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

science for global insight

The World in 2050 (TWI2050)

A Transformative Change Agenda

Nebojsa Nakicenovic

Deputy Director General

International Institute for Applied Systems Analysis

Professor Emeritus of Energy Economics

Vienna University of Technology

Snowmass Conferences: Climate Change Impacts and Integrated Assessment (CCI/IA), Snowmass, CO. – 26 July 2016

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

science for global insight

The World in 2050 (TWI2050)

A Transformative Change Agenda

Research

Nebojsa Nakicenovic

Deputy Director General

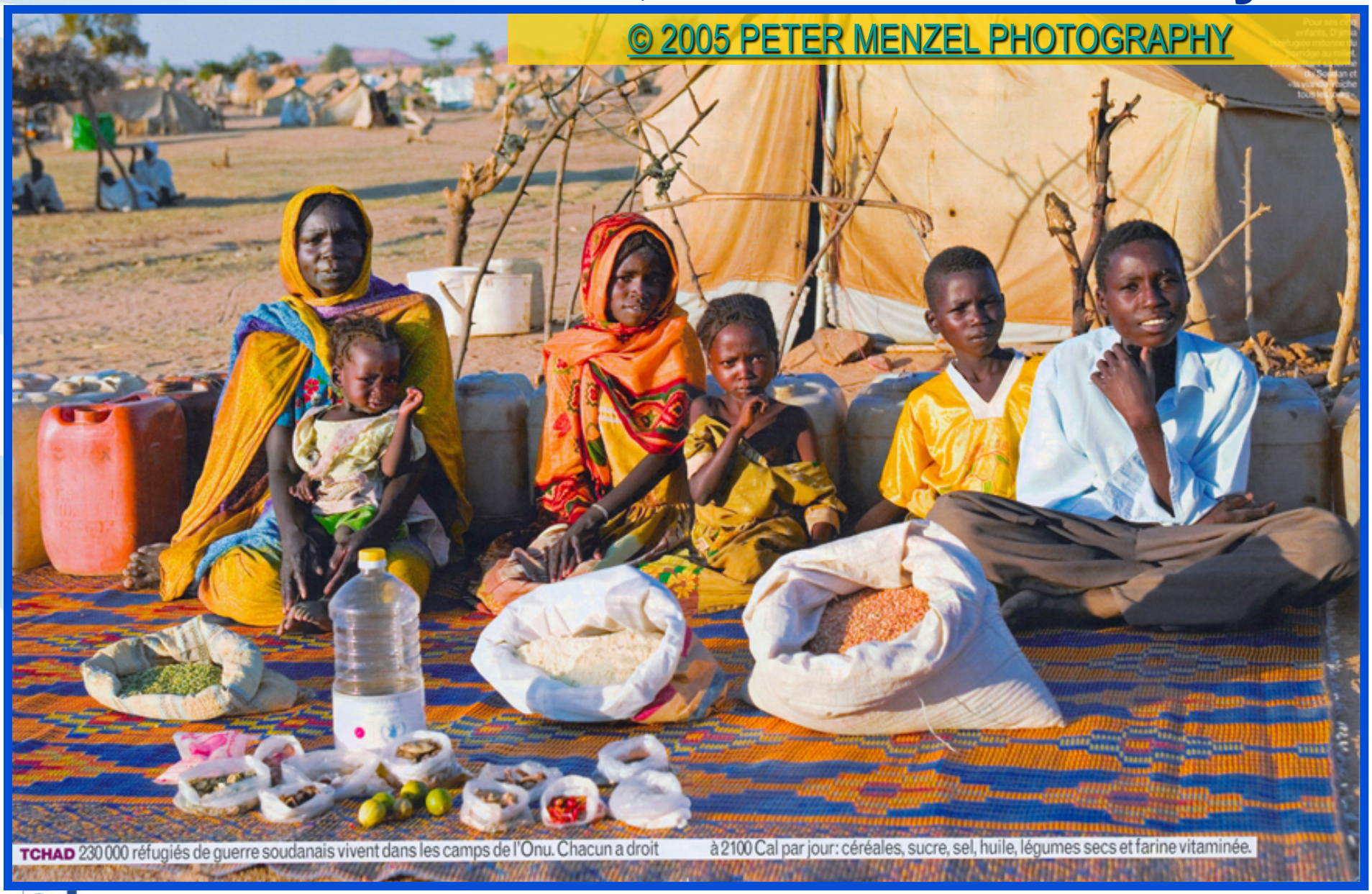
International Institute for Applied Systems Analysis

Professor Emeritus of Energy Economics

Vienna University of Technology

Snowmass Conferences: Climate Change Impacts and Integrated Assessment (CCI/IA), Snowmass, CO. – 26 July 2016

Food for a Week, Aboubakar Family



Food for a Week, Melander Family


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS


SUSTAINABLE DEVELOPMENT GOALS
17 PARTNERSHIPS FOR THE GOALS
ECONOMY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
SOCIETY
1 NO POVERTY
11 SUSTAINABLE CITIES AND COMMUNITIES
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
7 AFFORDABLE AND CLEAN ENERGY
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
2 ZERO HUNGER
BIOSPHERE
15 LIFE ON LAND
14 LIFE BELOW WATER
6 CLEAN WATER AND SANITATION
13 CLIMATE ACTION

SUSTAINABLE DEVELOPMENT GOALS

IIASA Research

"Science must be at the heart of this process so as to help achieve synergies and avoid conflicts among the 17 SDGs."

