

# ENERGY AND CLIMATE CHANGE SCENARIOS IN CASE OF IRREVERSIBILITY

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# CONVENTIONAL SCENARIOS

## Building “coherent” paths into the future

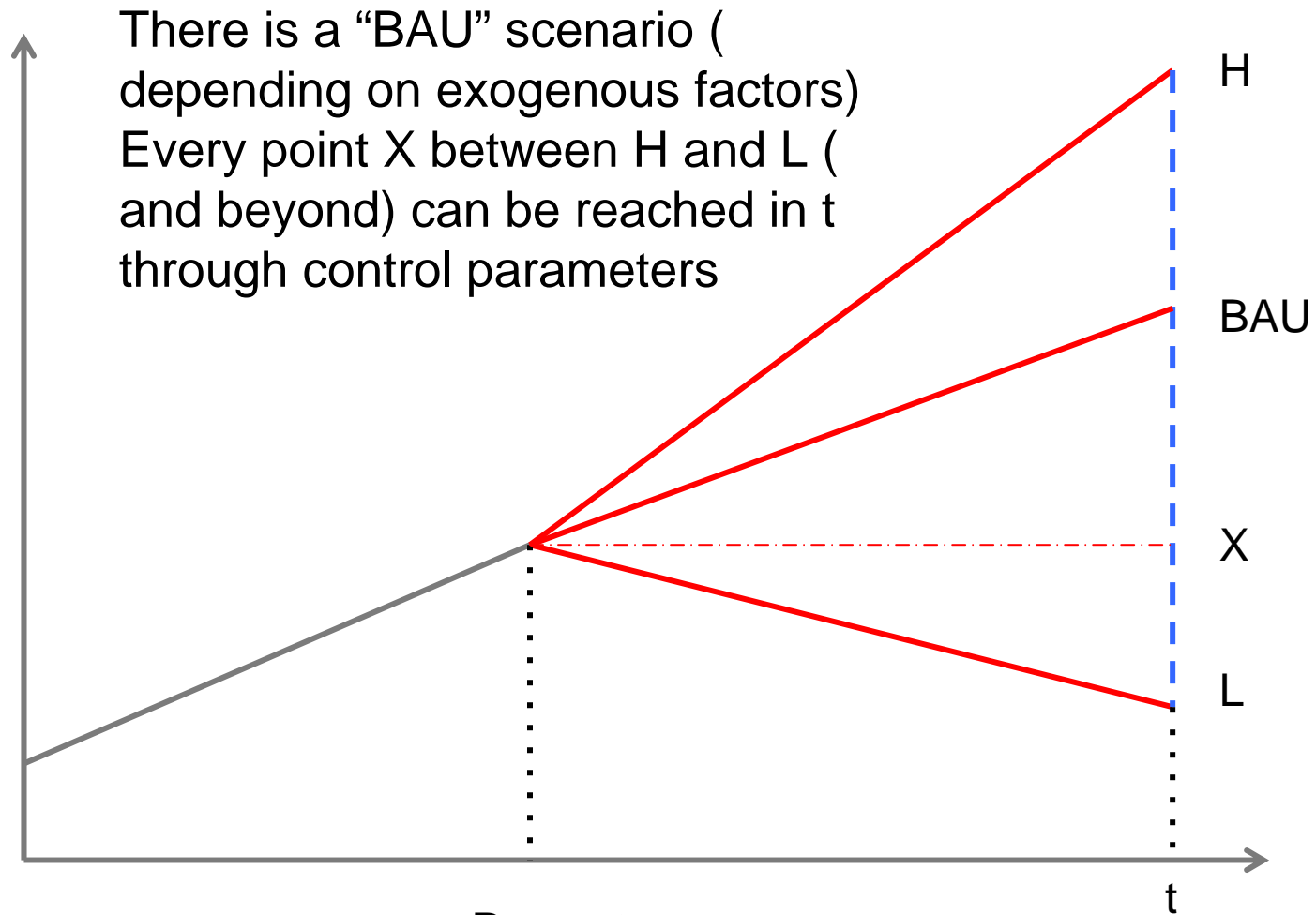
### Depending on two vectors:

