

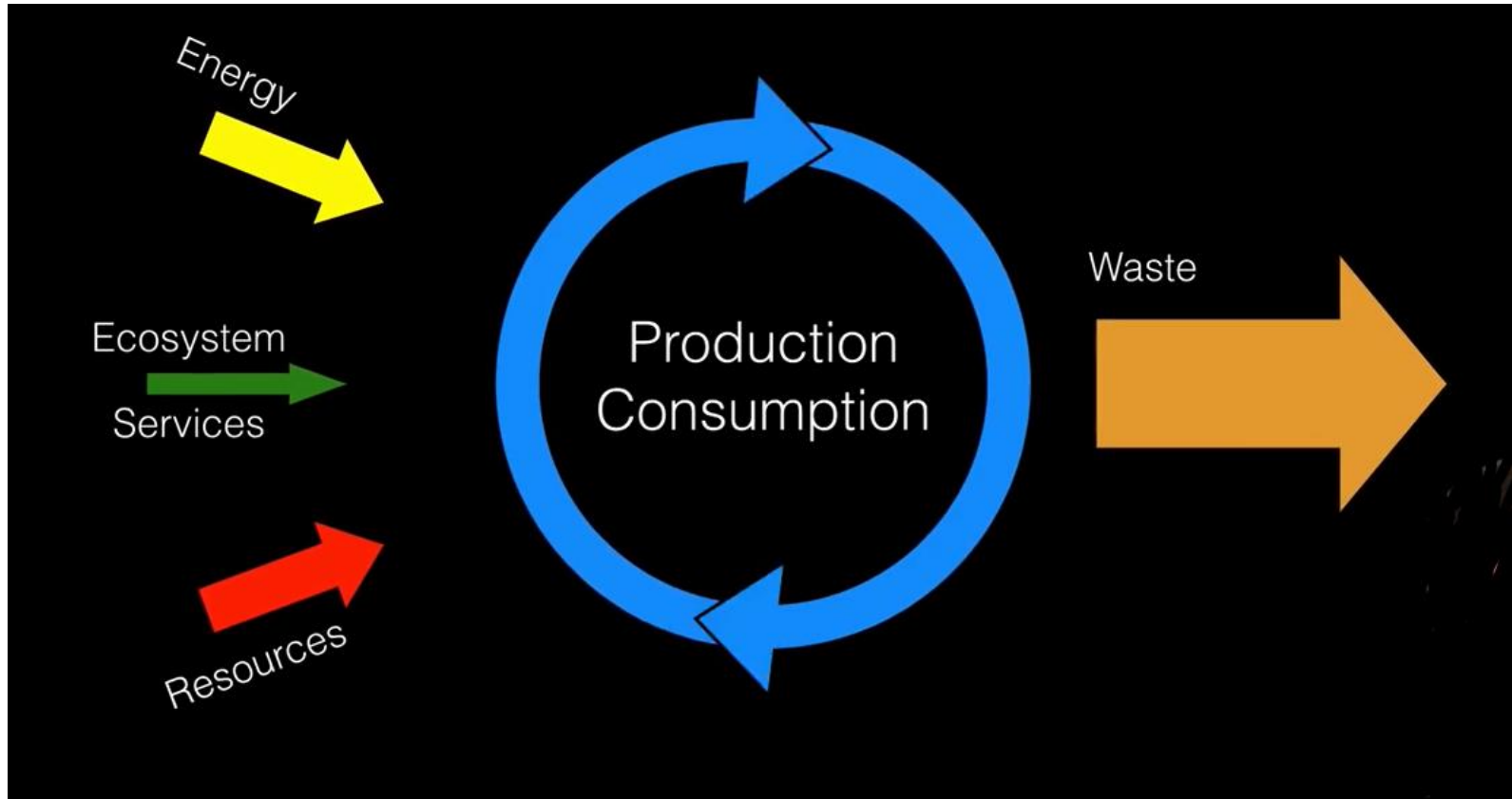
# Neoclassical vs. environmental economics

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# Introductory remarks

- Environment is providing us with necessary resources and services.
- These services are processed in the economy.
- Prevailing economic paradigm determines the way these sources are distributed and consumed.

