

New Climate Policies and Technology Transfer

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Panel II: The Impact of Social and Political Trends on IP
Innovation Policies Forum

The National Academies
Washington, DC

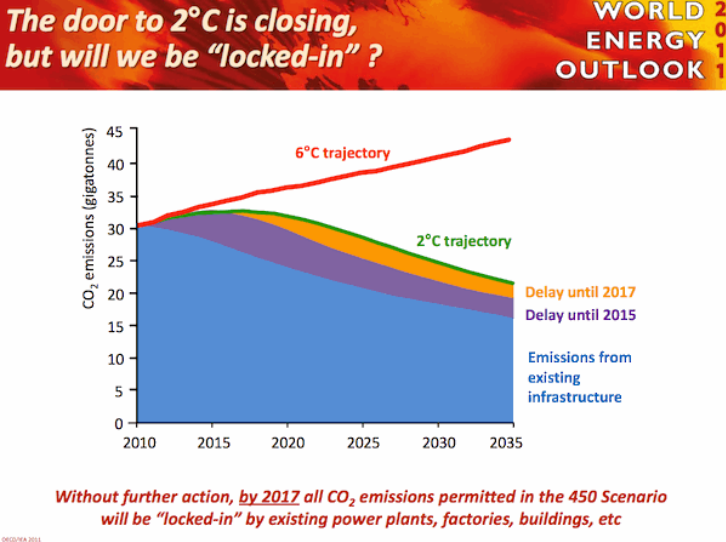
December 11, 2015



Stony Brook University



IEA* Projections on CO₂ Emissions (2011)



- Total energy-related CO₂ emissions permitted to 2035 in the 2°C scenario (450 ppm): 80% already locked-in .
- Without further action: 100% by 2017.
- Delayed implementation would cost an extra \$500 billion/year

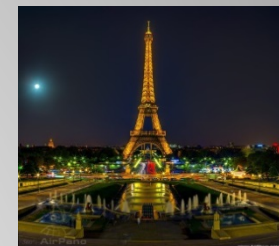
*Chief Economist Faith Birol, 2011/International Energy Agency

Government Actions- U.S. and China

Joint statements of Presidents- US and China strike deal on carbon cuts in push for global climate change pact (The White House, November 11, 2014)

- Post-2020 actions on climate change- longer range effort to transition to low-carbon economies to contain the global temperature goal of 2°C.
- United States: Intends to achieve an economy-wide target of reducing its emissions by 26%-28% below its 2005 level in 2025.
- China: Intends to achieve the peaking around 2030; increase the share of non-fossil fuels to around 20% by 2030.

COP21- An Update-1



11 / 29 / 2015

U.S. and China (#1 polluter at 27%) took the lead jump start the talks on September 29.

- Green Climate Fund. U.S. new pledge: \$3B

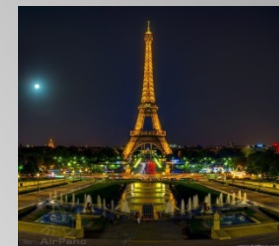
China:

- \$3.1B specifically for LDCs (South-South Cooperation on Climate Change)
- Establish Carbon Trading System by 2017

Key: 1) Tech transfer, 2) Technical and institutional capacity building, 3) Access to data

Note: Top 4 polluters: China (28%); U.S. (14%); EU (10%); India (7%)-
Total: 58%

COP21- An Update-2



12 / 10 / 2015- Disagreements

China blocking

- Watered down reporting system for emissions.
- Countries to update the pledges to reduce emissions every 5 years (2020 onwards)- Voluntary

Note: (1992)- China still classified as a 'Developing Country"- not obliged to report emissions regularly.

Other

- Island States want 1.5°
- \$100 B fund number disputed. In 2014, the Green Climate Fund was \$14B. Global fund for fossil fuel subsidies: \$425B/year
- India (#4 polluter at 7%) is an obstacle.