- Exogenous parameters
- Control parameters

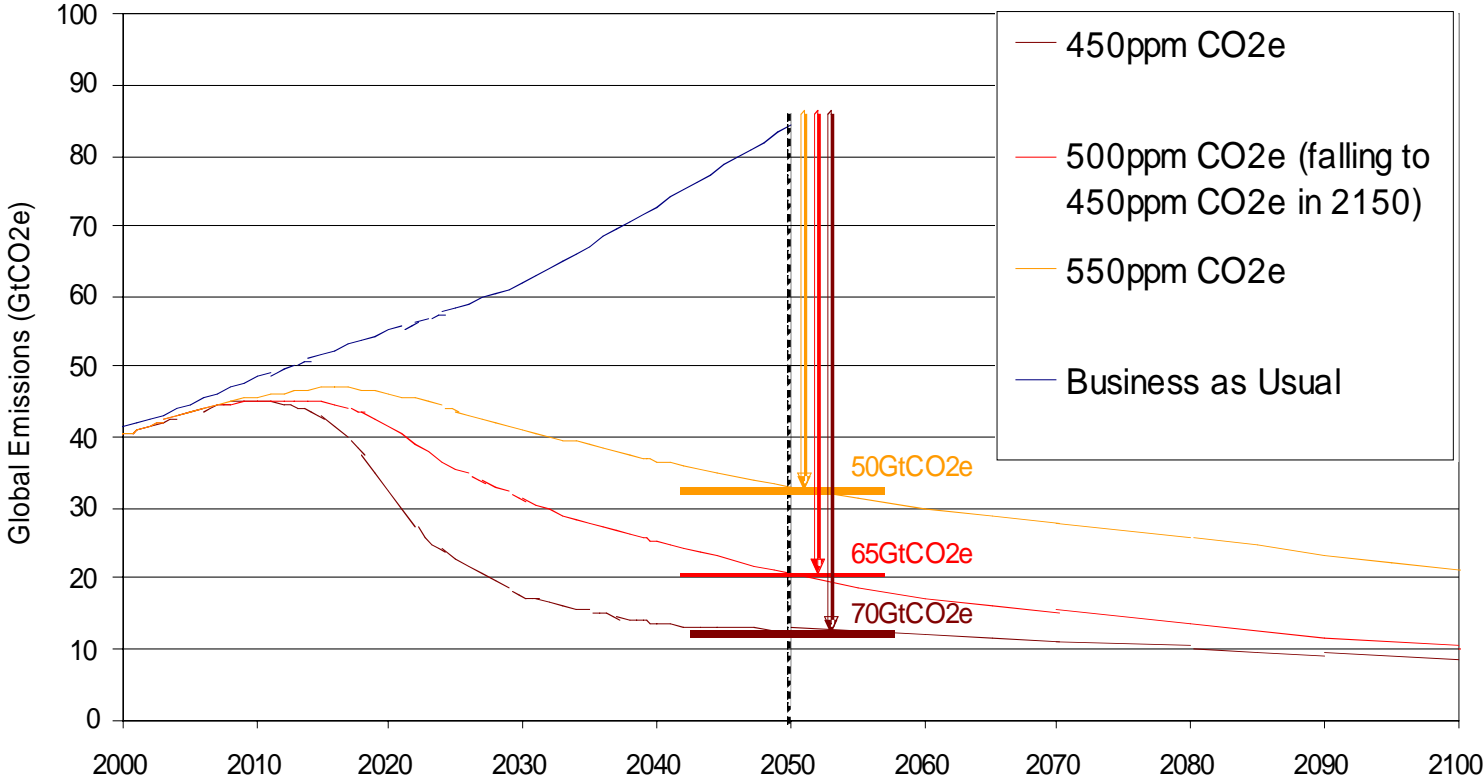
### Through “models”

