

# Energy and Climate – the 21th Century Flight to the Moon Reconsidered

Swiss Climate Change Day  
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ETH Zürich







- Moon flight and 2000 Watt Society
- The technological challenge
- A problem of another kind
- Time scales
- The changing role of science



## The flight to the moon

In 1961, shocked by the first Russian space flight, J.F. Kennedy promised to the Americans that before the end of the decade an American would land on the moon. At that time, in most European countries the average energy consumption was less than 2000 Watt per person. Today, consumption is 2 to 4 times larger.



# The flight to the moon of the 21th century

In January 2000, in a special edition of the *ETH Bulletin* dedicated to energy, *Dieter Imboden and Caroline Roggo* presented the then new project of the ETH Domain “**The 2000 Watt Society**”. They compared the task to transform a country like Switzerland into a 2000 Watt society to Kennedy’s challenge of 1961 and coined the term:

**The 2000 Watt Society –  
the 21th century flight to the moon.**



**In the 21th century, the challenges of mankind will be of a different nature than the technology based projects such as the Manhattan Project<sup>a</sup> or the flight to the moon.**

<sup>a</sup> The goal of the Manhattan Project during the 2nd World War was to develop a nuclear bomb before the Germans, as the Americans feared, would have such a weapon.

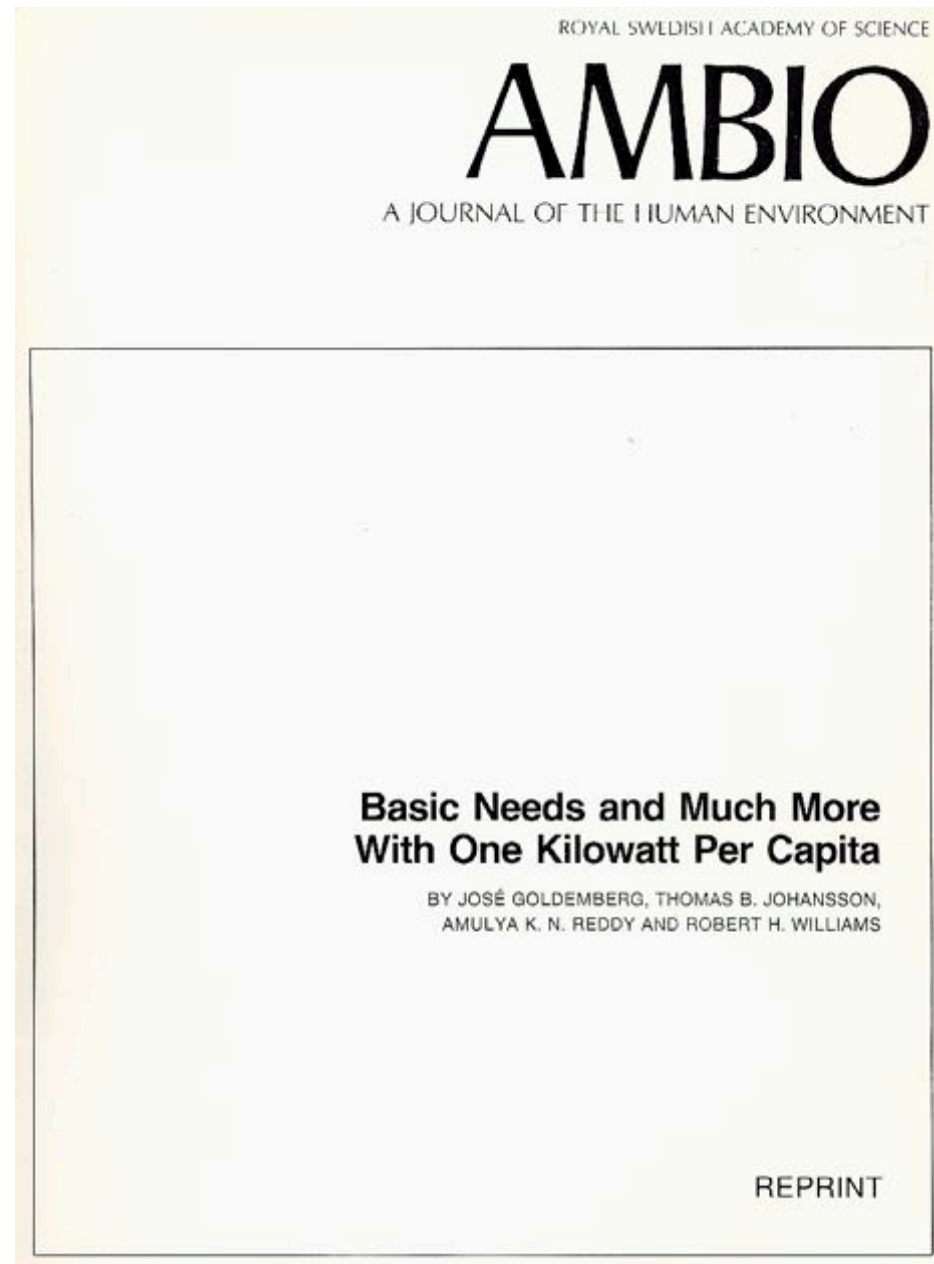
**Have we made progress in that project ,of a different kind‘?**





