International Institute for Applied Systems Analysis
IIASA www.iiasa.ac.at

science for global insight

GLOBAL TRANSFORMATION PATHWAYS
value of systems science

Professor Dr. Pavel Kabat
IIASA Director General and Chief Executive Officer
Professor Earth System Science
Wageningen, Netherlands

THE EARLY 1970s

Sources: nuclearweaponarchive.org, The Guardian

Sources: US Department of Interior, IIASA

IIASA 2017 – 24 COUNTRIES (NATIONAL MEMBER ORGANIZATIONS)

- **International, independent, interdisciplinary**
- **Research on major global problems**
- **Solution oriented, integrated systems analysis**

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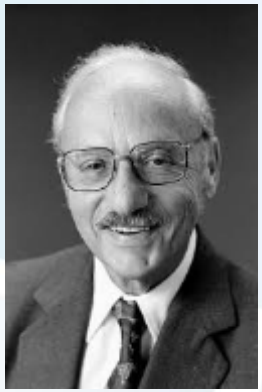
IIASA and US Highlights (2008-2017)

February 2017

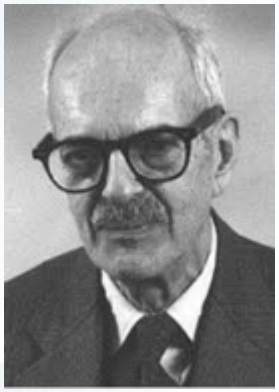
SUMMARY (2008-2016)

National Member Organization	National Academy of Sciences (NAS)
Membership start date	1972 (founding member)
Research partners	73 organizations in the US
Areas of research collaborations	Advancing Energy and Integrated Assessment Modeling in the US Global Energy Assessment and the US Curbing the Release of Black Carbon and Methane Projecting Changing Population in the US Improving the Use of Land for Food and for Combating Climate Change Advising Countries with Economies in Transition Increasing the Resilience of Vulnerable Communities Analyzing Ecological and Evolutionary Dynamics
Capacity Building	Over 100 young scientists from the US have participated in IIASA's Young Scientists Summer Program 6 in IIASA's Postdoctoral Fellowship Program 5 in the Southern African Young Scientists Summer Program
Publication output	873 publications
Staff	Over 40 US nationals have been employed by IIASA every year

SOME LEADING US PERSONALITIES FROM ACADEMIA AND ASSOCIATED WITH IIASA



George Dantzig



Nathan Keyfitz

Tjalling Koopmans

Donella & Dennis L Meadows

William Nordhaus

Jeffrey Sachs

Thomas . Schelling

SOME LEADING US PERSONALITIES FROM GOVERNMENT AND ASSOCIATED WITH IIASA

McGeorge Bundy

Steven Chu

William Colglazier

John Holdren

Robert McNamara

Norman Neureiter

Vaughan Turekian

COLLABORATING, RESEARCH & FUNDING PARTNERS

- 73 institutions in the US, including:
- National Science Foundation (NSF)
- White House Office of Science and Technology Policy (OSTP)
- US Department of State
- US Department of Energy (DOE)
- US Environmental Protection Agency (EPA)
- Harvard , Princeton, and Yale Universities
- Colorado State University
- National Aeronautics and Space Administration (NASA)
- National Center for Atmospheric Research (NCAR)
- National Renewable Energy Laboratory (NREL)
- Pacific Northwest National Laboratory (PNNL)
- Stanford University's Energy Modeling Forum (EMF)

EXAMPLES OF IIASA'S VALUE TO THE US
1. From Science to Evidence-based Policy

Office of Science and Technology Policy (OSTP): Multi-Agency Science and Technology Priorities:

- Global Climate Change
- Clean Energy

National Science Foundation Strategic Plan for 2014-18:

- Transform the Frontiers of Science and Engineering
- Stimulate Innovation and Address Societal Needs through Research and Education

GREENHOUSE GAS EMISSIONS 2000-2100

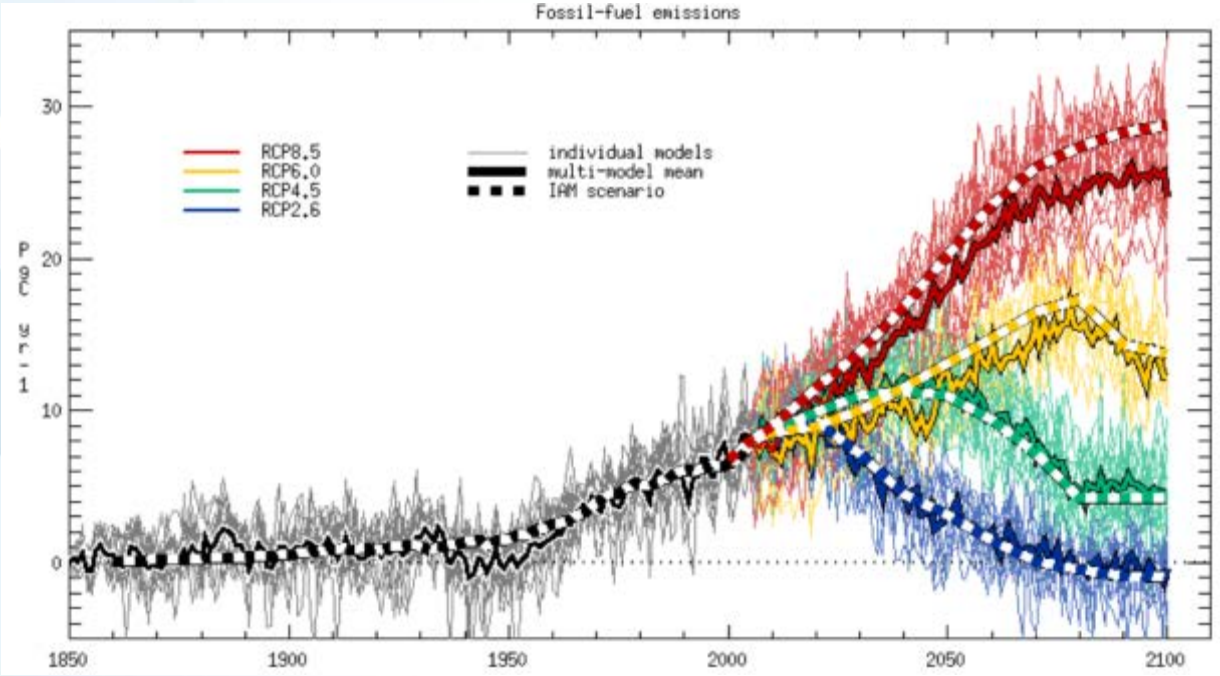
- Integrated Assessment Modeling Consortium includes IIASA & US partners:

EMF

Pacific Northwest NATIONAL LABORATORY

EPRI ELECTRIC POWER RESEARCH INSTITUTE

NCAR NATIONAL CENTER FOR ATMOSPHERIC RESEARCH



MESSAGE (IIASA)

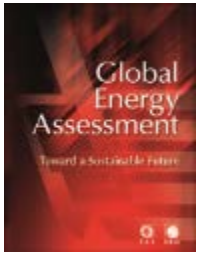
AIM (NIES)

