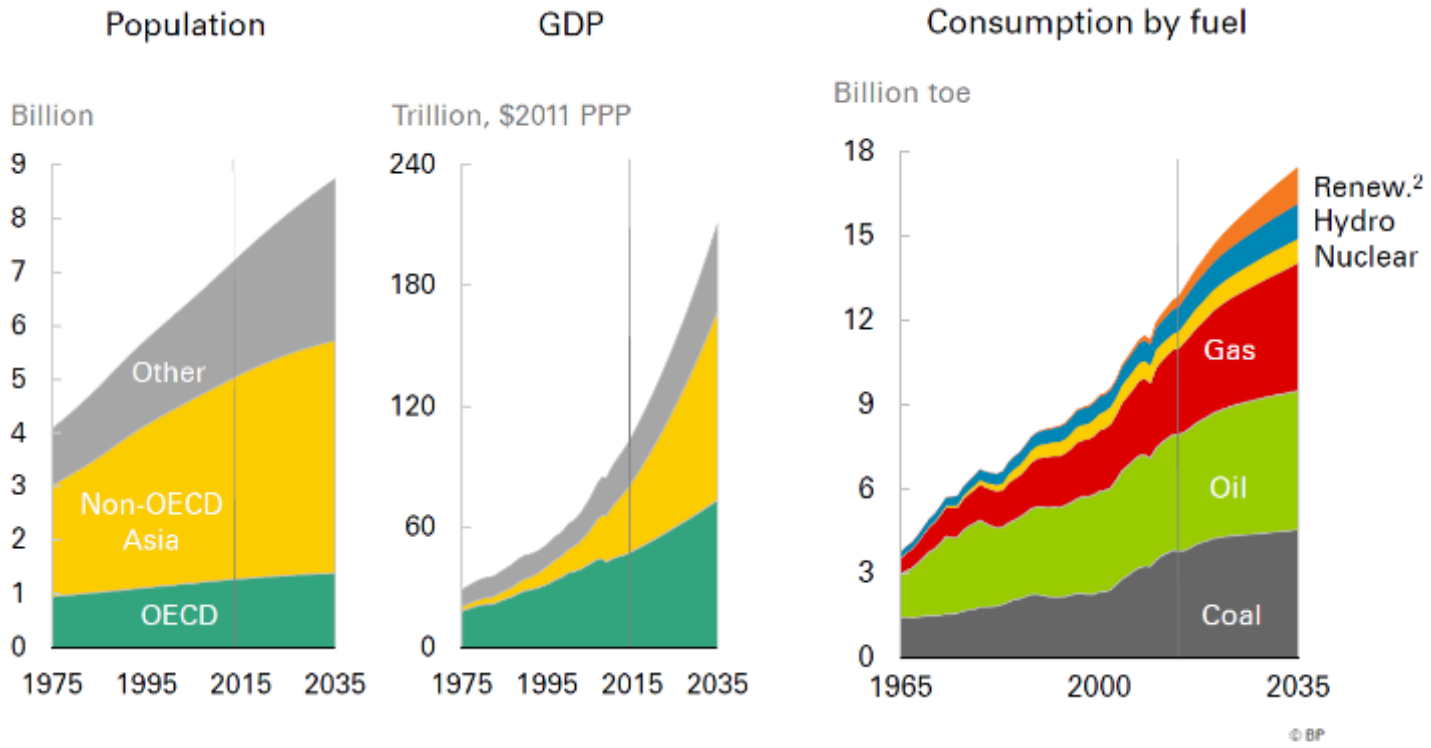
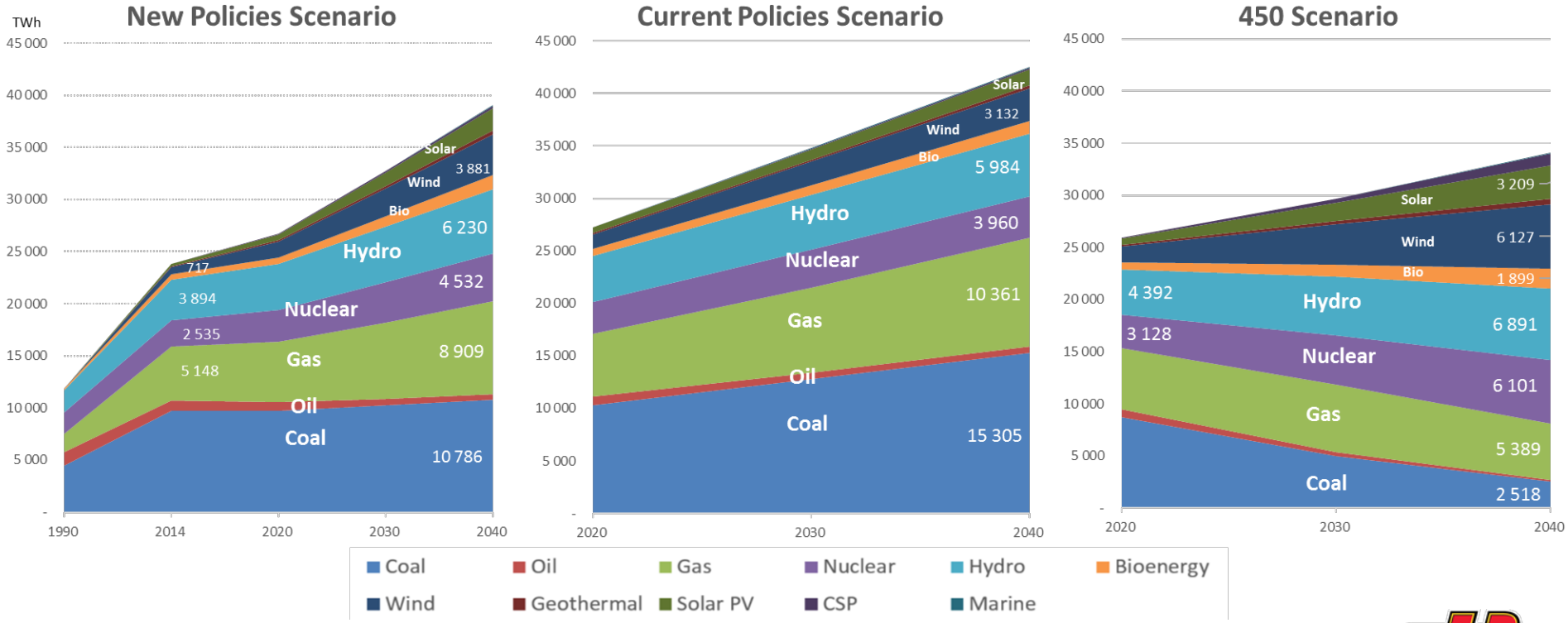
Carbon Farming
Let’s Make Sahara Green Again

