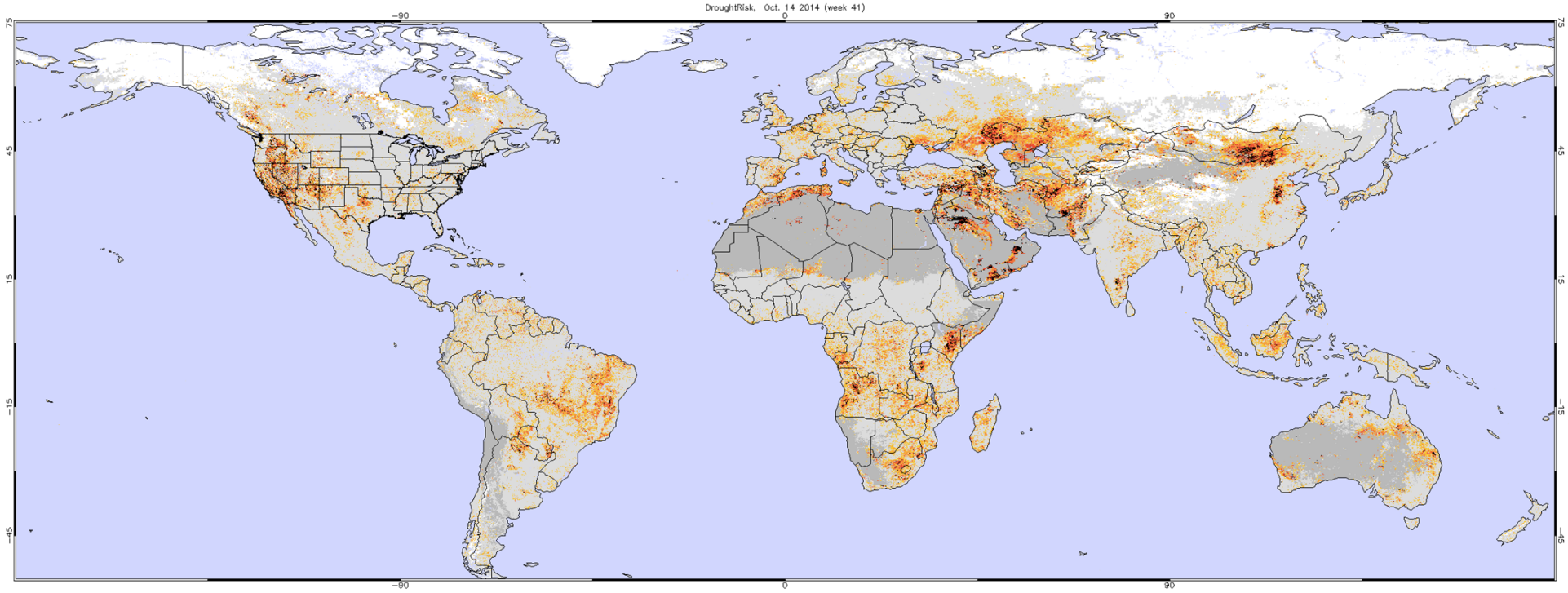
SUMATRA FOREST FIRES, MARCH 2014

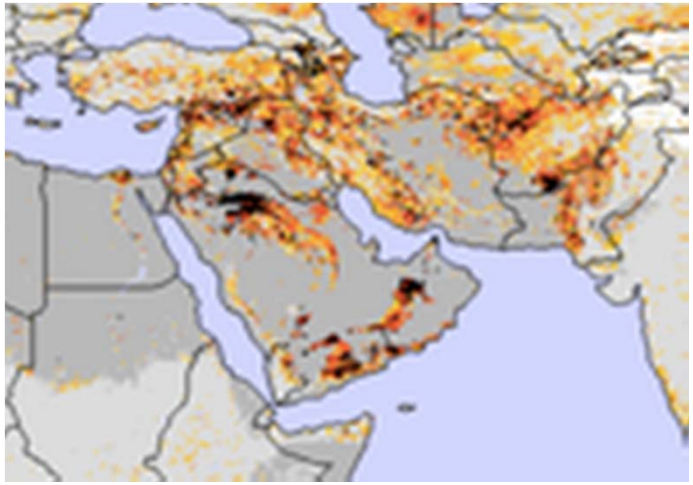

BOSNIA, May 16 2014

HIROSHIMA FLOODS, AUGUST 2014


STEVENS CREEK RESERVOIR, MAY 2014

# CURRENT DROUGHT RISK MAP,  OCTOBER 2014

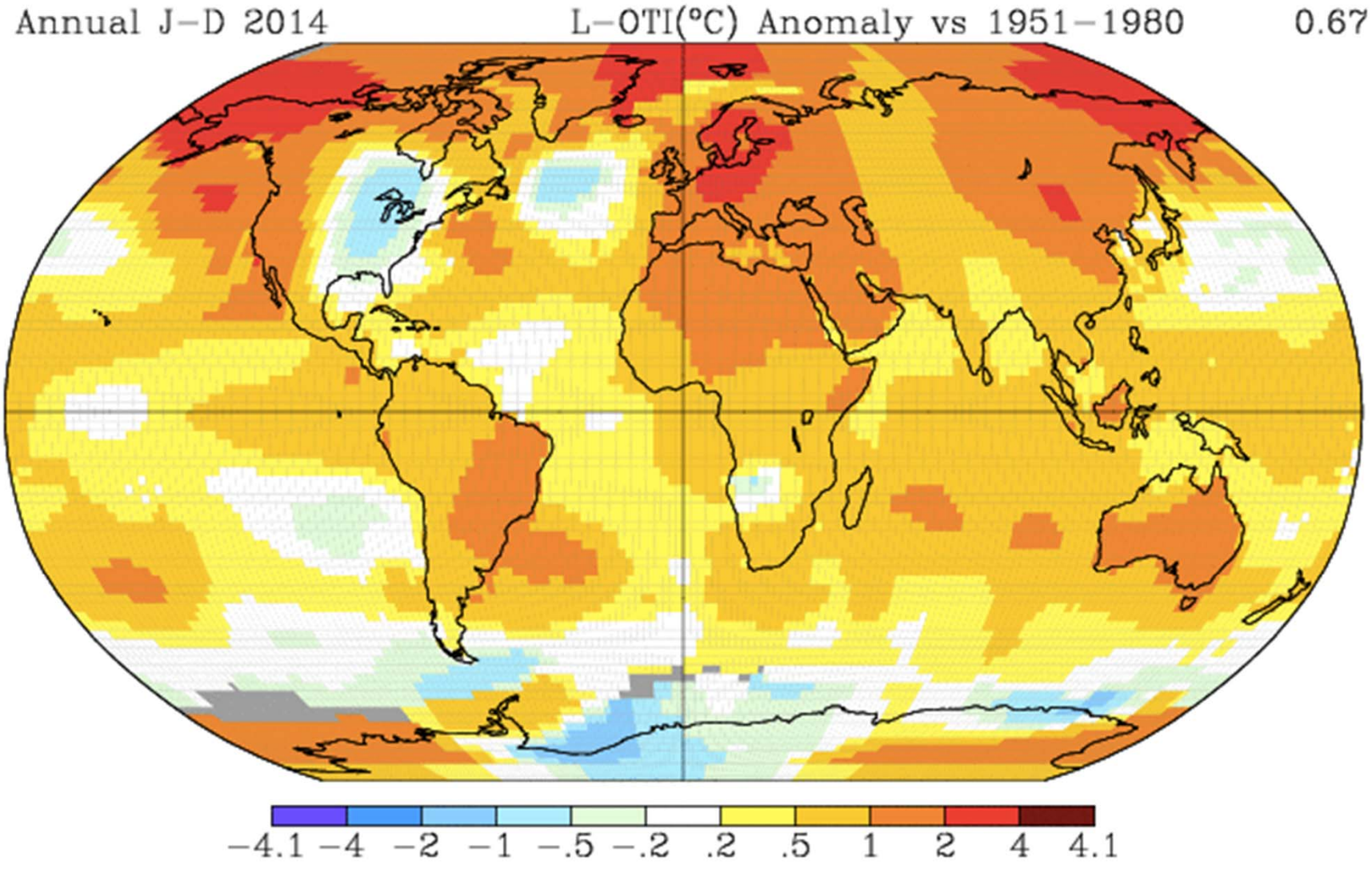


INSET FOR THE MIDDLE EAST AND WEST ASIA

http://www.star.nesdis.noaa.gov/smcd/emb/vci/VH/vh_browse.php

# 2014: Warmest Year on Instrument Record



## *Sustainable Development* as a Framework for Action

**Sustainable Development is the Holistic Integration of Economic, Social, and Environmental Objectives in an Approach to Scientific Analysis, Governance, Problem Solving, and Human Action**

