ENSURING ENERGY SECURITY IN THE FACE OF A CHANGING CLIMATE

Climate-Proofing Energy Systems. Tools for Assessment and Monitoring

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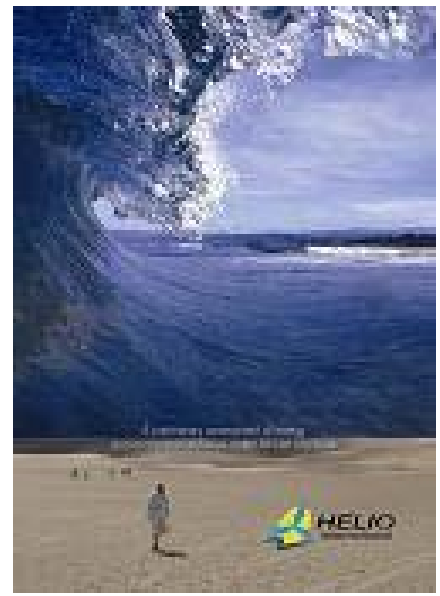
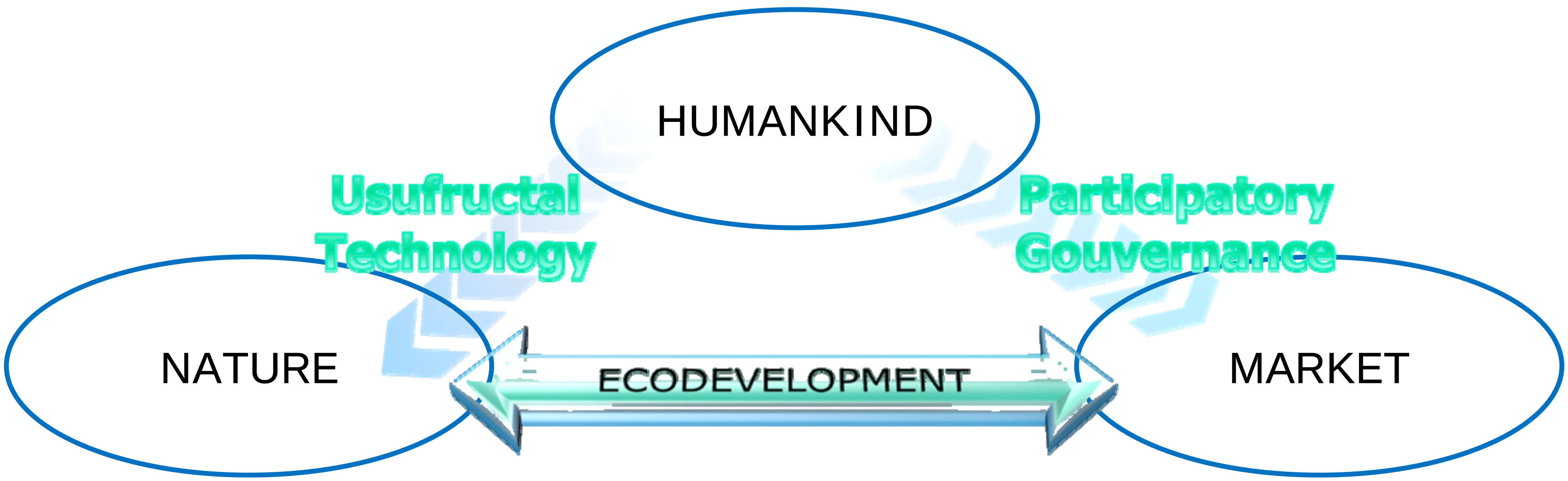
- HELIO International is an independent, international network of leading energy analysts whose common goal is to **promote sustainable and equitable development.**

- HELIO experts carry out **independent evaluations** of national energy policies and inform decision-makers about their effectiveness. They also analyse and advise on **ecodevelopment, participatory governance and climate stabilisation**.

- HELIO's core activity is **Sustainable Energy Watch**. SEW's objective is to measure progress towards sustainable energy and ecodevelopment practices nationally, regionally and globally.




HUMANKIND
Usufructal Technology
Participatory Gouvernance
NATURE
ECODEVELOPMENT
MARKET

Weather/Climate Risk Management: Energy sector

- Energy systems are both the **key** and the **Achille's heel** of our modern societies
- In unstable times / wars, they are a favorite target and require special protection
- Unconsciously humankind has been at war with its own environment for a long time. Large energy installations have been a major contributor to:
  - Destruction of habitats (biodiversity)
  - Soil degradation and loss (desertification, nuclear and other wastelands)
  - Air and water pollution
  - Disruptions of natural cycles (carbon) and genetic patrimony
  - ...