Rakennusten energiaseminaari
Finlandia-talo 4.10.2017
St1 Mika Anttonen

The Global Energy Challenge

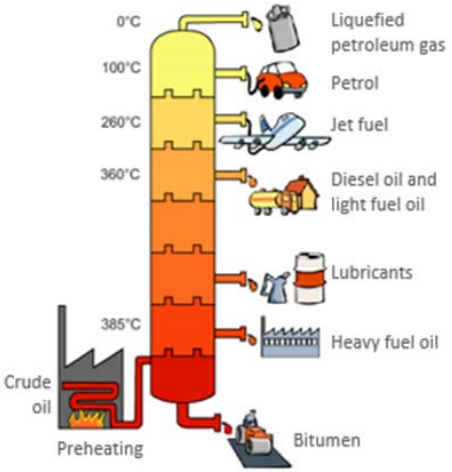


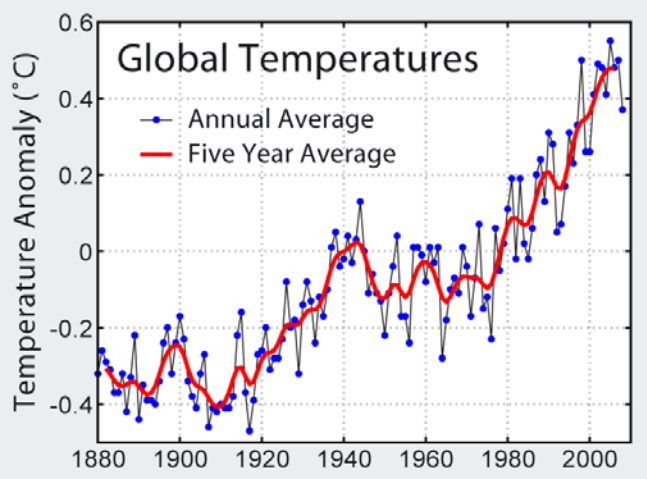
World Electricity generation outlook* . . .



* IEA, World Energy Outlook 2016

Resulting Global Consequences





Bottlenecks of the decarbonization through renewable energy

- Limited biomass amount
- Energy storage
- Distillation curve

Global warming

- Problems of the CCS have not been solved
- Carbon sequestration into biomass

Increasing and uncontrolled migration

- Population growth
- Worsening living conditions (desertification, erosion, aridity etc.)

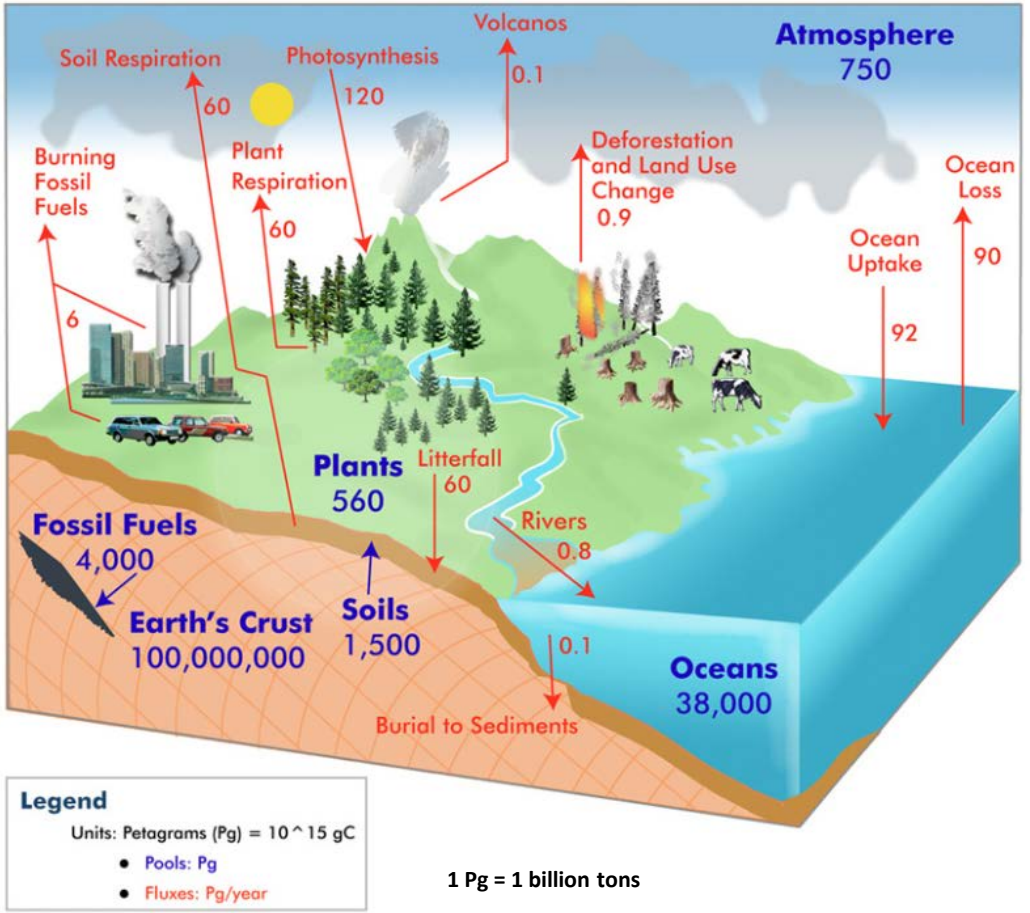
Images http://www.guardian.co.tt/lifestyle/2017-06-21/refugees-share-their-stories, https://www.crossculture.com/latest-news/mass-migration-or-refugee-crisis/, http://ete.cet.edu/gcc/?/resourcecenter/slideshow/3/1, Petroleum & Biofuels Association Finland