nature

IIASA Partnerships

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

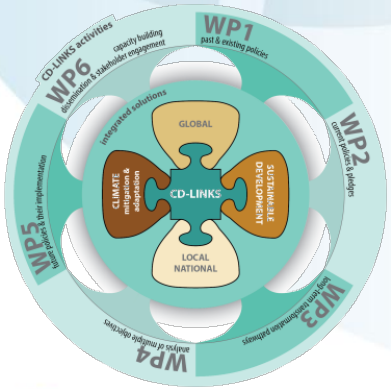
The World In 2050

Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship

IIASA
THE EARTH INSTITUTE
COLUMBIA UNIVERSITY

Global Commons

CD-LINKS



Nexus Solutions Partnership

UNIDO
IIASA
gef
IUCN

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)

- 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

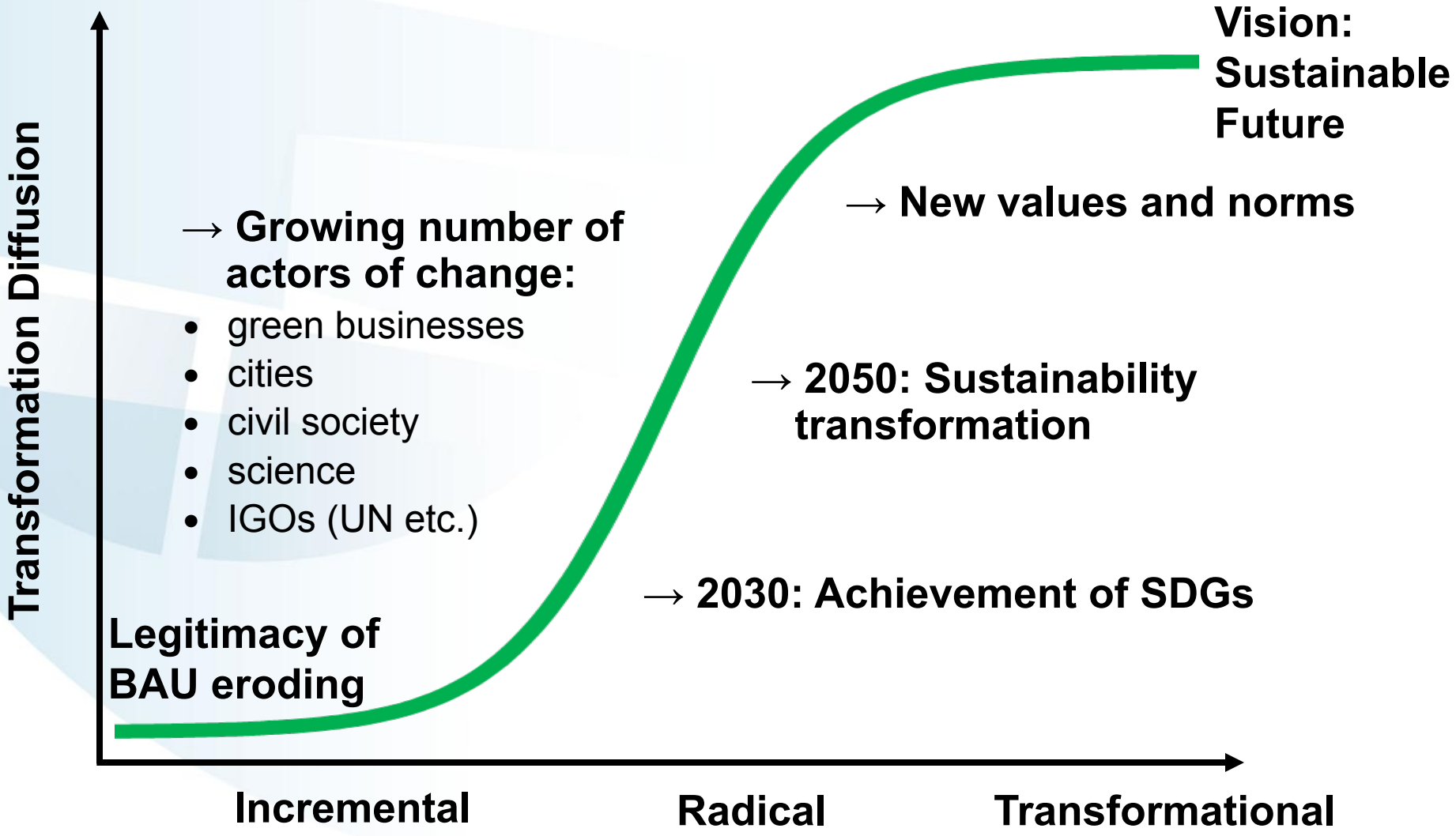
The World in 2050 (TWI2050)

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

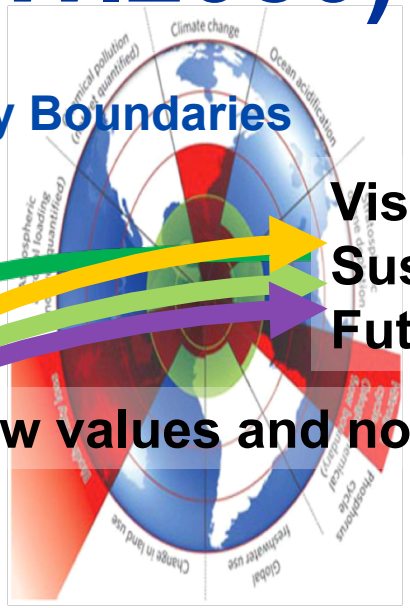
The World in 2050 (TWI2050)

