Addressing the WFE-Nexus components from an Agricultural perspective

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Water-Food-Energy-Ecosystem Nexus in Transboundary Basins
Water Convention Meeting, Geneva, April 8-9, 2013

Food and Agriculture Organization of the United Nations

Agriculture

Food producer

Water consumer

- 70% of total freshwater withdrawal
- 90% of total freshwater consumption

Energy producer/consumer

- 1% of total fuel-based transportation is produced by bio-fuel crops
- 30% of total energy demand is consumed by the food sector, including the supply chain (70% beyond farm gate)

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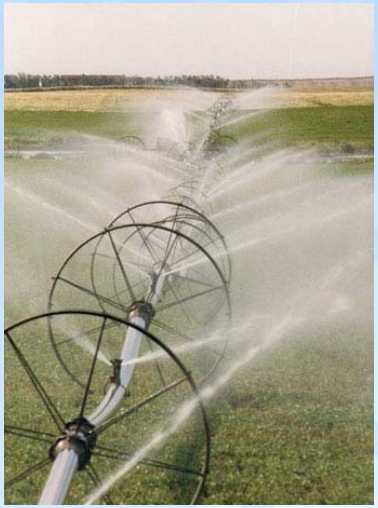
Irrigation/Hydropower (conflicting demands)



Fishery/Rivers-Dams (flow changes impact)

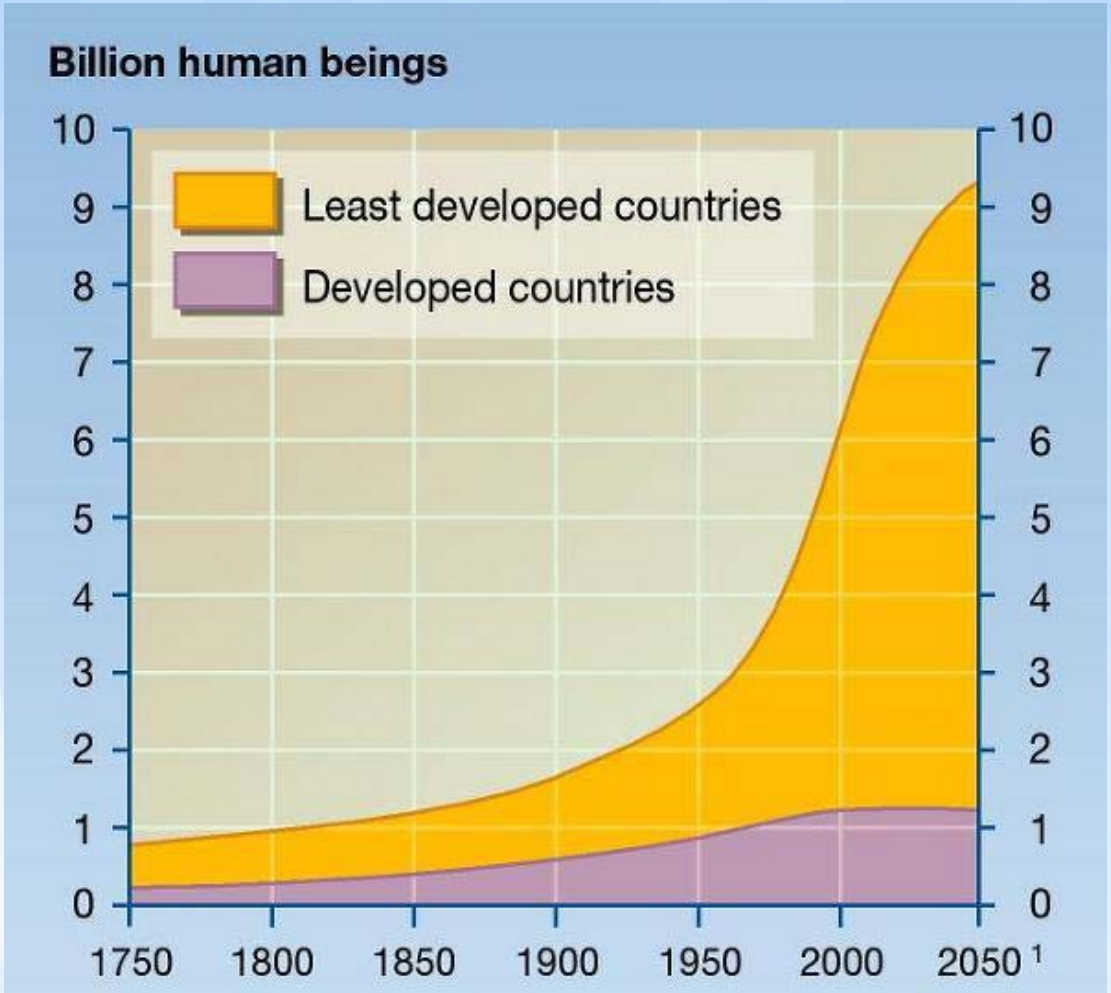
Projected global demands by 2050

~ 9.2 B people
+ 60% food
+ 50% energy

Water needs

1000-5000 l per person per day to provide his dietary need (~1l per kcal)