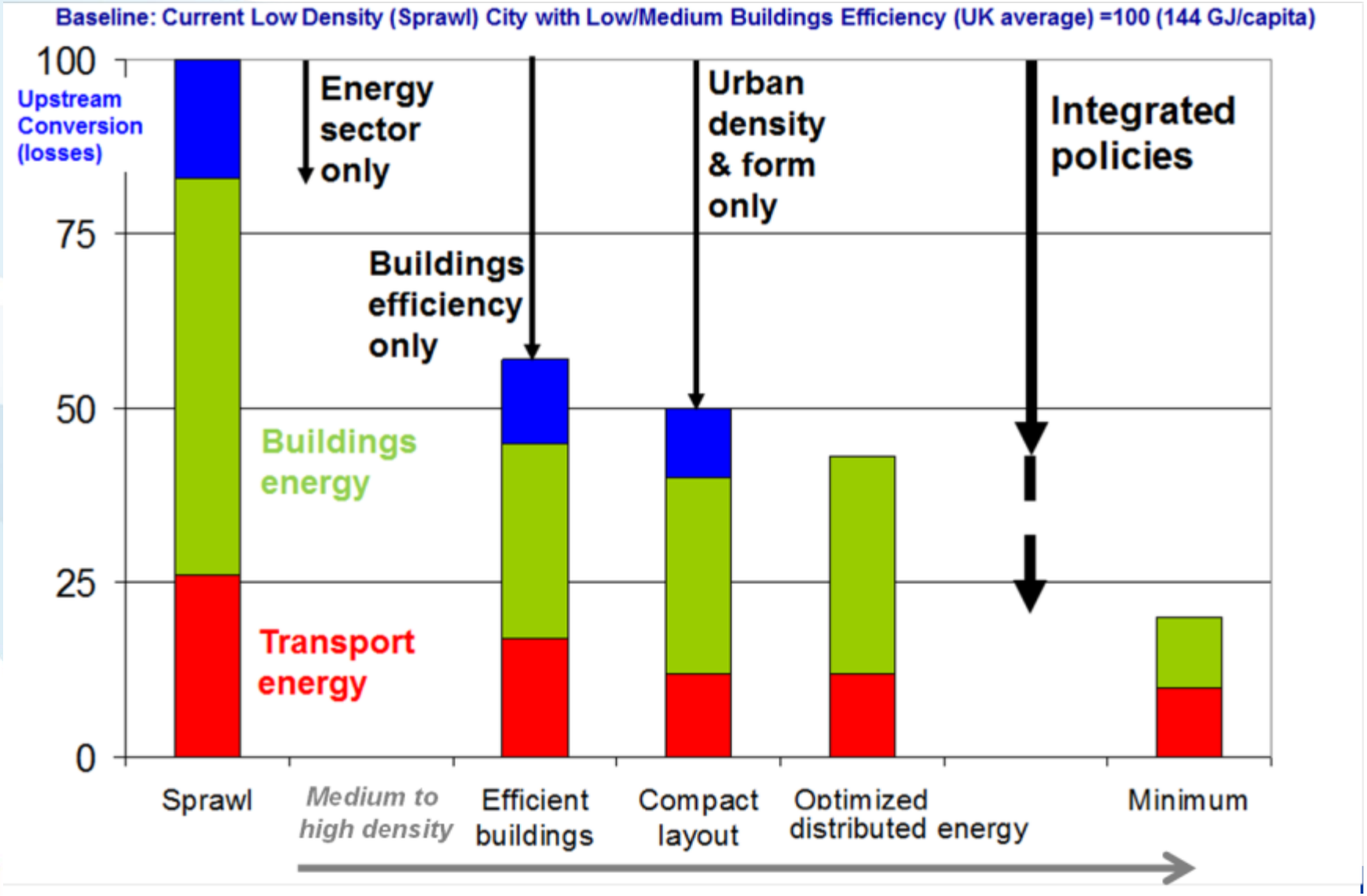
GCAM (PNNL)

Climatic Change

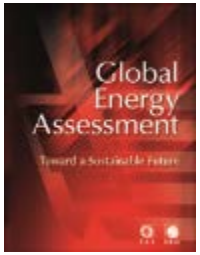
An Interdisciplinary, International Journal Devoted to the Description, Causes and Implications of Climatic Change

GLOBAL ENERGY ASSESSMENT AND THE US





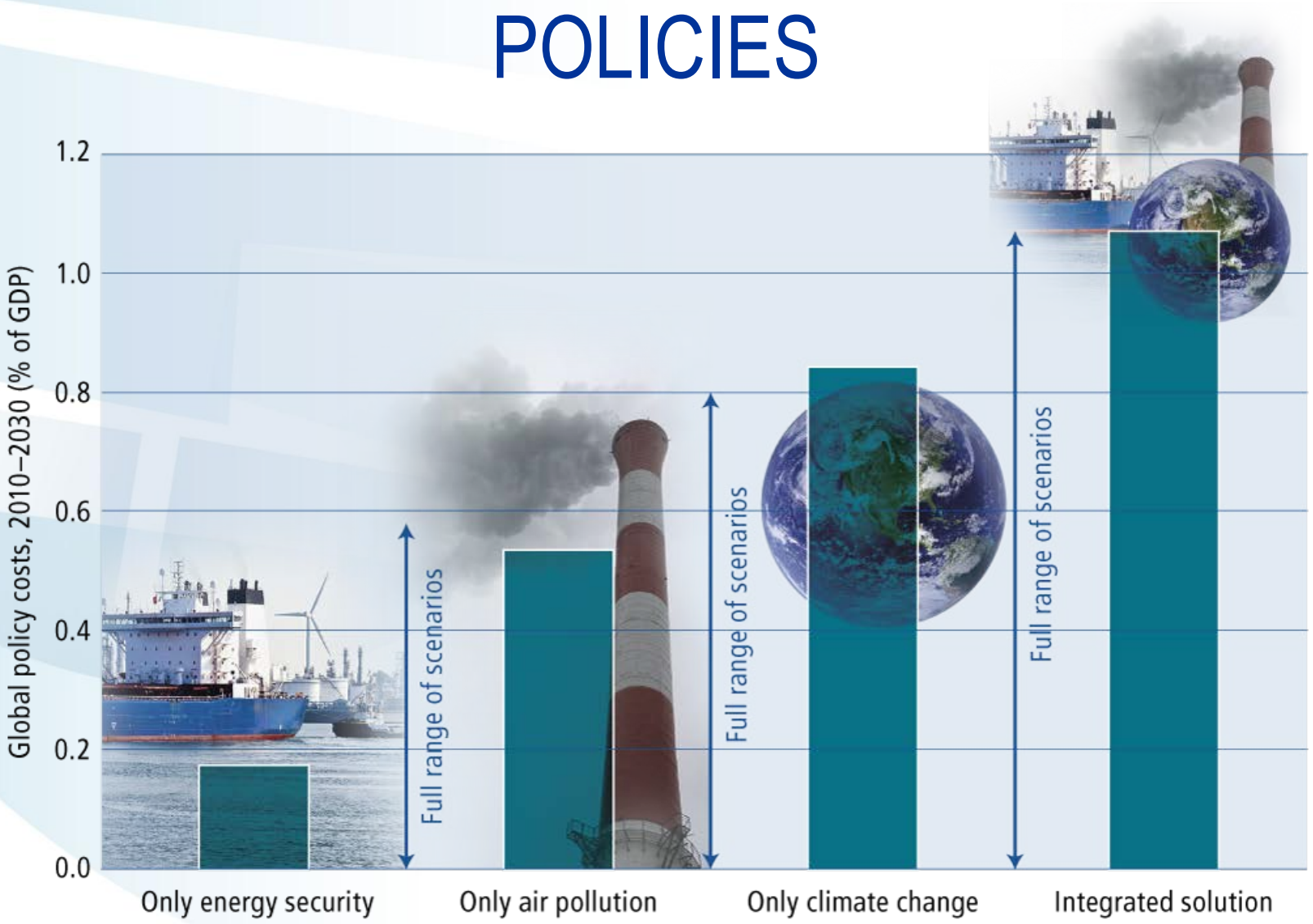
GLOBAL ENERGY ASSESSMENT AND THE US



- 2009 to date: GEA provides critical input to UN Secretary-General's Sustainable Energy For All Initiative including defining the aspirational yet feasible objectives:
  1. Ensure universal access to modern energy services
  2. Double the global rate of improvements in energy efficiency
  3. Double the share of renewable energy in the global energy mix