Balancing Global Carbon Cycle

1. **Balance deforestation and land use change**
   0.9 billion tons of carbon → replacement forest of 9 million ha

2. **Fossil fuel carbon offset**
   6 billion tons of carbon → compensation forest of 60 million ha

3. **Carbon capture from atmosphere = payment of "carbon debt"**
   eg. 10 % of 750 billion tons of carbon → forest size equals 83 % of Sahara



1 Pg = 1 billion tons

Image http://www.wrsc.org/attach_image/global-carbon-cycle

Carbon Farming

TARGET OF THE DEMO PROJECT

Annual carbon sink 100 000 t CO_2 captured

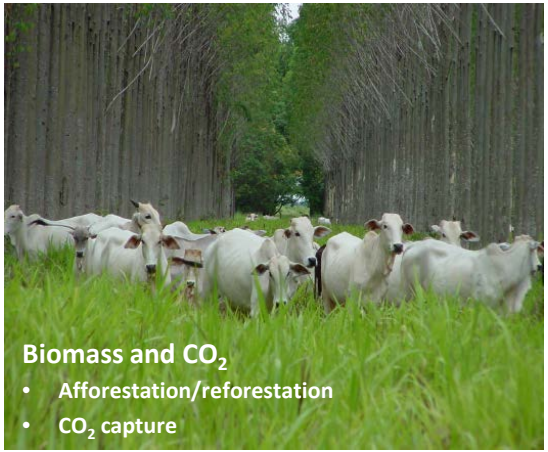
→ 5 000-10 000 ha agroforest (size depends on selected case and growth conditions)

Water

- Potable water
- Irrigation water is gained from waste water treatment, precipitation and desalination

Food

- Intercropping for food (eg. sesame, durra, wheat, sugar cane)



