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The contribution of renewable energy sources and rational use of energy to economic development

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Some basic aspects of RE/EE

There is no comprehensive study concerning economic effects!
But:
there are some circumstantial evidences and good examples.

Aspects that have to be taken into account:

1. Direct effects (investments, jobs etc.)
2. Indirect effects
   - Impacts on other branches
   - Avoided costs (climate change, health problems etc.)
   - Supply security
   - Impacts on competitiveness and innovation power
   - …

Indirect effects of RE/EE - a few examples

- RE/EE are indigenous energy "sources"
  => security of supply rises

- EE projects/processes increase the transparency of firms
  => better understanding of what happens
  => new ideas rise
  => enterprises become more innovative
  => competitiveness increases

- RE/EE are less polluting
  => **"external" costs will be diminished**

Air pollution in general causes damage to ...

- human health (morbidity and mortality)
- soils and plants (e.g. losses in yields)
- buildings, structural metals and art work
- social assets (e.g. loss in recreation areas)

that means in other words: high economic costs!

Energetic Aspects of Indonesia in 1991

- energy supply was based by 98 % on fossil fuels and traditional biomass
- share of traditional biomass was about 31 %
- 86 % of the biomass has been burned in households
- more than 50 % of the annual energy consumption was used in households (biomass, refined products, electricity)

=> households are the main contributor of air pollution

Case study: Indonesian Health Costs (World Bank 1994)

Comparison between
- the additional costs of air protection and
- the „doing nothing health costs“ for Jakarta.

These „doing nothing health costs“ mainly include:
- avoidable mortalities
- treatment of diseases
- lost working days (causes by suspended particulates, lead and nitrogen dioxide exposure)

Not considered:
- the whole set of hazardous air pollutants
- long-term damages to natural ecosystems etc.
- health costs in other cities of Jawa (Bandung, Surabaya ...)

Cost comparison for Indonesia

Year	Additional cost for ERC, 10^6/yr (1989)	Health cost for Jakarta only, 10^6/yr (1990)
1991	0	280
1996	0	585
2001	1,070	1,150
2006	1,430	1,890
2011	1,570	2,910
2016	2,300	4,130
2021	3,460	(5,340)

Avoidable Health Costs of Pollution in Jakarta, 1990

Pollutant	Total Value (US$ millions) Low	Central	High
Air pollution			
Suspended Particulates			
Avoidable mortality	15	113	262
Avoidable Illness	41	44	65
Lead			
Avoidable mortality	3	25	60
Avoidable Illness	37	37	37
Nitrogen dioxide			
Avoidable Illness	1	1	1
Total air pollution	97	220	425
Water pollution			
Fecal Contamination			
Avoidable mortality	40	300	700
Avoidable Illness	1	3	6
Total water pollution	41	303	706
Total air and water pollution	138	523	1,131

Regional value added

	Oil heating system	Wood heating system
Foreign countries	Euro 59,-	Euro 0,-
Germany	Euro 41,-	Euro 100,-

(referred to Euro 100,- for investing and fuel costs)

Austrian experiences (EnergieWirt BAUER 2000)