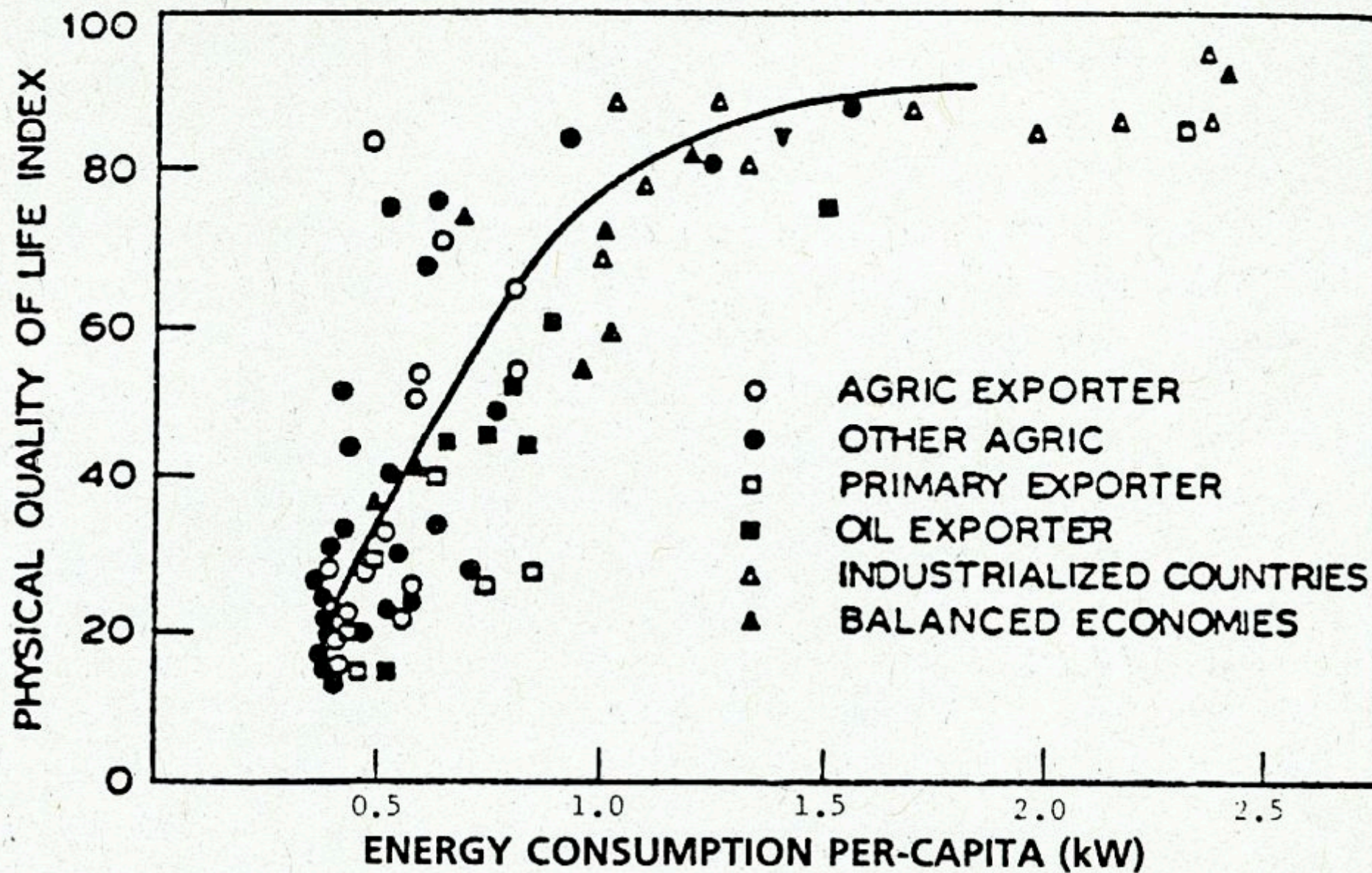
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- The technological challenge





