

Methodological aspects of climate-related indicators for energy systems

**Side Event: Ecodevelopment and Resilient Energy
Policies**



Durban, 28 November 2011



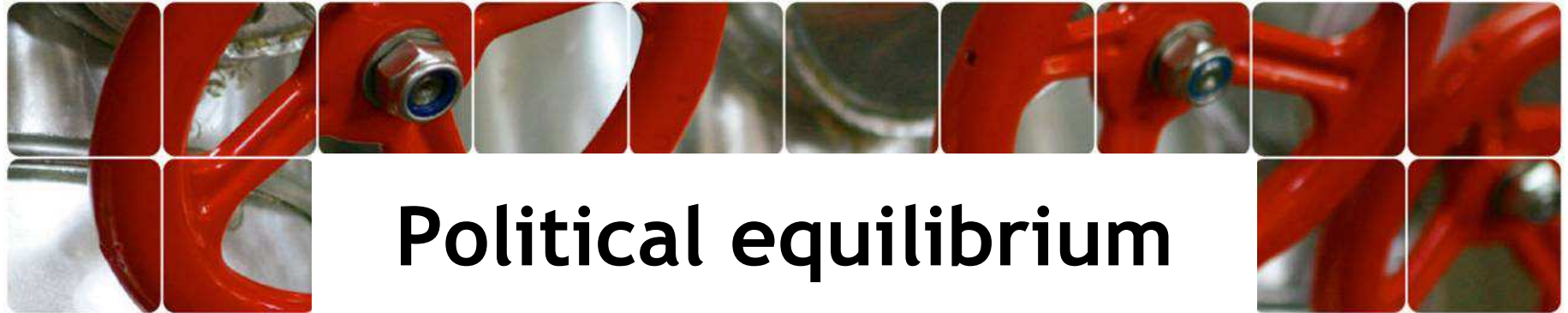
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- **The underlying concept of eco-development**
- **Types of indicators**
 - **24 indicators in 7 fields**
- **Key parameters entering into the indicators**
- **Data sources**
- **Applying the indicators**



- **Three pillars**
 - Mankind
 - Nature
 - Markets
- **Links through**
 - Technology that does not use up natural resources
 - Participatory governance
 - “Ecodevelopment”
- **Support through indicator systems**



The indicator set

| No. | Indicator | Parametres |
|--------------------|--------------------------|---|
| Environment | | |
| Indicator 1 | Greenhouse gas emissions | Energy-related CO2 emission per person |
| Indicator 2 | Key local air pollutant | Concentration or emissions of the key atmospheric pollutant (CO, NOx, SOx, PM, becquerels) per person |
| Indicator 3 | Deforestation | ha of forest or vegetation destroyed for energy purposes |
| Society | | |
| Indicator 4 | Electricity access | Share of households with electricity access |
| Indicator 5 | Domestic energy bill | Share of energy in total household expenses |
| Economy | | |
| Indicator 6 | Energy dependency | Dependency on non-renewable energy sources |
| Indicator 7 | Non-renewable ressources | Days of fossil fuel reserves |



The indicator set II

| No. | Indicator | Parametres |
|-------------------|---------------------------|--|
| Technology | | |
| Indicator 8 | Renewable energy | Locally available renewable energy |
| Indicator 9 | Energy efficiency | Energy or carbon intensity of industry |
| Indicator 10 | Quality of energy service | Duration and frequency of electricity outages and frequency variations |
| Governance | | |
| Indicator 11 | Revenue management | Reduction of rent which is not taxed |
| Indicator 12 | Informed consultation | Public meetings and stakeholder involvement during energy project impact assessment |
| Indicator 13 | Citizen participation | Active and official participation of NGOs, particularly female groups |
| Indicator 14 | Equilibrated governance | Equality of offer- and demand-based interests and transparency of decision processes |



The indicator set III

| No. | Indicator | Parametres |
|----------------------|---|---|
| Vulnerability | | |
| Indicator 15 | Vulnerability of non-renewable thermal energy | Vulnerability of thermal power plants (and refineries) to flooding |
| Indicator 16 | Vulnerability of renewable thermal energy | Vulnerability of renewable power plants to meteorological variability |
| Indicator 17 | Vulnerability of energy transmission | Grid vunerability to meteorological extremes |



The indicator set III

| No. | Indicator | Parametres |
|-------------------|------------------------------|--|
| Resilience | | |
| Indicator 18 | Investment capacity | Share of domestic savings in GNP |
| Indicator 19 | Mobilisation of green energy | Share of investment in renewable energy and energy efficiency |
| Indicator 20 | Local expertise | Share of science and engineering graduates in total population |
| Indicator 21 | Scientific information | Availability of maps of flood and drought risk |
| Indicator 22 | Planning | Avalability and enforcement of siting and construction guidelines taking into account climate change |
| Indicator 23 | Crisis management | Crisis plans for energy installations |
| Indicator 24 | Insurance | Availability of insurance policies for climatic events. |



Principles of indicators

- **Clearly defined without ambiguity**
- **Easy to understand for people and decisionmakers**
- **Based on data already available or likely to be available in the near future**
- **Relevant with regard to policies**
- **Coverage of the key social, economic, technical and environmental aspects of the energy system**
- **Measurement of aspects important for decisionmakers**
- **Relevant in the long term**



Two types

- **Quantitative** indicator without specific unit with a relative scale between a sustainable and an unsustainable level
- $I = (X - Y) / (W - Y)$, with X the actual level in the country in question, Y being the sustainable level set = 0, W the unsustainable level set = 1
- Example for indicator 1: CO2 emissions per capita: $Y = 0.226$ t C, $W = 1.13$ t C (1990 levels)
- **Qualitative** indicator with 3-5 steps



Some parameter choices

- **Local pollutants: $Y=10\%$ of 1990 level, $W= 100\%$ of 1990**
- **Deforestation: $Y=20\%$ of 1990 level, $W=100\%$ of 1990**
- **Electricity access: $Y=0\%$, $W=100\%$**
- **Energy bill: $Y= 5\%$, $W=15\%$ of household expenditures**
- **Energy imports/exports: $Y=0\%$, $W=100\%$**
- **Energy reserves: $Y=90$ days, $W= 0$ days**
- **Renewables: $Y=95\%$, $W= 0\%$ of primary energy**
- **Energy efficiency: $Y=EU$ ETS benchmark, $W=2x$ benchmark**
- **Rent not taxed: $Y=0\%$, $W=30\%$**



Some parameter choices

- **Vulnerability of power plants: $Y=0\%$, $W=100\%$ threatened**
- **Domestic savings: $Y=7500\%$, $W=0$**
- **Renewable energy investment (share of total energy investment): $Y=95\%$, $W=0\%$**
- **Local expertise (graduates in maths, IT, natural sciences, engineering): $Y=10\%$, $W=0\%$**
- **All other indicators are qualitative**



Data sources

- **Indicator 1: WRI CAIT**
- **Indicator 2: WHO**
- **Indicator 3: FAO**
- **Indicator 4: IEA/SIE**
- **Indicator 5: World Bank**
- **Indicator 6: EIA, World Bank**
- ...
- **Some indicators, especially the qualitative ones require expert judgement**



Thank you!

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