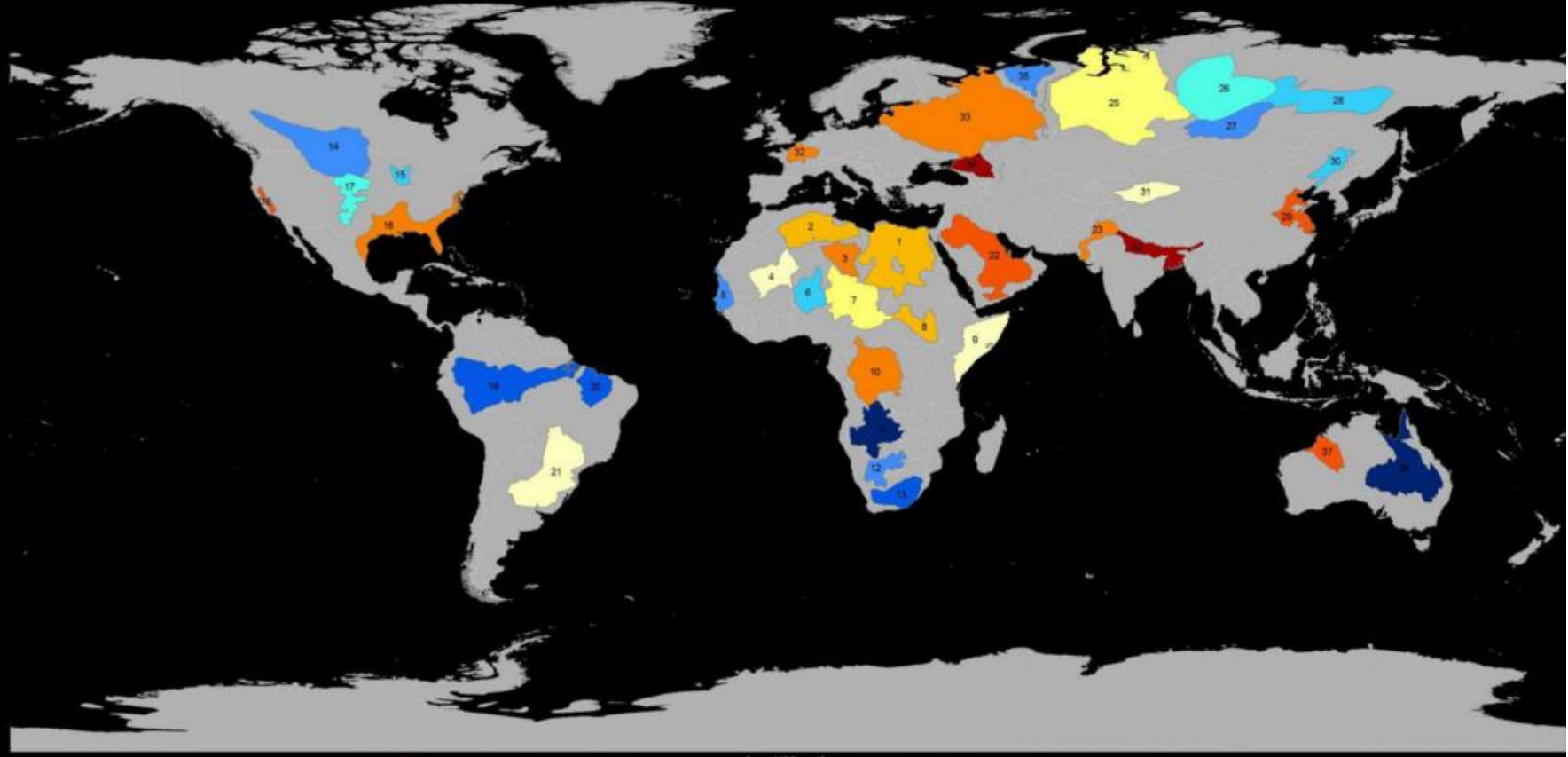
# Environmental system and society



# Neoclassical economics

- People (= rational actors) have rational preferences among outcomes, associated with a value.
- Individuals maximize utility, firms profits.
- People act independently on the basis of full and relevant information.
- Emphasis on market.
  
- Created in the limitless world – focus on the distribution, less on sources.
- Resources are „free“ – not valued.