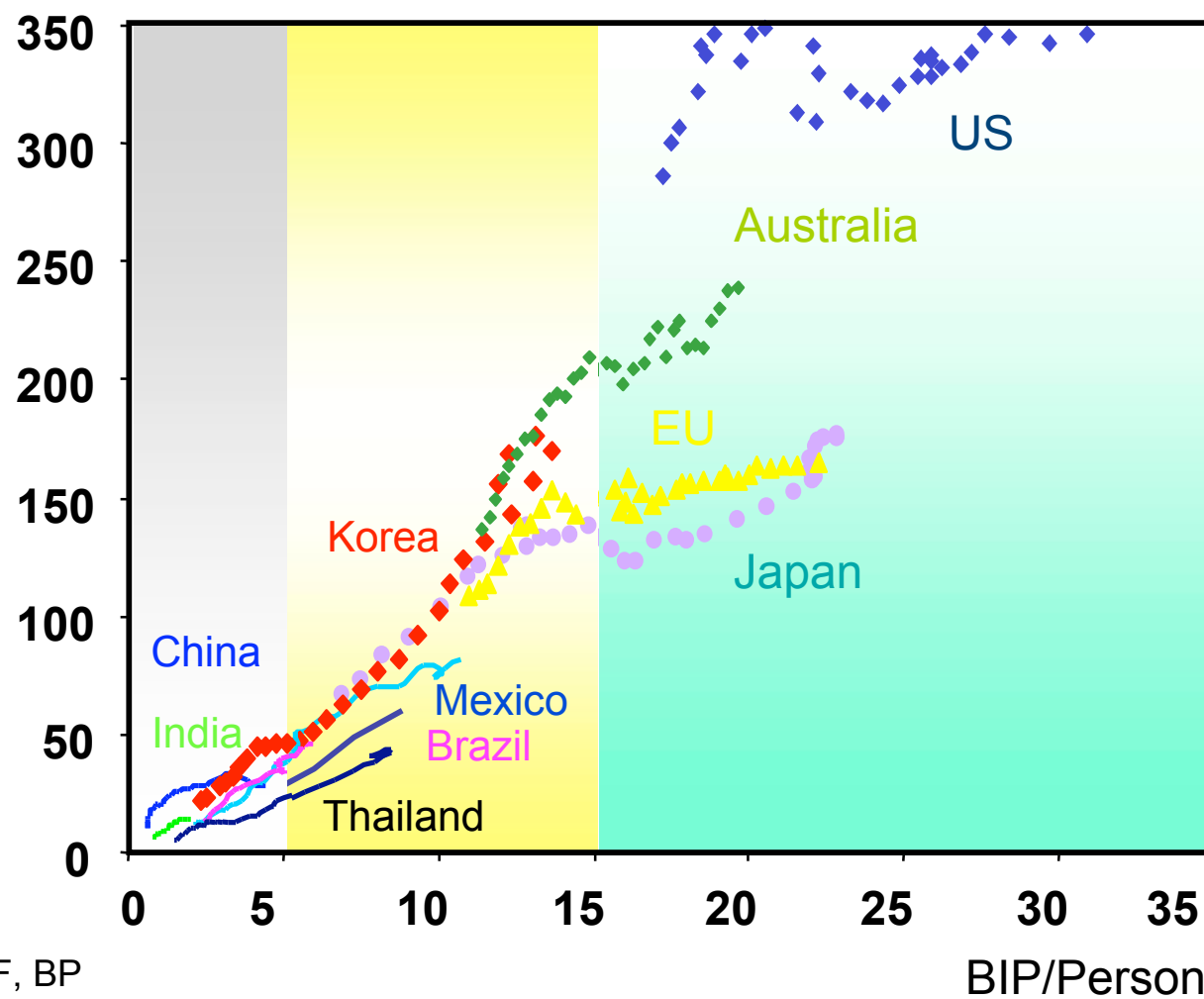
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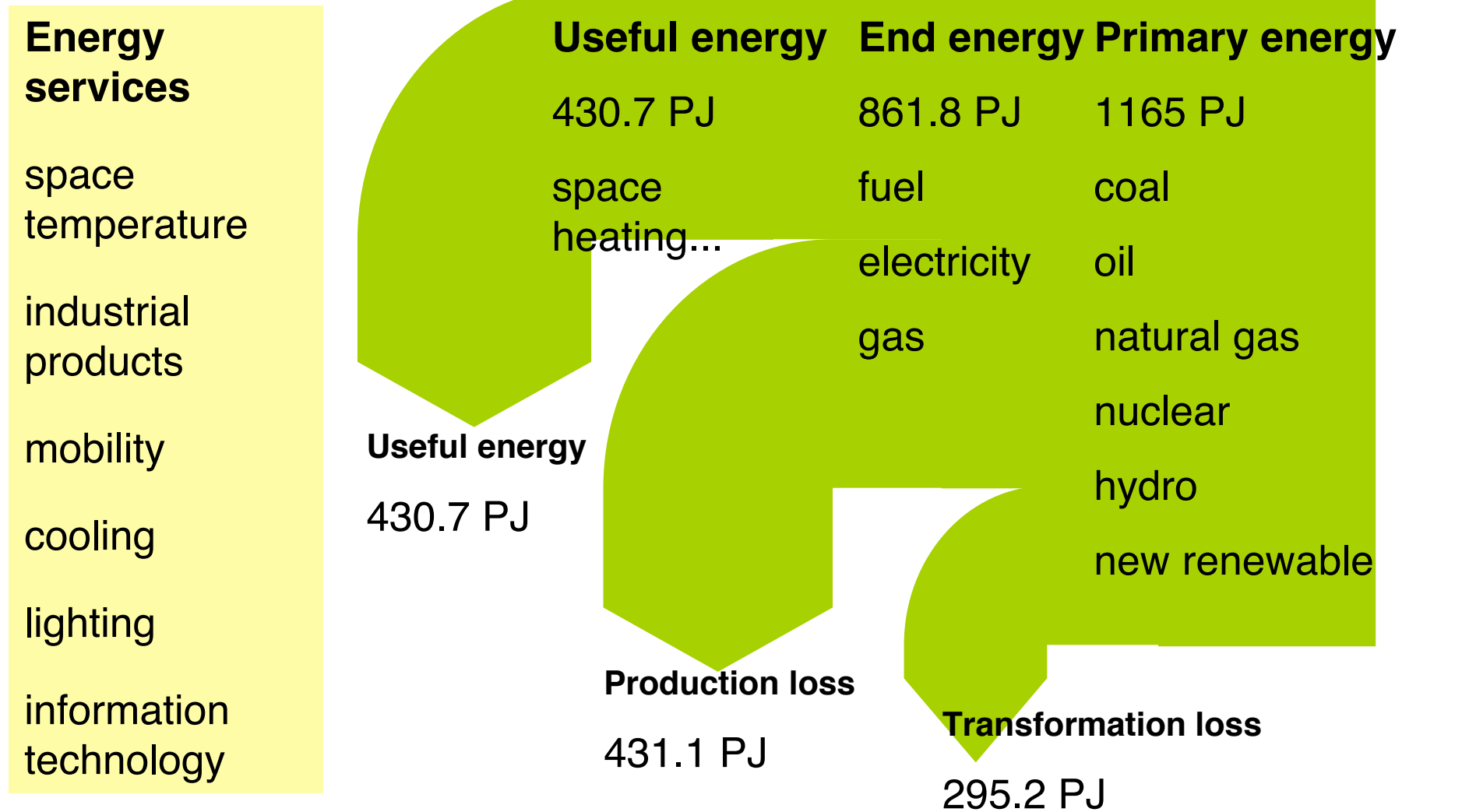
GJ/Person