The UN Member States are now negotiating **Sustainable Development Goals (SDGs)** to be adopted in September 2015

# 2015 is the Decisive Year for Setting Sustainable Development Goals

Financing for Sustainable Development (Addis Ababa, July 2015)

Sustainable Development Goals
(UN HQ, September 2015)

Climate Change Agreement at COP21
(Paris, December 2015)

# SDG PRIORITIES

## (CONSOLIDATING THE 17 STATED PRIORITIES OF THE UN GENERAL ASSEMBLY)

1. END POVERTY AND HUNGER
2. HEALTH FOR ALL
3. EDUCATION FOR ALL
4. REDUCE ECONOMIC INEQUALITIES; END GENDER INEQUALITIES
5. SUSTAINABLE GROWTH AND DECENT JOBS
6. SUSTAINABLE INFRASTRUCTURE
7. SUSTAINABLE CITIES
8. STOP HUMAN-INDUCED CLIMATE CHANGE
9. CONSERVE MARINE AND TERRESTIAL ECOSYSTEMS
10. GOOD GOVERNANCE AND GLOBAL PARTNERSHIPS

## Challenges to Meet the Sustainable Development:

Rapid Technological Transformation
Equity in Social Service Provision
Community Protection of Natural Resources
Strengthening of Local Governance
Sharing Work, Learning, and Leisure
Restraining Arbitrary Corporate Power
Responsible investing and Financial Markets
Re-Democratizing Our Democracies
Identifying Shared Global Values

CRITICAL “SUSTAINBLE SYSTEMS” PRIORITIES:

SUSTAINABLE ENERGY SYSTEMS

SUSTAINABLE AGRICULTURE AND NUTRITION

SUSTAINABLE URBANIZATION (“SMART CITIES”)

**WILL NEED TECHNOLOGICAL BREAKTHROUGHS**

NEED NEW GLOBAL PUBLIC-PRIVATE PARTNERSHIPS (PPPs) FOR SUSTAINABLE TECHNOLOGIES:

LOW-CARBON ENERGY SYSTEMS

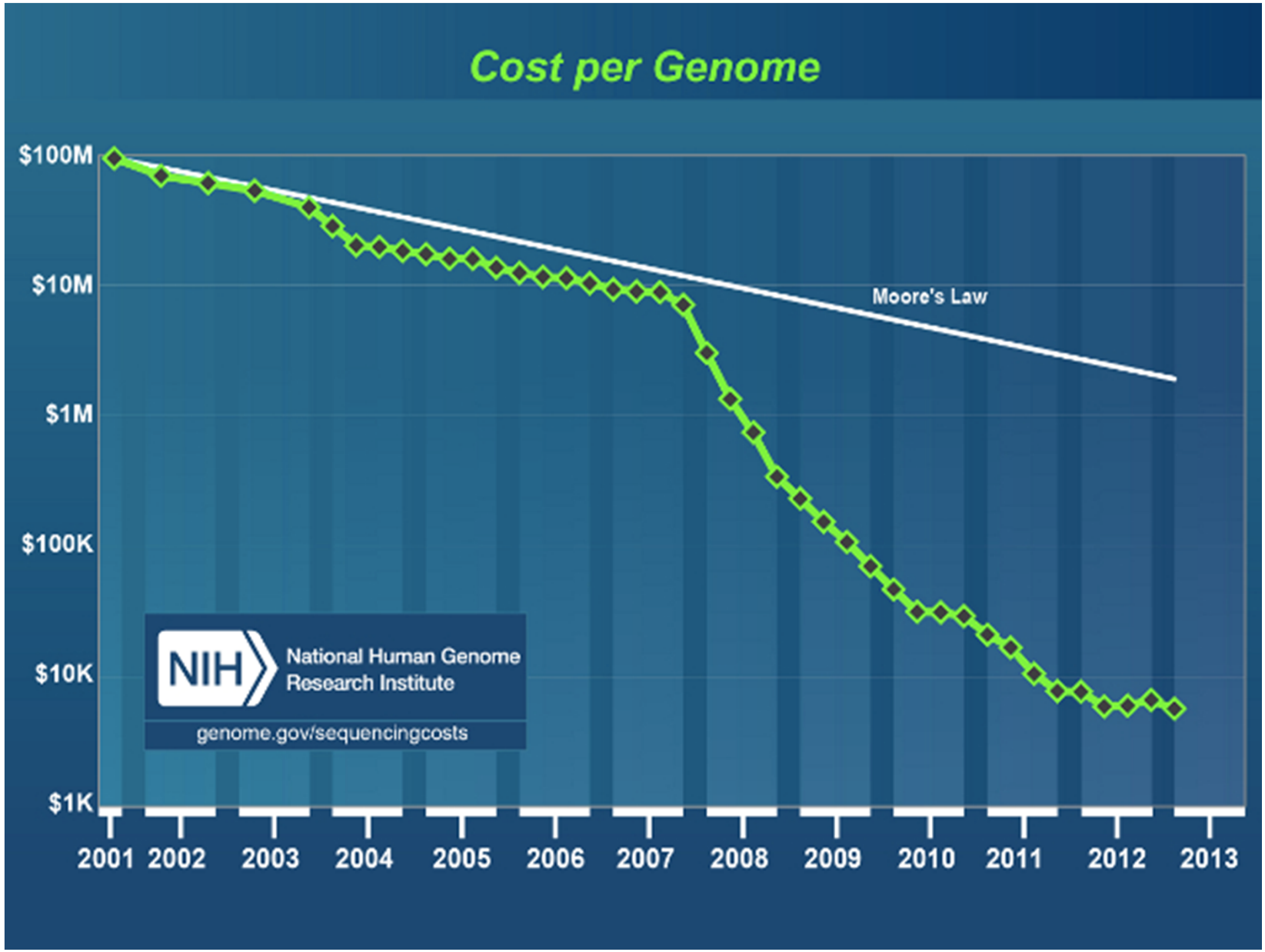
RESILIENT AND SUSTAINBLE AGRICULTURE

SMART ICT-ENABLED URBAN SYSTEMS

ICT-ENABLED HEALTH, EDUCATION, GOVERNANCE

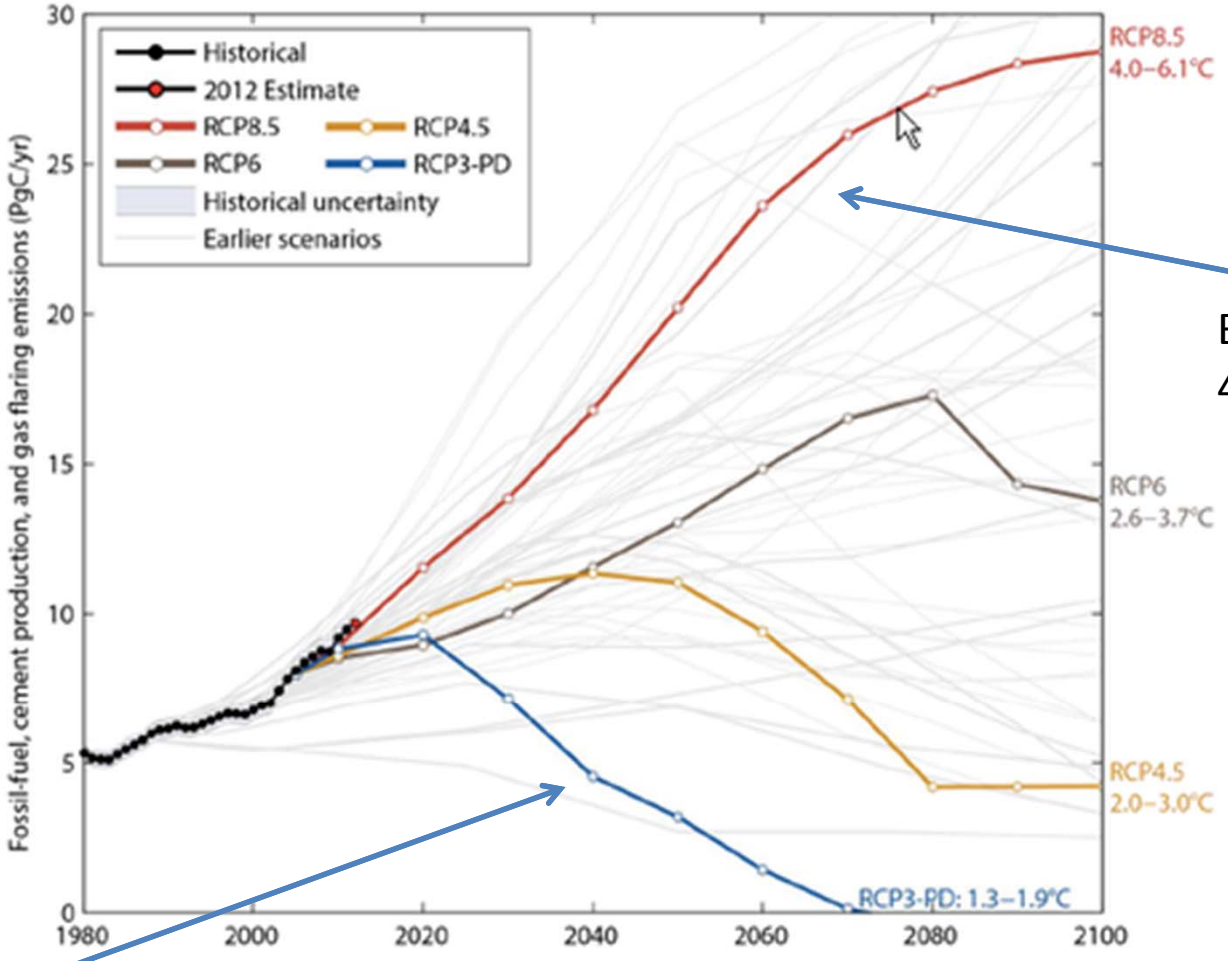
# EXAMPLES OF DIRECTED SCIENCE AND TECHNOLOGY:

VACCINES, MEDICINES, AND DIAGNOSTICS
RADAR
CRYPTOGRAPHY
NUCLEAR ENERGY
COMPUTING
SEMICONDUCTORS
SATELLITES AND SPACE SCIENCE
INTERNET
HUMAN GENOME PROJECT
HIGGS BOSON (CERN)
BRAIN INITIATIVE




HALVING OF COST ROUGHLY EVERY NINE MONTHS

## Emissions are heading to a 4.0-6.1°C "likely" increase in temperature
## Large and sustained mitigation is required to keep below 2°C




BAU:
4-6 degree C

2-degree C

Linear interpolation is used between individual datapoints

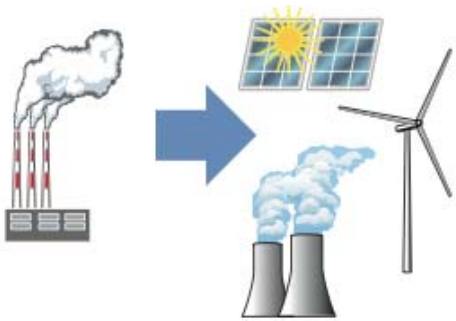
Source: Peters et al. 2012a; Global Carbon Project 2012;

