

The Issue

Currently energy policies in industrialised countries are predominately driven by the need to reduce greenhouse gas emissions. However measures under the Kyoto Protocol to mitigate the climatic impacts of energy production have failed to take into account the full impact of increased climatic variability: flooding, seasonal droughts, storm surges, landslides, extreme wind speeds, freezing conditions, heat waves. Adaptation efforts are therefore urgently needed—not only in geographically-vulnerable countries such as Bangladesh, Central Africa or Tuvalu—but everywhere, as climate change is a global phenomenon.

The Need

Compared to mitigation—where a common metric in terms of “ton of CO₂ equivalent reduced” has traditionally been used—identification of adaptation measures is still in its infancy. There are no commonly accepted parameters and indicators to compare adaptation needs and the effectiveness of adaptation measures.

Given energy’s importance in the economy and in the promotion of ecodevelopment, it is vital that vulnerabilities within the energy sector itself be substantially reduced.

Energy systems can be improved and adapted to withstand anticipated climate change and its impacts.

System resilience can be increased by:

- *reinforcing technical equipment*
- *diversifying energy supply sources*
- *siting power facilities differently*
- *expanding cooperation with other regions*
- *investing in technological change—renewables, efficiency, decentralisation—to further expand the portfolio of options*

An example: climate change impacts on hydroelectricity

Change in meteorological variable	Impact on electricity generation
Increase in average precipitation	Increase: temporal spacing of increases determines the degree of increase, i.e. the better distributed over time, the stronger the increase
Decrease in average precipitation	Decrease
Droughts	Decrease due to reduced river flow
Glacier melting	Short-to medium term increase, long-term decrease (depends on situation of glaciers with regards to the current and future snow lines)
Floods	Decrease if reservoir is filled with debris/silt; in rare cases destruction of power plant/dam
Increased frequency and/or strength of storms/cyclones	Marginal increase of risk of destruction of electricity generation equipment
Technical adaptation	Behavioral adaptation
<ul style="list-style-type: none"> ▪ Upstream land management to reduce possible erosion and dam siltation ▪ Building desilting gates ▪ Increasing height and floodgates 	<ul style="list-style-type: none"> ▪ Changes in plant operation to account for changes in river flow patterns

Proposed adaptation measures must also support ecodevelopment goals if they are to be reached.

The Result

HELIO has developed a series of indicators to measure the vulnerability of energy systems and identify possible adaptation efforts. These indicators have been applied to ten Sub-Saharan African countries.

Individual country reports and an accompanying global analysis can be found at:
www.helio-international.org