SUSTAINABLE ENERGY FOR ALL

GEA: MULTIPLE BENEFITS OF INTEGRATED POLICIES

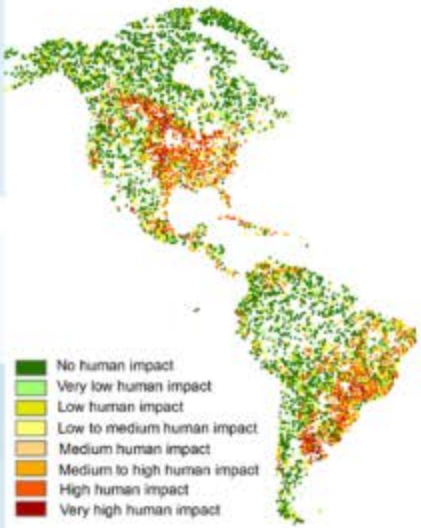


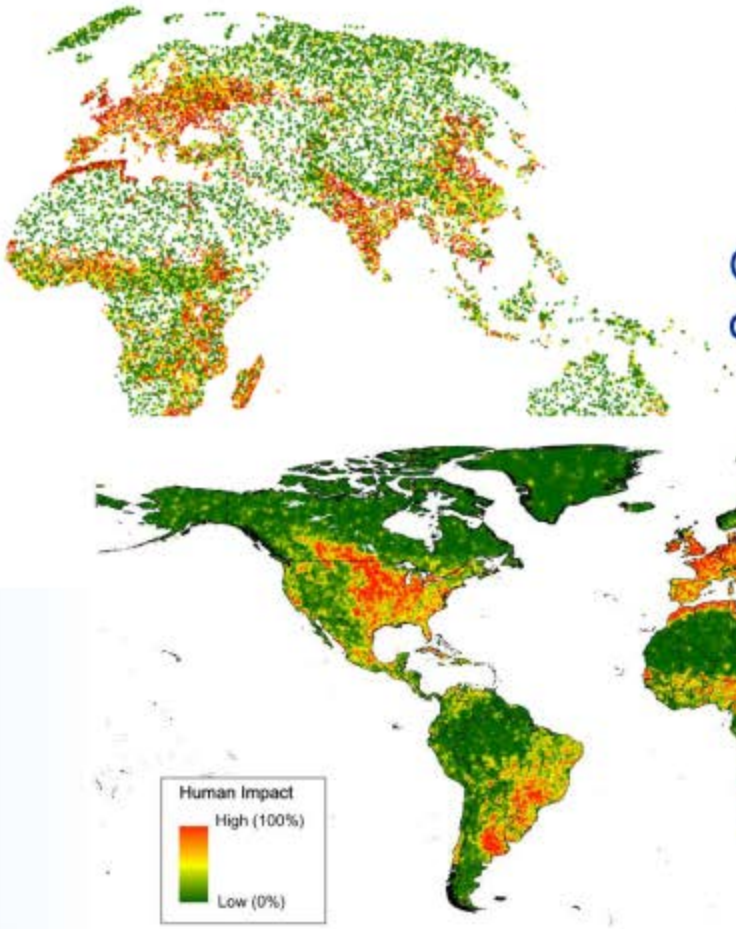
Source: McCollum, Krey, Riahi, 2012

Geo-Wiki Output: Downgrading recent estimates of land availability for biofuel production

Cai et al., 2011
1107 mil. hectares

Fritz et al., 2013
375 mil. hectares





Geo-Wiki Output: Global Map of Human Impact / Wilderness

Fritz et al, 2013, Environmental Science and Technology

THE NEXT GENERATION OF SYSTEMS ANALYSTS

Over 100 young researchers from the US or undertaking a PhD in the US have taken part in IIASA's Young Scientists Summer Program from 2008 -2016

EXAMPLES OF IIASA'S VALUE TO THE US
3. Contributing US Foreign Policy

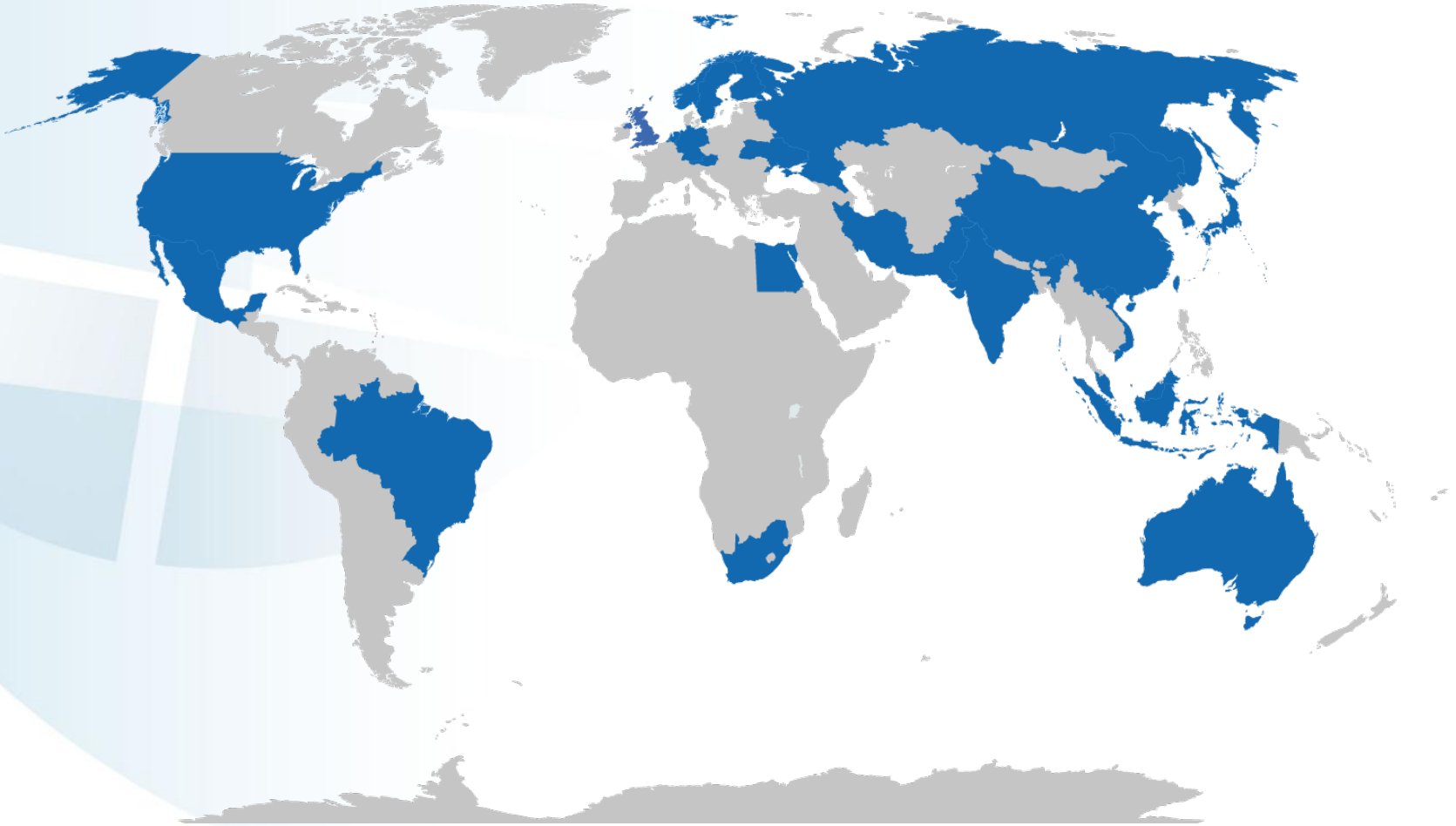
Office of Science and Technology Policy (OSTP): Multi-Agency Science and Technology Priorities:

- Global Climate Change
- Arctic

Department of State Quadrennial Diplomacy and Development Review

- Increasing our partnerships and engaging beyond the nation state
- Strengthen climate diplomacy and development
- Engaging Americans as partners in foreign affairs

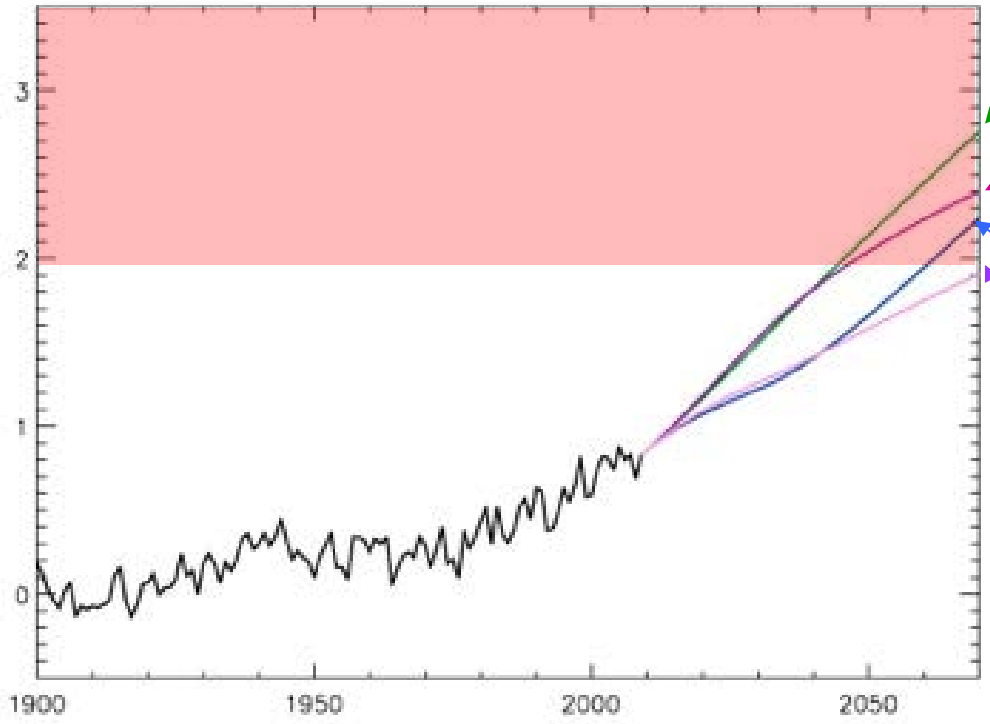
GLOBAL PROBLEMS REQUIRE GLOBAL PARTNERSHIPS TO FIND GLOBAL SOLUTIONS



TACKLING BLACK CARBON AND METHANE

GAINS identified 14 key air quality measures that if implemented could slow the pace of global warming, save millions of lives, and boost agricultural production.

Global temperature 1900-2070



Reference scenario
IEA World Energy Outlook 2009

CO_2 measures
IEA 450 ppm scenario 2009

Near-term measures
IIASA set of 16 measures
for CH_4 and black carbon

CO_2 + Near-term measures

These 14 measures are
- win (for air quality),
- win (for near-term climate change)
- win (for economic development).

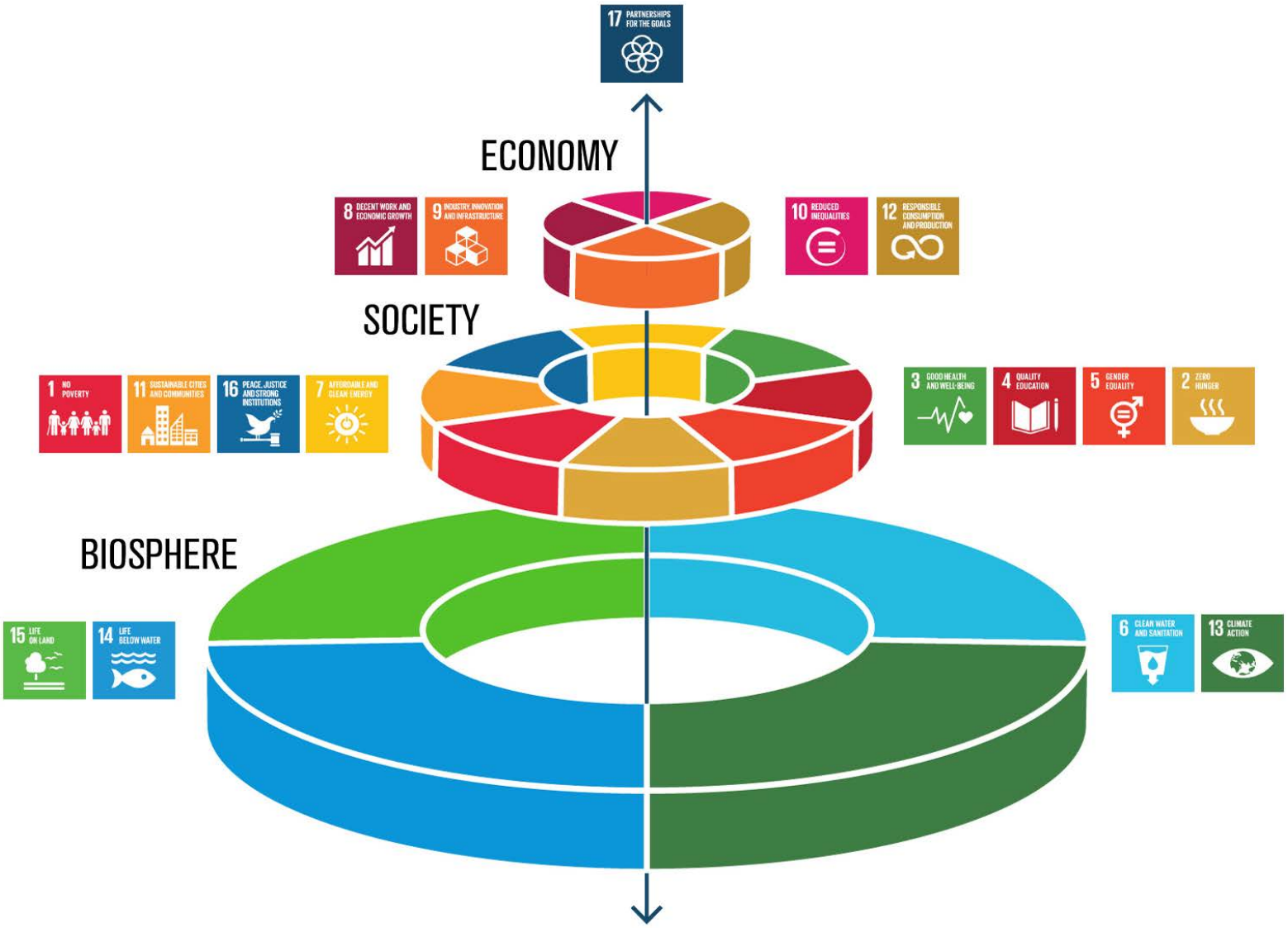
TACKLING BLACK CARBON AND METHANE (2

- Feb 2012: US State Secretary Hillary Clinton launched the Climate and Clean Air Coalition to Reduce Short Lived Climate Pollutants
- Today, CCAC has 33 member countries, 39 International Organizations and IIASA's Markus Amann on scientific committee

SUSTAINABLE DEVELOPMENT GOALS

IIASA

SUSTAINABLE DEVELOPMENT GOALS



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.