Trends in Groundwater Storage from NASA GRACE Mission (2003-2013)



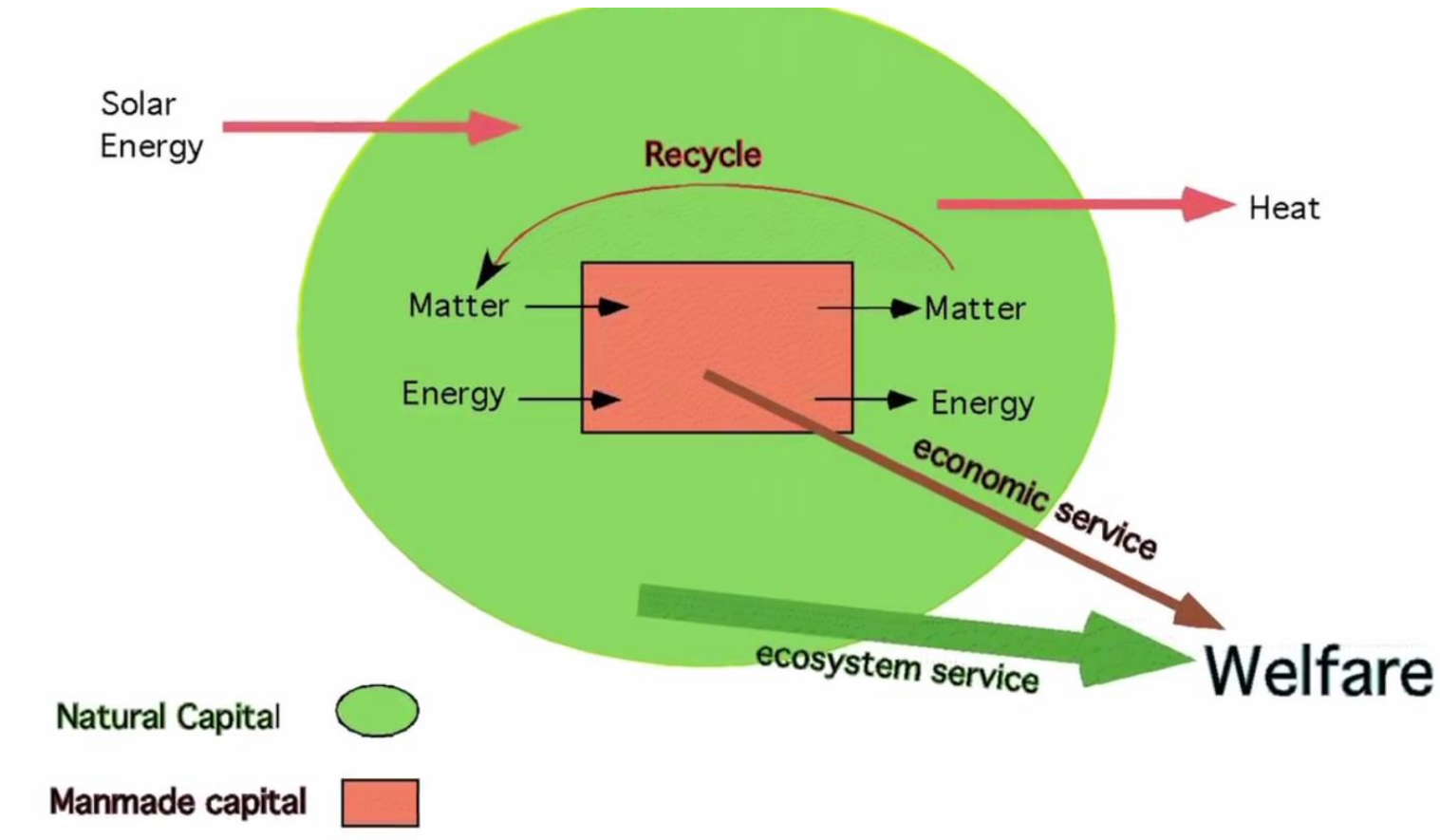
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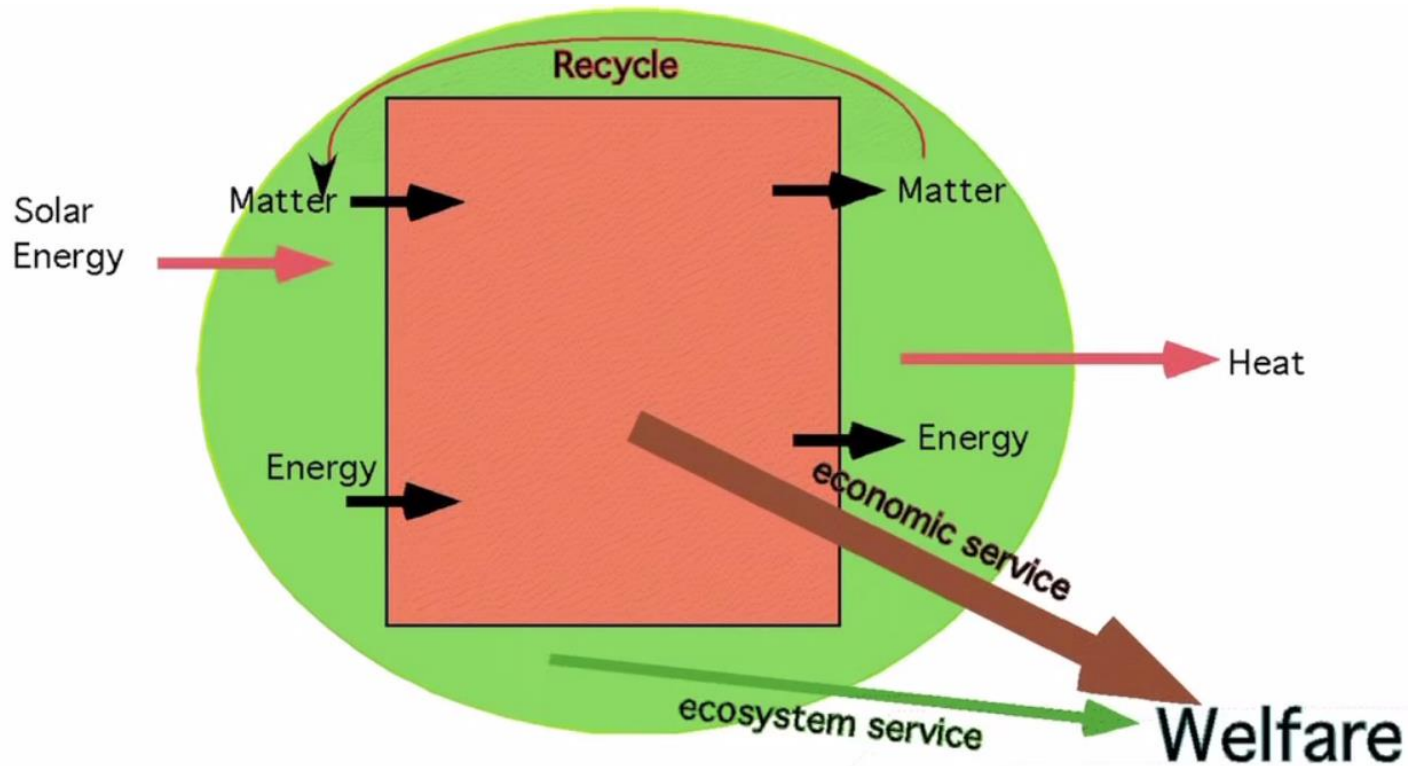
Richey, A.S., B.F. Thomas, M. Lo, J.T. Reaper, J.S. Famiglietti, K. Voss, S. Swenson, M. Rodell (2015), Quantifying Renewable Groundwater Stress with GRACE, *Water Resour. Res.*, doi: 10.1002/2015WR017349

