

The Energy Sector in the Context of Sustainable Development – A Review of Concepts

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**International Association for Energy
Economics**

**„New Challenges for Energy Decision
Makers“**

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Introduction

Sustainable Development

- Global Issues
- National Issues

Energy Dimension of Sustainable Development

- Global Issues
 - Brundtland-Commission
 - UN-Summit in Rio de Janeiro
 - UN-Summit in Johannesburg
- National (German) Issues



UN-Summit at Jo'burg – Energy Framework for Action

Key Issue	Action Areas
1. Access to energy and modern energy services	<ul style="list-style-type: none"> - Reduce poverty by providing access to modern energy services in rural and peri-urban areas. - Improve health and reduce environmental impacts of traditional fuels and cooking devices. - Improve access to affordable and diversified energy sources in Africa.
2. Energy efficiency	<ul style="list-style-type: none"> - Reduce poverty by providing access to modern energy services in rural and peri-urban areas. - Improve energy efficiency in all sectors using established practices on standards and labelling techniques. - Improve efficiency in power generation.
3. Renewable energy	<ul style="list-style-type: none"> - Progressively increase contribution of renewable energy mix of all countries. - Improve access to basic health care and education for poor people through the provision of renewable energy systems in primary health care centres and schools. - Promote the use of renewable energy in vaccine and immunisation programmes. - Provide the use of renewable energy to facilitate access to safe drinking water.
4. Advanced fossil-fuel technologies	<ul style="list-style-type: none"> - Increase the use of advanced fossil fuel technologies for energy generation. - Promote the use of clean coal technologies in countries using coal. - Reduce atmospheric pollution from energy generating systems. - Enhance productivity through advanced fossil fuel technologies.
5. Energy and transport	<ul style="list-style-type: none"> - Improve air quality and public health through the introduction of cleaner vehicular fuels. - Implement better transportation practices and systems in mega-cities. - Promote new technologies for transport.

Source: WEHAB Working Group: A Framework for Action on Energy. World Summit on Sustainable Development, Johannesburg 2002.

Sustainable Development in Germany (I)

Government

- **Key Elements of the national Strategy**
 - **Generation Justice,**
 - **Quality of Life,**
 - **Social Co-Operation and**
 - **International Responsibility**

- **Topics of the “Green Cabinet”**
 - **Decoupling the demand for energy and other natural resources from economic growth,**
 - **Reduction of primary energy demand by increased efficiency and rational use of energy,**
 - **Improvements in energy services and**
 - **Emphasis on renewable energy and reduced usage of fossil and nuclear energy**



German Catalogue of SD Indicators

Generation Justice	Quality of Life	Social Bonds	International Responsibility
conservation of resources climate protection renewable energies land use biodiversity national indebtedness economic precautions for the future innovation education	economic prosperity mobility nutrition air quality health crime	employment prospects for families equal rights integration of foreign citizens	development cooperation opening markets



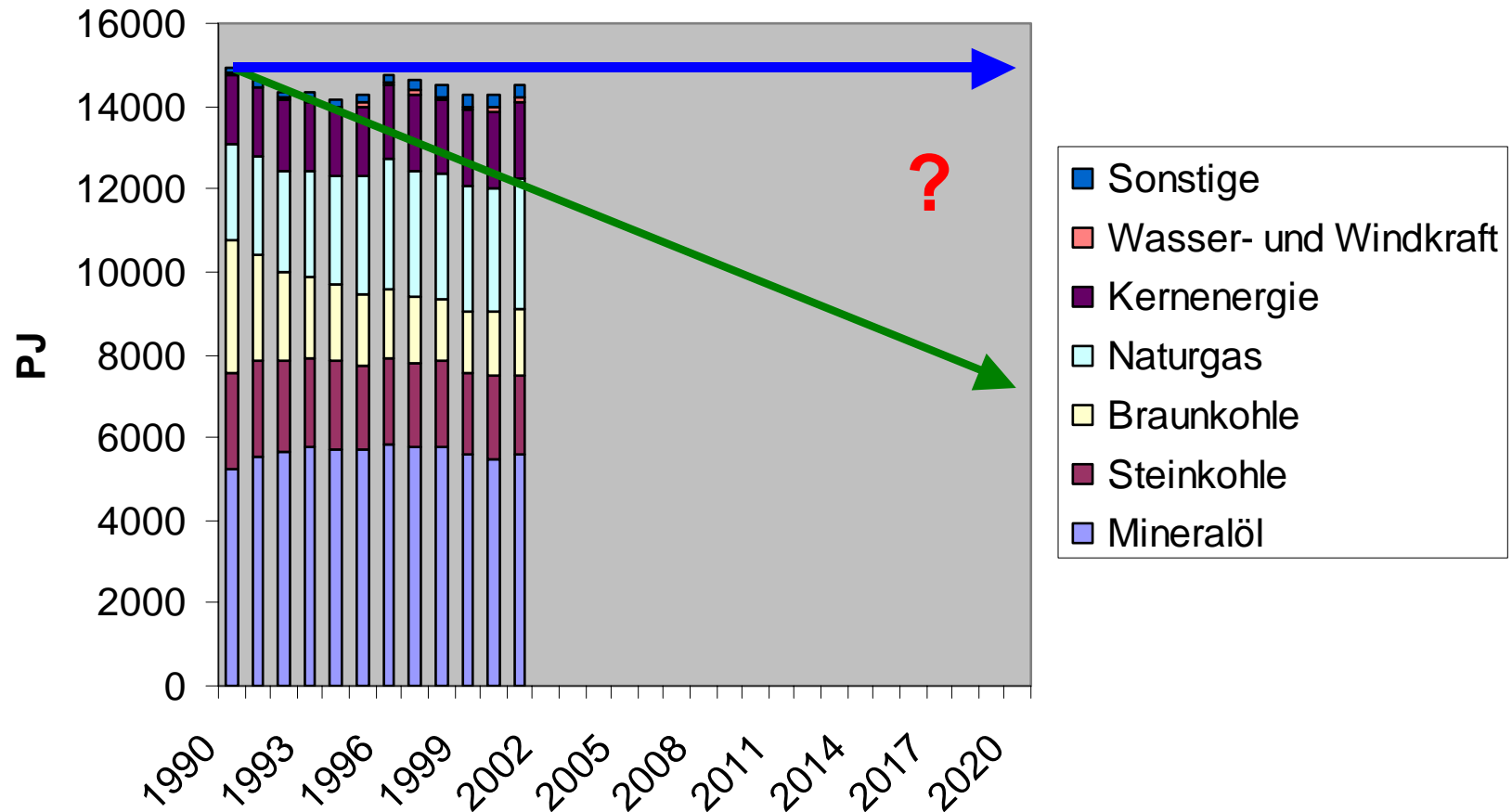
Sustainable Development in Germany (II)