"Doing More with Less" within Planetary Boundaries



The World in 2050 (TWI2050)

"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

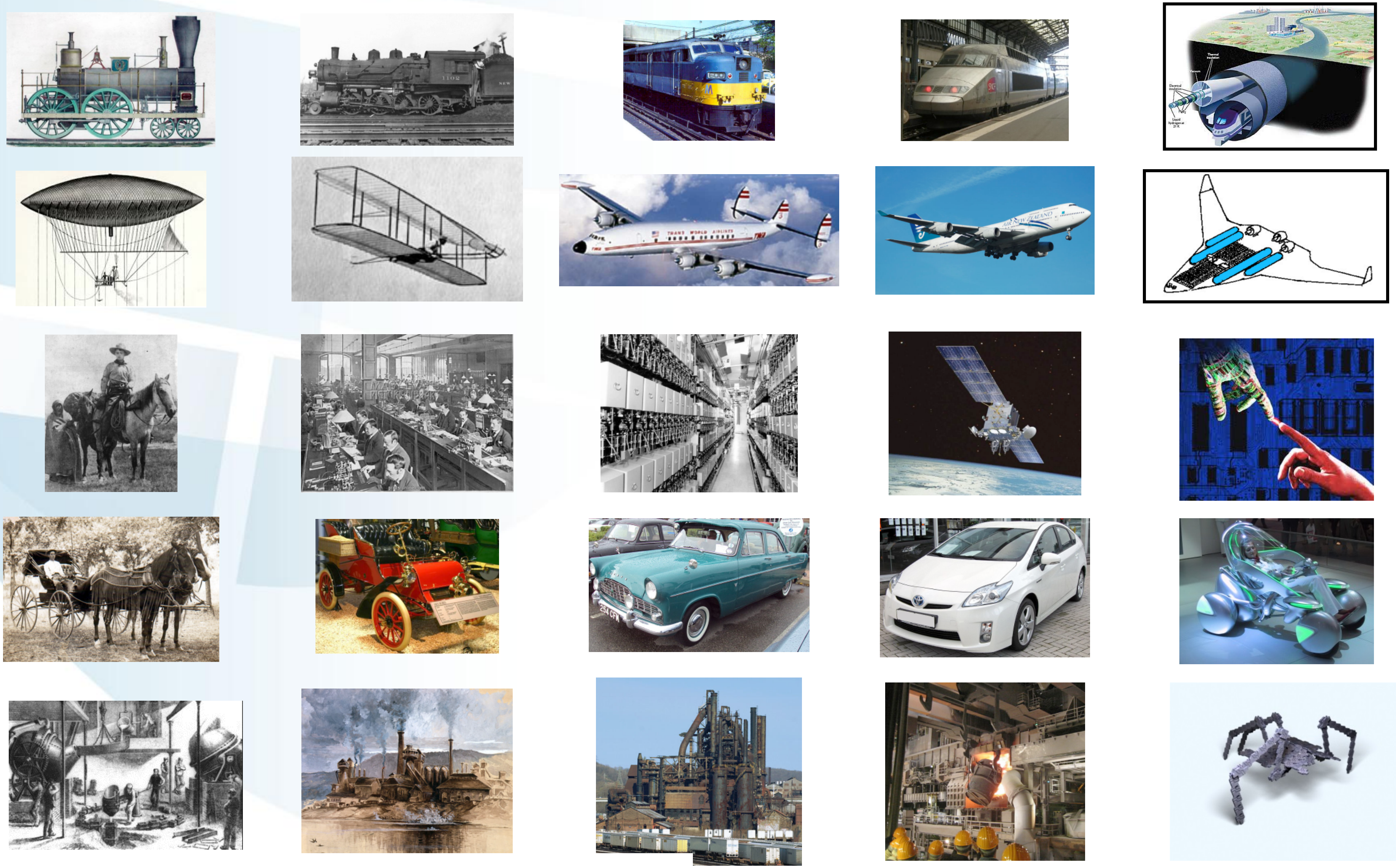
Incremental

Radical

Transformational

Transformational Change