IP Issues and Developing Countries

- 1.3 billion people live on \$1.25/day
- Several avenues to address LDCs issues (48 countries): TRIPS; UN-OHRLLS; UN-SGDs; South-South Cooperation.
- Technology and Prosperity Linkage
- International patent filing (a measure of global competitiveness in technology):
 - U.S./Japan/Germany: 58% of global share
 - LDCs not even on the radar screen
 - Sub-Saharan Africa- A rather poor showing

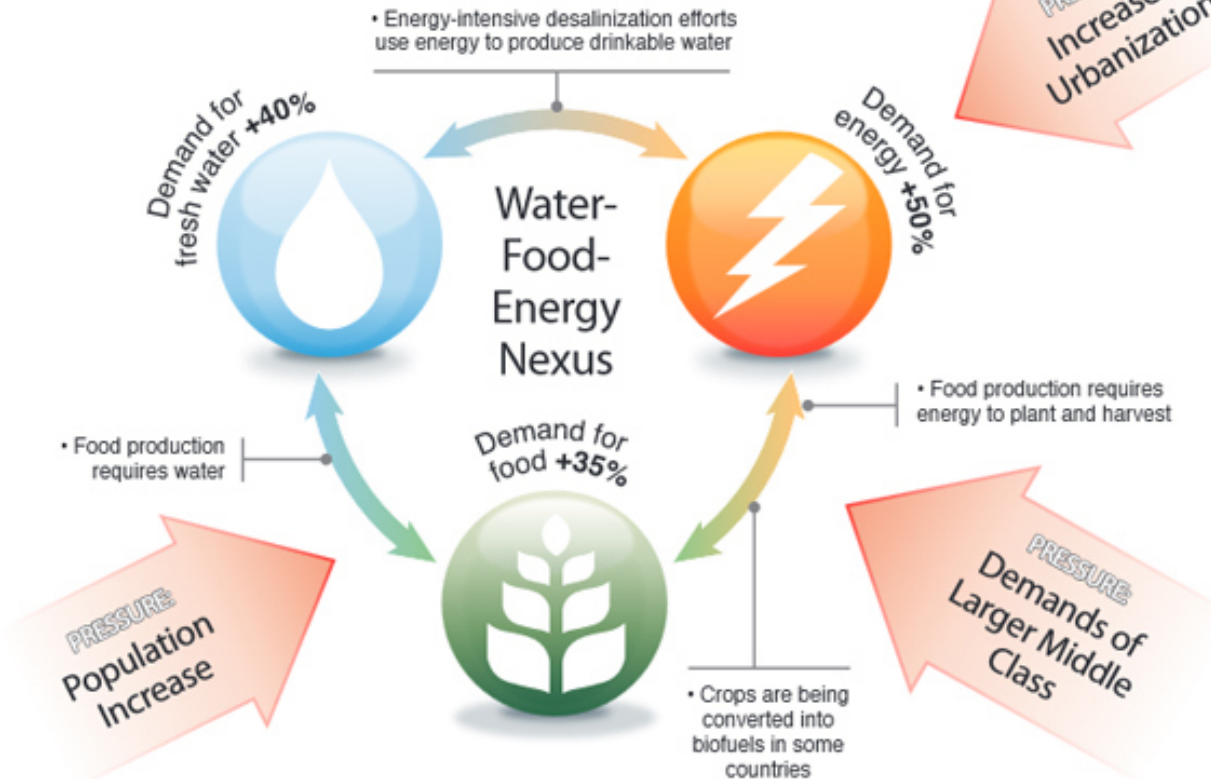
How do we change this?