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Weather/Climate Risk Management: Energy sector

Now nature retaliates visibly and in no uncertain terms to preserve its own balance...

ENSURING ENERGY SECURITY IN THE FACE OF A CHANGING CLIMATE

- Climate change impacts **both** the demand and supply-side of the energy equation:
  - Impacts of temperature and climatic changes - direct AND indirect, immediate or delayed
  - Role of efficiency in increasing security (decreasing demand rather than increasing costly supply)

- Main obstacle: Lack of commonly accepted parameters/indicators to compare:
  - Adaptation needs
  - Effectiveness of adaptation measures
  - Total social costs (free of subsidies & including externalities)

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- An energy system can be made more secure in several ways:
  - Good siting practices
  - Diversification
  - Better design, manufacturing and use
  - Closeness of supply and demand → decentralisation

- But it must first be part of a genuine strategy of ecodevelopment:
  - Devised and adopted by citizens living in the area (agenda 21)
  - Environnementally sane
  - Technologically and economically sustainable

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Project Vulnerability-Adaptation-Resilience (VAR) in Africa

- Assessment of the vulnerability of energy systems in ten African countries:

  Benin, Burkina Faso, Cameroon, Democratic Republic of Congo, Kenya, Mali, Nigeria, Senegal, Tanzania, Uganda

- Identification of their assets of resilience (state of the five forms of capital)

- Recommendations to reinforce capacity to face climate change impacts

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Project Vulnerability-Adaptation-Resilience (VAR) in Africa

- VAR Project developed a methodology and indicators for energy systems to:

  1. Identify key energy systems
  2. Measure their vulnerability and resilience
  3. Assess local adaptive capacity

Vulnerability + Adaptive capacity = Level of resilience

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Indicators: what to measure…

- Vulnerability:
  - Country-level vulnerabilities
  - Individual energy systems vulnerabilities
  - Transmission and distribution weaknesses
- Capacity for Resilience (all forms of capital):
  - Environmental
  - Technological
  - Human
  - Financial
  - Institutional
    - governance; decision-making; regulations; civil society

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Country-level Vulnerability Indicators

- Environmental:
  - Change in rainfall patterns
  - Variation in temperatures
- Economic:
  - Households getting access to electricity
  - Increased energy autonomy
- Technical:
  - Change in renewable energy provided
  - Diversity of renewable supply
- Social:
  - Change in prevalence of diseases
  - Change in employment
- Civic:
  - Land tenure improvement
  - Public participation in planning process

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Energy Systems Vulnerability Indicators

- **Coal**: **VC1**: Number of coal mines plants located at less than 1 metre above sea level and within the area that could be flooded by a flood with a current recurrence period of 100 years
- **Oil and Gas**: **VOG1**: Share of offshore oil and gas installations likely to be hit by a storm of more than 70 m/s gusts within the next 20 years (%). **VOG2**: Share/number of refineries likely to be hit by a storm of more than 70 m/s gusts within the next 20 years (%)
- **All Fossil Fuels**: **VF1**: Number of thermal (coal, oil and gas) power plants located at less than 1 metre above sea level and within the area that would be flooded by a flood with a current recurrence period of 100 years

Additional information: Expected number of droughts that lead to a capacity decrease of thermal power plants by more than 10% within the next 30 years.

Energy Systems Vulnerability Indicators

- **Nuclear:**
  - **VN1**: Number of nuclear power plants located at less than 1 metre above sea or river level and within the area that would be flooded by a flood with a current recurrence period of 100 years
  - **VN2**: Number of incidents/accidents since the plant was built
  - **VN2b**: Describe the most significant incidents

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Energy Systems Vulnerability Indicators

- **Transmission and Distribution Systems**
- **VT1**: Length of in-country, above-ground transmission and distribution lines (km)
- **VT1b**: Distinguish voltages (2 sub-indicators): high voltage transmission; middle + low voltage lines (distribution)
- **VT1c**: Describe any transnational lines
- **VT2**: Number and length of power cuts (differentiate between failures due to weather or equipment failures and those cuts due to rationing)
- **VT2b**: Average hours of interruption per year
- **VT3**: Percentage of energy supply requiring regional transport over 50 km
- **VT3b**: % that is transportation of fossil fuel
- **VT3c**: % that is transportation of biomass