- |  |   |                             |                               |
|--|---|-----------------------------|-------------------------------|
| 1 Nubian Aquifer System (NAS)                | 11 Upper Kalahari-Cuvelai-Upper Zambezi Basin | 20 Maranhao Basin           | 29 North China Aquifer System |
| 2 Northwestern Sahara Aquifer System (NWSAS) | 12 Lower Kalahari-Stampriet Basin             | 21 Guarani Aquifer System   | 30 Song-Liao Basin            |
| 3 Murzuk-Djado Basin                         | 13 Karoo Basin                                | 22 Arabian Aquifer System   | 31 Tarim Basin                |
| 4 Taoudeni-Tanezrouft Basin                  | 14 Northern Great Plains Aquifer              | 23 Indus Basin              | 32 Paris Basin                |
| 5 Senegalo-Mauritanian Basin                 | 15 Cambro-Ordovician Aquifer System           | 24 Ganges-Brahmaputra Basin | 33 Russian Platform Basins    |
| 6 Iullemeden-Irhazer Aquifer System          | 16 Californian Central Valley Aquifer System  | 25 West Siberian Basin      | 34 North Caucasus Basin       |
| 7 Lake Chad Basin                            | 17 Ogallala Aquifer (High Plains)             | 26 Tunguss Basin            | 35 Pechora Basin              |
| 8 Sudd Basin (Umm Ruwaba Aquifer)            | 18 Atlantic and Gulf Coastal Plains Aquifer   | 27 Angara-Lena Basin        | 36 Great Artesian Basin       |
| 9 Ogaden-Juba Basin                          | 19 Amazon Basin                               | 28 Yakut Basin              | 37 Canning Basin              |
| 10 Congo Basin                               |   |                             |                               |