1850 1900 1950 2000 2050



Source: After Granger Morgan, 2013

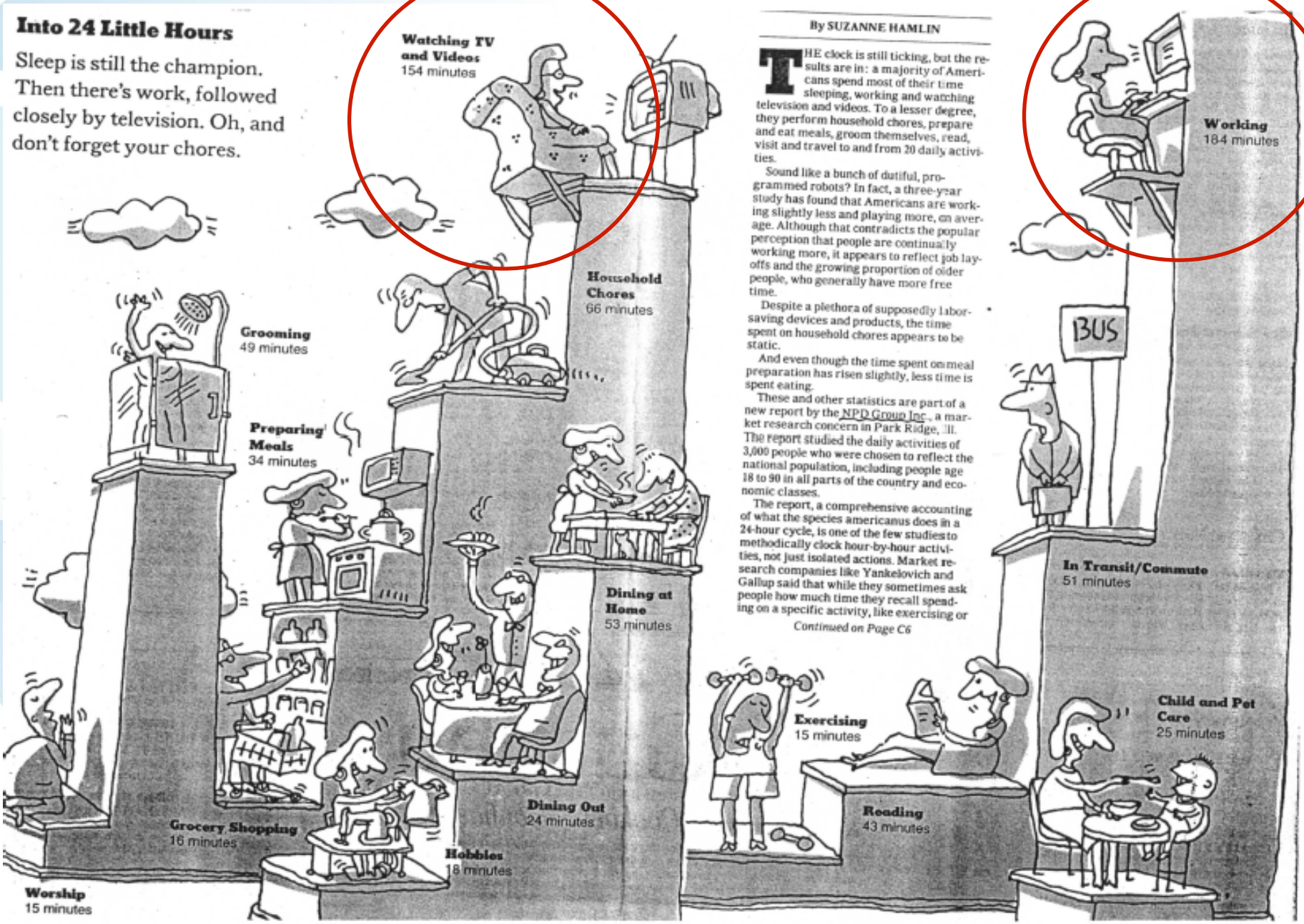
Disruptive Change

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

1900: where's the car?

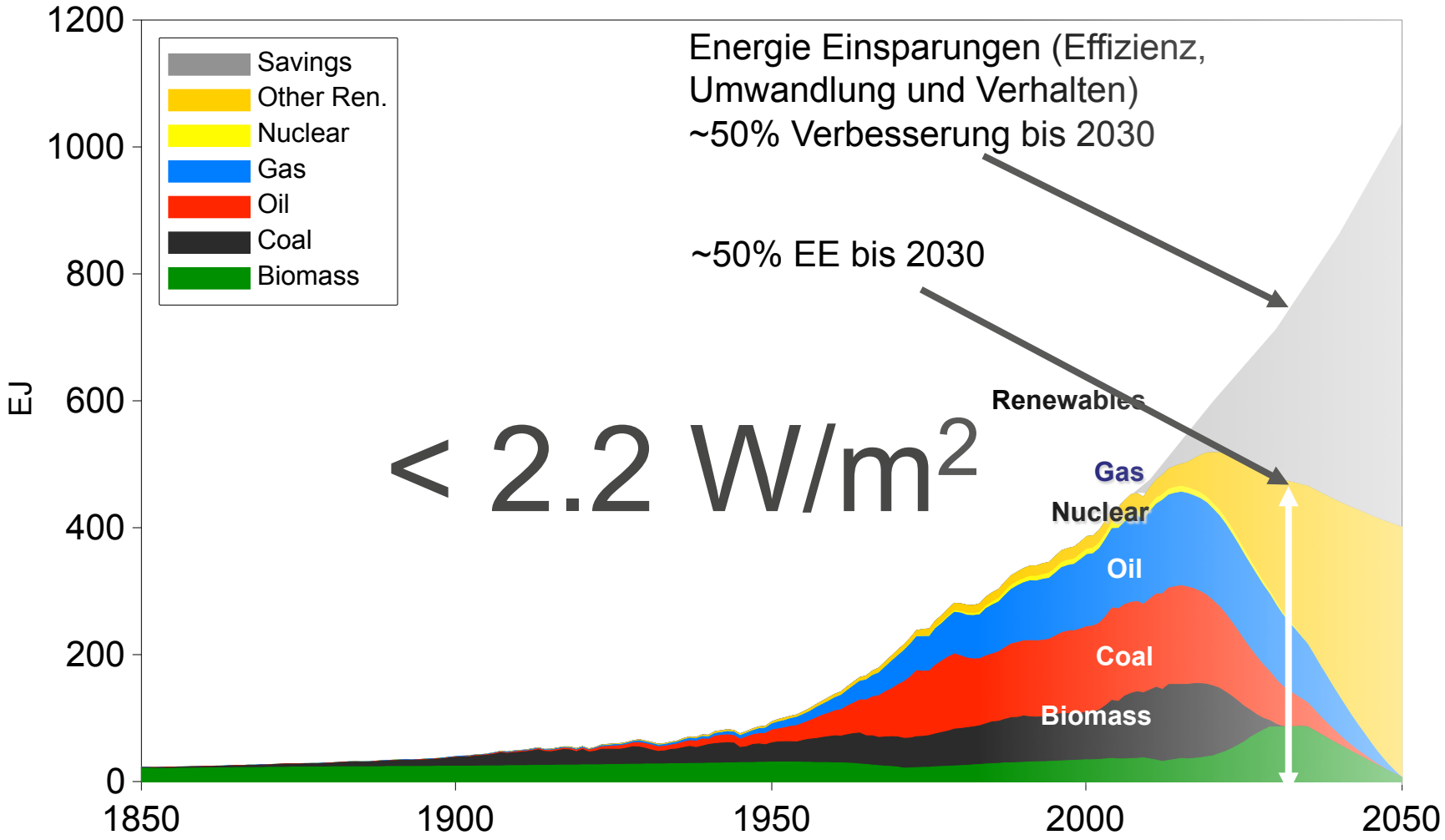
1913: where's the horse?