# Main Decarbonization Strategies

**Strategy**

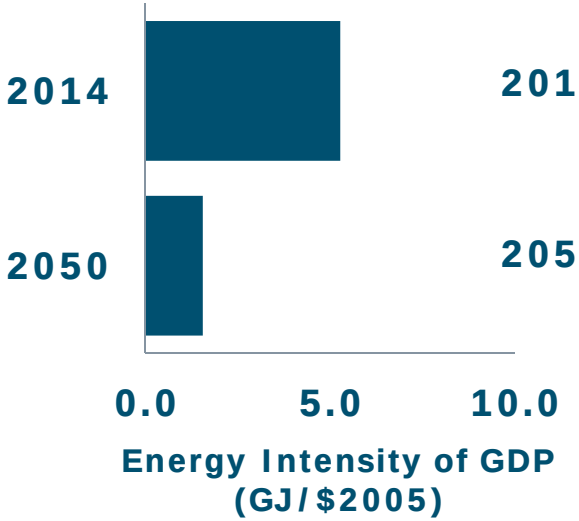
**Energy Efficiency**

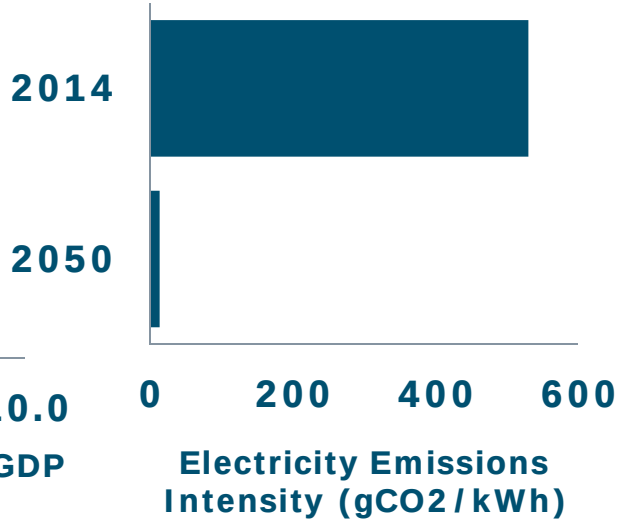
**Decarbonization of Electricity**

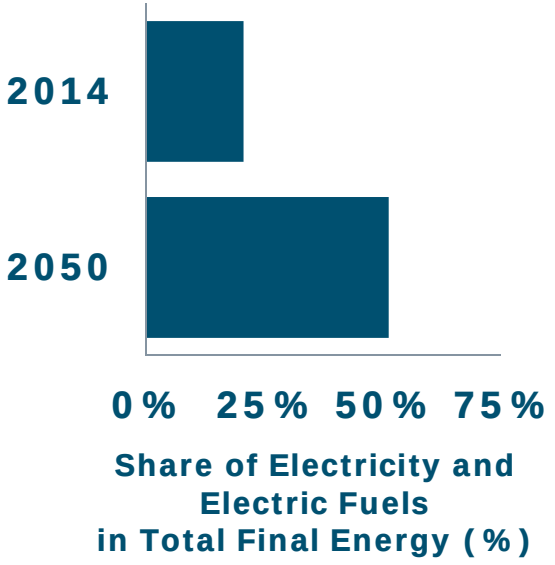


**End Use Fuel Switching to Electric Sources**

**Key Metric of Transformation**



# THE WORLD WILL NEED TO STRAND OIL, GAS, AND COAL RESERVES

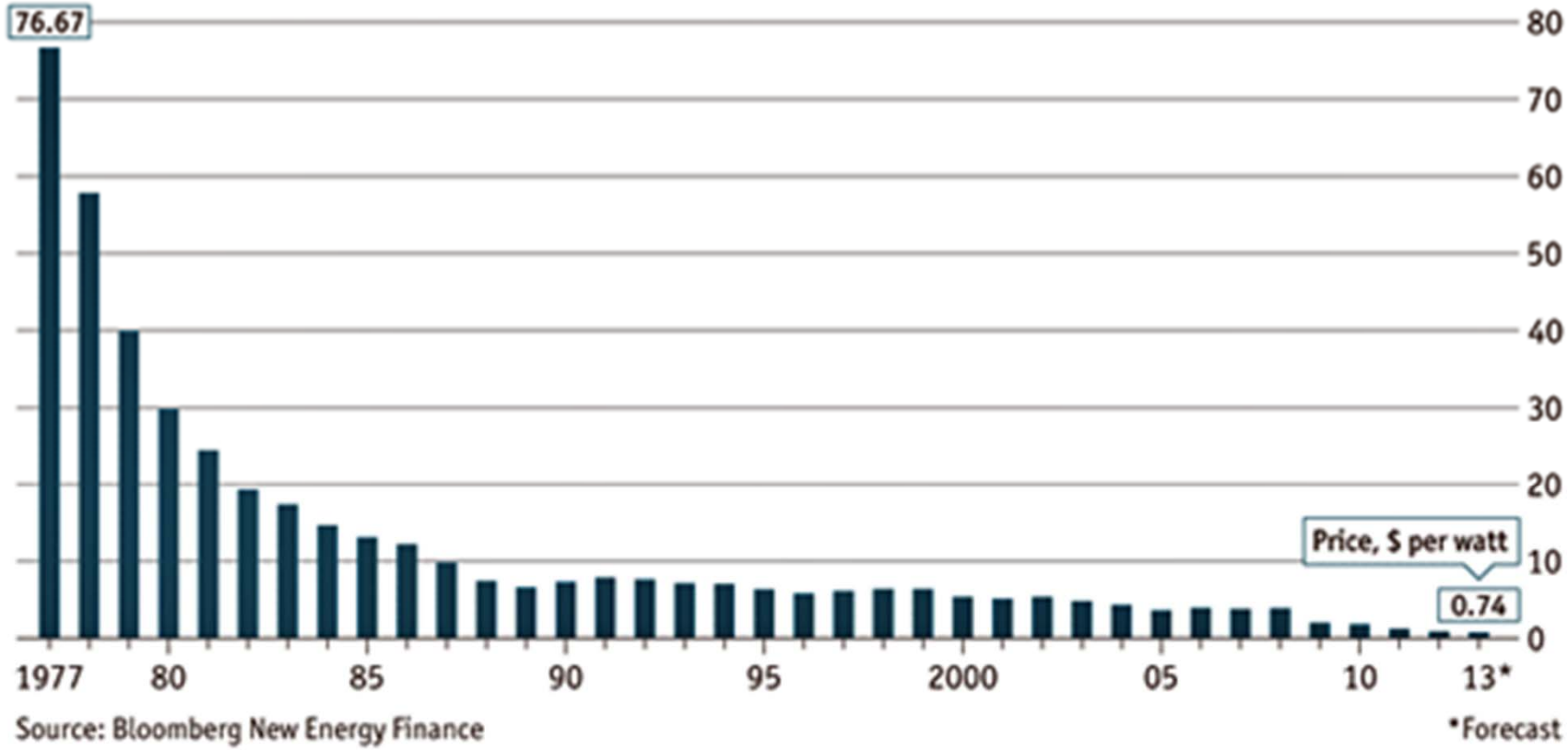
**Table 1 | Regional distribution of reserves unburnable before 2050 for the 2 °C**

| | 2 °C with CCS | | | | | |
|---|---|---|---|---|---|---|
| | Oil | | Gas | | Coal | |
| Country or region | Billions of barrels | % | Trillions of cubic metres | % | Gt | % |
| Africa | 23 | 21% | 4.4 | 33% | 28 | 85% |
| Canada | 39 | 74% | 0.3 | 24% | 5.0 | 75% |
| China and India | 9 | 25% | 2.9 | 63% | 180 | 66% |
| FSU | 27 | 18% | 31 | 50% | 203 | 94% |
| CSA | 58 | 39% | 4.8 | 53% | 8 | 51% |
| Europe | 5.0 | 20% | 0.6 | 11% | 65 | 78% |
| Middle East | 263 | 38% | 46 | 61% | 3.4 | 99% |
| OECD Pacific | 2.1 | 37% | 2.2 | 56% | 83 | 93% |
| ODA | 2.0 | 9% | 2.2 | 24% | 10 | 34% |
| United States of America | 2.8 | 6% | 0.3 | 4% | 235 | 92% |
| Global | 431 | 33% | 95 | 49% | 819 | 82% |