The World in 2050 (TWI2050.com)

- How to achieve global development within a safe and just operating space
- “Safe space” of interaction among SDGs: sustainability narratives and integrated models e.g. SSP1, GEA, DDPP
- Multiple-benefits and tradeoffs of transformation toward sustainable futures

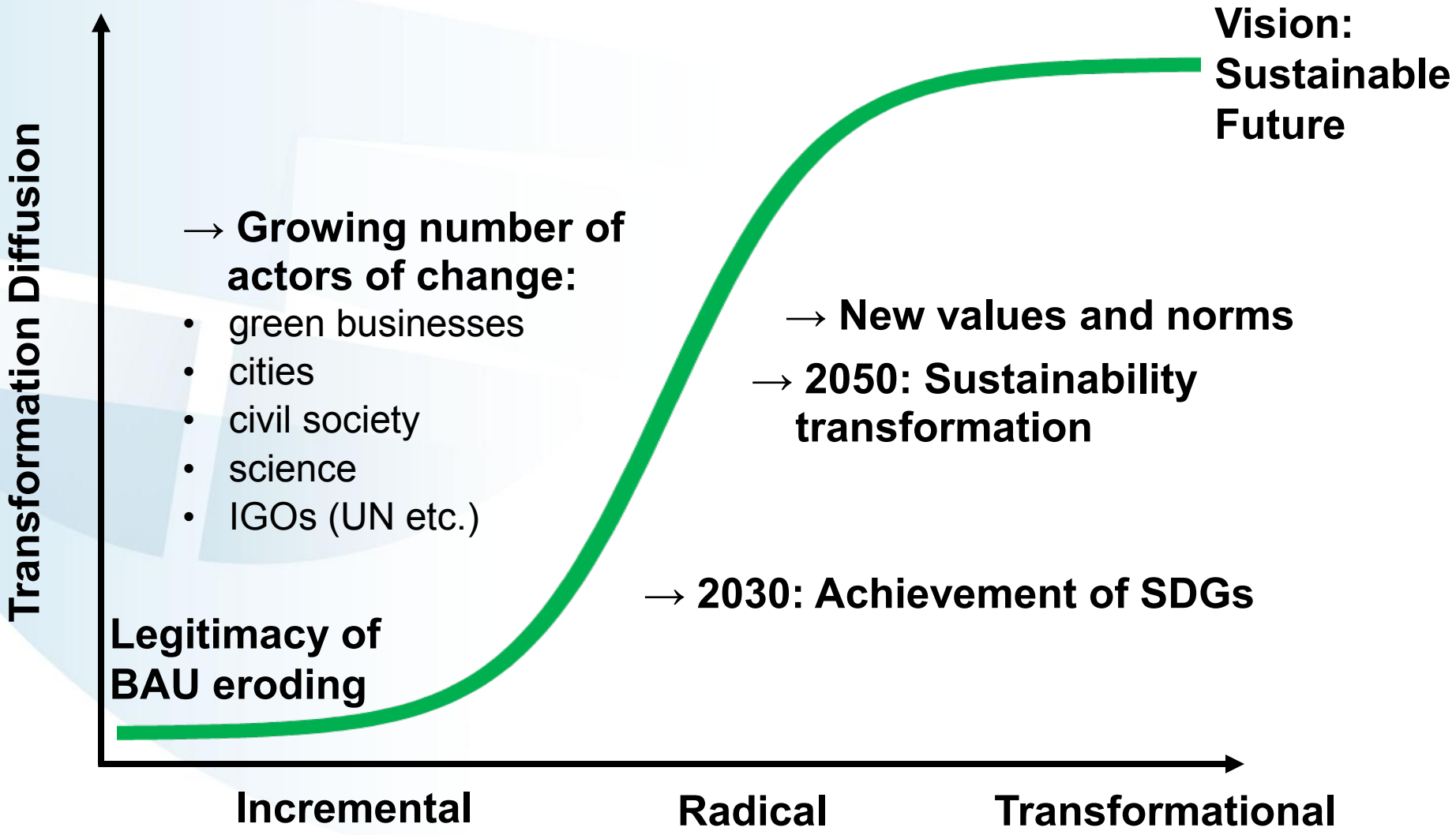
The World in 2050 (TWI2050.com)

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)**
- 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

The World in 2050 (TWI2050.com)

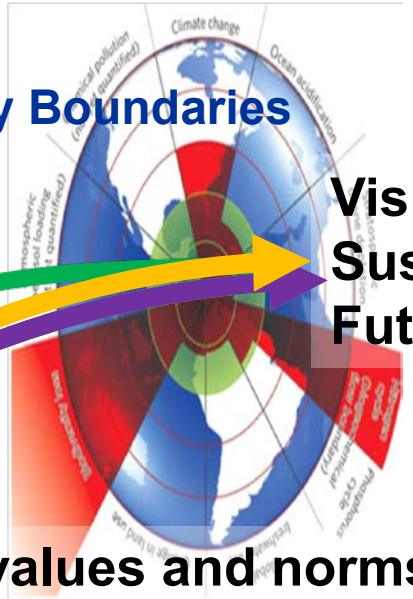
"Doing More with Less" within Planetary Boundaries



Source: After WBGU, 2011

The World in 2050 (TWI2050.com)