Parliament

- **Study Commissions**
 - **Climate Change**
 - **Sustainable Energy**

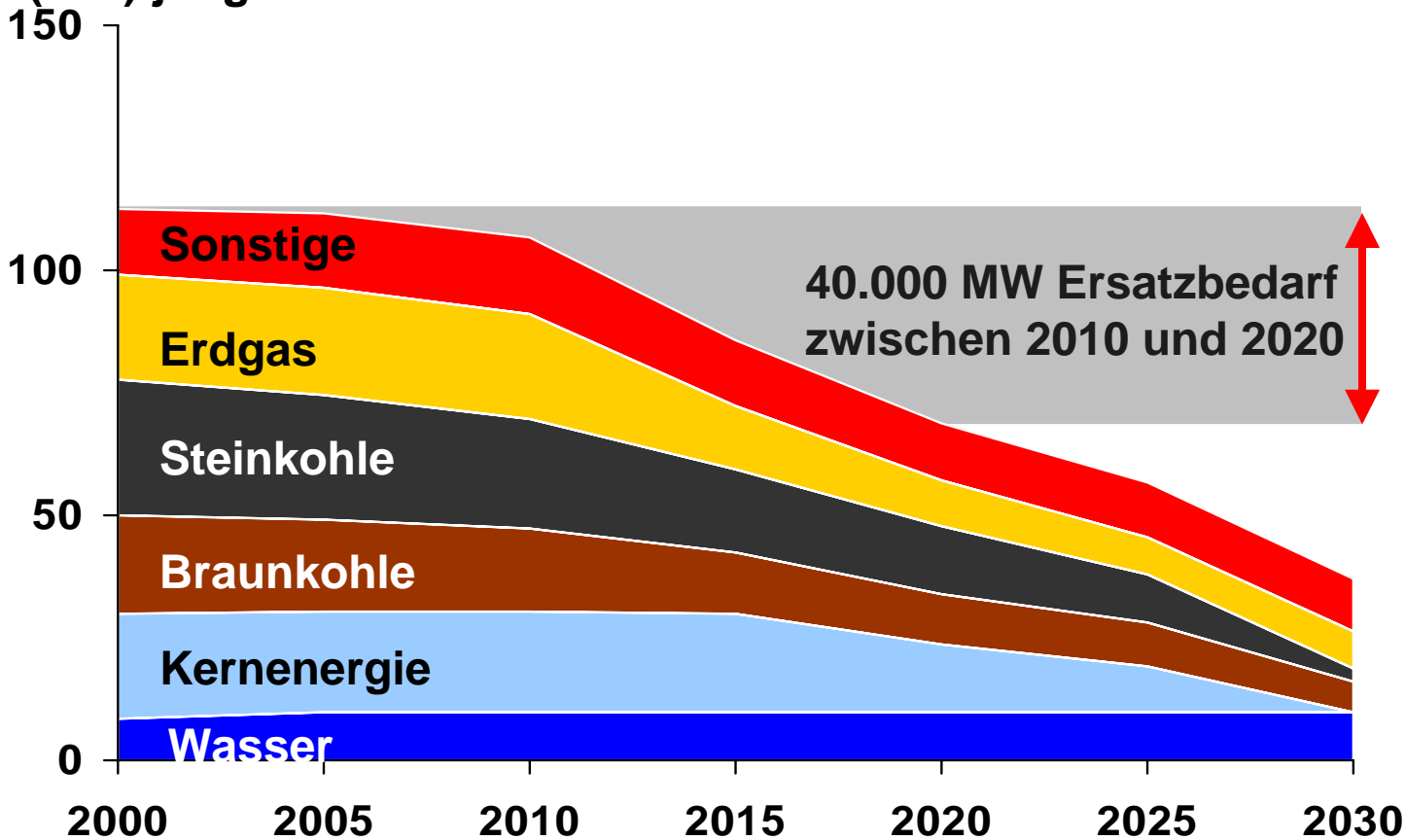
- **Topics of the Study Commission “Sustainable Energy”**
 - **Goals and Indicators**
 - **Instruments**
 - **Measures**