- *If possible, comment on the informal sector*

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Energy Systems Vulnerability Indicators

- **Hydro**
  - **VH1**: Expected precipitation change over next 20 – 50 years (%) **and/or** probability of floods in each watershed
  - **VH2**: Number of multiple-use dams in the country today: volume of water (m3) of each dam
  - **VH2b**: Describe what % of the water is used for: agriculture and irrigation; power production; drinking

Additional information: Expected additional run-off from glacier melting (million m3)

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Energy Systems Vulnerability Indicators

- **Biomass**
  - **VB1**: Proportion of biomass used for energy purposes (%) in total biomass production
  - **VB1b**: If possible distinguish between different sources and different applications – agricultural biomass harvest; generation of electricity, heat
  - **VB1c**: Forest (as defined by FAO) biomass harvest: electricity; heat
  - **VB2**: Expected precipitation change over next 20 – 50 years (%)

    Additional information: Probability of temperature increase beyond biological heat tolerance of key biomass crops within the next 20 years (%)

- **Wind**
  - **VW1**: Number of wind turbines at less than 1 m above sea level
  - **VW2**: Projected change of average windspeed over the next 20 years, based on regional climate models (%)

Energy Systems Vulnerability Indicators

- **Solar**
  - **VS1**: Capacity of solar installations already in place (m2)
  - **VS1b**: Distinguish between PV (MW) and thermal (m2)
  - **VS1c**: Describe sites (quality of the insulation and of the building on which systems are installed) and what type of ownership (private, government, public/private partnership etc.)
  - **VS2**: Expected temperature increase in the next 20 years (°C) relevant for PV capacity)

Additional information: Projected change in rainfall and cloud cover over next 20 years (%)

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Energy Systems Resilience Indicators

- **Indicators needed for a snapshot assessment of the adaptative capacity of energy systems using a selection of resilience indicators:**
  - **RI4:** Hazard maps for floods and drought
  - **RI5:** Siting and construction guidelines
  - **RI6:** Emergency plans for meteorological events
  - **RI7:** Availability of Domestic insurance schemes
  - **RI8:** Citizens' users groups
  - **RCHG1:** Siting maps for mines/power plants usable for climate events
  - **RCHG2:** National regulations for thermal plants siting with sufficient cooling water availability
  - **RH1:** National plans for hydro optimisation
  - **RH2:** Presence of desiltation gates
  - **RW1:** Storm proofing of wind installations
  - **RW2:** Siting maps – wind installations

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Example of Indicators of Increased Resilience: Civic involvement

Energy systems are a strategic public good put under the care of citizens and of responsible authorities. They require:

- Balanced energy governance between suppliers and users
  - Participatory energy decision-making with accountability
  - Public awareness, skills and means (Councils of Users-CUBEs)
  - Free and early access to relevant information
- Integration with ecodevelopment planning and policies
  - Institutional mechanisms, capacities and structures (Agenda 21)
  - Sustainable livelihoods to reduce overall vulnerability
- Preparedness: Organisational capacities and coordination
  - Early warning systems and trained emergency teams
  - Collective contingency planning

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VAR Recommendations to Climate-proof Energy Systems

1. **Assess and monitor** energy systems to ensure systems can adapt to anticipated climate change impacts
2. Expand current assessment process for new energy systems
3. Develop medium- to long-term **strategies for decentralised** low carbon energy supply systems
4. Implement **energy demand management** as adaptation measure

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VAR Recommendations to Climate-proof Energy Systems

5. Cultivate **in-country capacity** to evaluate/respond to energy needs from a climate perspective
6. Invest in **ecosystem services** that support existing and planned energy production
7. Establish **transparent** technology transfer and financing procedures
8. Develop **participatory governance** to truly understand energy needs and mobilise support to promote ecodevelopment

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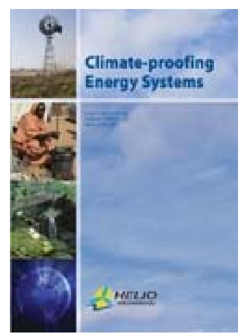
We run carelessly to the precipice, after we have put something
in front of it to prevent us from seeing it.
Pascal (Pensées)

Climate-Proofing Energy Systems: Tools for Assessment and Monitoring

Reports, indicators and more:

- Go to: www.helio-international.org
- Click on:



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