

ENSURING ENERGY SECURITY IN THE FACE OF A CHANGING CLIMATE

Climate-Proofing Energy Systems. Tools for Assessment and Monitoring

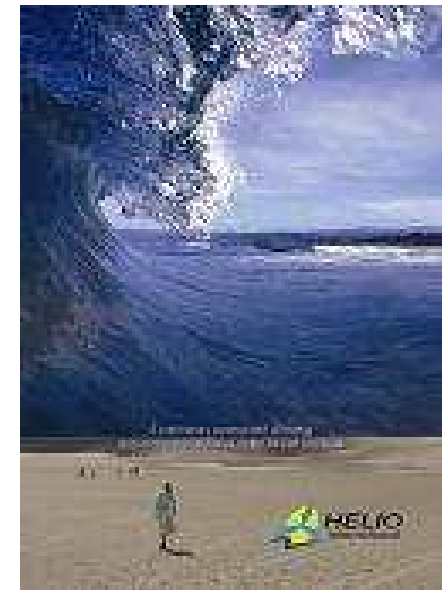
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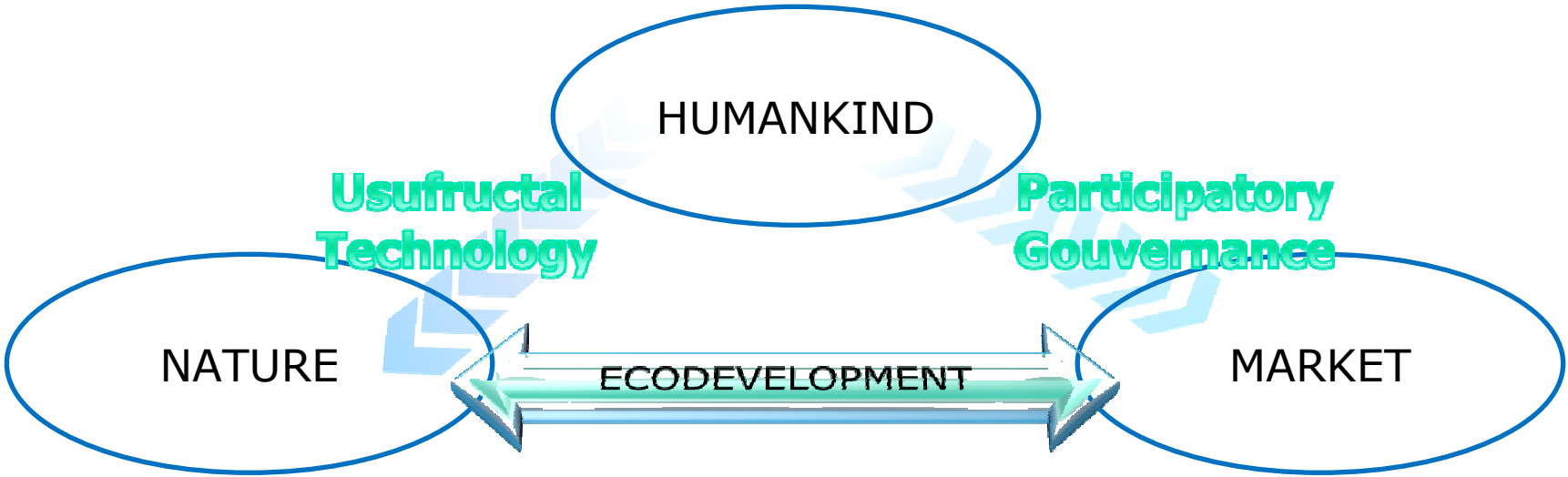
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HELIO International

- 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.







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
 - ...



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)

ENSURING ENERGY SECURITY IN THE FACE OF A CHANGING CLIMATE

- 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)
 - Environmentally sane
 - Technologically and economically sustainable

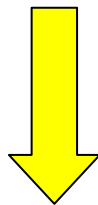


Project Vulnerability-Adaptation-Resilience (VAR) in Africa

- 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

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

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

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

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



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*

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)

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 (%)

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

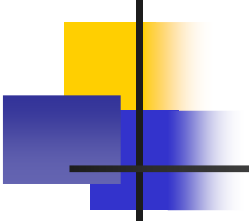
Example of Indicators of Increased Resilience: Civic involvement

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



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



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

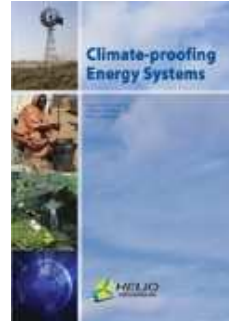
*We run carelessly to the precipice, after we have put
something
in front of it to prevent us from seeing it.
Pascal (Pensées)*



CLIMATE-PROOFING ENERGY SYSTEMS. Tools for Assessment and Monitoring

Reports, indicators and more:

- Go to: www.helio-international.org
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