

Transformative Pathways towards Sustainability:

*can we **think** “out of the box?”*
*can we **act** “out of the box?”*

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IIASA Director General and Chief Executive Officer

Professor Earth System Science

Wageningen, Netherlands

Summer

summer
temperate
Rough winds
summer
hot
fair
fair
nature
summer
fair
shade
time
life

Shall I Compare Thee To A Summer's Day?

by William Shakespeare

Shall I compare thee to a summer's day?
Thou art more lovely and more temperate.
Rough winds do shake the darling buds of May,
And summer's lease hath all too short a date.
Sometime too hot the eye of heaven shines,
And often is his gold complexion dimm'd;
And every fair from fair sometime declines,
By chance or nature's changing course untrimm'd;
But thy eternal summer shall not fade
Nor lose possession of that fair thou ow'st;
Nor shall Death brag thou wander'st in his shade,
When in eternal lines to time thou grow'st:
So long as men can breathe or eyes can see,
So long lives this, and this gives life to thee.



SUSTAINABLE DEVELOPMENT GOALS



➡ Japan – SDG Implementation Guiding Principles & Specific Measures to Achieve SDGs



Sources: BBC, Salon

JAPANESE GOVERNMENT RESEARCH GOALS

“To position Japan as the world’s most innovation-friendly country”

Japan Revitalization Strategy 2016

Abenomics

- Maximize introduction of renewable energy
- Conduct a comprehensive reform in energy for the first time in 60 years
- Support Growth in areas including the Internet of Things and Big Data
- Extend the “Energy Efficiency Benchmark Program”



Integrated Systems approach to SDG-Pathways

We lack a truly integrated, comprehensive quantitative understanding of sustainable development pathways, accounting for the inter-linkages between the economy, technology, environment, climate, human development and planetary boundaries.

Food for a Week, Aboubakar Family

© 2005 PETER MENZEL PHOTOGRAPHY



TCHAD 230 000 réfugiés de guerre soudanais vivent dans les camps de l'Onu. Chacun a droit

à 2100 Cal par jour: céréales, sucre, sel, huile, légumes secs et farine vitaminée.