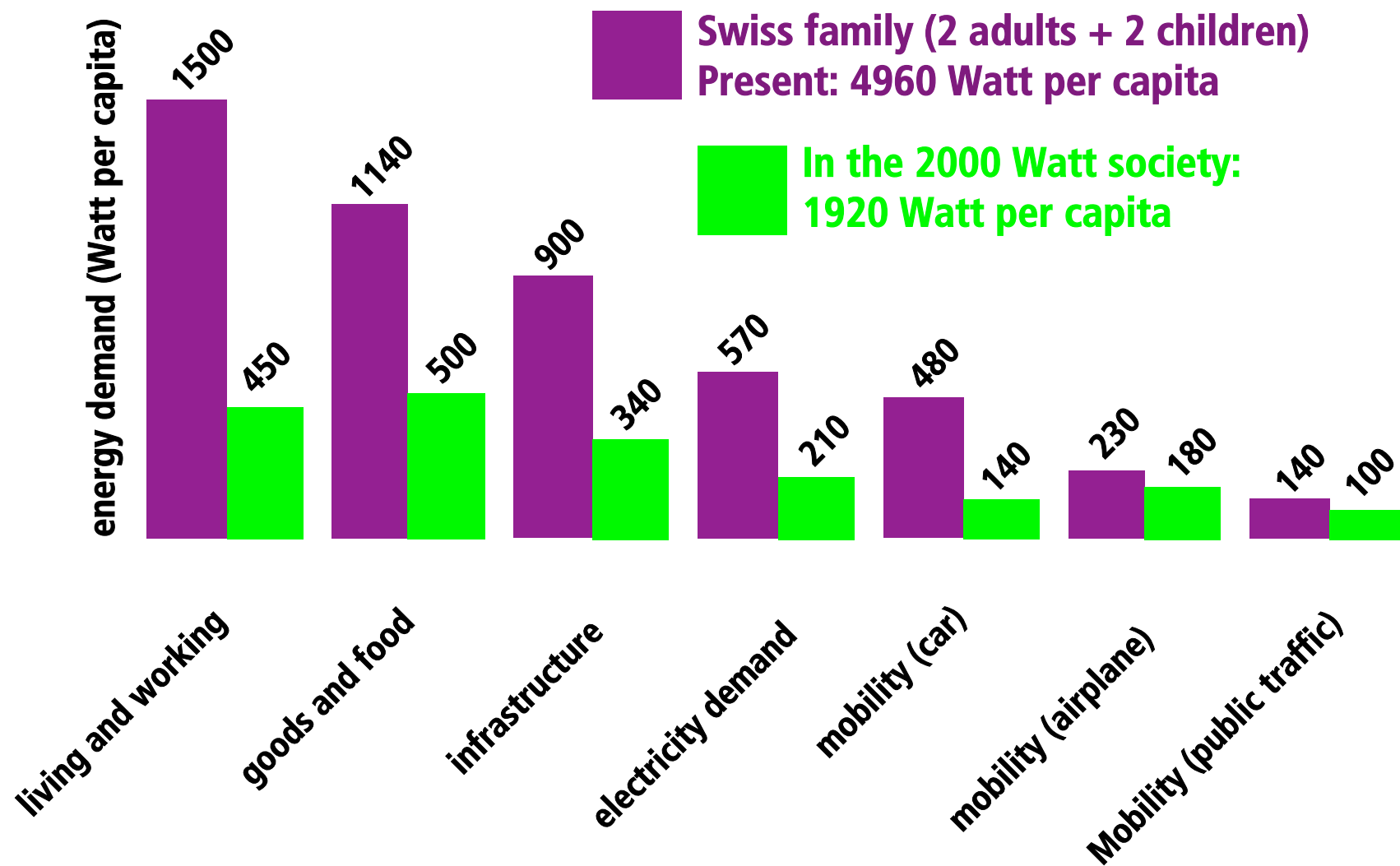
Source: IMF, BP



# Swiss Energy Flow Diagram

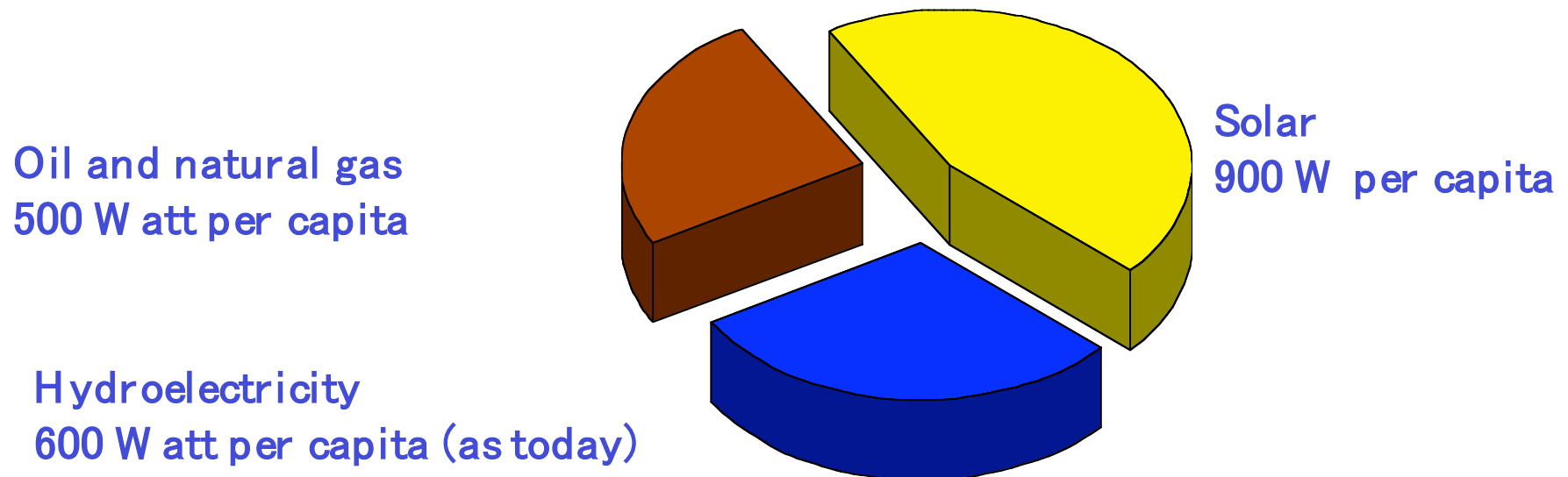








## Possible energy mix in the 2000 