"Doing More with Less" within Planetary Boundaries



Vision: Sustainable Future

→ New values and norms

→ 2050: Sustainability transformation

→ 2030: Achievement of SDGs

Legitimacy of BAU eroding

Transformation Diffusion

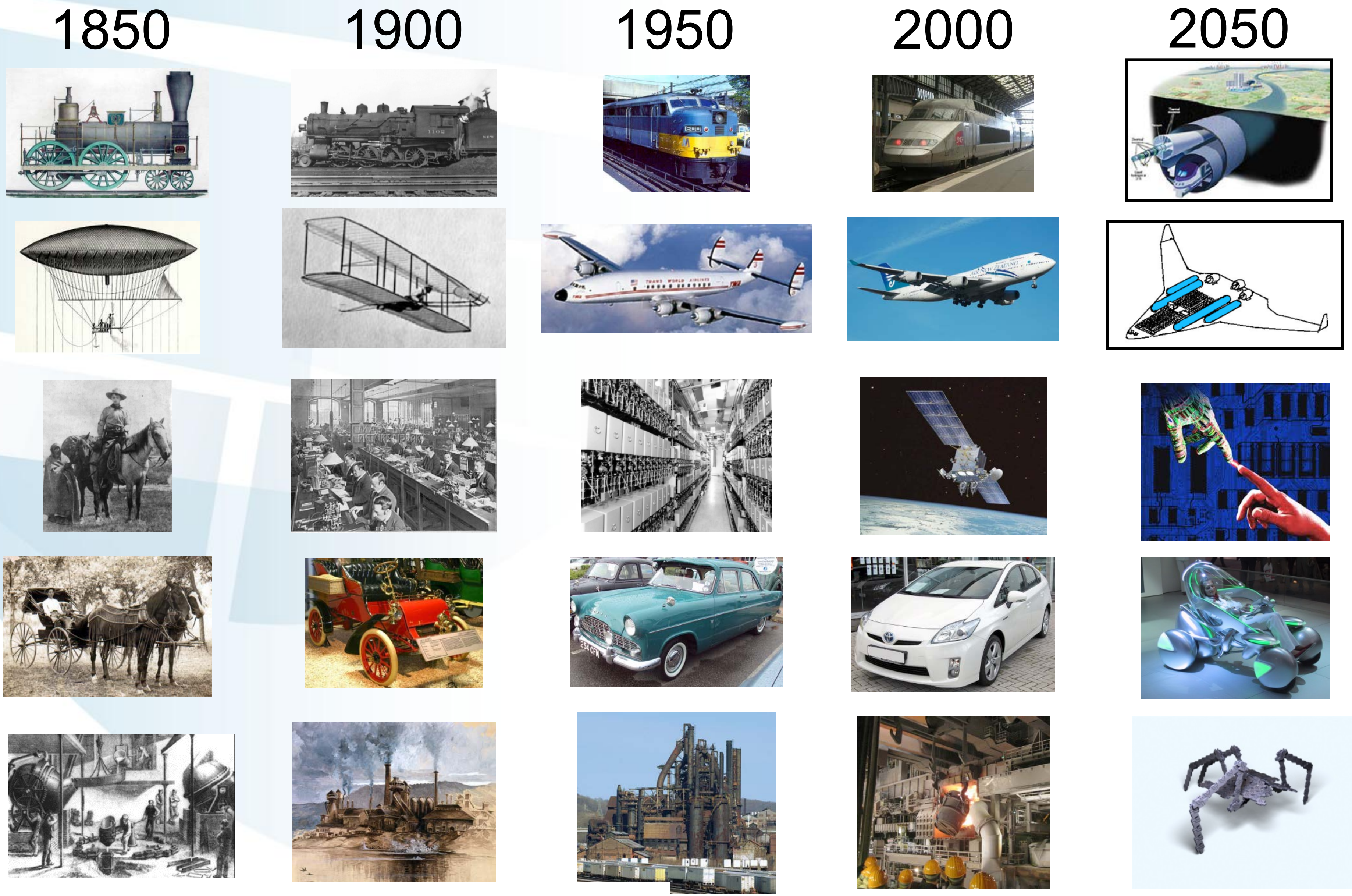
Incremental

Radical

Transformational

Source: After WBGU, 2011