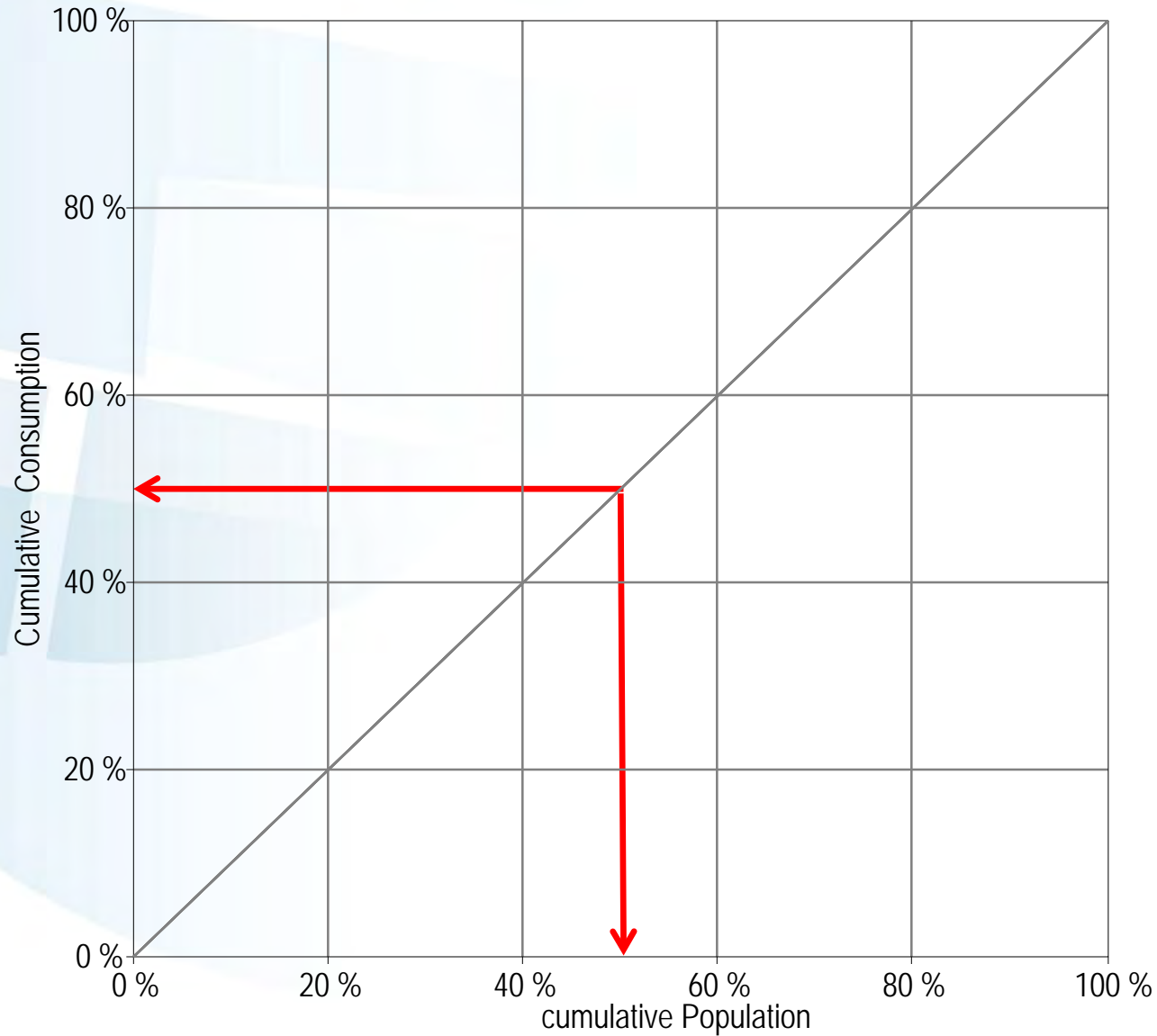
Food for a Week, Melander Family

© 2005 PETER MENZEL PHOTOGRAPHY

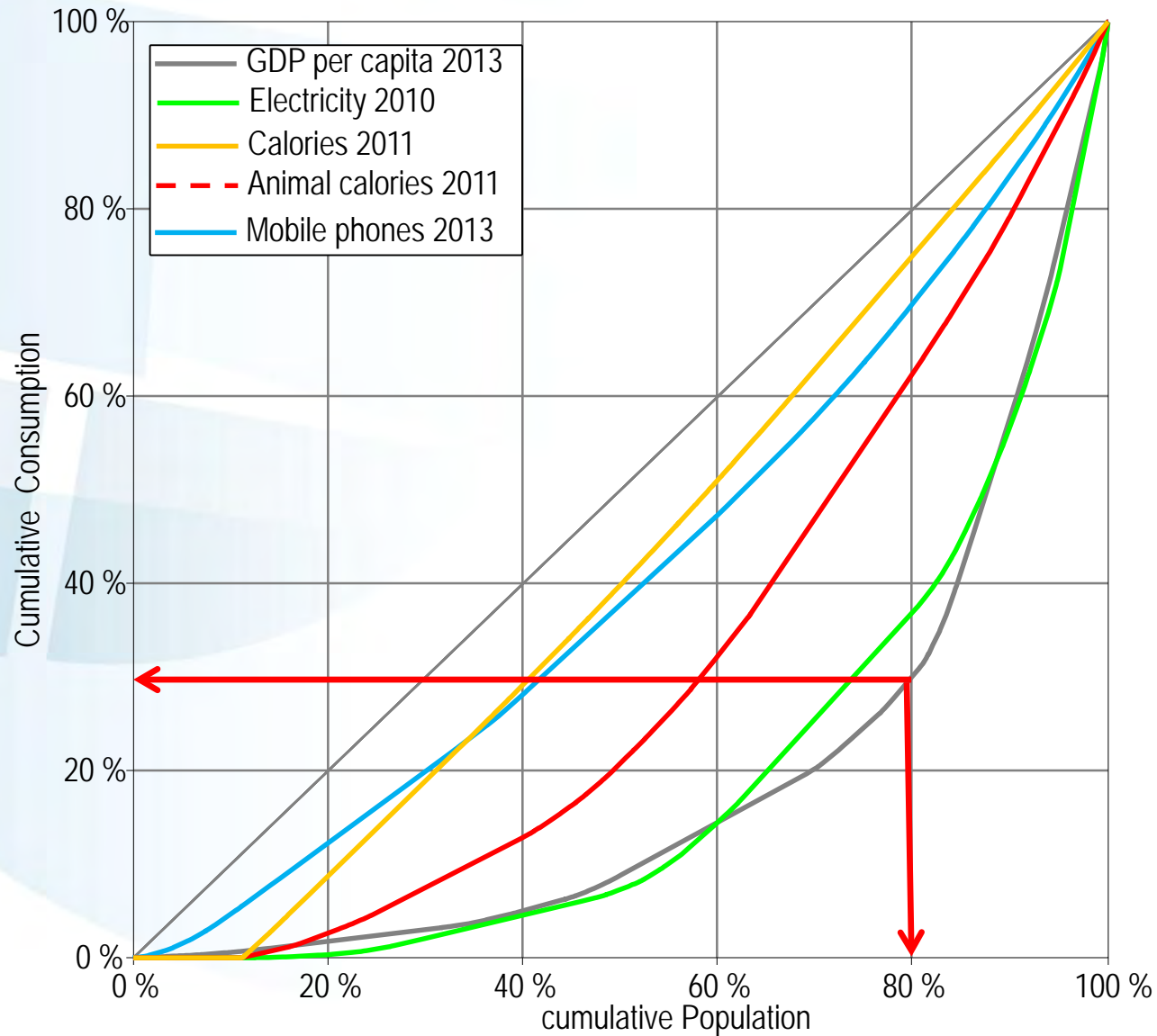


Source: Menzel, 2005

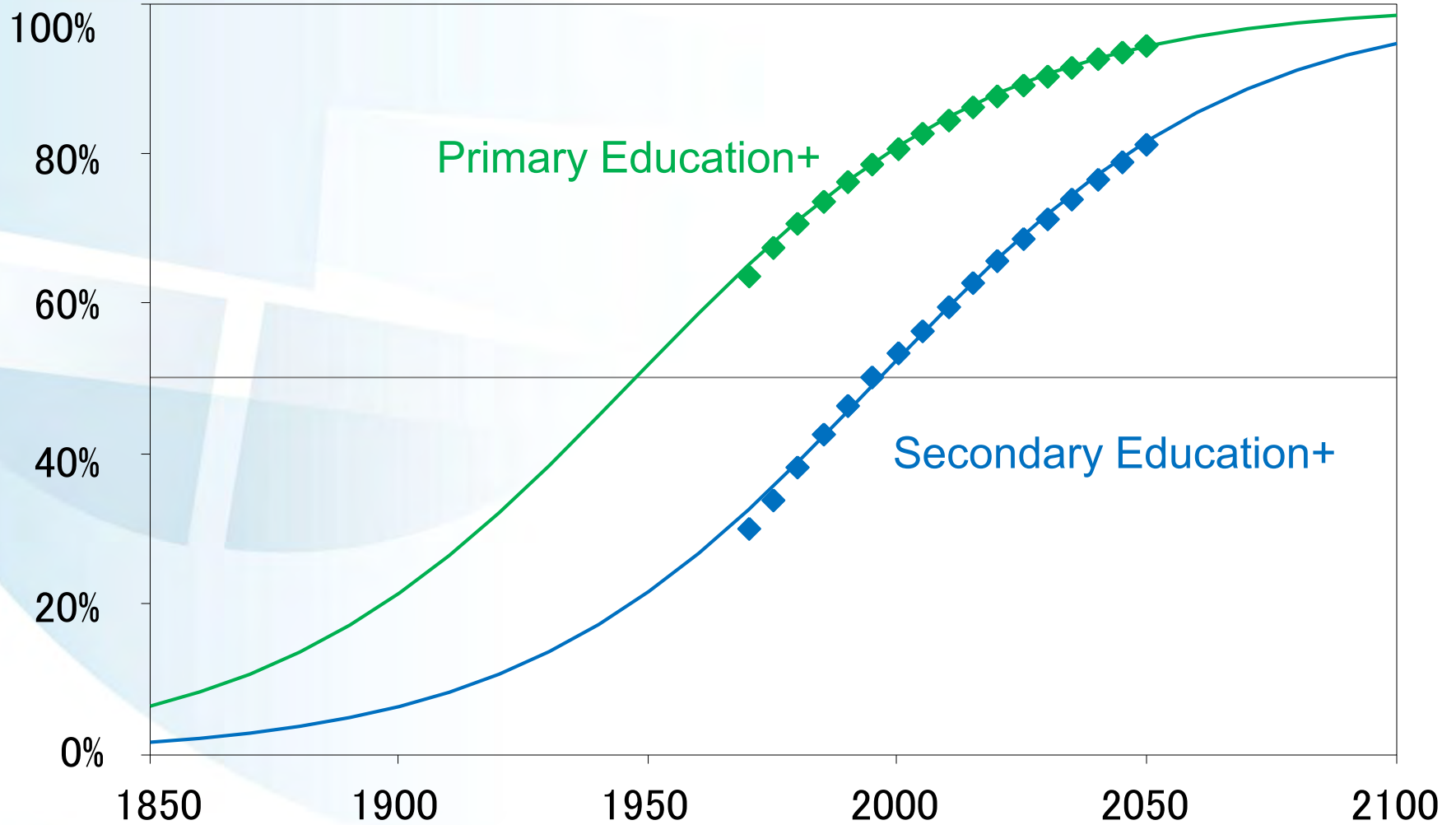
Global Lorenz Distributions



Global Lorenz Distributions

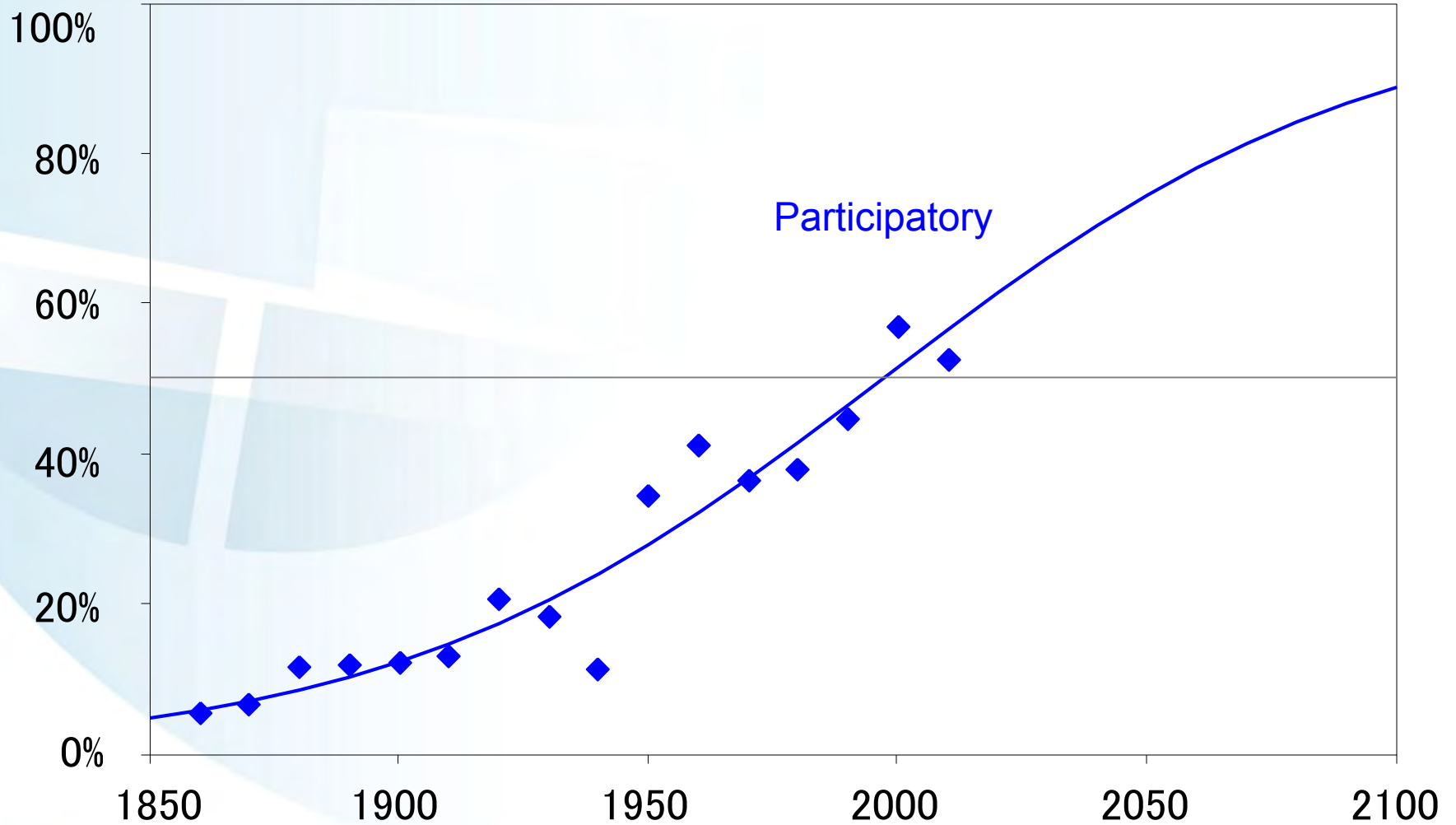


Global Educational Attainment



Source: Lutz et al. (2007)

Diffusion of Democracy



Source: Modelski & Perry, 2002; 2010

Sustainable Development:

unprecedented opportunities for accelerated innovations

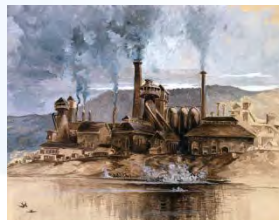
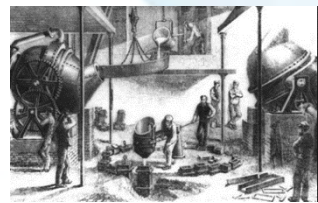
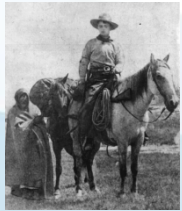
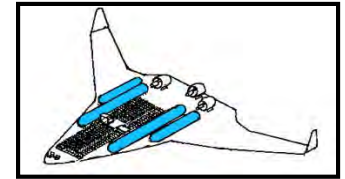
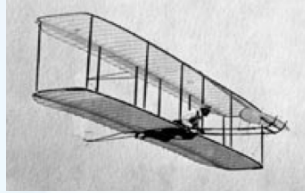
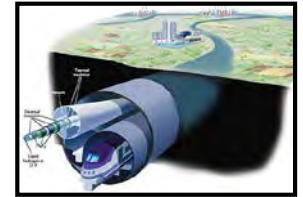