W-society



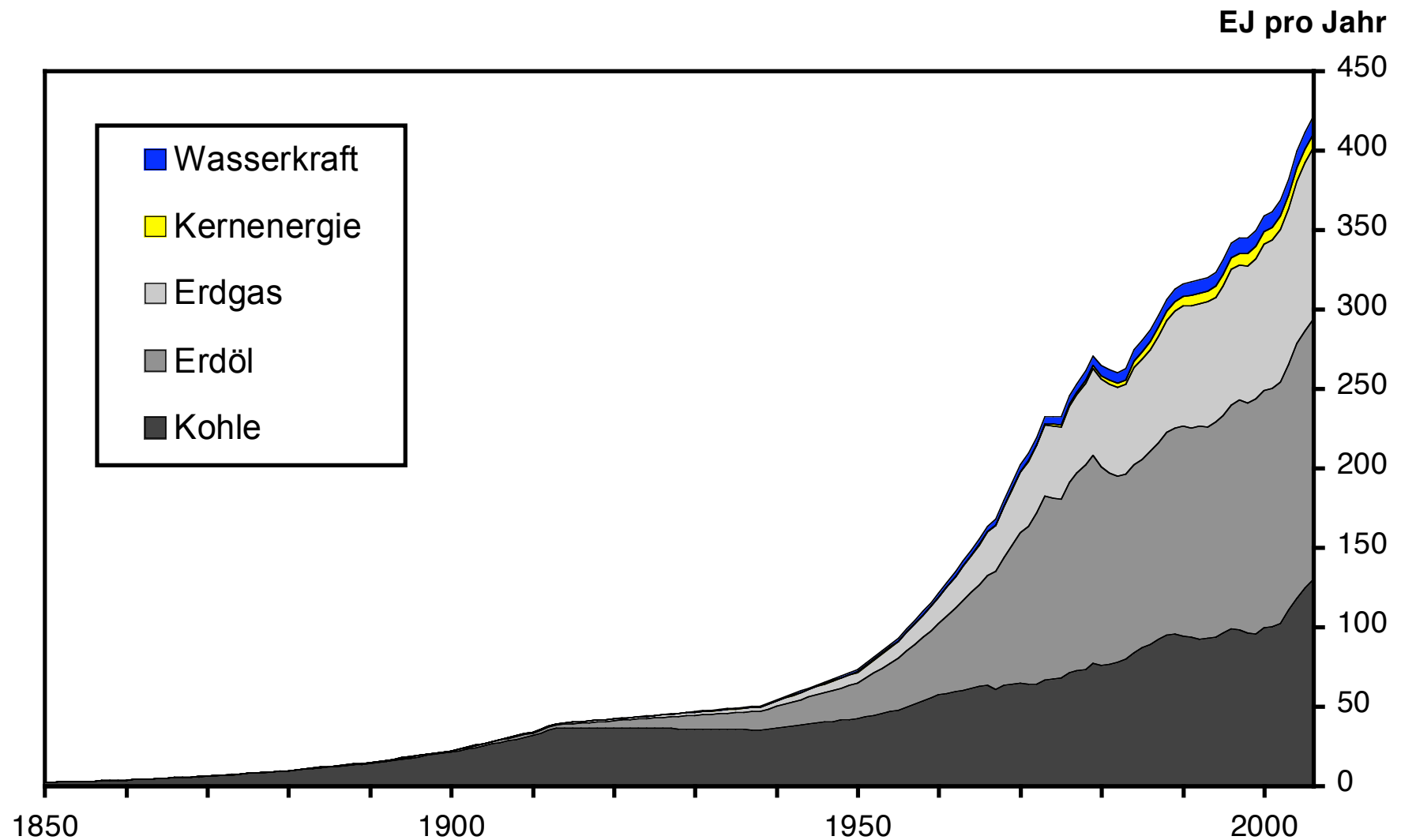
Total 2 '000 W att per capita



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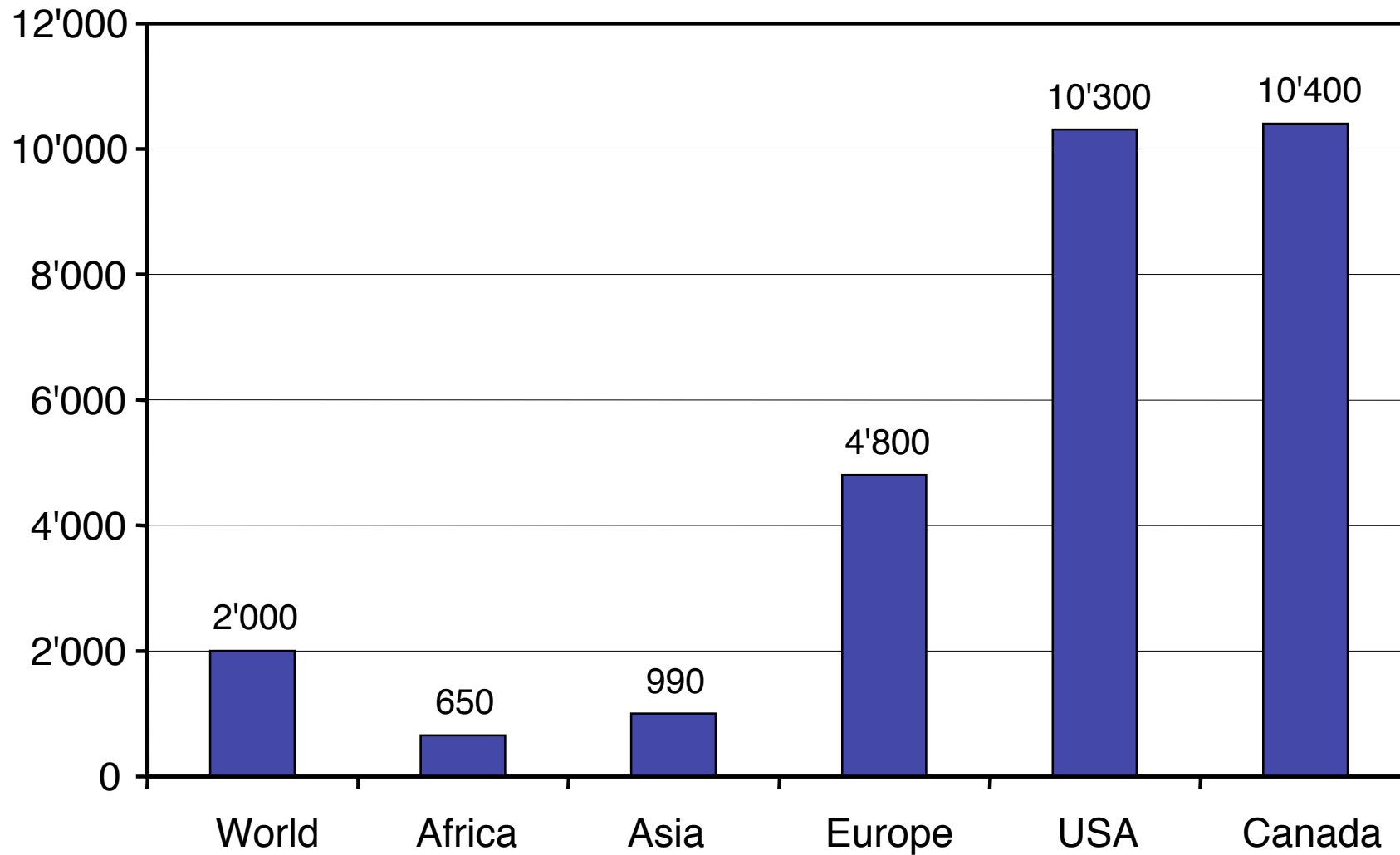