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://tonyseba.com/keynote-at-altcar-expo-100-electric-transportation-100-solar-by-2030/


Into 24 Little Hours
Sleep is still the champion. Then there's work, followed closely by television. Oh, and don't forget your chores.
Watching TV and Videos
154 minutes
Household Chores
66 minutes
Grooming
49 minutes
Preparing Meals
34 minutes
Dining at Home
53 minutes
Dining Out
24 minutes
Grocery Shopping
16 minutes
Hobbies
18 minutes
Worship
15 minutes
Working
184 minutes
BUS
In Transit/Commute
51 minutes
Exercising
15 minutes
Reading
43 minutes
Child and Pet Care
25 minutes
By SUZANNE HAMLIN
THE clock is still ticking, but the results are in: a majority of Americans spend most of their time sleeping, working and watching television and videos. To a lesser degree, they perform household chores, prepare and eat meals, groom themselves, read, visit and travel to and from 20 daily activities.
Sound like a bunch of dutiful, programmed robots? In fact, a three-year study has found that Americans are working slightly less and playing more, on average. Although that contradicts the popular perception that people are continually working more, it appears to reflect job layoffs and the growing proportion of older people, who generally have more free time.
Despite a plethora of supposedly labor-saving devices and products, the time spent on household chores appears to be static.
And even though the time spent on meal preparation has risen slightly, less time is spent eating.
These and other statistics are part of a new report by the NPD Group Inc., a market research concern in Park Ridge, Ill. The report studied the daily activities of 3,000 people who were chosen to reflect the national population, including people age 18 to 90 in all parts of the country and economic classes.
The report, a comprehensive accounting of what the species americanus does in a 24-hour cycle, is one of the few studies to methodically clock hour-by-hour activities, not just isolated actions. Market research companies like Yankelovich and Gallup said that while they sometimes ask people how much time they recall spending on a specific activity, like exercising or
Continued on Page C6