~2500 l per l of Bio-ethanol



Progressive water scarcity

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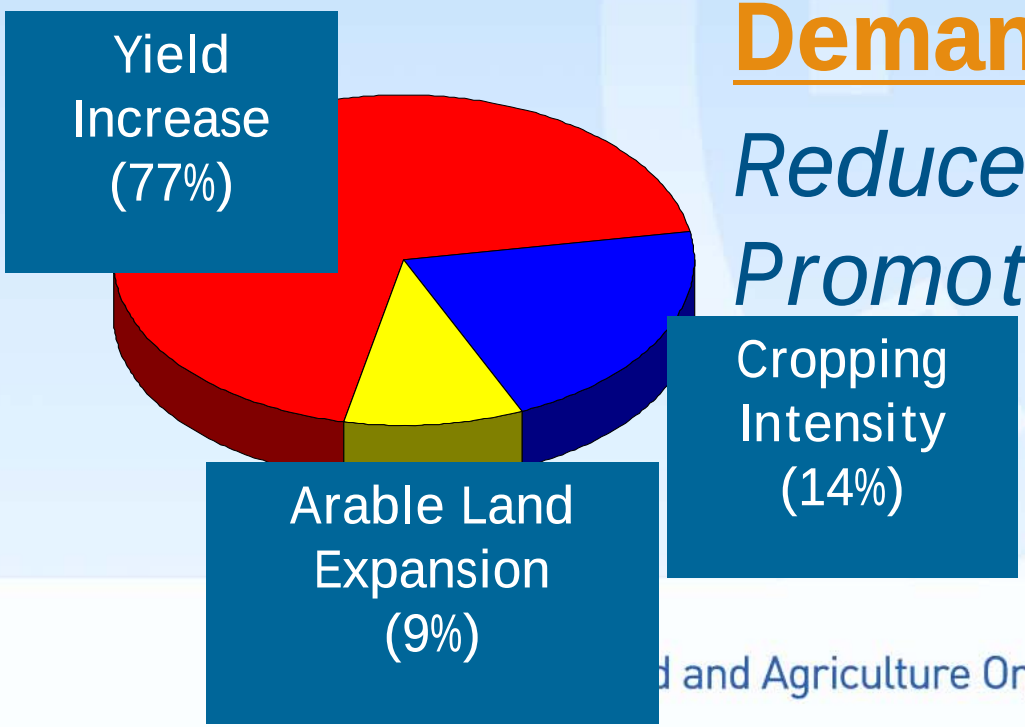
Where the food will come from?

Supply side

Expand arable land
Increase intensification
Higher productivity



Demand side

Reduce waste/losses
Promote sustainable diets

Where the water will come from?

Supply side

Rainwater harvesting/storages
Unconventional water use
Soil-moisture management

Demand side

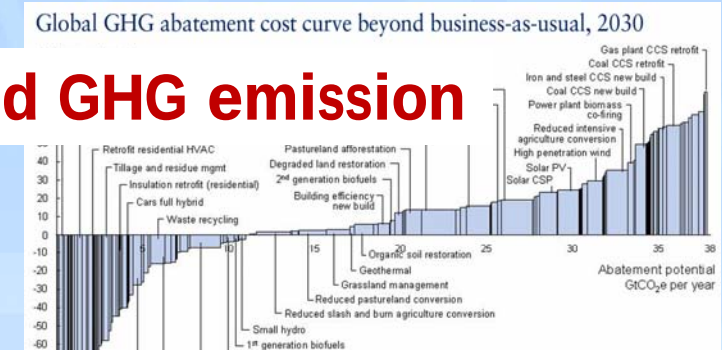
Increase water productivity
Increase overall water use efficiency

Where the energy will come from?