FROM McGLADE AND EKINS, NATURE MAGAZINE, JANUARY 8, 2015

## The Swanson effect

Price of crystalline silicon photovoltaic cells, $ per watt

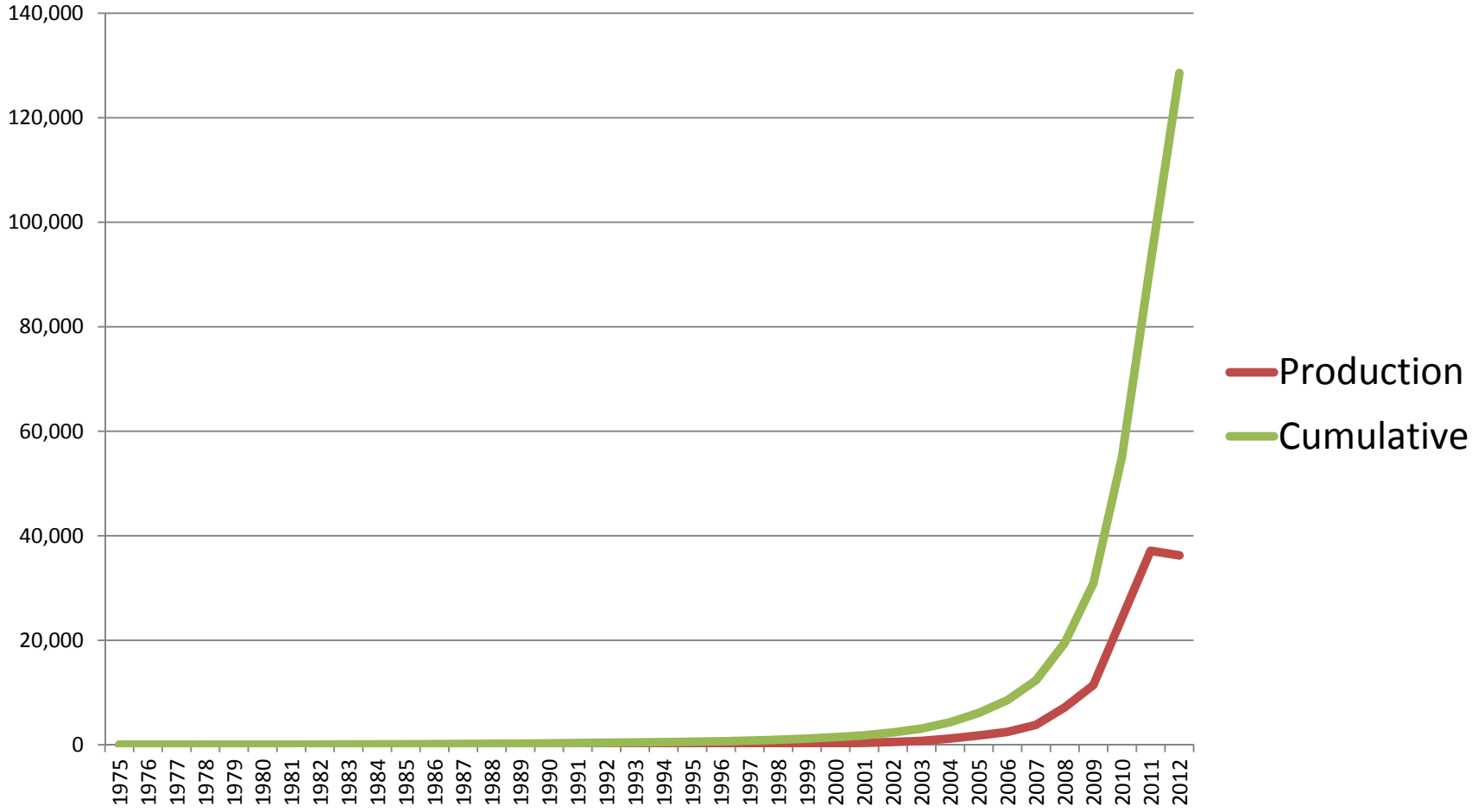



Source: Bloomberg New Energy Finance

*Forecast

Economist.com/graphicdetail

# Solar PV: Annual and Cumulative Production (MW)



# KEY ROLES OF SUSTAINABLE DEVELOPMENT DISCIPLINES

(1) Understanding Mechanisms: climate, biodiversity, economic dynamics

(2) Monitoring and mapping Earth system states

(3) Developing integrated physical-human systems for the "green economy"

(4) Assisting directed technological change e.g. "deep decarbonization," ICT-based health and education, sustainable agriculture, smart cities

(5) Leading public and university education, and building a shared global framework for action

# Some Recent Alliances for Sustainable Development

- Earth League
- UN SDSN
- SDSN.Edu and MDP
- DDPP
- PPPs for Low-Carbon Technology

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