Fossil fuels

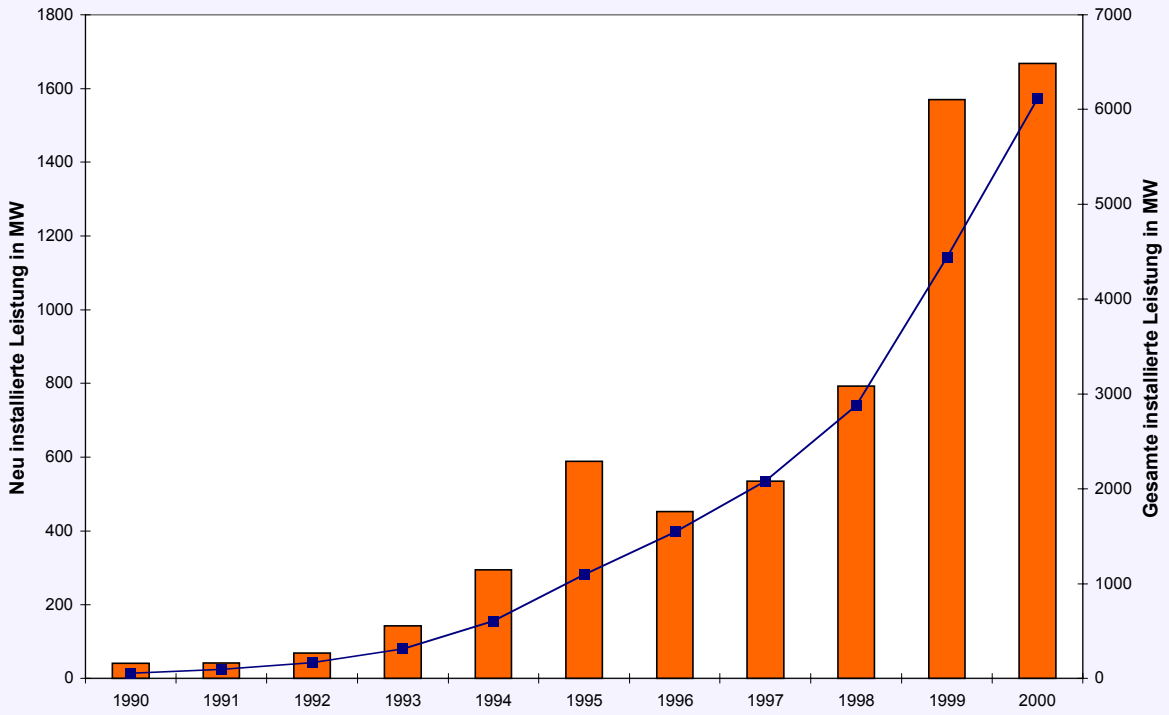
= 9 jobs

Bioenergy

= 135 jobs

Relating to:
Town with 10,000 people
4,000 heating objects
40 MW heat demand

Wind energy in Germany



Impacts of renewable energy sources in Germany

All together investments of about 4 bi Euro have been taken in 2000:

- Wind energy: 1.9 bi Euro
- Bioenergy: 1.0 bi Euro
- Solar thermal: 0.6 bi Euro
- Photovoltaic: 0.3 bi Euro
- Other: 0.3 bi Euro

The return for feeding in electricity amounts to 2.6 bi Euro, avoided costs for heating fuels come to 1.4 bi Euro (primary energy share of RE is ca. 2,5 %).

These facts lead to more than 120,000 employees that are dependent from RE!!!

To compare:
labour intensity of RE: 1 per 50,000 Euro GDP
labour intensity of fossil/nuclear: 1 per 130,000 to 150,000 Euro GDP

Environmental policy impacts

Actually, the German environmental sector (1.3 mi jobs) is, economically seen, more important than the mechanical engineering (1.15) or the food sector (0.97).

Even in the most conservative estimation, a 25 % reduction of materials and energy would create 160,000 jobs in Germany until 2020 (Prognos 1999).

B.A.U.M., a German business group for environment-conscious management, expects even 1.5 million new jobs due to environmental politics.

Canadian experiences show, that the specific employment rate due to energy efficiency investments is five times higher than the one due to conventional energy resources.

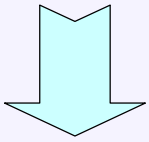
"New economy"

Some new economic options exist:

- green electricity
- green investments
- e.g. wind shares, solar holdings
- green funds
- joint ventures between industry and utilities
- contracting
- entire stock market
- venture capital
- life insurances
- …

Conclusion

An economic push can be created by setting the right frame conditions for developing a RE/EE market



Try to be the first in Latin America

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the earlier the better!