Diversifying the energy mix from the nexus perspective

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THE NEXUS

Energy and power production require water
- Thermolectric cooling
- Hydropower
- Energy minerals extraction/milling
- Fuel Production (fossil fuels, H2, biofuels, shale)
- Emission control

Food sector requires both water and energy
- Biofuel
- Pump efficiency
- Energy for fertilizers
- Food supply chain
- Virtual water

Water production, processing, distribution, & end-use require energy
- Pumping
- Conveyance and Transport
- Treatment
- Use conditioning
- Surface and Ground water
DRIVING FORCES

- Security
- Create Business
- The Nexus
- Health and wellness
- Policy
- Environment
- Sustainable Development

WORLD ENERGY USE, PAST AND FUTURE

Source: Energy Information Administration (EIA), May 2010.
GLOBAL WATER DEMAND INCREASES BY 50%

ENERGY MIX AND ENERGY PUZZLE


All of these are needed!!

Mix of Technology Transmission
Alternative Fuels Energy Storage
Smart / Strong Grid, Smart Meters
Electric Transportation (PHEV)
Micro-Generation Regulation
Consumer Behavior
Electric Power Generation
Unconventional Drilling Energy
Future Efficiency
BEFORE UNDERSTANDING THE ENERGY MIX WE NEED TO QUANTIFY THE INTENSITY!!

WHAT IS THE FIRST STEP? WHAT IS MISSING IN THE RESEARCH WORLD?

- **Objectives:**
  Detailed, reliable, and easily accessible data

- **Current Status:**
  Policymakers get data that often is: difficult to find and interpret, piecemeal with large gaps, estimated with uncertain reliability, and Backward looking

- **Future plan/direction:**
  Provide policymakers with easily accessible, comprehensive coverage, accurate and reliable, up-to-date, and forward looking data
HOW TO HELP AND WHAT KAPSARC IS DOING?

Define interdependencies between natural resources
Evaluate energy intensity to meet water demand
Policy development and implementation
Knowledge development
Conservation and green infrastructure
Embodied energy in international trade

HOW AND WHY THE ENERGY REQUIRED TO MEET WATER DEMAND DIFFERS?

[Bar chart showing water productivity and energy productivity across different countries]
PRODUCTIVITY AND VALUE ADDED IN AGRICULTURE SECTOR

Bubble Size: Total Value Added in Agriculture (Constant 2005 USD)

Source: Compiled, KAPSARC Analysis

ENERGY IMPLICATION OF WATER TRANSFER AND DISTRIBUTION

Source: Compiled, KAPSARC Analysis
POLICY CONSIDERATIONS

- There is a significant **trade off** between Food Security and Water/Energy security in some countries

- **Incorrect pricing** of water and energy is most likely the reason for its overuse relative to capital in some countries

- Should countries be exempt from Water and Energy productivity targets because of **uncontrollable factors**? What are the implications of this?

  Uncontrollable factors such as climate, geographical location, topography...

![CO2 emissions from water as % of Total Emissions](chart1.png)

![Water Scarcity](chart2.png)

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Thank You!