1850

1900

1950

2000

2050



Source: After Granger Morgan, 2013

Disruptive Changes ?

Easter Parade on Fifth Avenue, New York, 13 years apart

1900: where's the car?



1913: where's the horse?



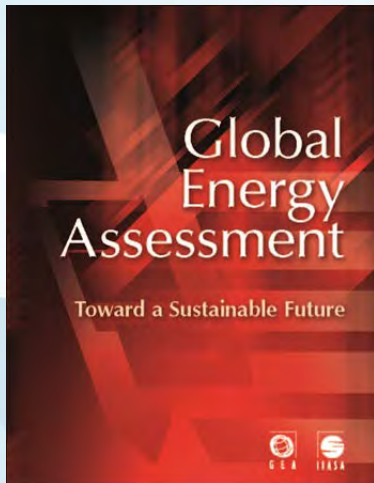
Images: L. National Archive, www.archives.gov/research/american-cities/images/american-cities-101.jpg

R. shorpy.com/node/204.

Inspiration: Tona Seba's keynote lecture at AltCar, Santa Monica CA, 28 Oct 2014.

<http://tonaseba.com/keynote-at-altcar-2014-100-electric-transportation-100-solar-by-2030/>

GLOBAL ENERGY ASSESSMENT



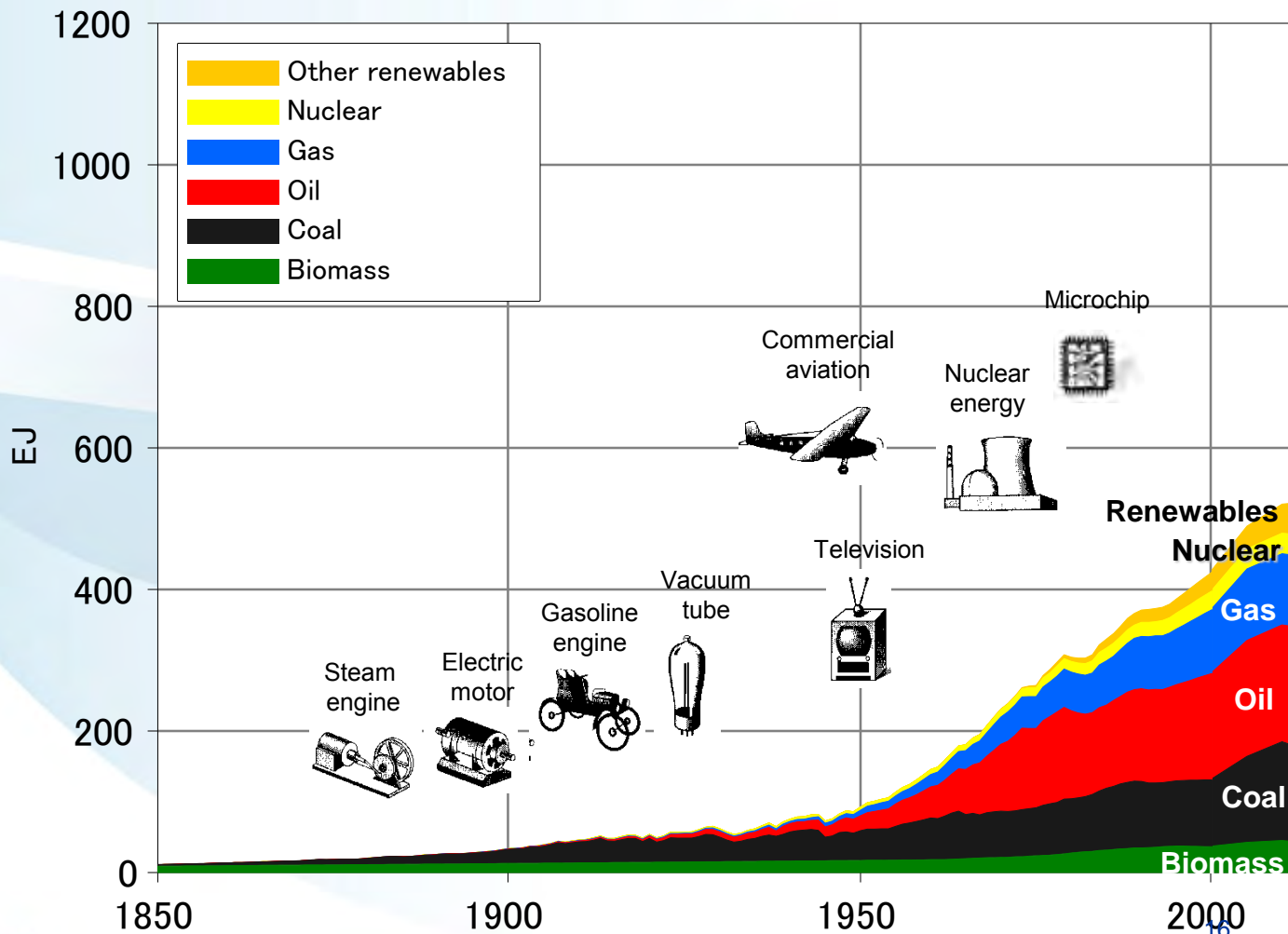
2006-12: GEA defines a new global energy policy agenda—one that transforms the way society thinks about, uses, and delivers energy.