The Food-Energy-Water Nexus

As population grows, pressures mount

And the relationships between food, water, and energy supplies become critical

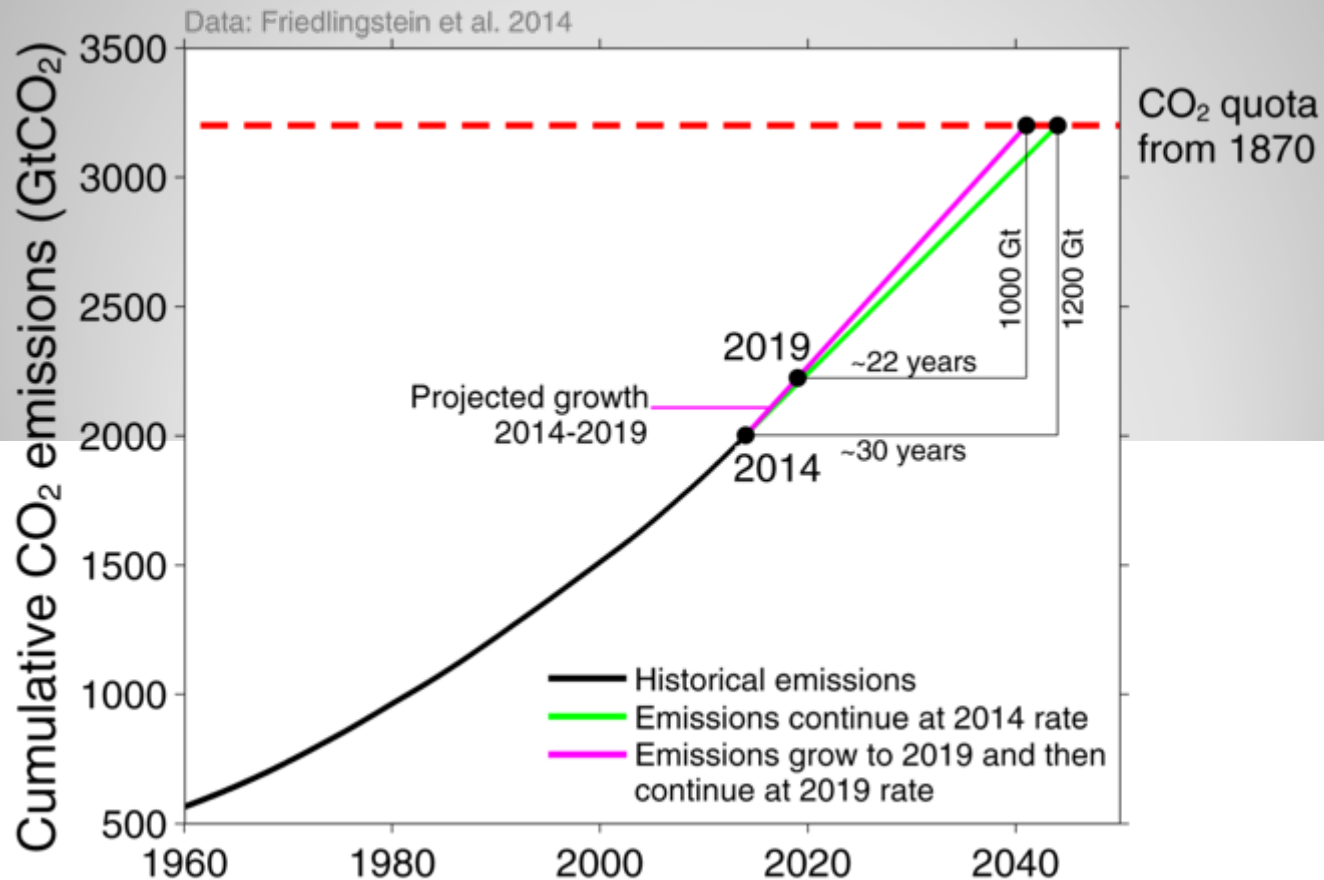
Because of growth in global population and the consumption patterns of an expanding middle class, in less than two decades three key demands will sharply increase ...



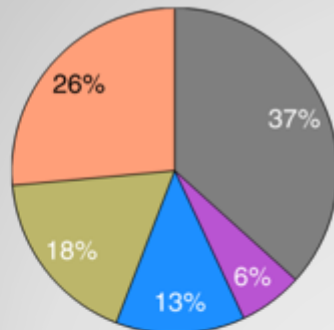
Common Elements??