# Mindset of traditional economics



# Modern 7bn people world



# Approaches to energy resources (or any environmental services)

- Technology-based substitution

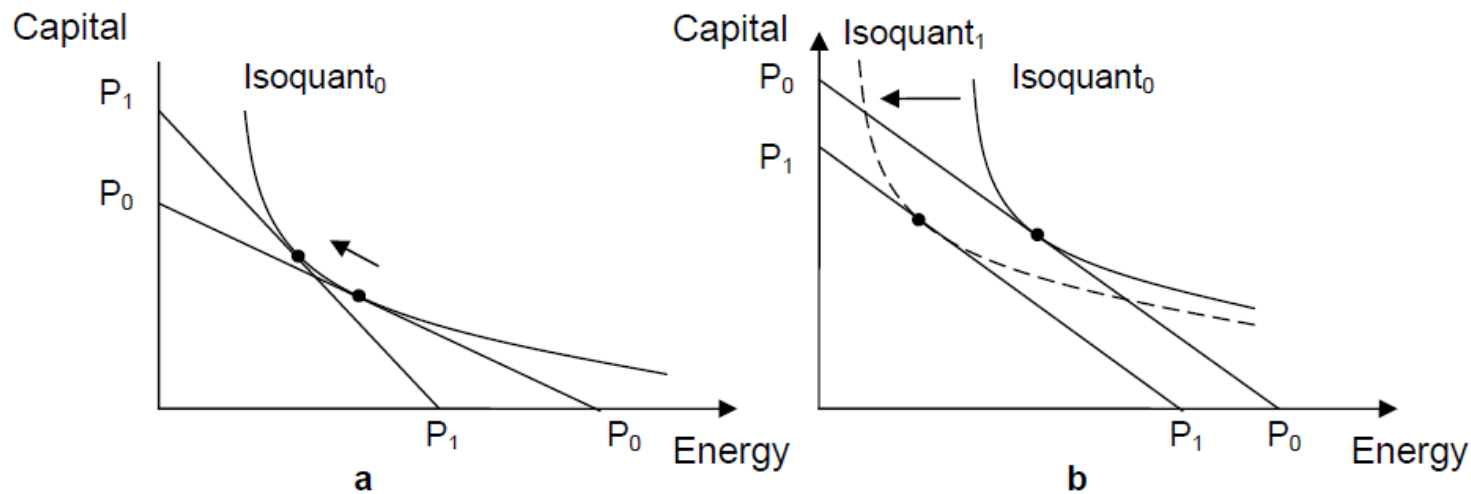


Figure 1 (a) Energy efficiency-improving substitution versus (b) energy-saving technological change.