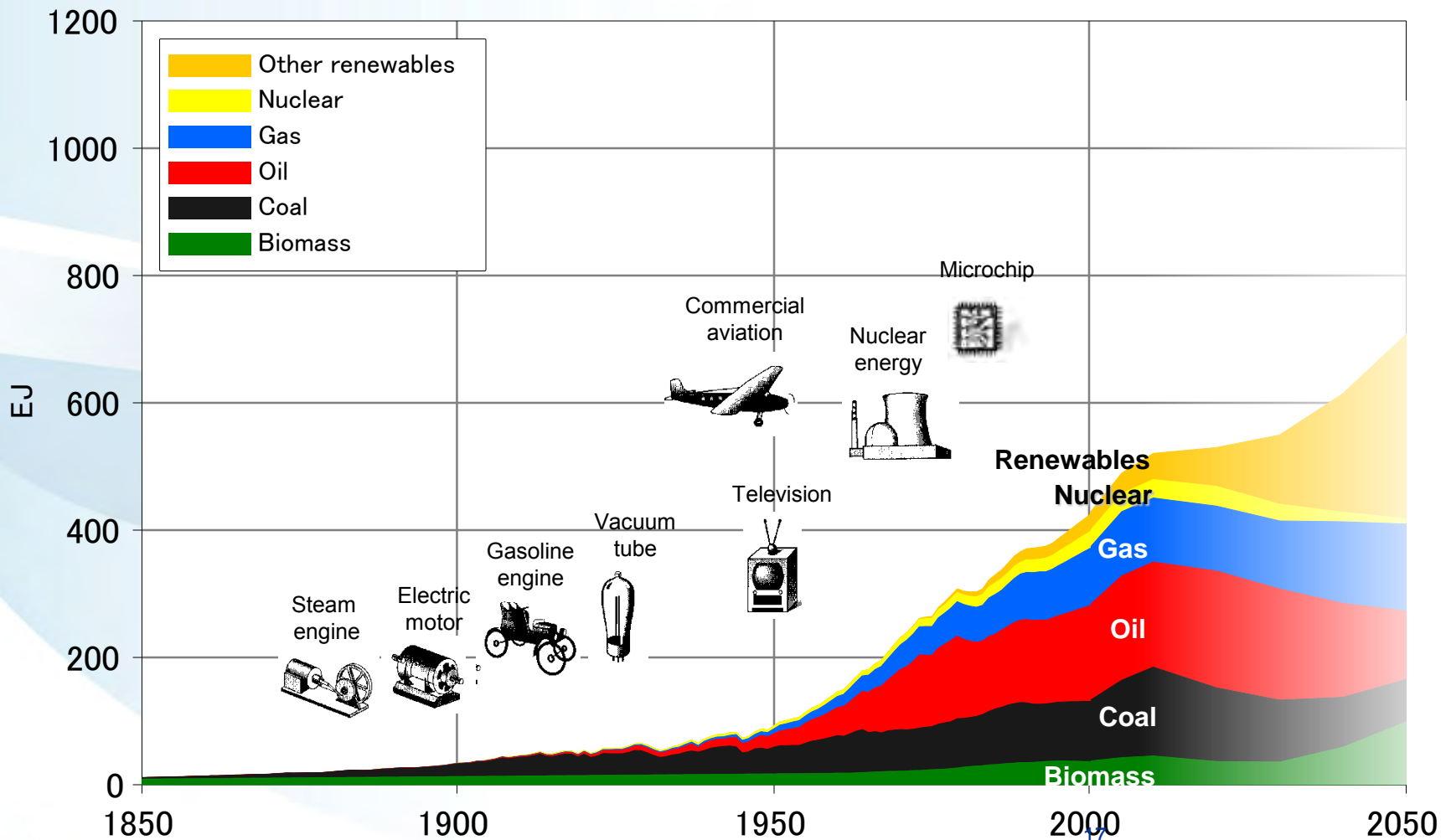
Significant Japanese contribution:
Nine lead analysts, four contributors and one reviewer
Findings relevant to Japan and Asia were presented at a workshop in Tokyo in 2013