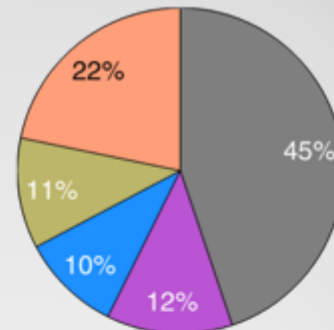
Remaining Emissions Quota



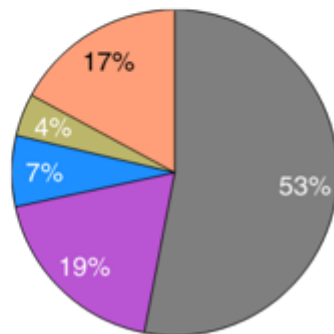
Sharing the Remaining Emissions Quota



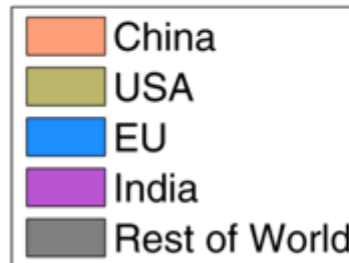
Inertia



Blended



Equity



Data: Raupach et al. 2014

Inertia: current emis.
Equity: population
Blended: 50-50 split

- Emissions trading would allow additional sharing of the quota
(Source: [Raupach et al 2014](#))

Low-Carbon Sources: A Cost Comparison

Type of Renewable Energy	Cost / kWh	Application
Fossil Fuels		
Coal / Natural gas	\$0.039 - \$0.055	Baseline case
Renewables		
Solar	\$0.15 - \$0.30	PV and Solar Thermal- \$0.05/kWh possible
Wind	\$0.038 - \$0.06	Marginal operating cost- \$0.01/kWh
Biomass	\$0.029 - \$0.09	Methane from landfills /animal manure- combustion technology
Hydro	\$0.051 - \$0.11	Require large dams
Geothermal	\$0.039 - \$0.30	Reliability > 97%
Nuclear	\$0.039 - \$0.055	

Implementation Challenges

1. Development of low-carbon technologies.
2. Developed countries must transfer technologies to developing countries (a hot-button issue!!).
3. Separate Science (open source) from Technology (IP based).
4. Engaging local universities in joint IP development (sharing model).
5. Is there a way forward for LDCs after TRIPS Agreement expires (in 2021)?
6. Istanbul Plan of Action- Effectiveness of the Technology Bank

IP: A key component to move forward.

International Collaborations How Important?

- 1. China- Fugitive gases**
- 2. East Africa- Off-grid solution**

Newly Released Publication



SPECIAL TOPIC: U.S.-CHINA ECOPARTNERSHIPS: APPROACHES
TO CHALLENGES IN ENERGY AND ENVIRONMENT

J. Renewable Sustainable Energy 7 (2015)

Preface

U/S Catherine A. Novelli, U.S. Department of State

Guest Editors

Devinder Mahajan, Stony Brook University

Chai Xiaoli, Tongji University

Brian Holuj, EcoSecretariat, U.S.

Wu Hongliang, NDRC, China

Integrated Management of Landfill Gas to Control Greenhouse Effect

July 2013-December 2017

In China, anthropogenic CH_4 produced in the landfill contributes about 13% of all CH_4 emissions. The integrated management can produce 20 bcm CH_4 as a renewable source and avoided 300 MMT CO_2e .

- ❑ One of the 25 projects under the US-China S&ED.
- ❑ Fugitive Gas workshop in Beijing (Sept. 2014).
- ❑ Landfill gas clean-up and conversion into diesel substitute technologies.
- ❑ Planned pilot-scale tests of the SBU developed process at the Town of Brookhaven site (New York).
- ❑ Technology demonstration at 2 China landfill sites
- ❑ MOU signed to establish 'US-Sino Innovation Center for Fugitive Gases' (Sept. 2014 in Beijing).

Challenge: Learning curve- Tech Transfer



East Africa

- East Africa Oil & Gas market is about \$4 billion (2013)

Upcoming East Africa Oil Projects

- 100,000 bpd refinery in Kenya's northeastern town of Isiolo to refine crude from Turkana.
- Uganda's first refinery estimated to cost ~\$2.5 billion.
- Proposed \$12 billion refinery in Mozambique. Planned capacity: ~350,000 bpd.