Transformational Change

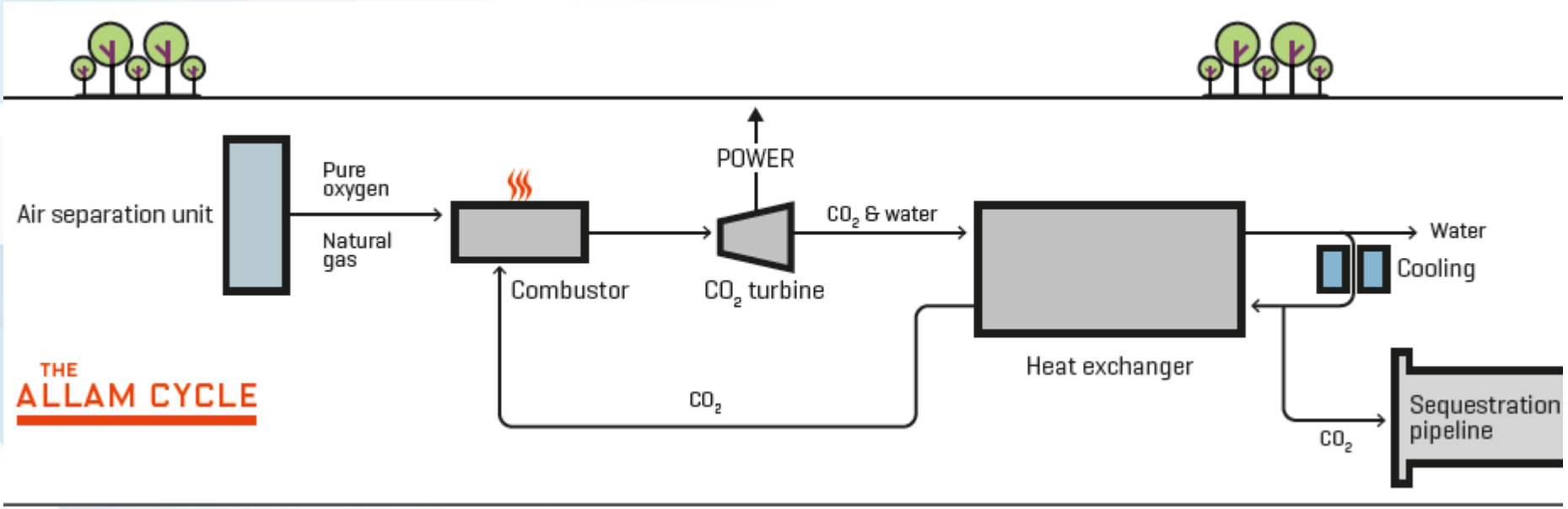


Source: After Granger Morgan, 2013

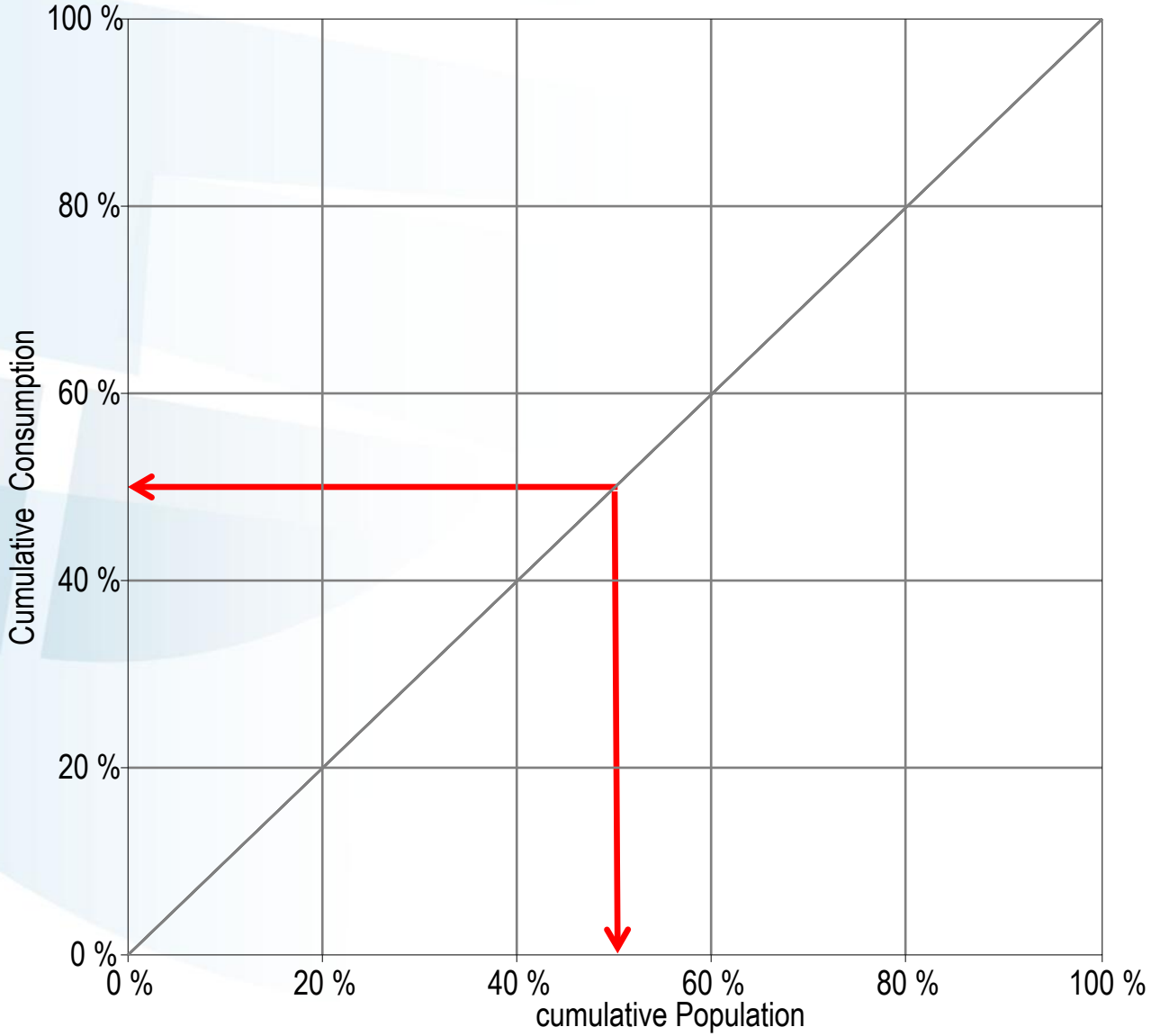
Disruptive Change

Source: Campanale, Carobntracker

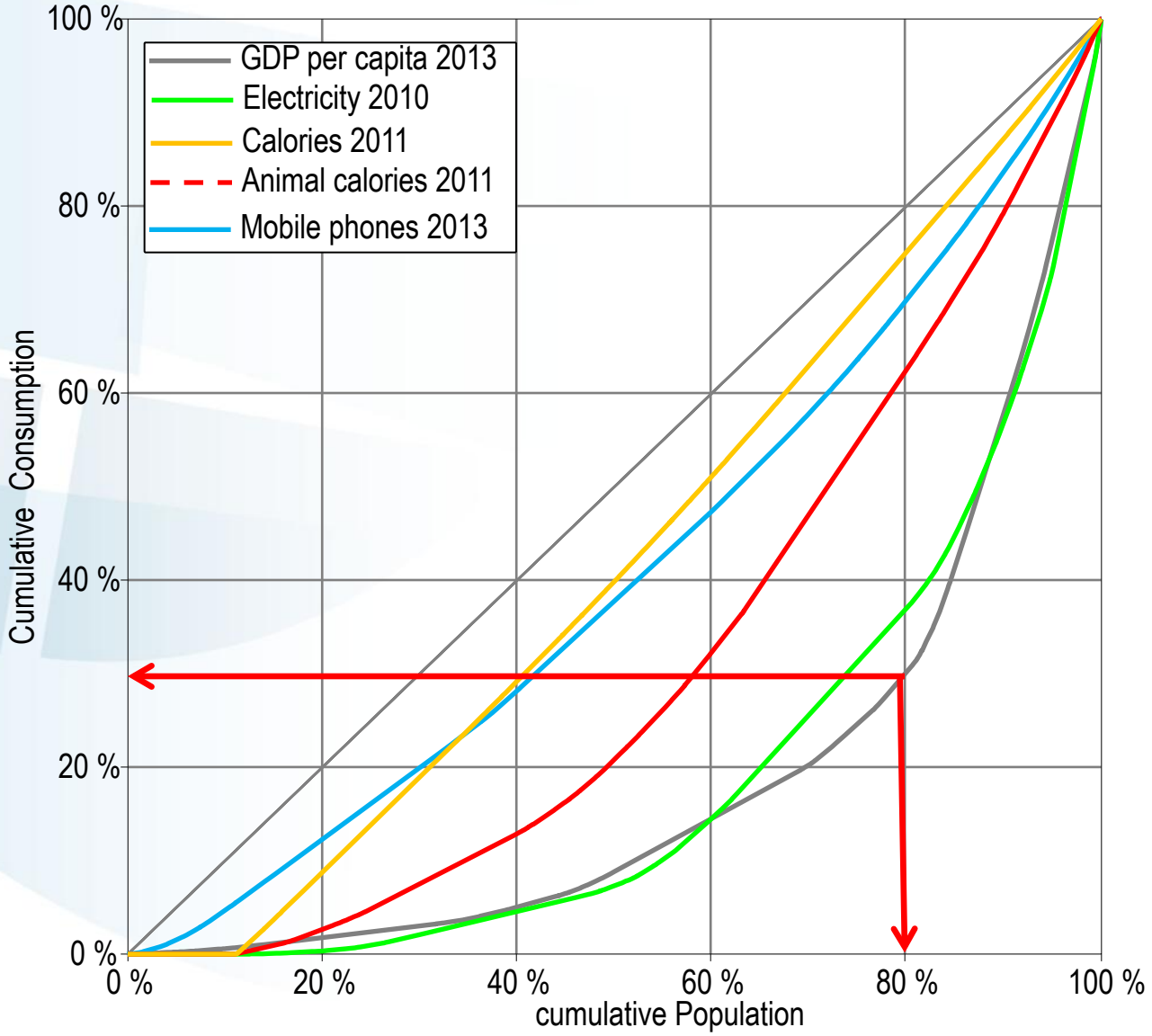
NET POWER Breaks Ground on Demonstration Plant for Oxyfuel, Nantural Gas ZEP, La Porte, Texas