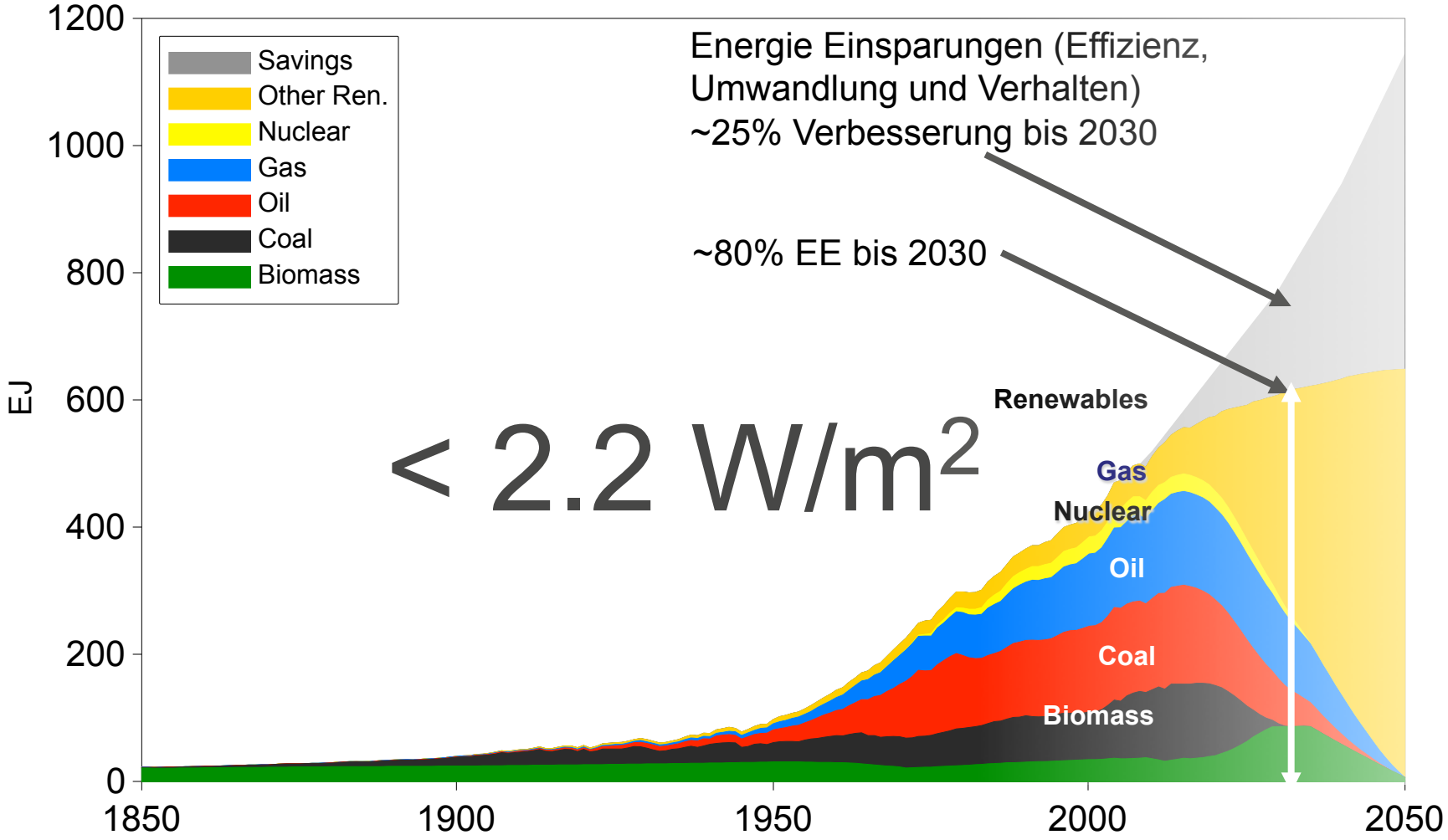
Global Primärenergie

WBGU



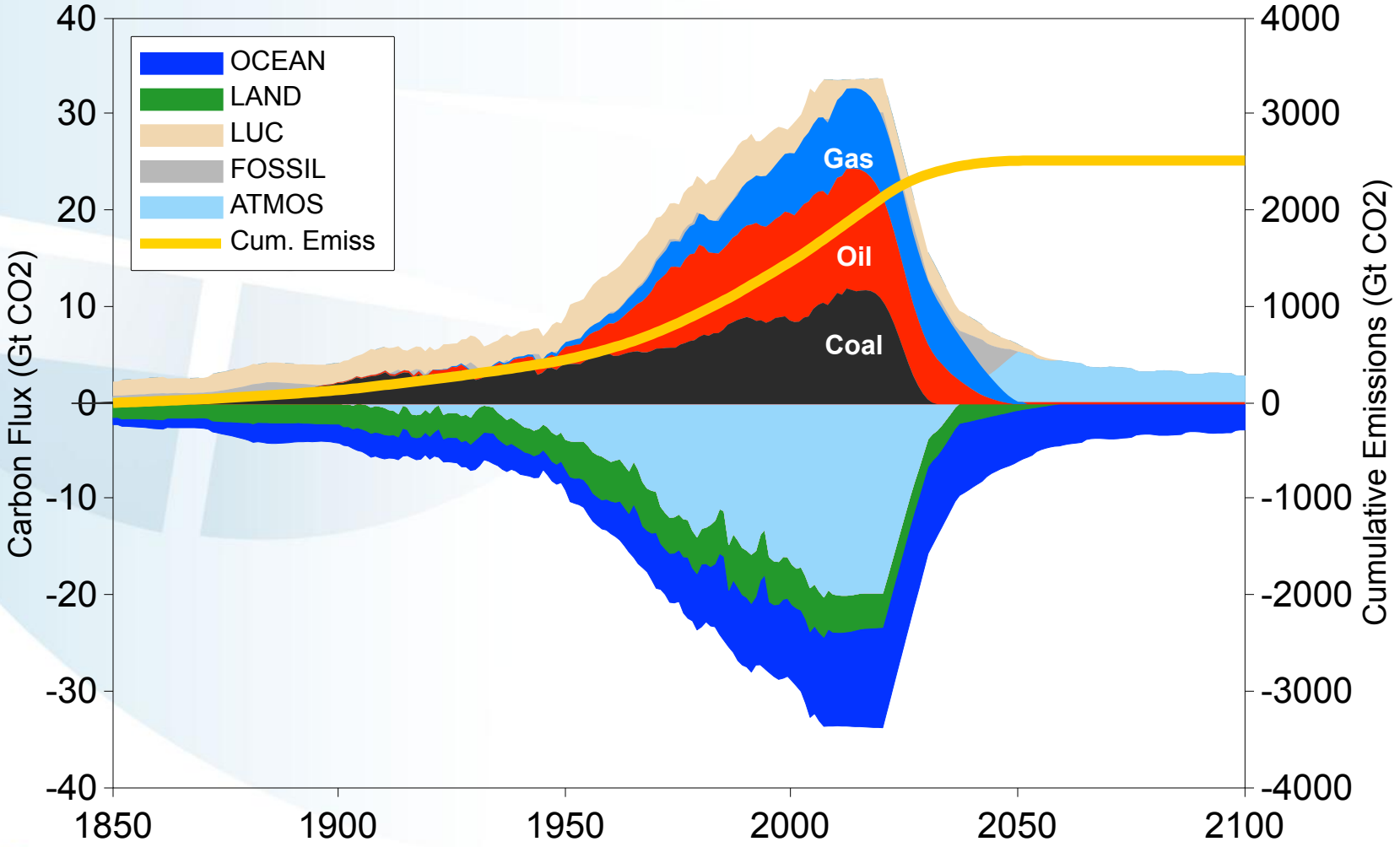
Source: Sterner et al. 2016 after WBGU, 2050