Global Primary Energy

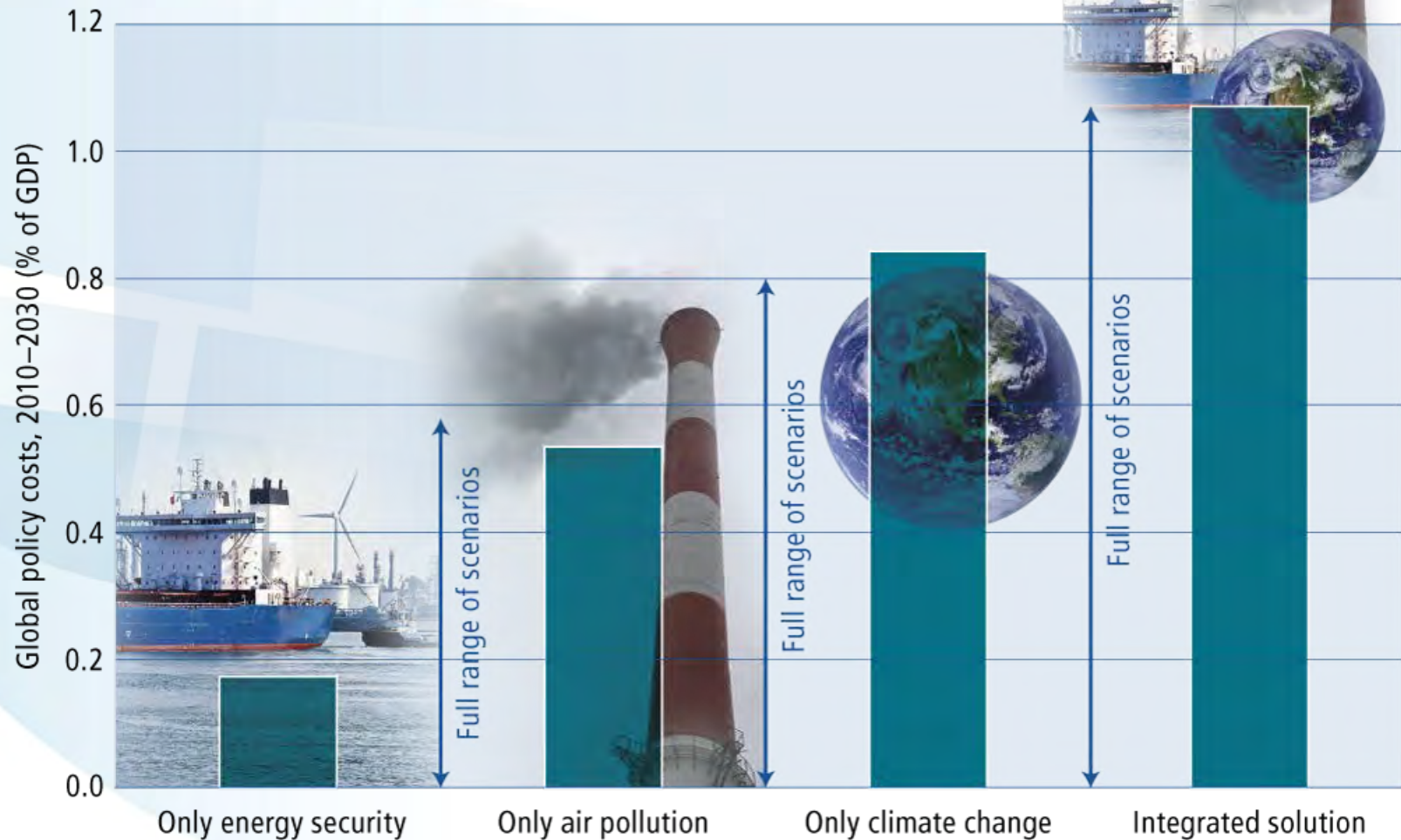
Efficiency



Global Primary Energy Efficiency

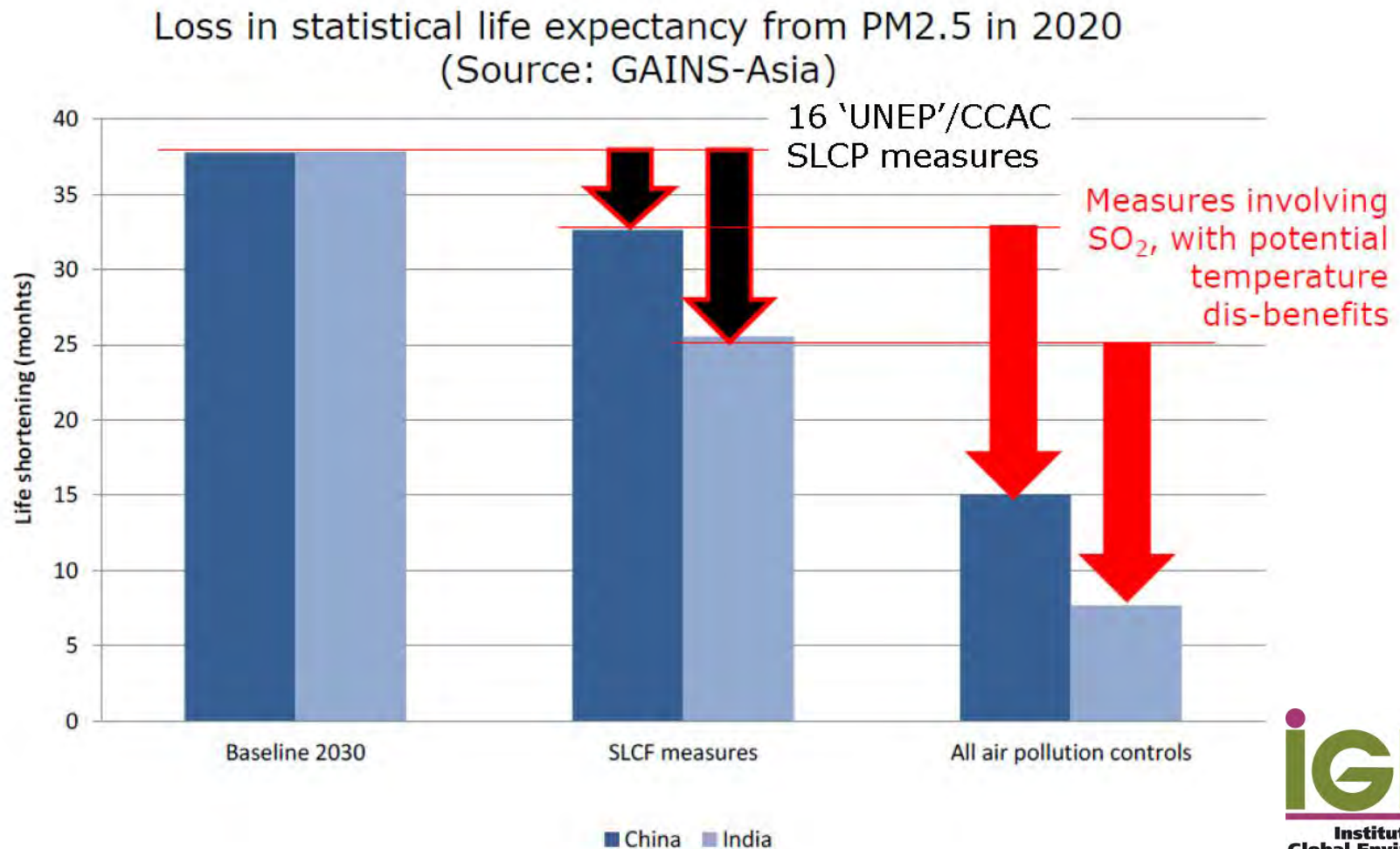


MULTIPLE BENEFITS OF INTEGRATED POLICIES



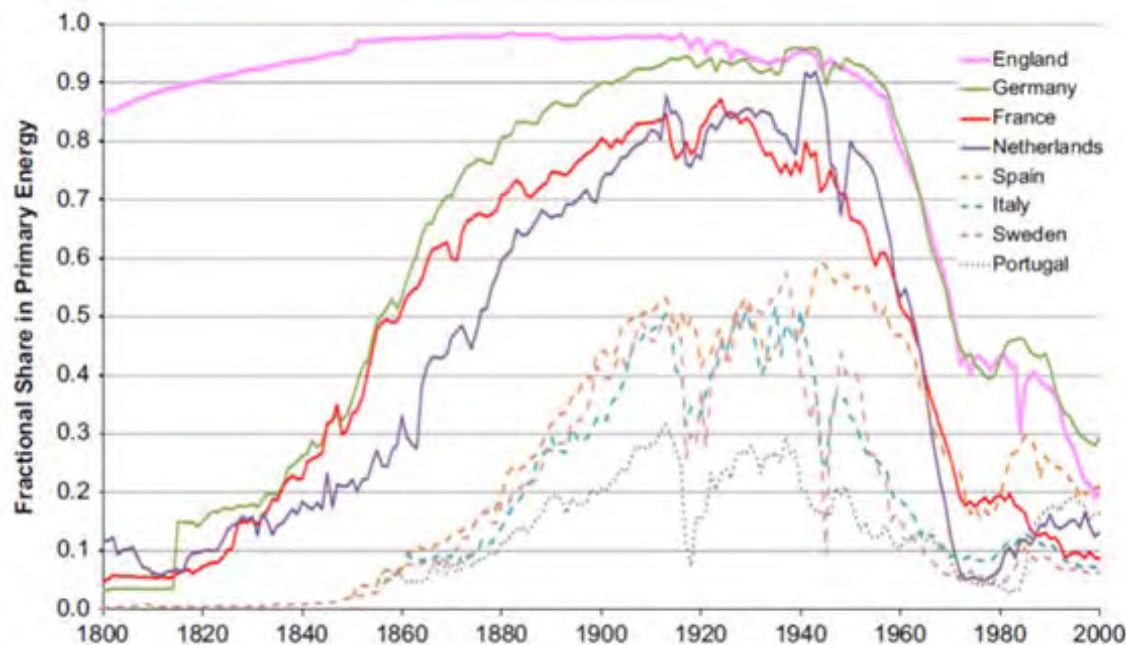
Source: McCollum, Krey, Riahi, 2012

CO-BENEFITS: IMPROVING AIR QUALITY AND TACKLING CLIMATE CHANGE



ALTERNATIVE PATHWAYS TOWARD SUSTAINABLE DEVELOPMENT AND CLIMATE STABILIZATION (ALPS)

Diffusion of Coal Power Plants (ALPS 2014)