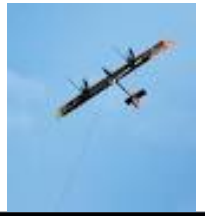
Global Lorenz Distributions



Global Lorenz Distributions

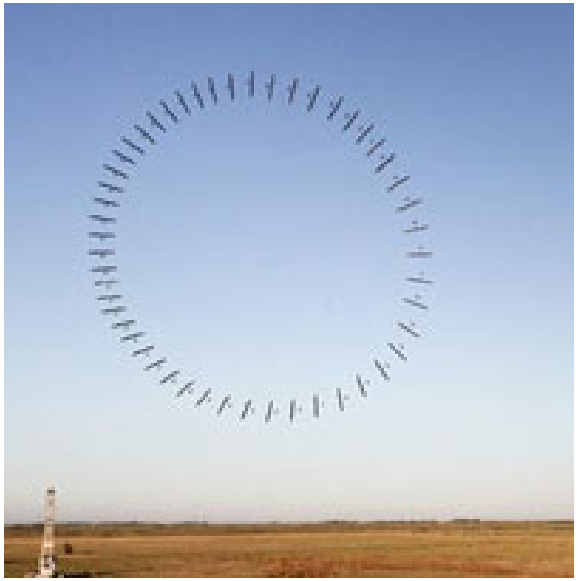


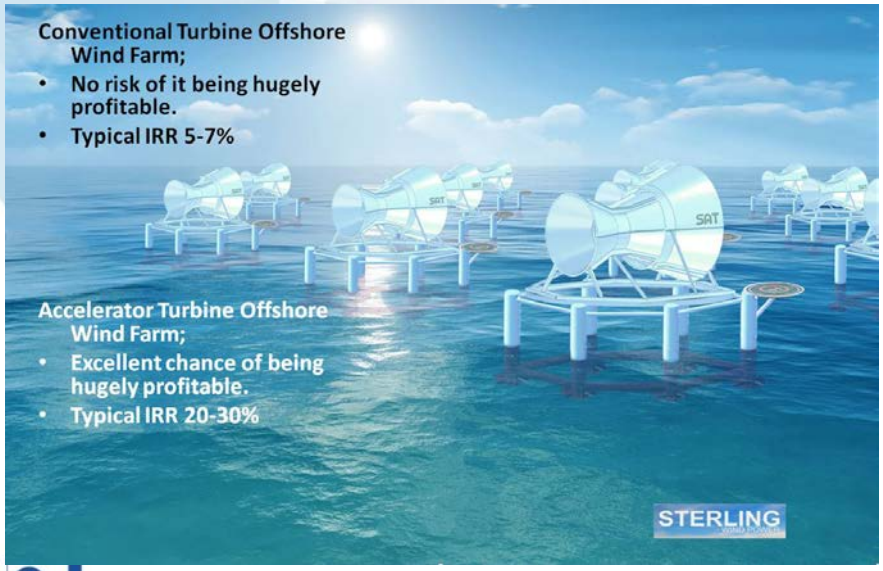
Possible transformational technologies

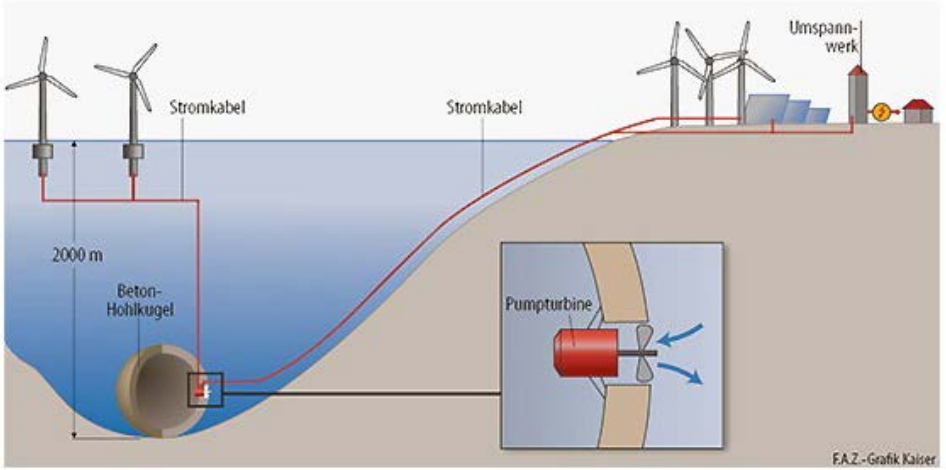


MAKANI POWER

Google X

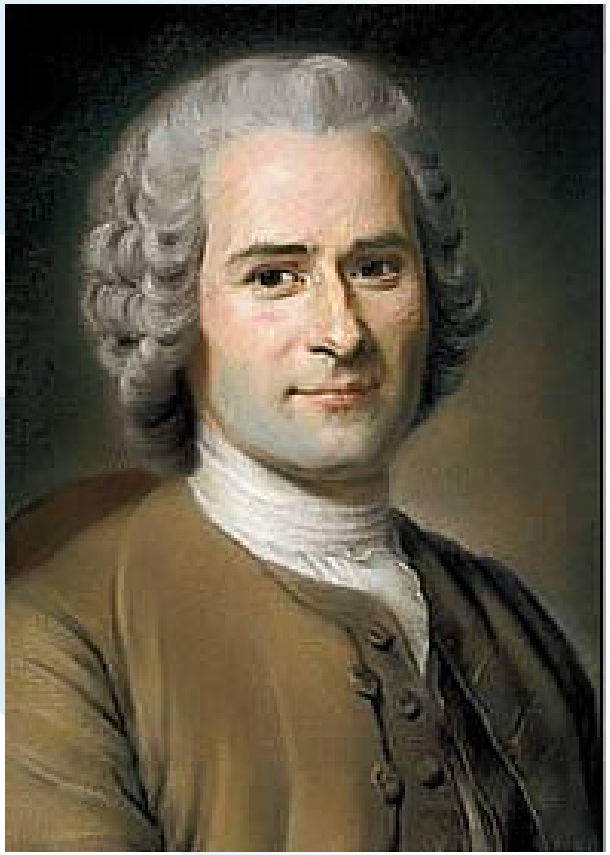


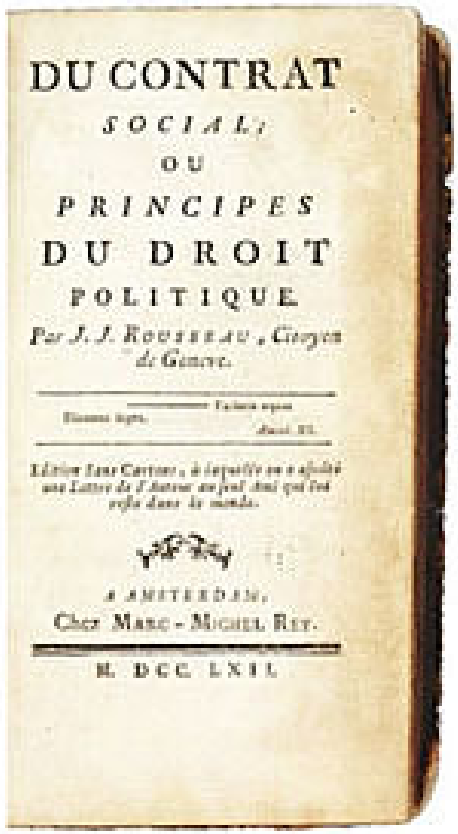


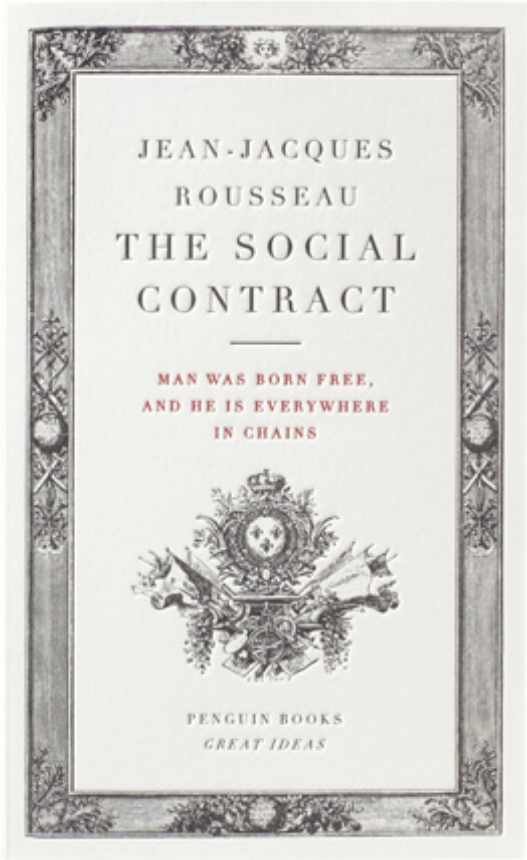


SuperGrid and MagLev Trains

Social Contract
Vision of Sustainable Future







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Thank you and welcome at IIASA soon (again)!