Global Primärenergie Äquivalent



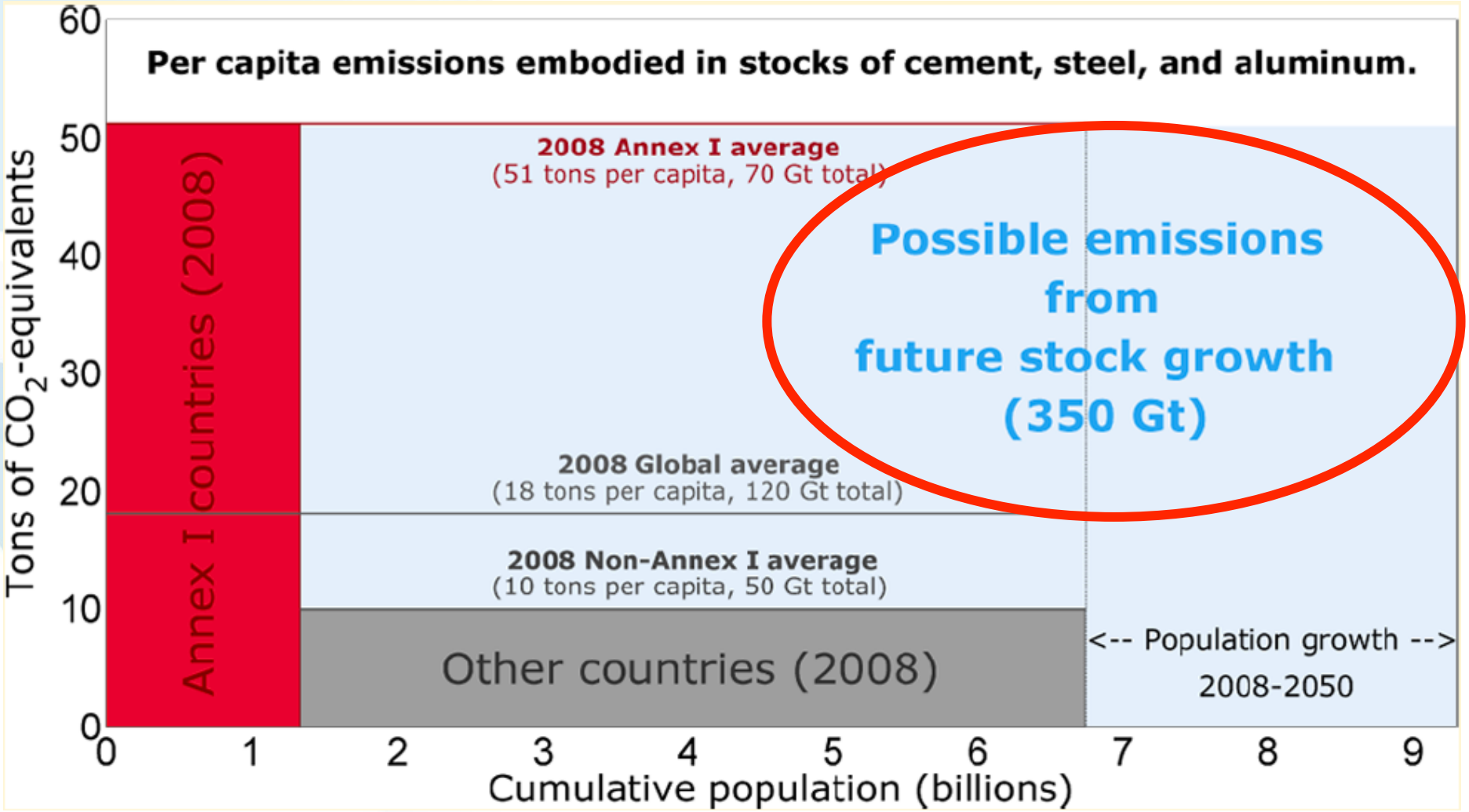
Source: Sterner et al. 2016 after WBGU, 2011