Further Challenges and Nexus implications

Climate Change

Energy and GHG emission



Water quality, use and allocations

Urbanization

Financial crises

Food-prices volatility

Land use changes

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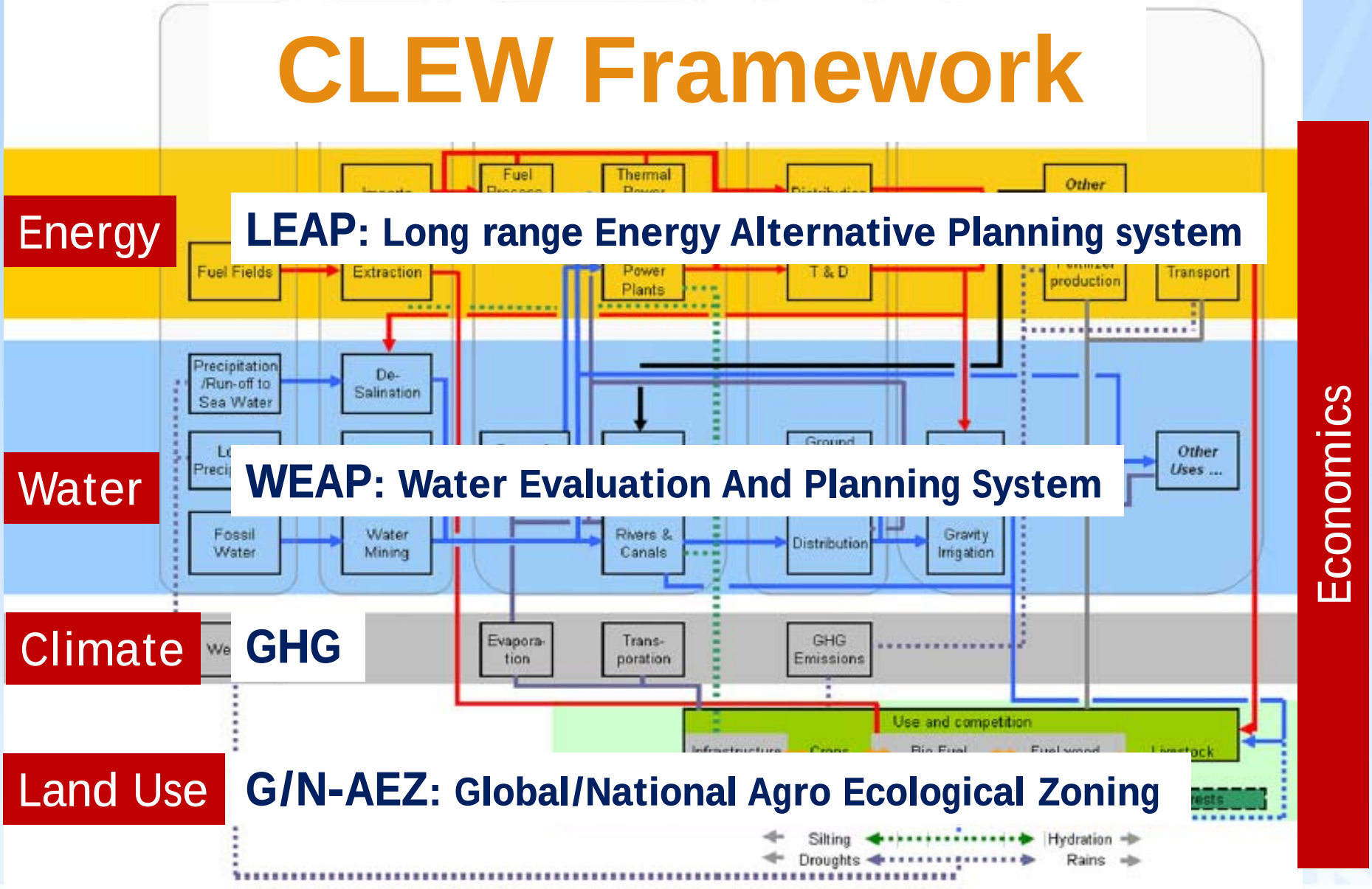
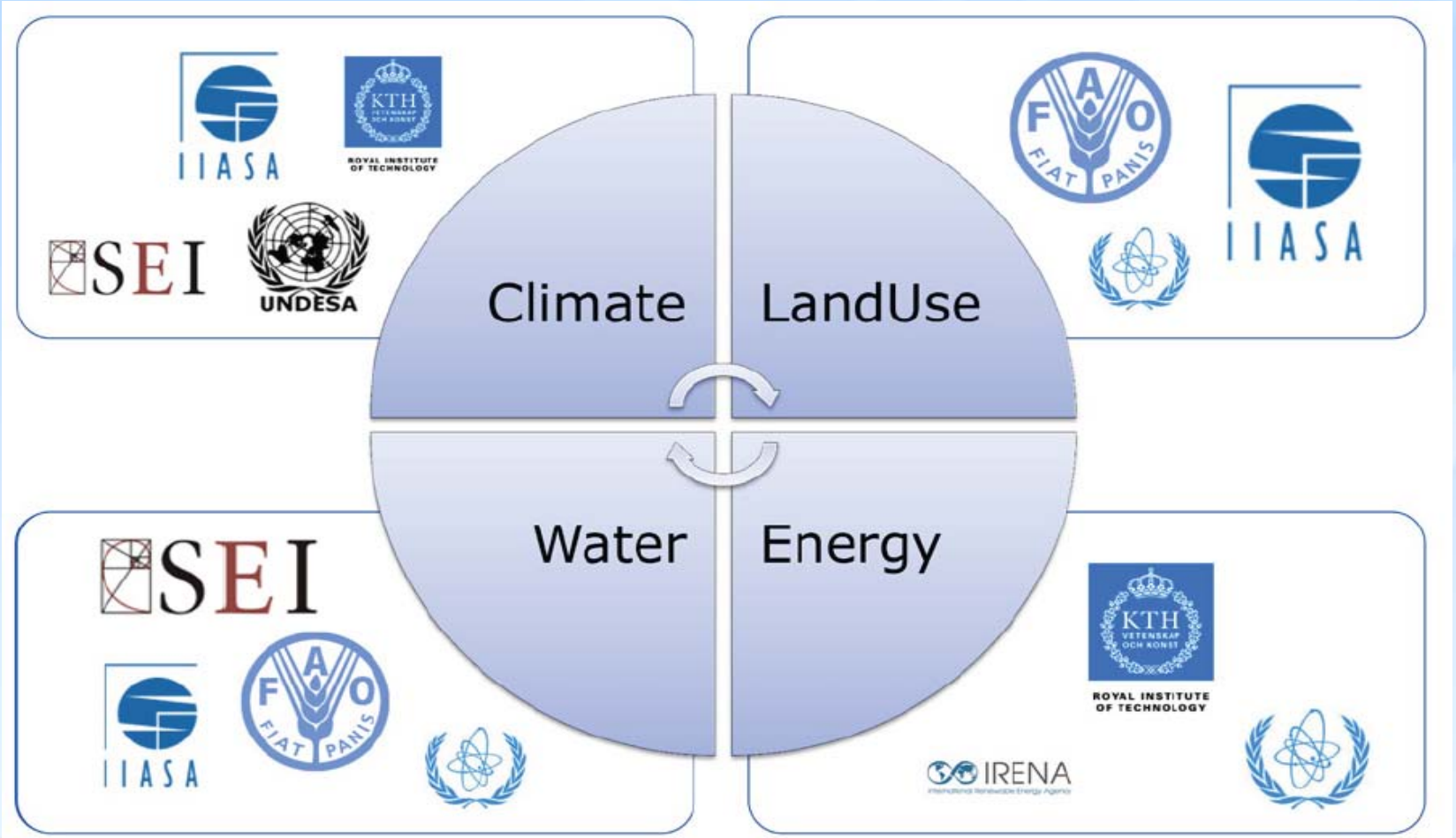
CLEW Framework