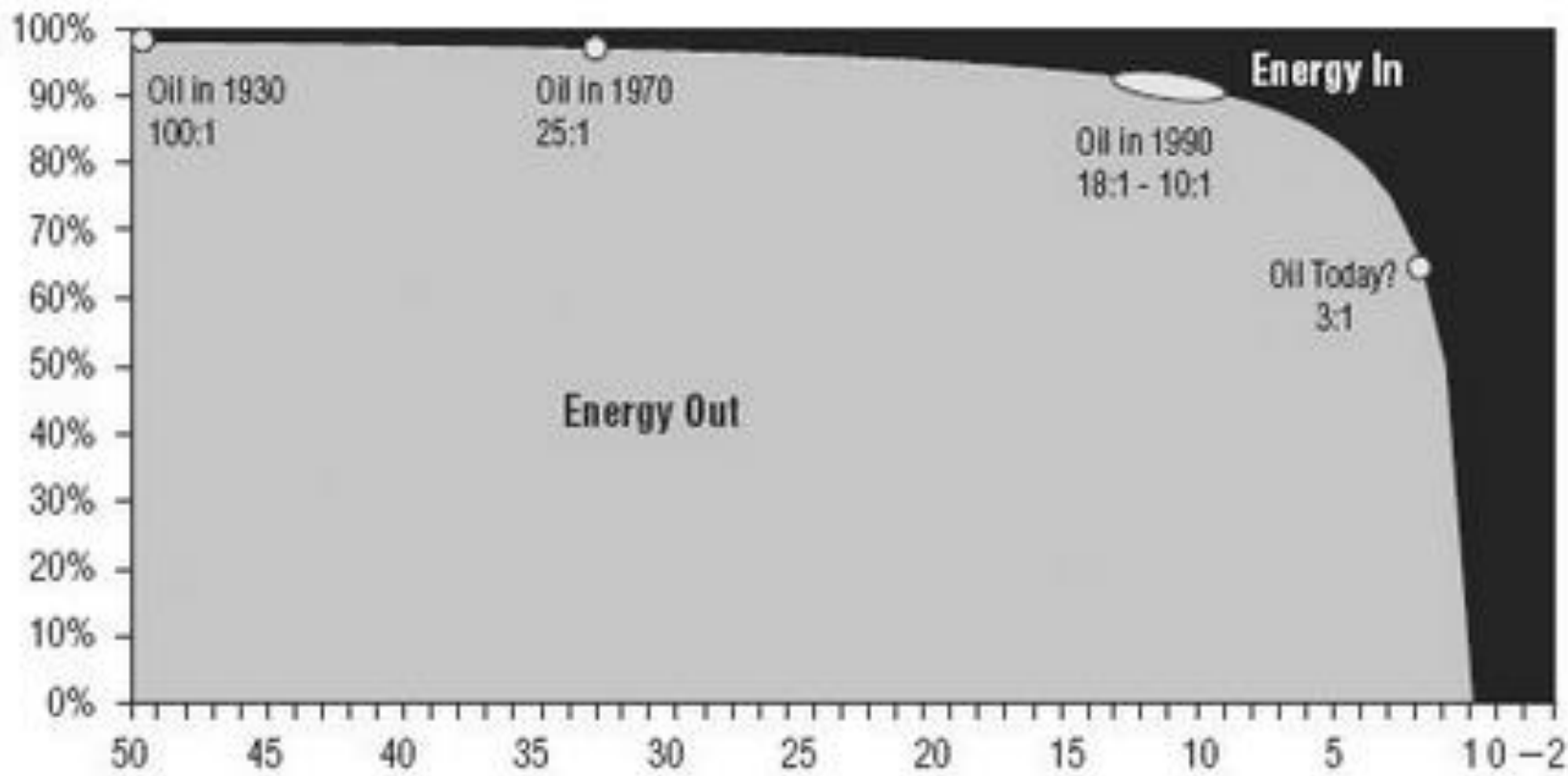


# Approaches to energy resources (or any environmental services)

- Thermodynamics argumentation:
  - Energy can neither be created nor destroyed.
  - Energy transformation always losses at least a little energy in the form of diffuse heat (entropy).
  - In any process some energy is always needed – full substitution of energy with technology is not possible (steam engine – from 0,5% to 60% at best).

# Approaches to energy resources (or any environmental services)

- New (unconventional) sources of energy.
- EROEI = usable energy output/energy consumed.
- Net energy = energy output – energy consumed.
- Global EROEI is declining (= you need to produce more gross energy to satisfy the same consumption).



# Approaches to energy resources (or any environmental services)

- New energy source
- „Are there any?“
- Path dependence

# Environmental economics

- Scarcity of resources, limited supply of environmental services.
- Recognizes necessity to consume natural resources and services and pollute.
- Calls for balancing the economic activity and environmental impacts by taking into account all costs and benefits.
- Market failure = inability of markets to reflect the full costs or benefits, resulting in inefficient allocation of resources.
- To fix the market failures by correcting prices so they take into account external costs.

# Tools of environmental economics

- Putting the price on the nature (externalities and 'tragedy of commons').
- Regulation.
- Change of mindset – GDP to be replaced by „index of happiness“?

# Sources

- Andersen, P.: Environmental Science, Bozeman Science.
- Erickson, J.: Ecological Economics, GundIndistute.
- NASA: Third of Big Goundwater Basins in Distress.