International Growth Centre public lecture

The Age of Sustainable Development

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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

![Graph showing the increase in international US trillions from 1990 to 2000. The graph starts with a nearly flat line until around 1995, then shows a sharp increase towards 2000.]
Gross World Product per Capita
Human Population in the Holocene
Carbon dioxide (CO₂)

- Law Dome ice/firm
- Cape Grim (flasks/in situ)
SIXTH WAVE SHOULD BE SUSTAINABLE GROWTH BUILT ON DIGITAL REVOLUTION
THE INFORMATION AGE
(TRANSISTOR COUNT ON INTEL MICROPROCESSORS)

INTEL 4004
2.3K

XEON PHI
5.0B
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 CRISSES

6. ECONOMIC AND GEOPOLITICAL MULTI-POLARITY
PROGRESS DURING THE MDG ERA

Hooray!

Global poverty rate, %

Baseline scenario
Range based on best and worst scenarios

Source: Laurence Chandy, Natasha Ledlie and Veronika Penciakova
YET ECONOMIC GROWTH AND POVERTY REDUCTION ARE HAMPERED BY THREE LARGE HURDLES:

GROWING INCOME INEQUALITY AND SOCIAL EXCLUSION

CONTINUED RAPID POPULATION GROWTH

GROWING ENVIRONMENTAL CRISSES
GINI COEFFICIENT IN US, 1968-2010

SOURCE: US CONGRESSIONAL RESEARCH SERVICE 2012
GINI COEFFICIENT IN CHINA, 1981-2012

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
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


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 “SUSTAINABLE 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 SUSTAINABLE 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

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:
- **Energy Intensity of GDP (GJ/$2005)**
  - 2014: 5.0
  - 2050: 0.0
- **Electricity Emissions Intensity (gCO2/kWh)**
  - 2014: 600
  - 2050: 0
- **Share of Electricity and Electric Fuels in Total Final Energy (%)**
  - 2014: 0%
  - 2050: 25%
THE WORLD WILL NEED TO STRAND OIL, GAS, AND COAL RESERVES

<table>
<thead>
<tr>
<th>Country or region</th>
<th>Oil</th>
<th></th>
<th>Gas</th>
<th></th>
<th>Coal</th>
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<tr>
<td></td>
<td>Billions of barrels</td>
<td>%</td>
<td>Trillions of cubic metres</td>
<td>%</td>
<td>Gt</td>
<td>%</td>
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<tr>
<td>Africa</td>
<td>23</td>
<td>21%</td>
<td>4.4</td>
<td>33%</td>
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<td>0.3</td>
<td>24%</td>
<td>5.0</td>
<td>75%</td>
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<tr>
<td>China and India</td>
<td>9</td>
<td>25%</td>
<td>2.9</td>
<td>63%</td>
<td>180</td>
<td>66%</td>
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<tr>
<td>FSU</td>
<td>27</td>
<td>18%</td>
<td>31</td>
<td>50%</td>
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<tr>
<td>CSA</td>
<td>58</td>
<td>39%</td>
<td>4.8</td>
<td>53%</td>
<td>8</td>
<td>51%</td>
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<tr>
<td>Europe</td>
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<td>20%</td>
<td>0.6</td>
<td>11%</td>
<td>65</td>
<td>78%</td>
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<tr>
<td>Middle East</td>
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<td>46</td>
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<tr>
<td>OECD Pacific</td>
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<td>2.2</td>
<td>56%</td>
<td>83</td>
<td>93%</td>
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<tr>
<td>ODA</td>
<td>2.0</td>
<td>9%</td>
<td>2.2</td>
<td>24%</td>
<td>10</td>
<td>34%</td>
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<tr>
<td>United States of America</td>
<td>2.8</td>
<td>6%</td>
<td>0.3</td>
<td>4%</td>
<td>235</td>
<td>92%</td>
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<tr>
<td>Global</td>
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<td>33%</td>
<td>95</td>
<td>49%</td>
<td>819</td>
<td>82%</td>
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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
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
The Age of Sustainable Development

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