Energy Demand in Germany



Missing Capacities in Germany from 2010

Kraftwerkskapazitäten in Deutschland (GW) jünger als 40 Jahre



Quelle: RWE 2001



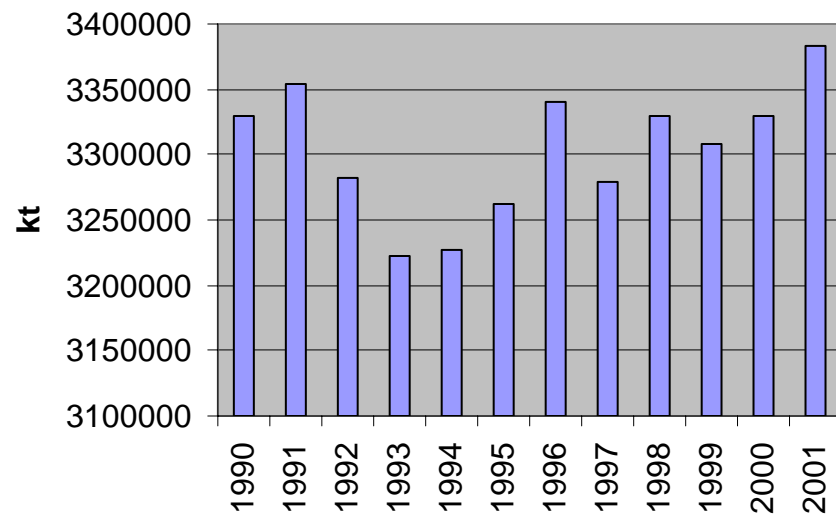
Core Indicators of the Study Commission “Sustainable Energy”

Ecological Dimension	<ul style="list-style-type: none"> Emissions of GHG Emissions of air pollutants Acidification Settlement area Area consumption Non-toxical and non-nuclear waste Toxical waste Nuclear waste Nuclear inventory
Social Dimension	<ul style="list-style-type: none"> Labour Employment rate Household expenses for energy consumption
Economic Dimension	<ul style="list-style-type: none"> Total primary energy supply Renewable energy Nuclear energy Fossil fuels Biomass Primary energy supply per GDP Energy consumption and demand of transportation Energy consumption and demand of households Share of fossil fuels and REN for power generation Range of coverage of different energy sources Total costs of energy supply and energy use Import quota of energy sources
Innovative Dimension	<ul style="list-style-type: none"> R&D-Expenses for energy supply and energy use R&D-Expenses for fossil fuels R&D-Expenses for nuclear fuels R&D-Expenses for REN Coverage of development aid