Carbon Flux

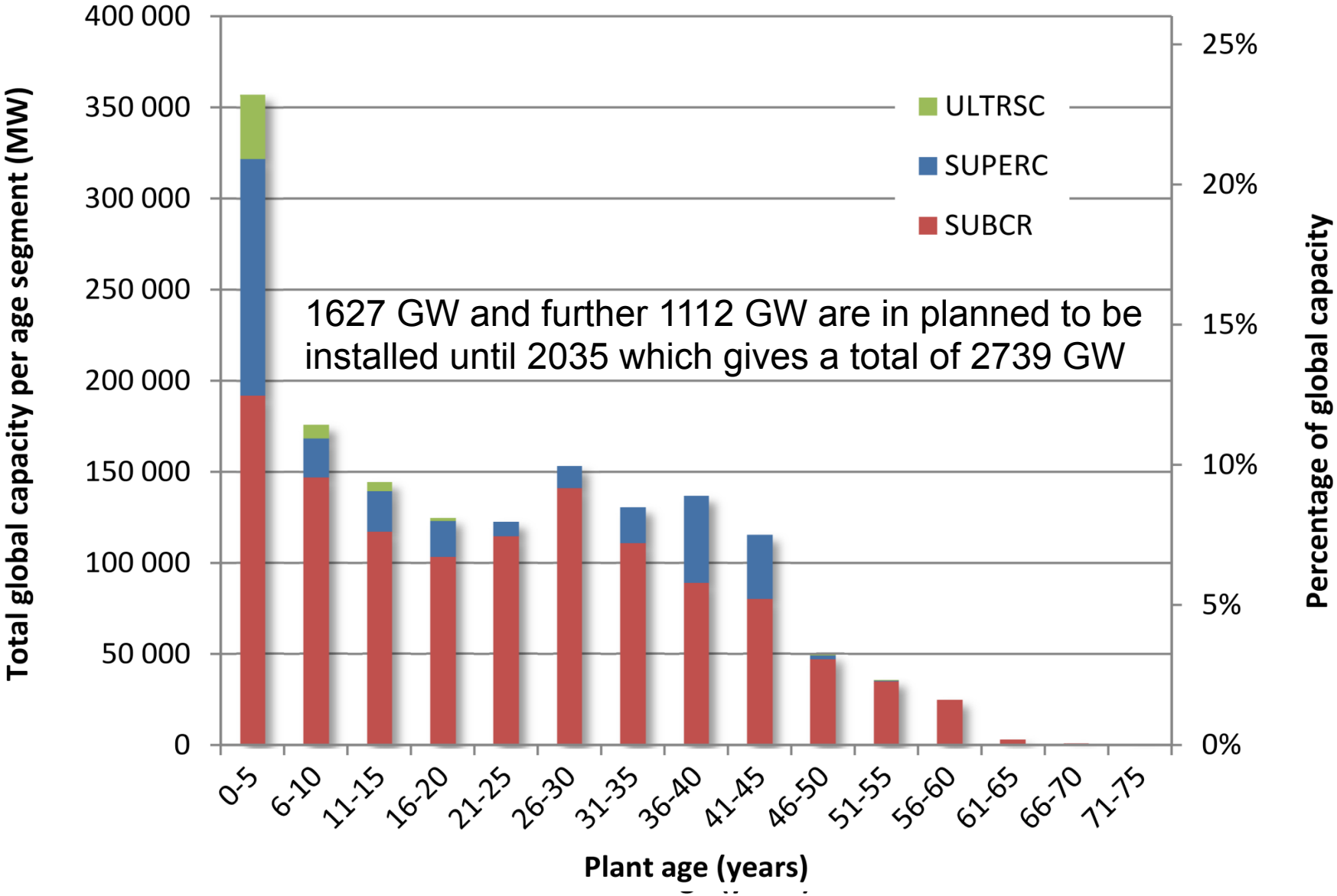

OCEAN
LAND
LUC
FOSSIL
ATMOS
Cum. Emiss
Gas
Oil
Coal
Carbon Flux (Gt CO2)
Cumulative Emissions (Gt CO2)
40
30
20
10
0
-10
-20
-30
-40
4000
3000
2000
1000
0
-1000
-2000
-3000
-4000
1850
1900
1950
2000
2050
2100

Urban Embodied Emissions

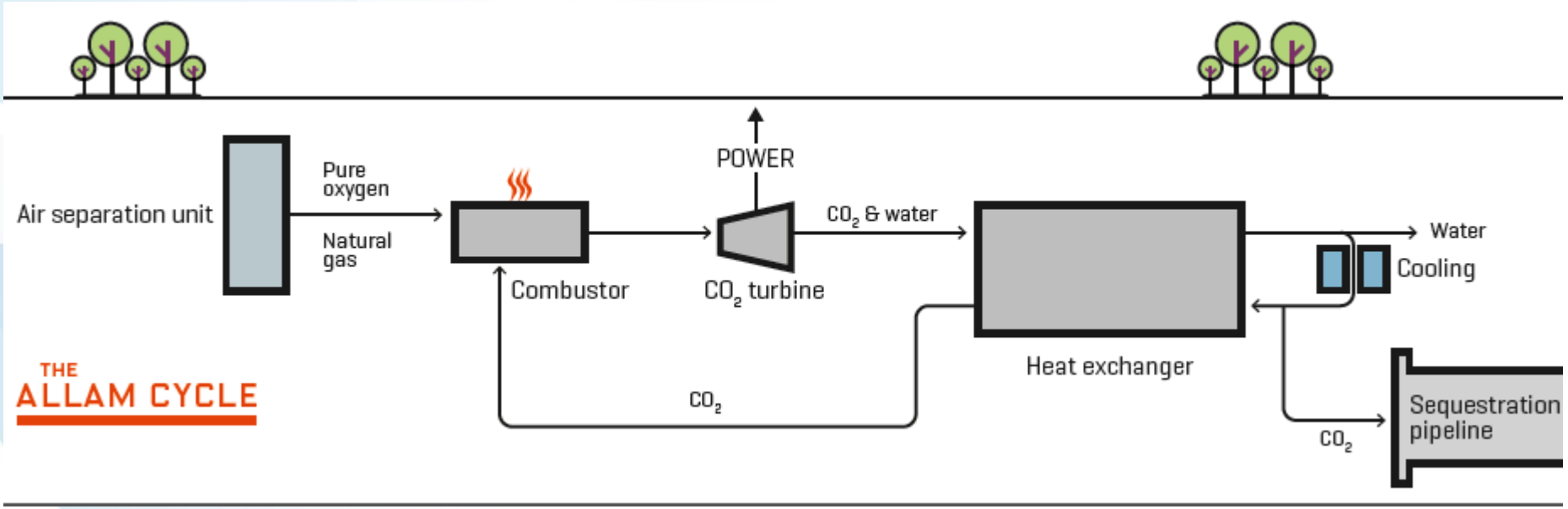
Compared to Global Budget of 800 $GtCO_2$ for 2°C



Global Coal Power Plants



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



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

THANK YOU

science for global insight

naki@iiasa.ac.at