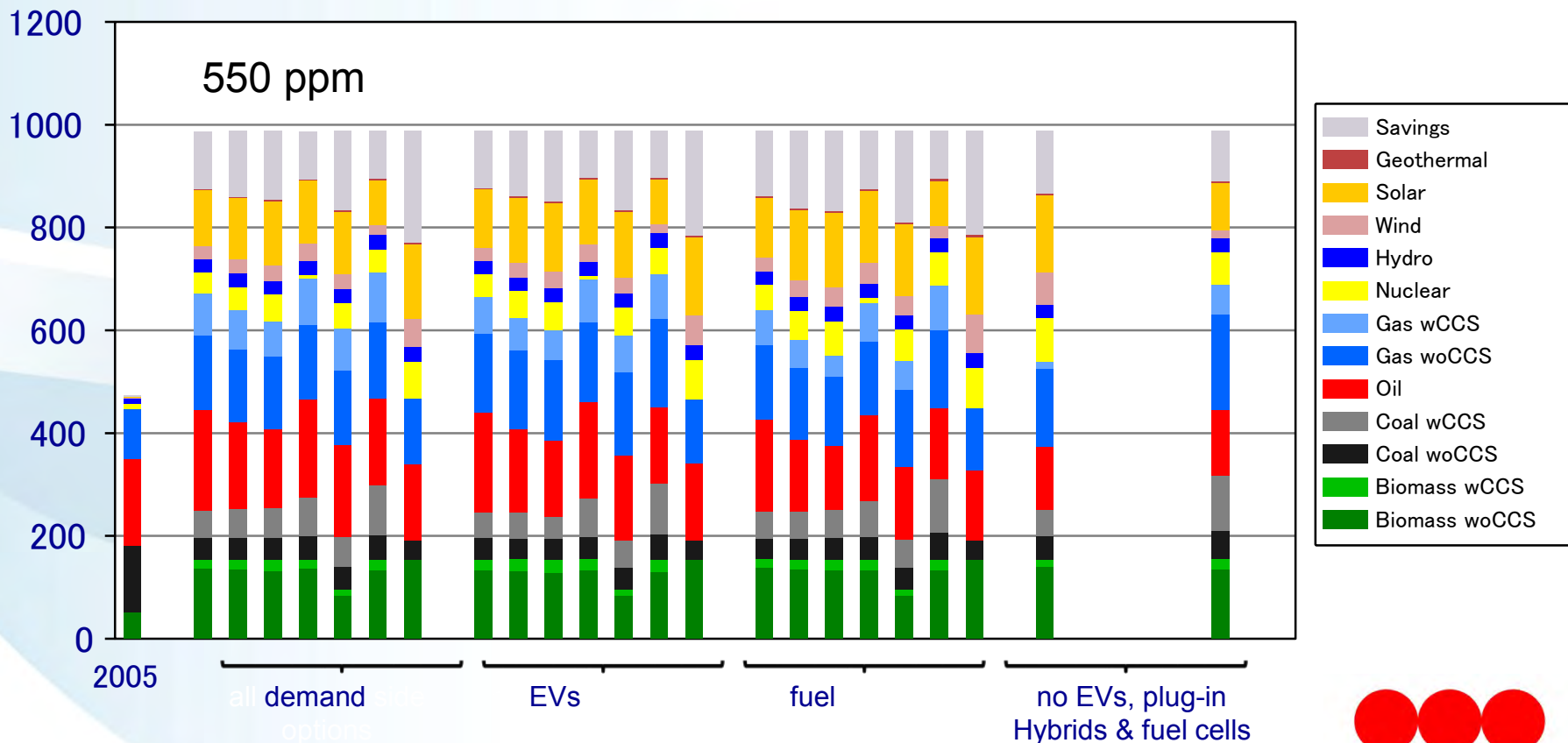


TOPICS:

- ✓ Energy security
- ✓ Technology diffusion
- ✓ New Concepts for technological learning
- ✓ Actor heterogeneity & behavior

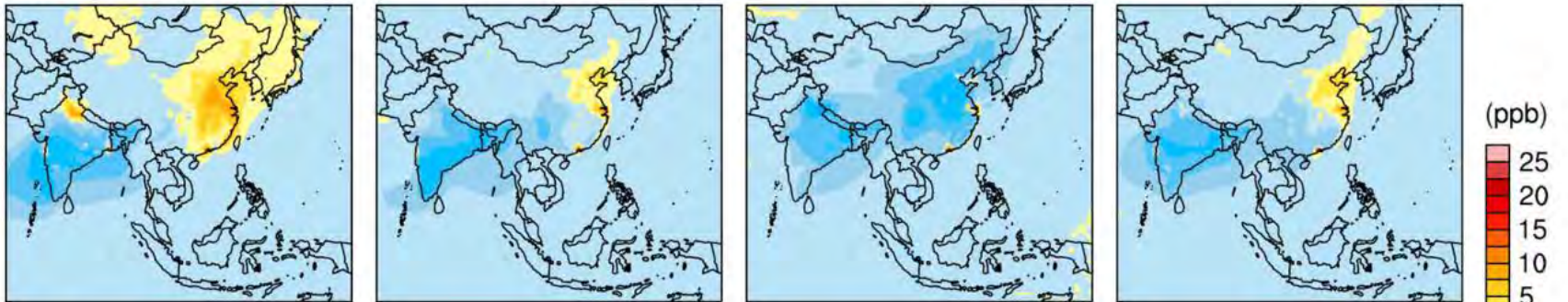


POTENTIAL FOR GLOBAL ELECTRIFICATION TO REDUCE GREENHOUSE GAS EMISSIONS

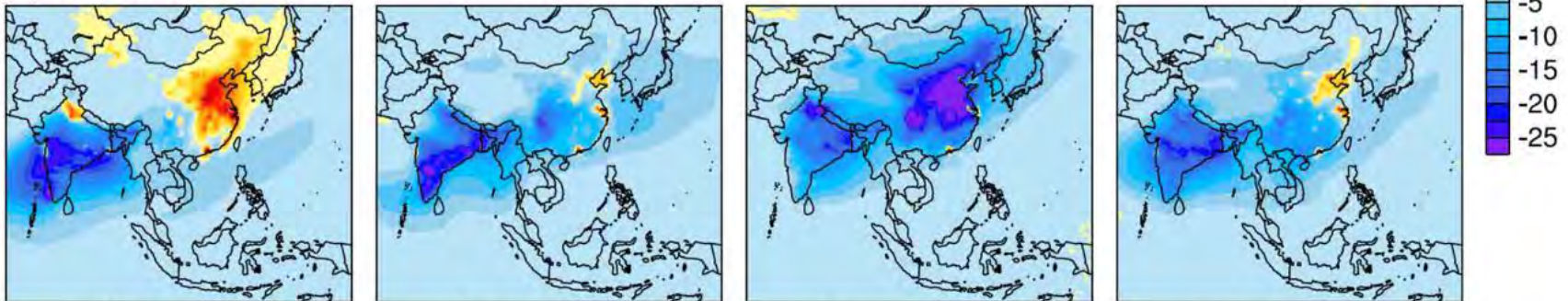


FUTURE PREDICTION OF TROPOSPHERIC OZONE OVER SOUTH AND EAST ASIA IN 2030

(a) PC0-BAU0



(b) PC1-BAU0



Winter (DJF)