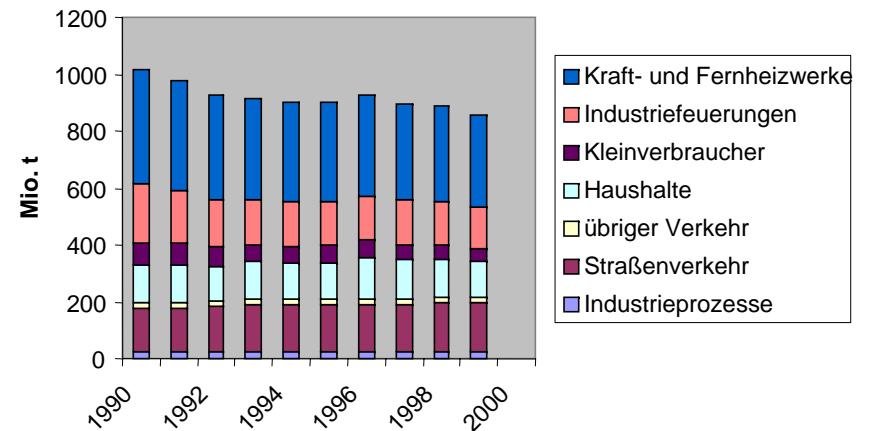


CO₂-Emissions

EU-15

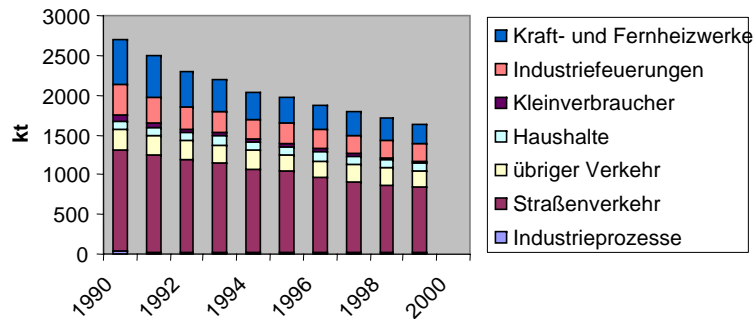


Germany

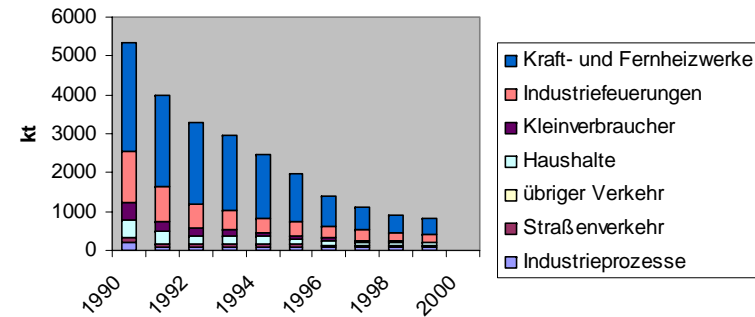


Other Emissions in Germany

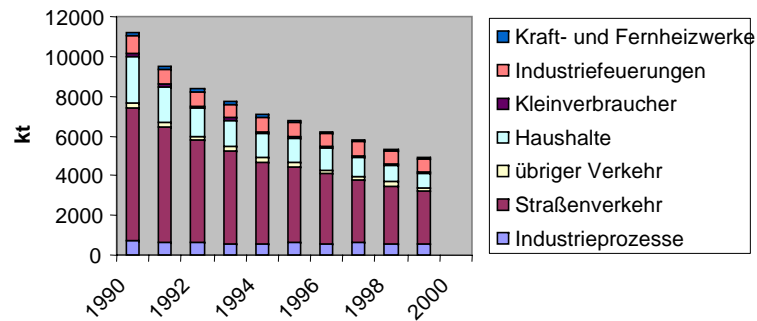
NOx-Emissions



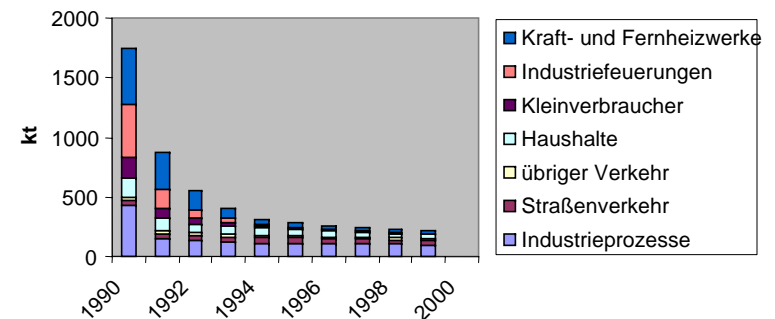
SO₂-Emissions



CO-Emissions

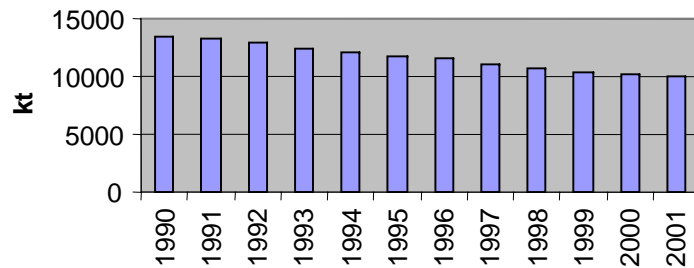


Dust

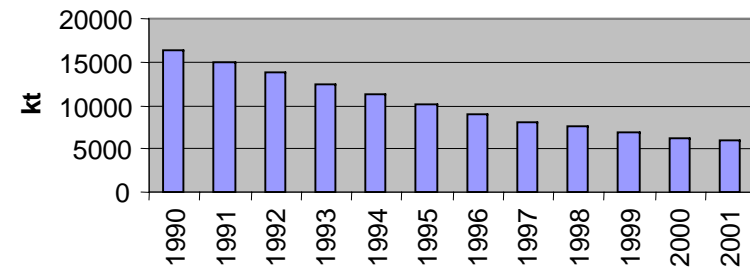


Other Emissions in EU-15

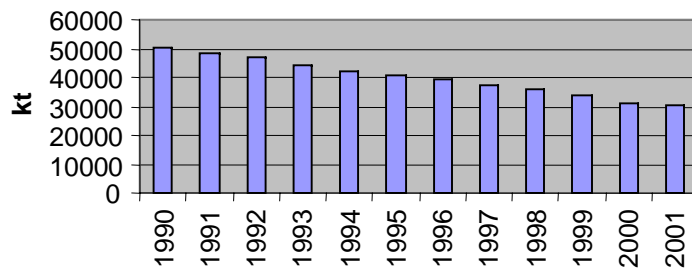
NO_x-Emissions EU-15



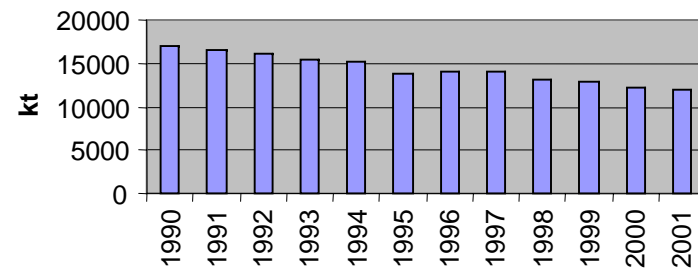
SO₂-Emissions EU-15



CO-Emissions EU-15



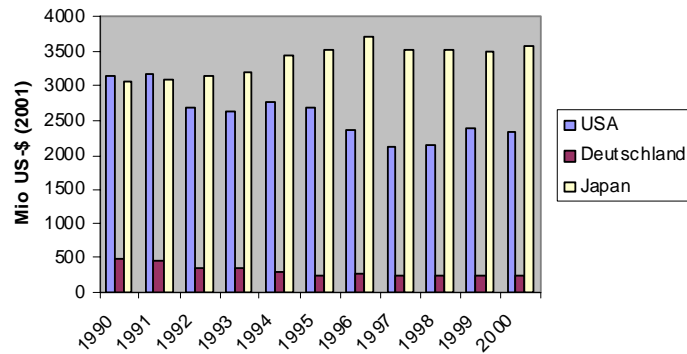
Dust EU-15



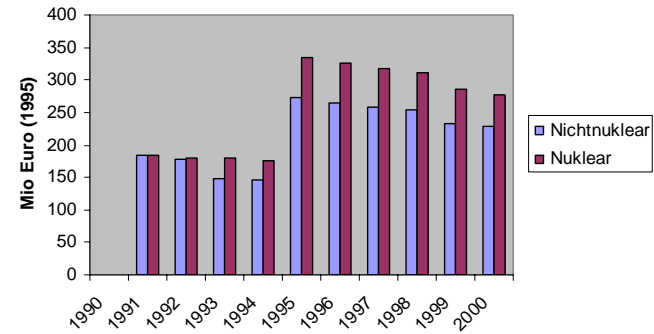


Expenditures for Energy R&D

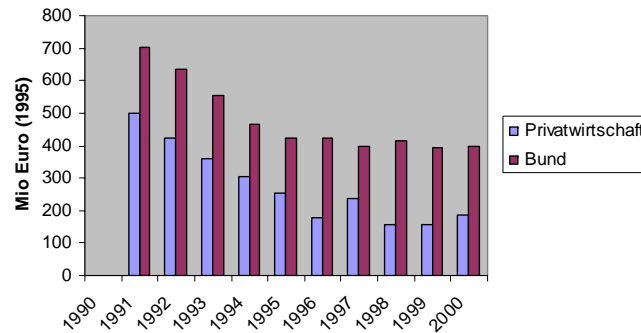
USA, Germany, Japan



EU-15



Germany





Conclusions (I)

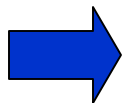
General

- Sustainable Development represents an open process with respect to decisions of present and future generations