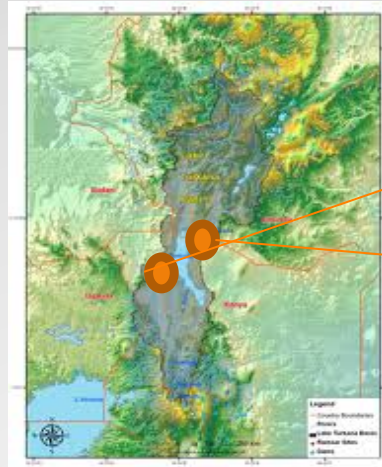
Turkana Basin- Key Facts



- TB least developed county in Kenya (per capita: 1/8th).
- Environmental degradation is a way of life- Trees to charcoal production is alarming.
- Abundant Renewables: Solar, Biomass, Geothermal.
- Oil & Gas finds will transform the region in 5 years.



TURKANA BASIN
INSTITUTE



Richard Leakey's initiative

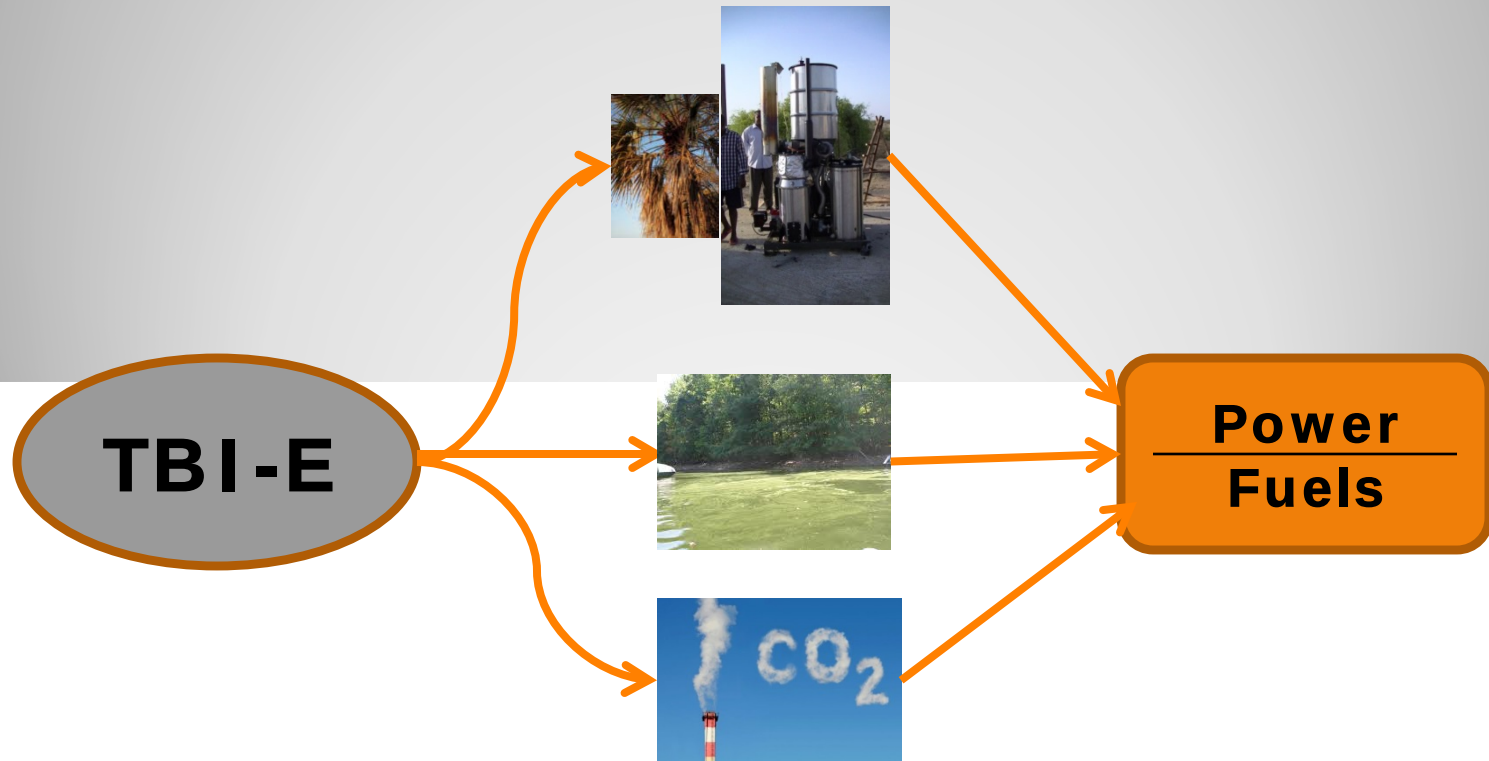
Primary Focus: Understand “Human Evolution”