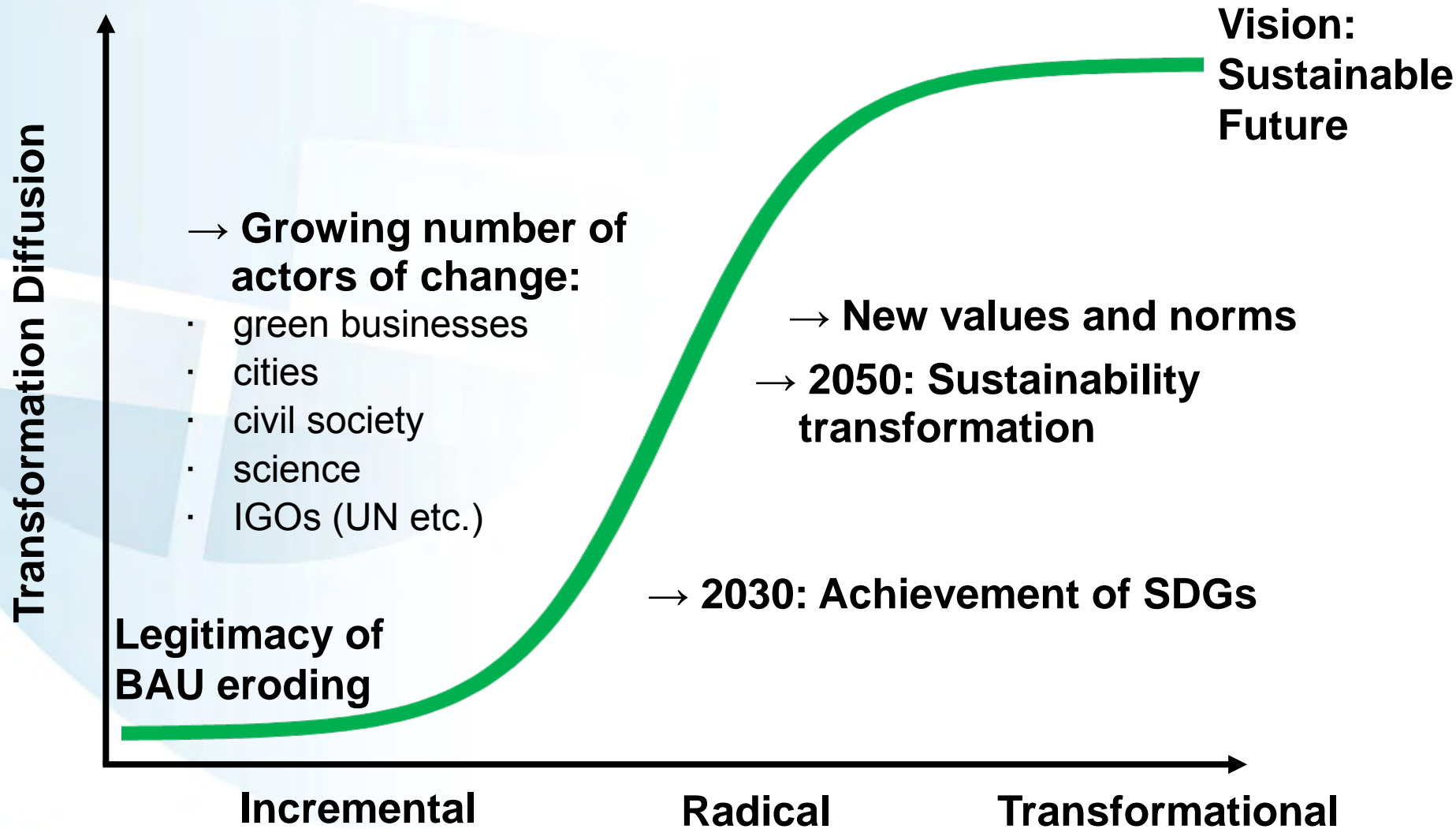
Spring (MAM)

Summer (JJA)

Autumn (SON)

The World in 2050 (TWI2050.com)

“Doing More with Less” within Planetary Boundaries



Source: After WBGU, 2011

The World in 2050 (TWI2050.com)

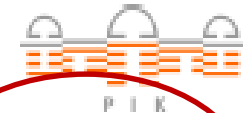
“Doing More with Less” within Planetary Boundaries



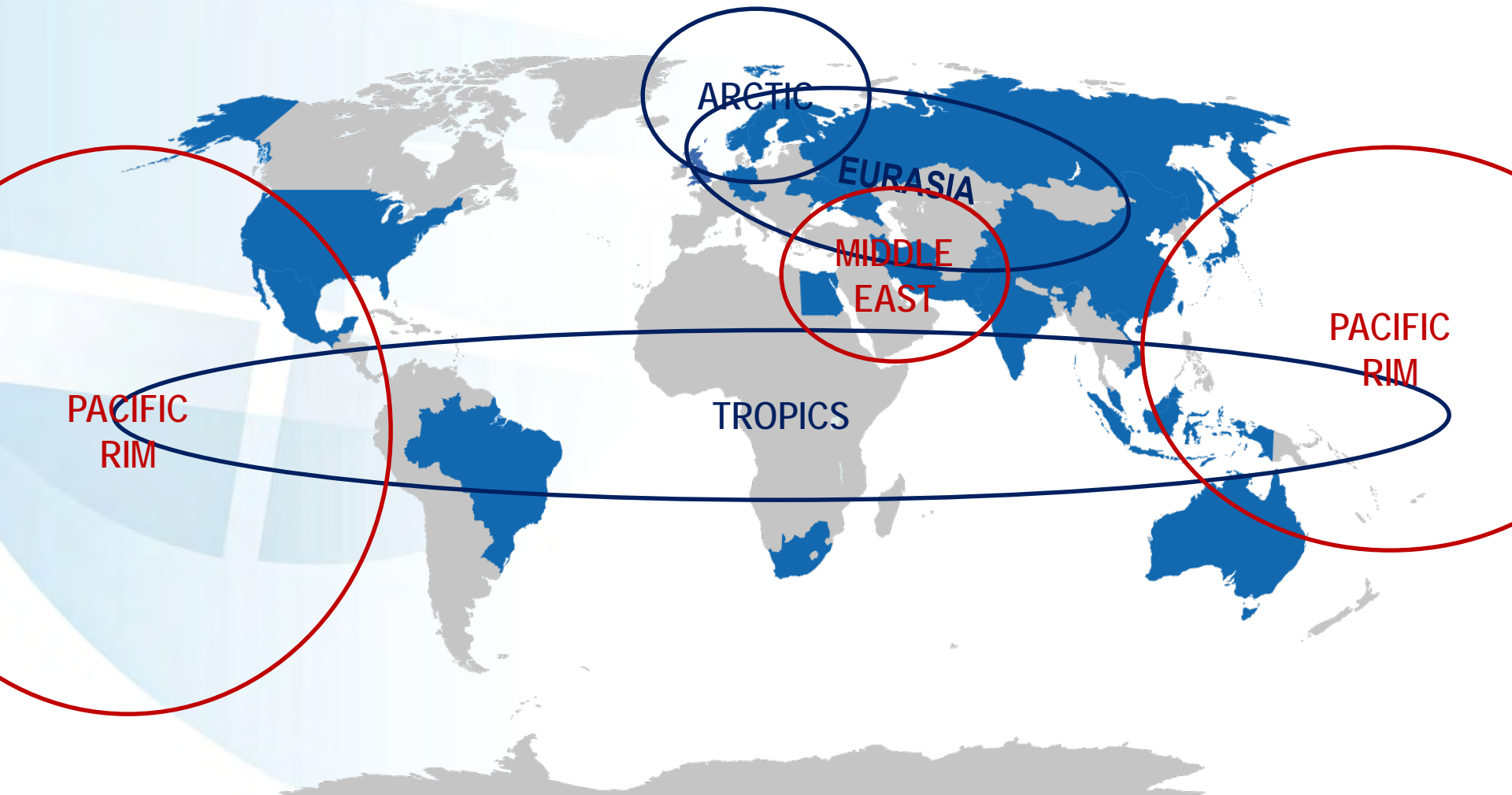
Source: After WBGU, 2011

The World in 2050 “Consortium”

- AIMEs
- Brazilian Federal Agency for the Support and Evaluation of Graduate Education (CAPES)
- Centre for Integrated Studies on Climate Change and the Environment (CIRED)
- Commonwealth Scientific and Industrial Research Organization (CSIRO)
- Earth League, whole Earth system modelling initiative
- **Earth Institute, Columbia University**
- Energy Planning Program, COPPE, Federal University of Rio de Janeiro
- Fondazione Eni Enrico Mattei (FEEM)
- Future Earth
- German Development Institute (DIE)
- Global Ocean Ecosystem Dynamics (GLOBEC)
- Indian Institute International Futures
- Indian Institute of Technology (IIT)
- International Energy Agency (IEA)
- International Food Policy Research Institute (IFPRI)
- International Monetary Fund (IMF)
- **International Institute for Applied System Analysis (IIASA), EUROPEAN COMMISSION**
- Intergovernmental Panel on Climate Change (IPCC)
- Joint Research Centre, European Commission
- Joint Global Change Research Institute at Pacific Northwest National Laboratory (JGCRI/PNNL)
- Mercator Research Institute on Global Commons and Climate Change
- National Center for Atmospheric Research (NCAR)
- National Institute for Environmental Studies (NIES)
- National Renewable Energy Laboratory (NREL)
- Organisation for Economic Co-operation and Development (OECD)
- Potsdam Institute for Climate Impact Change (PIK)
- PBL - Netherlands Environmental Assessment Agency
- Research Institute of Innovative Technology for the Earth (RITE)
- Stanford University
- **Stockholm Resilience Centre**
- **Sustainable Development Solutions Network (SDSN)**
- The City University of New York (CUNY)
- Tsinghua University
- UN Population Division
- UN DESA
- UNEP- World Conservation Monitoring Centre (UNEP-WCMC)
- University of Hamburg
- World Bank



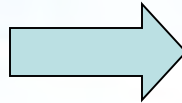
ASIAN PACIFIC REGIONAL APPROACH?