- Societal and political decision making has to reflect that the understanding of the corresponding natural and social systems is not yet complete

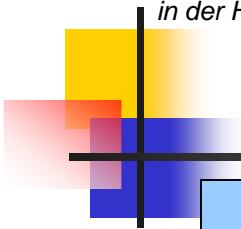
Conclusions (II)

Energy sector

- The approach to Sustainable Development starts in many cases from the supply side of energy assuming that new and advanced technology will suffice to full-fill demand
- The assessment of existing energy technologies does not yet show a consistent picture
- One-side approaches focussing on efficiency will probably not be sufficient as many experts already have pointed out
- Increased efficiency has to be complemented by rational use of energy including all aspects up to questioning consumption patterns particular in the industrialised countries



**Gap between vision and reality can only be closed
by intensified science and research**

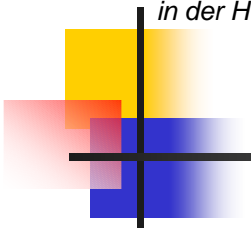


Thanks for your Attention!

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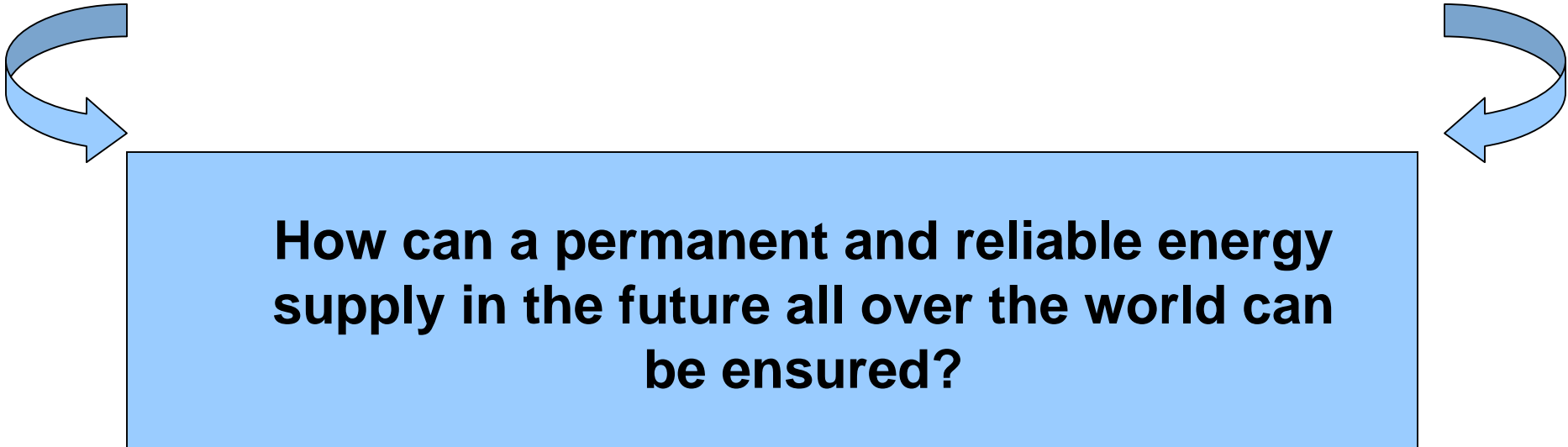
Sustainable Development in Germany