CLEW Network



Mauritius

- Small island with clear boundaries
- Producer and exporter of sugar (occupying 80 % cultivated land area)
- Dependent on fuel imports for its energy requirement
- Highly vulnerable to climate change

Government vision: making Mauritius a sustainable island focussing on reducing dependence of fossil fuel and reducing GHG emission …

The CLEW modelling framework was used to assess the energy, water and land-use system in the context of different scenarios in Mauritius:

- Reduce gasoline imports by producing ethanol, displacing sugar exports
- Considering different energy system alternatives and land use options (e.g. different crops) under uncertain future dryer climatic conditions (lower rainfall)

Results (in 2030):

- Net balance of 43.5 M US$ - export sugar/producing ethanol
- Increased energy security (+1.95 TJ of ethanol)
- Reduction of 148,000 tons of GHG emission

Burkina Faso

- 3% annual population growth rate (17.3 M in 2011; 30 M in 2030)
- Traditional farming is the mainstay of the economy (Agric. Employs 86% of population; 40% of GDP)
- 80% of cultivated land is represented by cereals
- Very extensive agric.
- Cotton main export crop (1/2 of export revenue)
- Fragile environment-prone to droughts/floods

- Significant land use in forests and savannas
- Wood as most widely used primary energy resource

Government aims: increasing food security; shift away from wood as source of energy (to protect forests); increase electrification to 60% by 2020

Scenarios investigated with CLEW:

- Intensification of agricultural production
- Potential introduction of Jatropha as biofuel crop

Results:

- Increasing food production with low intensity agriculture requires expansion of crop-land to the expensed of forest land. Intensification of agriculture saves land.
- More intensified agriculture requires more energy (e.g., in the form of fertilizer), i.e., more GHG emission, though compensated by sequestration of saved forest land
- Jatropha introduction, even in marginal land, was not valid

Concluding remarks

- Single resource analysis is limited on medium- and long- term policy development
- Without an integrated approach (nexus), strategies and policies formulation to increase water, food and energy security could be counterproductive
- A nexus approach is even more relevant when addressing trans-boundary water cases
- Analytical frameworks to investigates the nexus are available and can be assembled without dependencies

Thank You

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