Biomass and CO_2

- Afforestation/reforestation
- CO_2 capture

Bioproducts

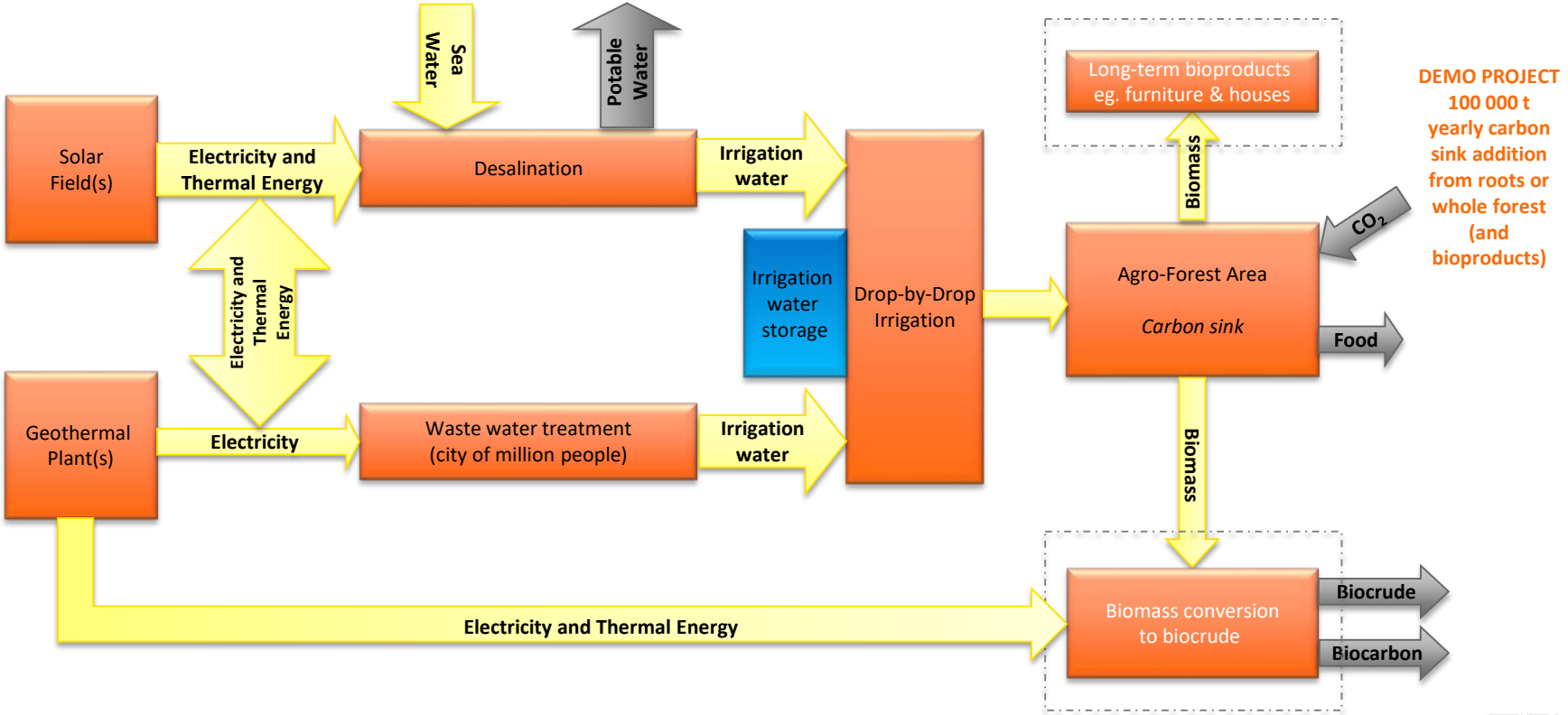
- Saw mill raw material (for furniture, houses)
- Liquid biofuels
- Biocarbon or biochar

Energy

- Energy is collected from the sun by using solar PV or CSP

Images http://wca2014.org/soybean-wheat-cropping-sequence/#.WcTRGsgjGUk, https://www.researchgate.net/publication/224830968_Economic_Feasibility_of_an_Eucalyptus_Agroforestry_System_in_Brazil, http://www.astronergy-solarmodule.de/en/presse-leser/astronergy-receives-licence-to-import-100-mw-of-solar-modules-to-turkey.html, https://blogs-images.forbes.com/uhenergy/files/2016/09/clean-drinking-water-1200x795.jpeg

Carbon Farming Concept



Commitment of the Local People

Food, living and hope for the better future could be created in areas where it does not exist today

- Local people must commit to the project
- Land ownership issues are extremely important
- Food and potable water production might be essential to successful projects

Irrigation of deserted land could provide opportunities for intercropping agricultural crops and plantation forest in the same areas

- Selection of the best wood species for carbon sequestration (eg. Eucalyptus species)
- Selection of the best wood species for varied usage (eg. Azadirachta indica and commonly known as neem; which is used as a medicine and spice etc.)
- Selection of the best agro species for local people and local soil (eg. sesame, durra and wheat)

A successful agroforest project

- Creates income and other benefits for local people
- Is persevering over generations
- Creates strong ownerships

Images http://fiohnetwork.org/?p=1144

Let's make Sahara green again

Image http://clubofmozambique.com/news/southern-africa-join-great-green-wall-august-30-2016/