- ➔ Focus of the German Green Cabinet is also on the energy sector
- ➔ Main goal consists of decoupling the demand for energy and other natural resources from economic growth
- ➔ Specific action should take place in the following fields:
 - Reduction of primary energy demand by increased efficiency and rational use of energy,
 - Improvements in energy services and
 - Emphasis on renewable energy and reduced usage of fossil and nuclear energy



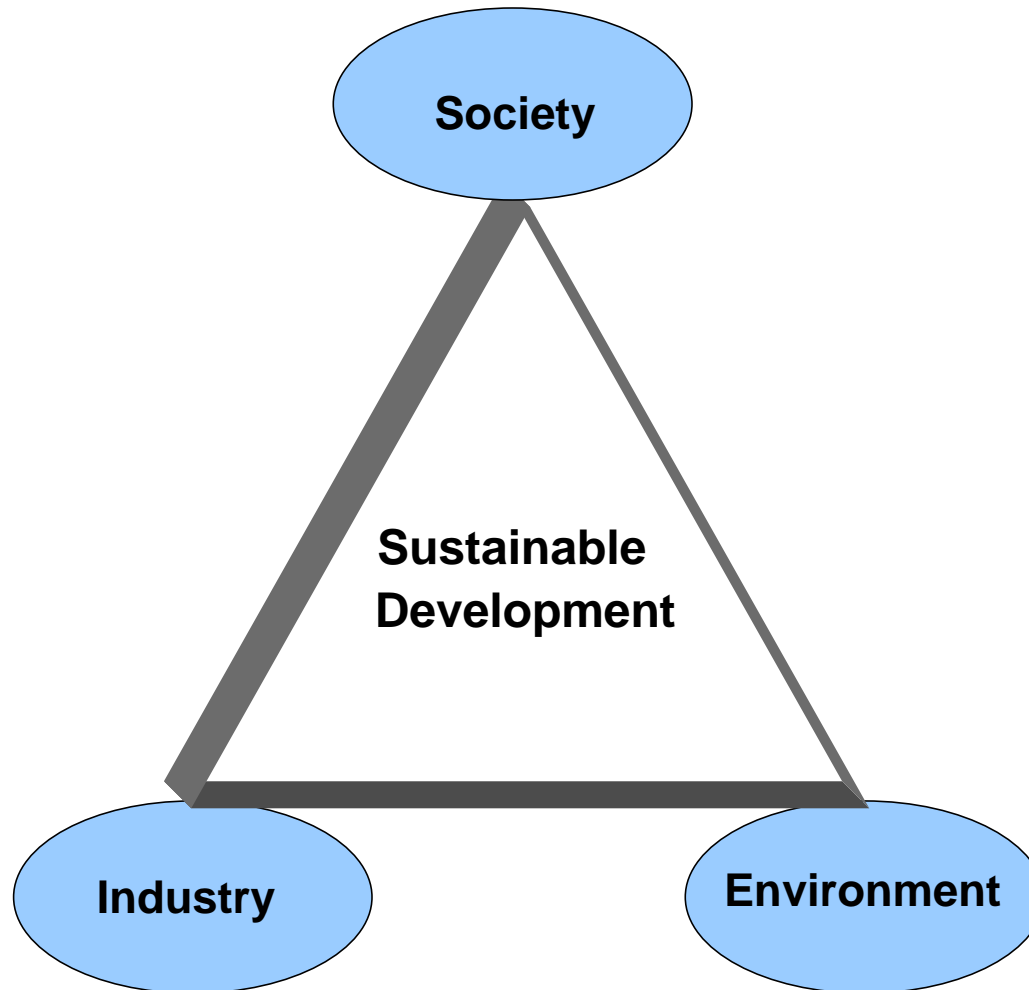
Energy in the Context of Sustainable Development

„Energy is necessary for daily survival. Future development crucially depends on its long-term availability in increasing quantities from sources that are dependable, safe and environmentally sound. At present, no single source or mix of sources is at hand to meet this future need.“
(„Our Common Future“ / 7th Chapter)



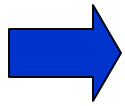
How can a permanent and reliable energy supply in the future all over the world can be ensured?