# Global Energy Demand 1850 - 2006



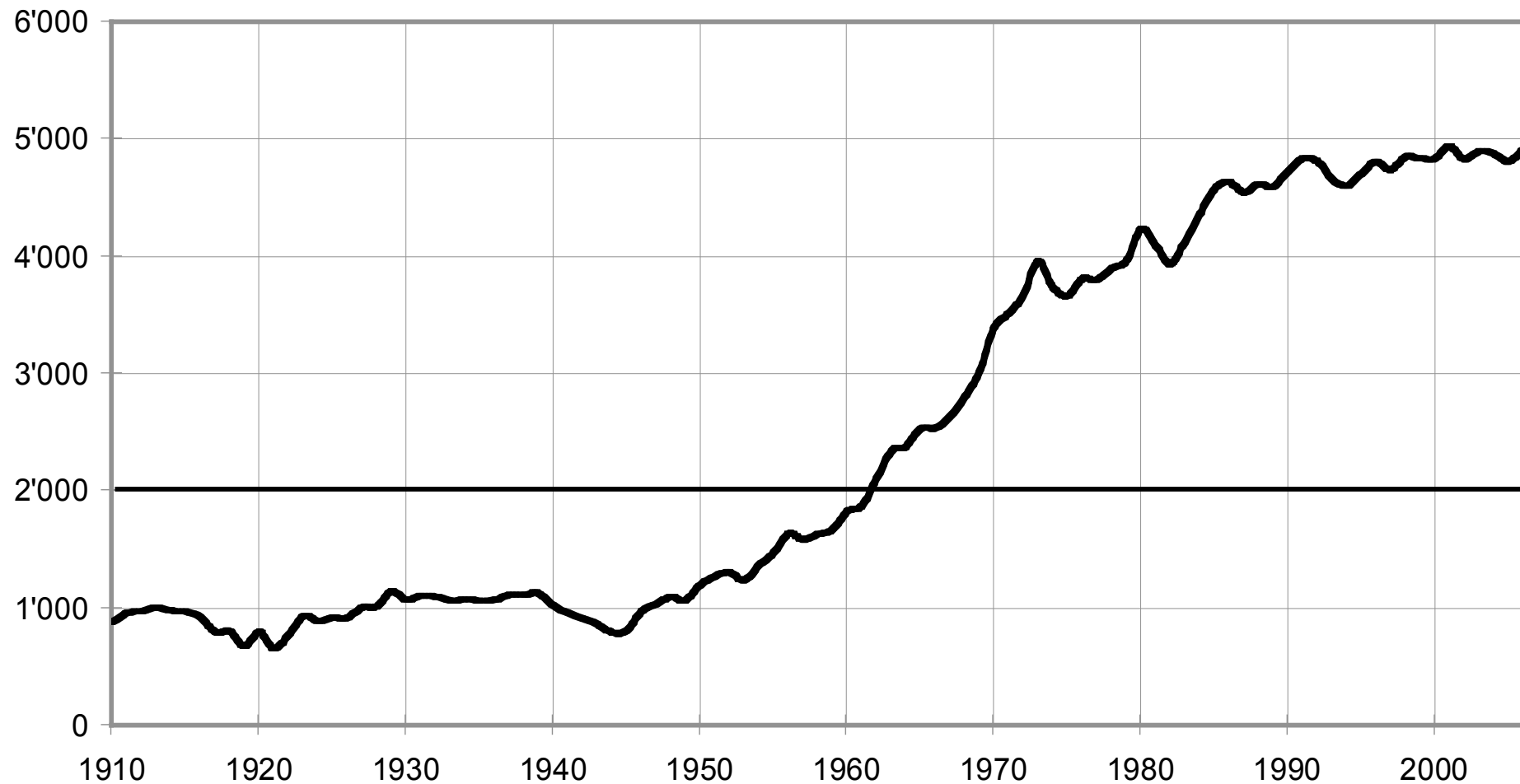


## Energy Demand [Watt/cap]



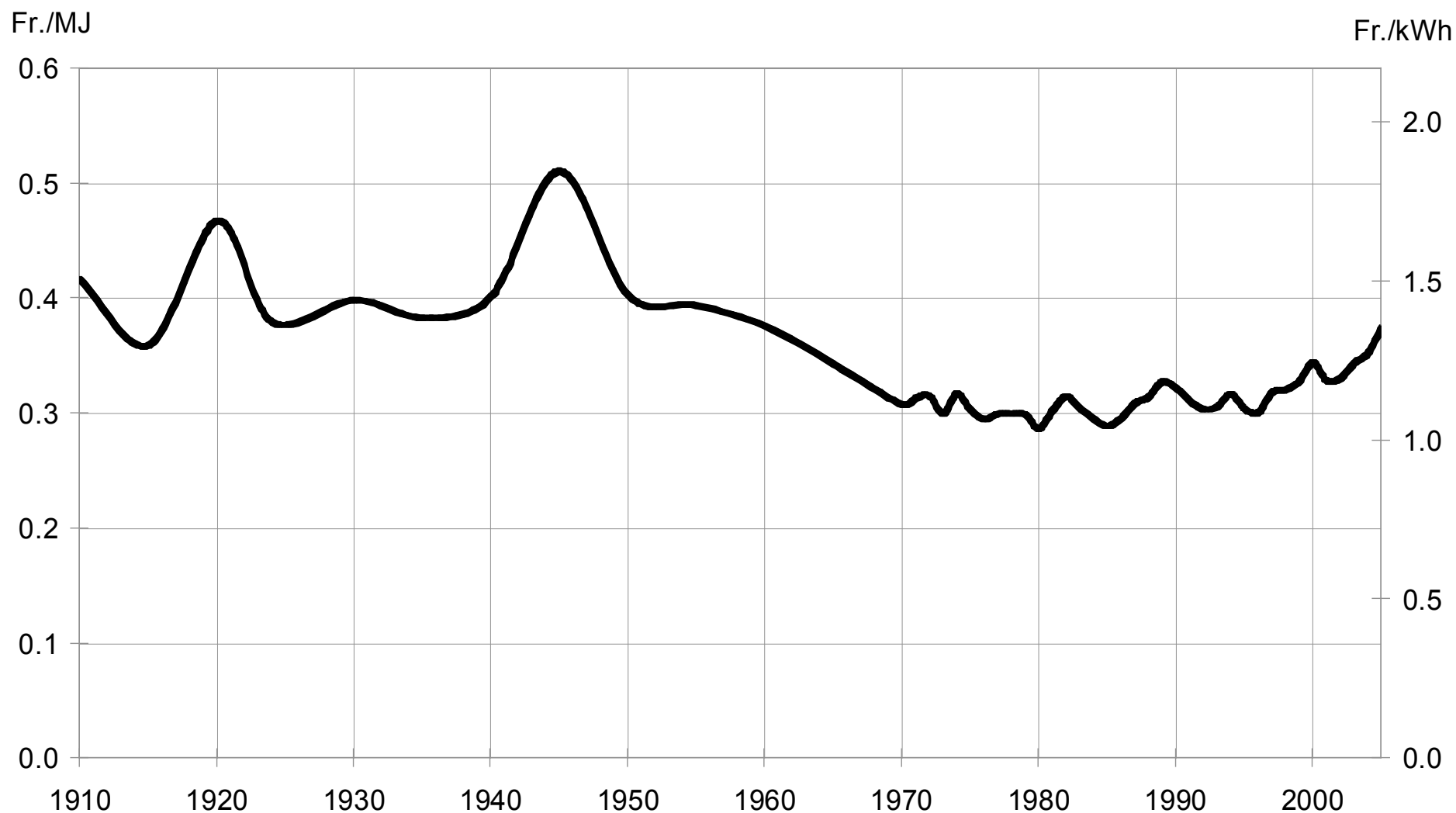


## Switzerland: Primary energy demand (Watt/person)

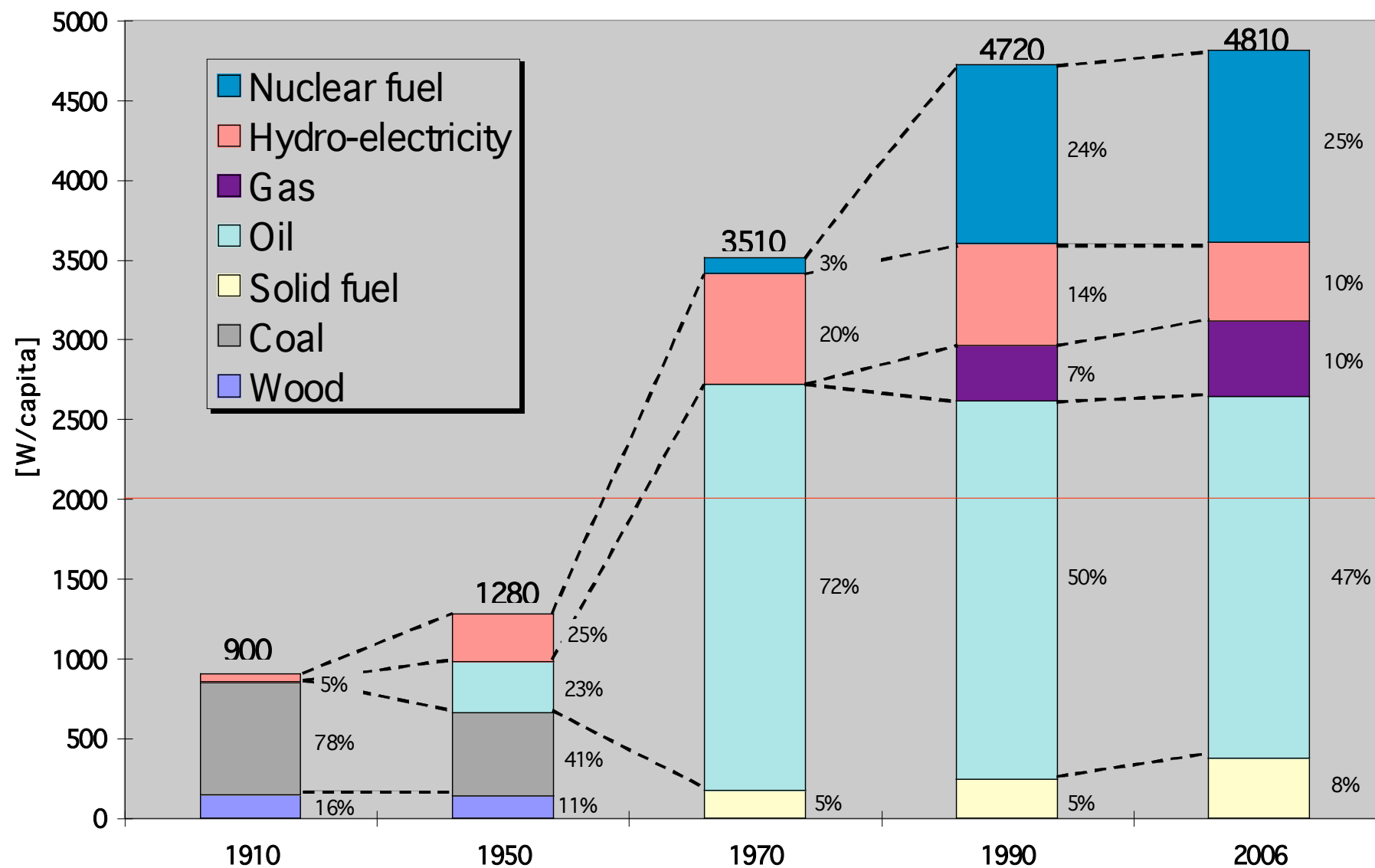




## Switzerland: GNP per energy consumption









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**Jahre****60****50****40****30****20****10****0**

Time constant of  
motor vehicles  
11.3 years

60 years