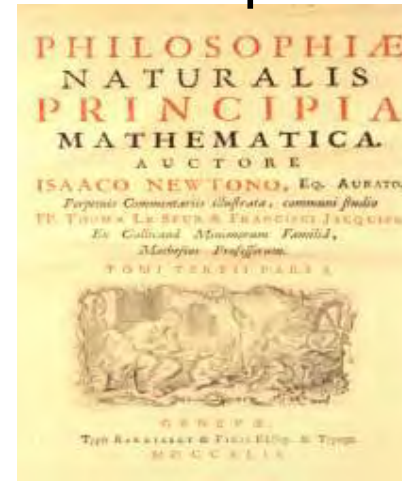
What type of science and scientific collaboration do we need?



Sir Isaac Newton



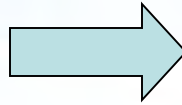
Principia



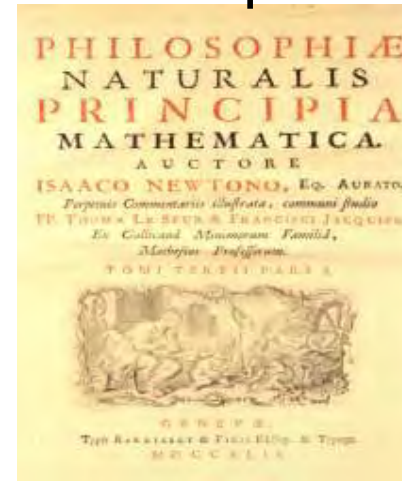
The Renaissance vision



Sir Isaac Newton



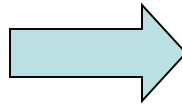
Principia



The Anthropocene vision



????



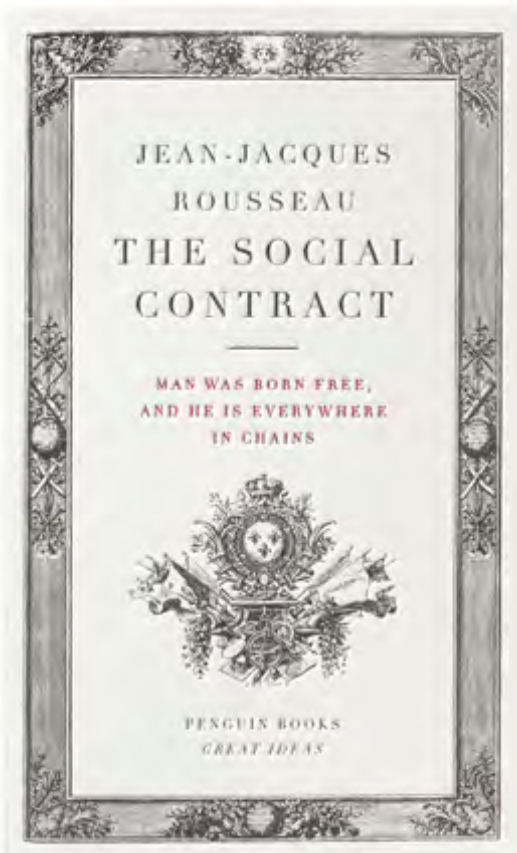
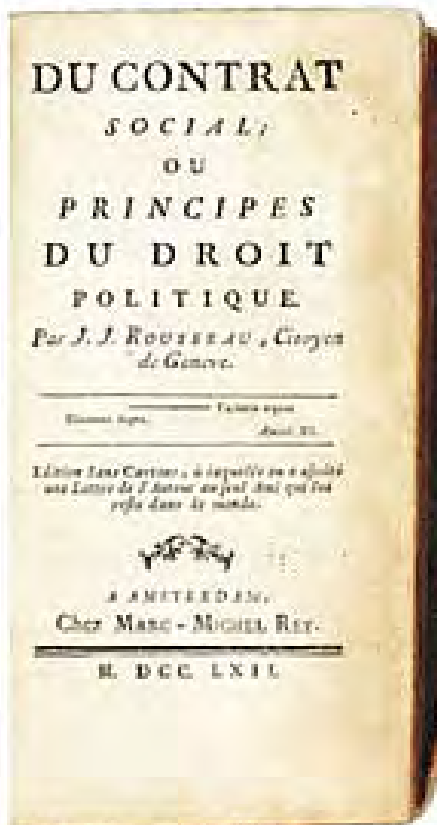
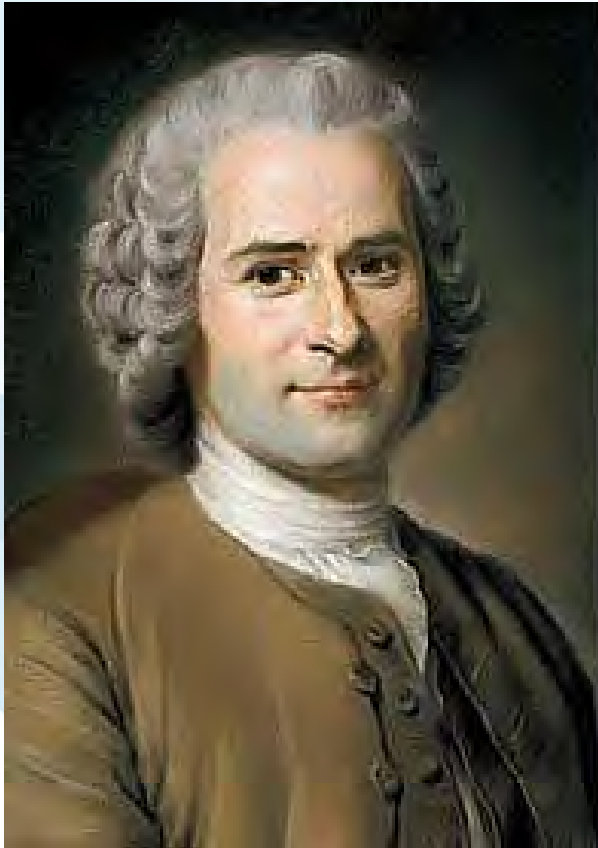
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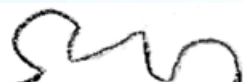
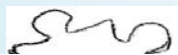
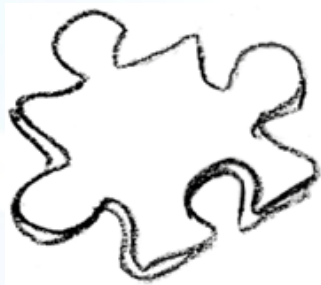
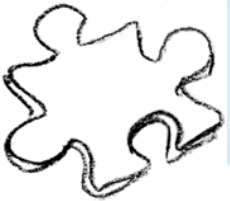


Science of Social Contract

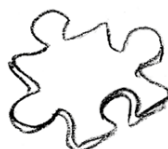
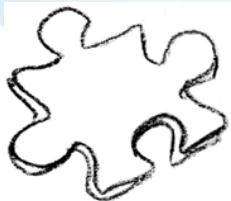
rules that govern relations among people and institutions

Vision of Sustainable Future





...system thinking and integrated approaches help to put the puzzle together....



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at IIASA (again)!
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