Dimensions of „Sustainable Development“





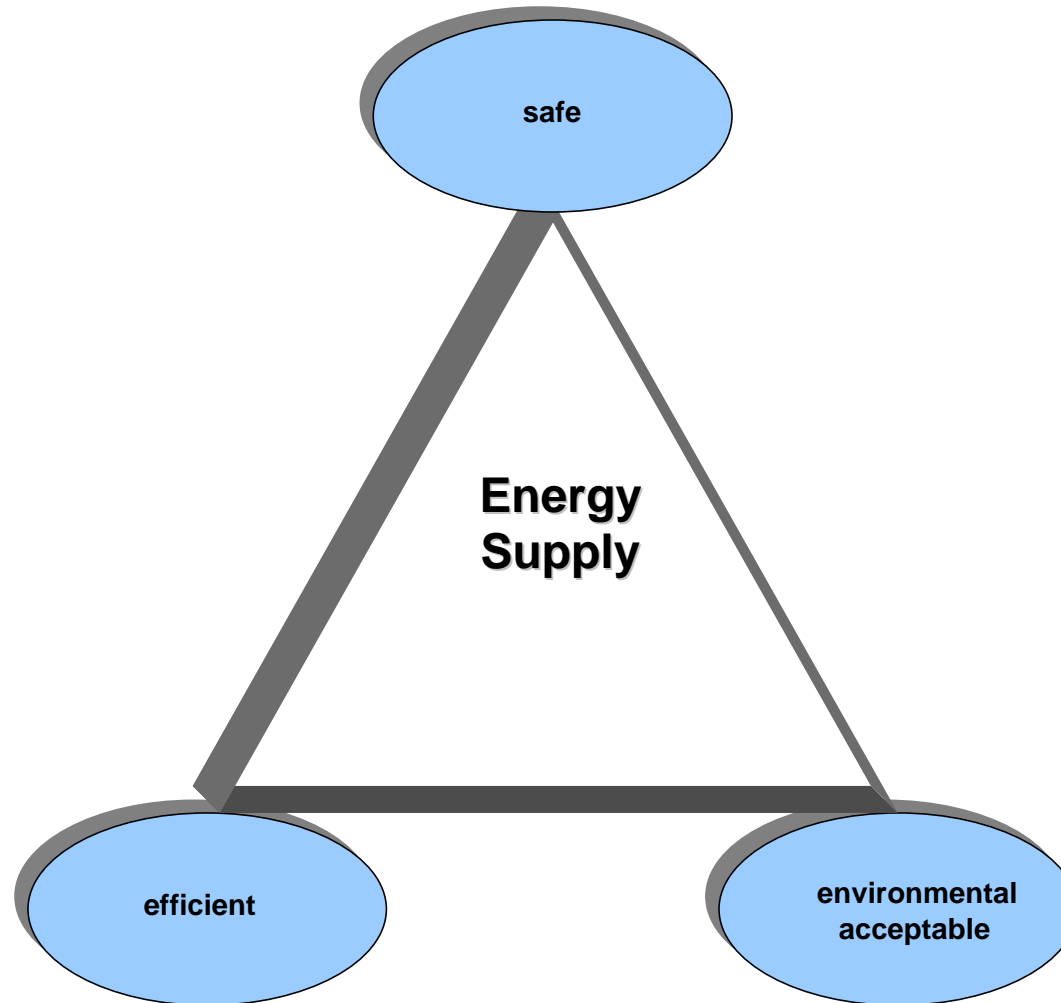
Sustainable Development in Germany



Key Elements of the national Sustainable Development Strategy:

- Generation Justice,
- Quality of Life,
- Social Co-Operation and
- International Responsibility

Pillars of „Sustainable Development“

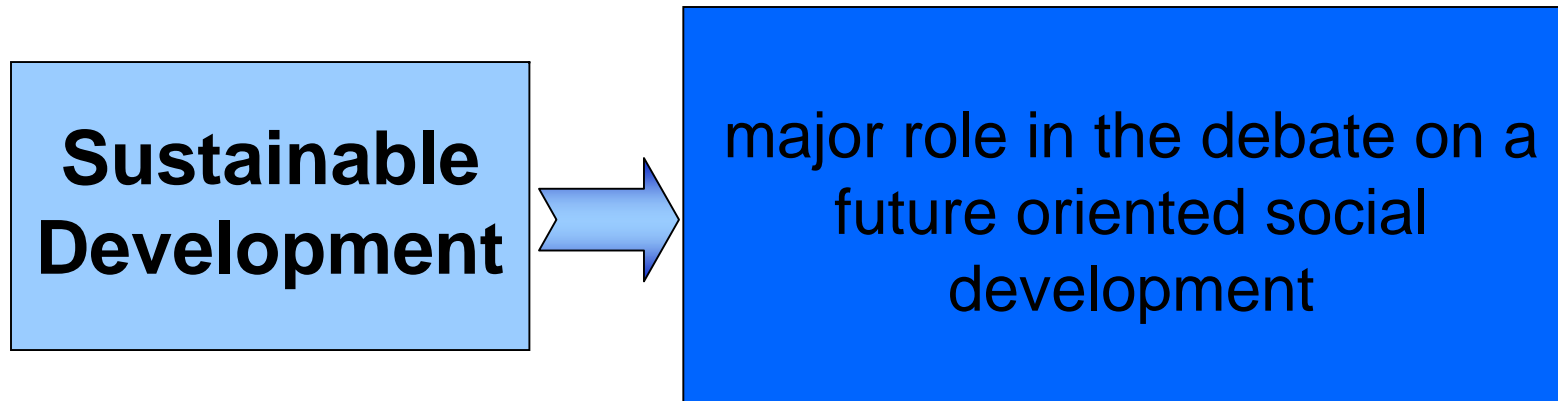




History of Sustainable Development

- **1972 United Nations Action Plan for the Human Environment**
- **1987 Brundtland-Commission**
 - *„Our Common Future“*
- **1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro**
 - *Agenda 21*
- **1997 „Rio plus 5“-Conference in New York**
- **2002 „Rio plus 10“ – Conference in Johannesburg**