Time constant of  
Constructed CH







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# Three kinds of knowledge

*Proclim 1997: Research on Sustainability and Climate Change –  
Visions in Science Policy by Swiss Researchers*

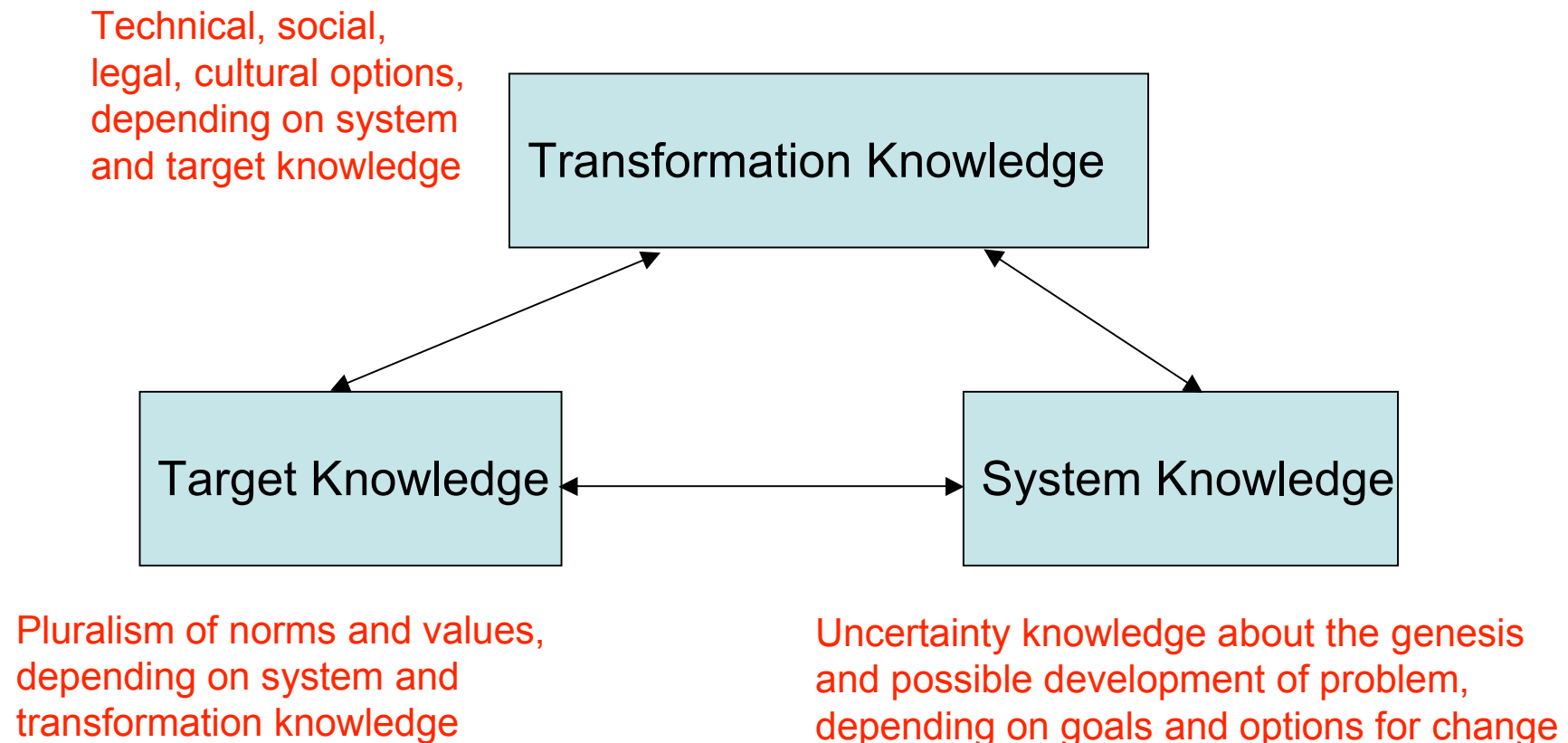
- Systems knowledge
- Target knowledge
- Transformation knowledge

**Scheme is open to technocratic misunderstanding**



# Transdisciplinarity as a Form of Research

See Gertrude Hirsch Hadorn et al., 2008, *Handbook of Transdisciplinarity Research*





## Take Home Message

- The replacement of the 2000 Watt Society by the 1t CO<sub>2</sub> is a regression into the world of the „Technology-Fix-Only“.
- The 2000 Watt society is not a utopia, but a project with a time-scale extending beyond the usual political horizon, but it needs knowledge of all three kinds.
- Scientists should not leave the field of transformation knowledge to politics or economy.