Energy: A “Living Laboratory”- serve as a model of Sustainability.

Goal: Poverty reduction in the region through local capacity building.

TBI- R&D Focus

➡ TBI, a “Living Laboratory” for Sustainability



- Produce: 1) Power using *Doum* nut (20 kW) and 2) Fuel (diesel) using algae, to meet the energy needs of TBI facility (near term).
- Production of fuels from atmospheric CO₂ (long-term).

TBI Implementation Plan

- Need village-level technologies to meet electric (Power Africa relevance) and fuel needs.
- Partnerships with local institutions.
 1. Jomo-Kenyatta University of Agriculture and Technology (JKUAT)
 2. Kenyatta University
- IP protection through joint filing with local universities.

SUMMARY

- Favorable share of remaining carbon emissions quota for LDCs.
- Educate international institutions. IPE/DoS has developed a tool (ppt) that we are using.
- Clearly differentiate between S & T.
- Recognition that inventors must be compensated for creating IP.
- Compensation for (already developed) technology as part of the project financing.
- Going forward, form partnership, develop technology and file joint patents to get LDCs out of the cycle.
- Patents inventory in the IPoA technology bank-
Quality control!

Supplementary Slides

TBI: Approach

- **Establish Energy education and research center.**
 - Facility accessible to faculty and students in sub-Saharan Africa
- **Develop local renewable energy sources.**
 - TBI is off-grid. Utilize solar, wind and other resources to power TBI facilities.
 - Work with SMEs and import technology with IP protection
- **Provide employment to local communities**

China

FACTS

- Largest importer of oil
- Largest CO2 emitter
- #2 Economy
- Top slot in patent filing
- Developing Country status!!
- Taking the lead to address environmental issues
- \$3 billion (Africa)
- \$3.1 billion (South-South Cooperation)

TRIPS

Trade Related Aspects of IP Rights (TRIPS) / WTO Agreement

- Connected International Trading System and IP.
- Allows WTO member states to establish minimum standard of legal protection and enforcement for IPRs.
- 139 member countries (as of 2015).
- Powerful enforcement mechanism.
- *Consistent with social and economic welfare and balanced rights and obligations.*
- *LDCs are expected to graduate in 8 years (in 2021).*
Another extension is possible.

LDCs

Special UN Office: Office of the High Representative for Least developed, landlocked, island states (OHRLLS)

LDCs: 48 countries (34/13/1)

Stats:

Population: 880 million (12%)

GDP share: 2%

Global trade: 1%

Brussels Plan of Action (2001-2010)

Istanbul PoA (2011-2020)

South-South Cooperation- a vehicle for partnership

Carbon Footprint and Energy Cost

Household Energy	USA/NE*	Europe	Sustainable
Carbon Footprint (Tons/yr)	55	20	7
Total Home Energy Usage	\$5,000	\$1,818	\$636
Heating	\$2,890	\$1,051	\$368
Cooling	\$289	\$105	\$37
Domestic Hot Water	\$723	\$263	\$92
Lighting	\$434	\$158	\$55
Major Appliance	\$434	\$158	\$55
Small Appliances	\$231	\$84	\$29

Sources: CommAve, LLC; U.S. DOE; harvardlocal.org