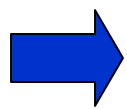
Key Elements of Sustainable Development



Key Elements:

linking economic progress to the conservation of the natural environment and to maintain social justice

Aims of the Brundtland-Commission (I)

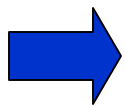


The Brundtland Commission derives the following claims for a Sustainable Development in the energy sector:

- Expansion of energy supply to meet the demand for energy services to a sufficient extent world wide,
- Measures to improve efficient energy use,
- Reduction of health risks associated with energy use,
- Measures for the protection of the biosphere and prevention of the increase of local environmental pollution



Aims of the Brundtland-Commission (II)

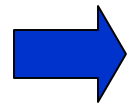


The recommendations derived by the Brundtland Commission can be subsumed under the following keywords:

- Lowering specific per-capita energy
- Expanding the investments for the development of technologies and mechanisms resulting in a reduction of energy consumption and
- Reducing the provision of energy from non-renewable resources



UN-Summit in Rio de Janeiro (I)



The following concrete measures and their implementations are proposed in the Agenda 21:

- Cooperation in identifying and developing economically viable, environmentally sound energy sources to promote the availability of increased energy supplies to support sustainable development efforts, in particular in developing countries;
- Promoting the development at the national level of appropriate methodologies for making integrated energy, environment and economic policy decisions for sustainable development through environmental impact assessments;
- Promoting the research, development, transfer and use of improved energy-efficient technologies and practices, including endogenous technologies in all relevant sectors, giving special attention to the rehabilitation and modernization of power systems, with particular attention to developing countries;
- Promote the research, development, transfer and use of technologies and practices for environmentally sound energy systems, including new and renewable energy systems, with particular attention to developing countries;



UN-Summit in Rio de Janeiro (II)

- Promote the development of institutional, scientific, planning and management capacities, particularly in developing countries, to develop, produce and use increasingly efficient and less polluting forms of energy;
- Preview of current energy supply mixes to determine how the contribution of environmentally sound energy systems as a whole, particularly new and renewable energy systems, could be increased in an economically efficient manner, taking into account respective countries unique social, physical, economic and political characteristics, and examining and implementing, where appropriate, measures to overcome any barriers to their development and use;
- Coordination of energy plans regionally and subregionally, where applicable, and study the feasibility of efficient distribution of environmentally sound energy from new and renewable energy sources;
- in accordance with national socio-economic development and environment priorities, evaluate and, as appropriate, promote cost-effective policies or programmes, including administrative, social and economic measures, in order to improve energy efficiency;



UN-Summit in Rio de Janeiro (III)

- Build capacity for energy planning and programme management in energy efficiency, as well as for the development, introduction, and promotion of new and renewable sources of energy;
- Promote appropriate energy efficiency and emission standards or recommendations at the national level, aimed at the development and use of technologies that minimize adverse impacts on the environment;
- Encourage education and awareness-raising programmes at the local, national, subregional and regional levels concerning energy efficiency and environmentally sound energy systems;
- Establish or enhance, as appropriate, in cooperation with the private sector, labelling programmes for products to provide decision makers and consumers with information on opportunities for energy efficiency.



Johannesburg – Plan of Implementation

- Poverty Eradiction,
- Changing Unsustainable Patterns of Consumption and Production,
- Protecting and Managing the Natural Resource Base of Economic and Social Development
- Sustainable Development in a Globalizing World,
- Health and Sustainable Development,
- Sustainable Developments of Small Island States,
- Sustainable Development for Africa,
- Means of Implementation and
- Institutional Framework for Sustainable Development

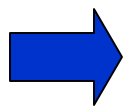


Conclusions (I)

- Sustainable Development represents an open process with respect to decisions of present and future generations
- Societal and political decision making has to reflect that the understanding of the corresponding natural and social systems is not yet complete
- For the energy sector, the approach to Sustainable Development starts in many cases from the supply side of energy assuming that new and advanced technology will suffice to full-fill demand
- The assessment of existing energy technologies does not yet show a consistent picture

Conclusions (II)

- One-side approach focussing on efficiency will probably not be sufficient as many experts already have pointed out
- Increased efficiency has to be complemented by rational use of energy including all aspects up to questioning consumption patterns particular in the industrialised countries
- International treatment of model problems like climate change already indicates the difficulties to achieve international concerted action
- Appropriate treatment of these model problems seems absolutely necessary with respect to Sustainable Development



Gap between vision and reality can only be closed by intensified science and research