- Linear or log linear
- Calibrated on the past

# CONVENTIONAL SCENARIOS



# CONVENTIONAL SCENARIOS: AN EXAMPLE



# NATURAL CAPITAL

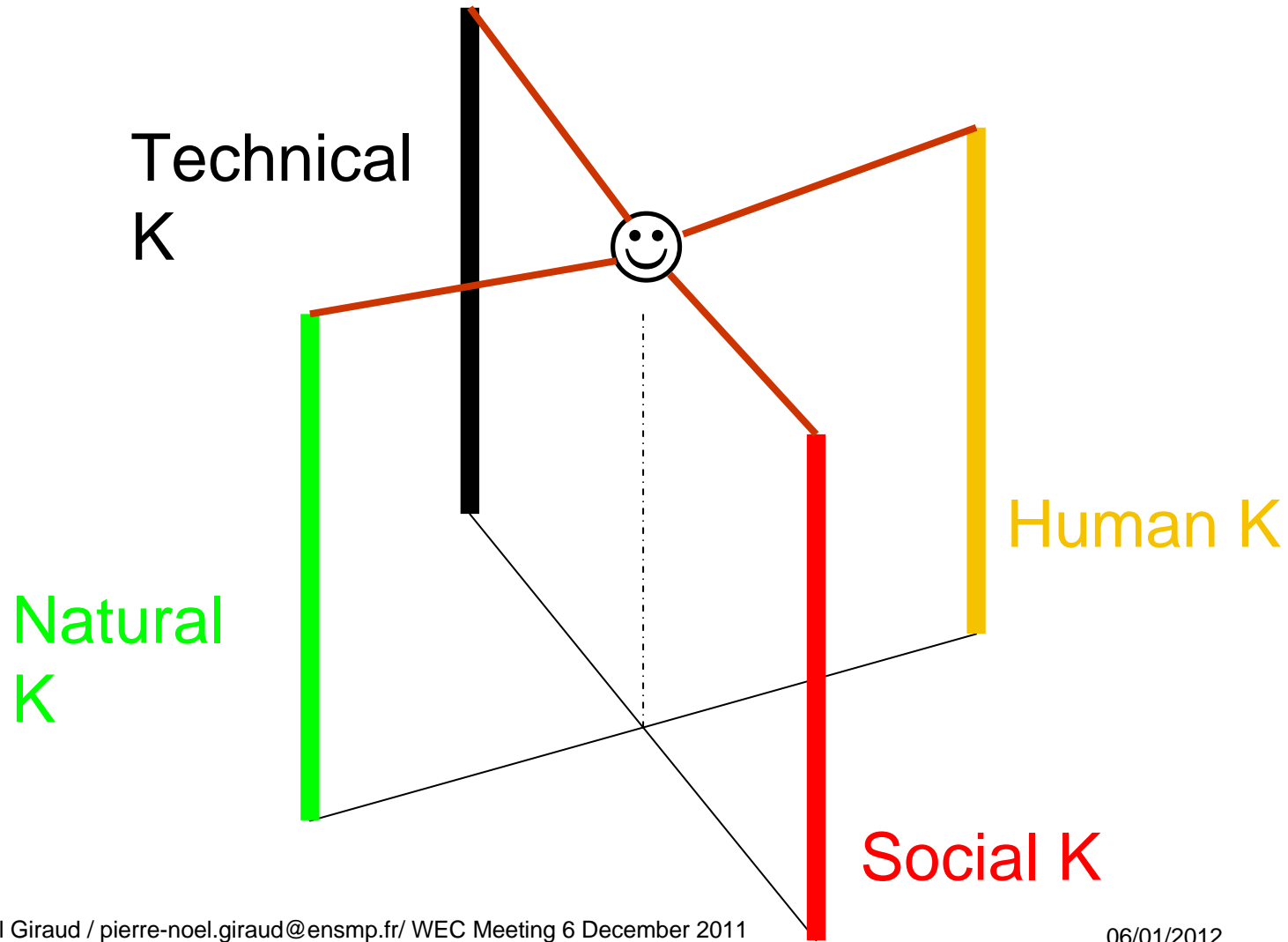
## **Energy conversion and final use tap into natural capital:**

- Upstream as a resource ( fossil carbon, biomass, solar radiations, wind and water streams,...)
- Downstream as a waste recipient and recycler (  $\text{CO}_2$ ,.....)

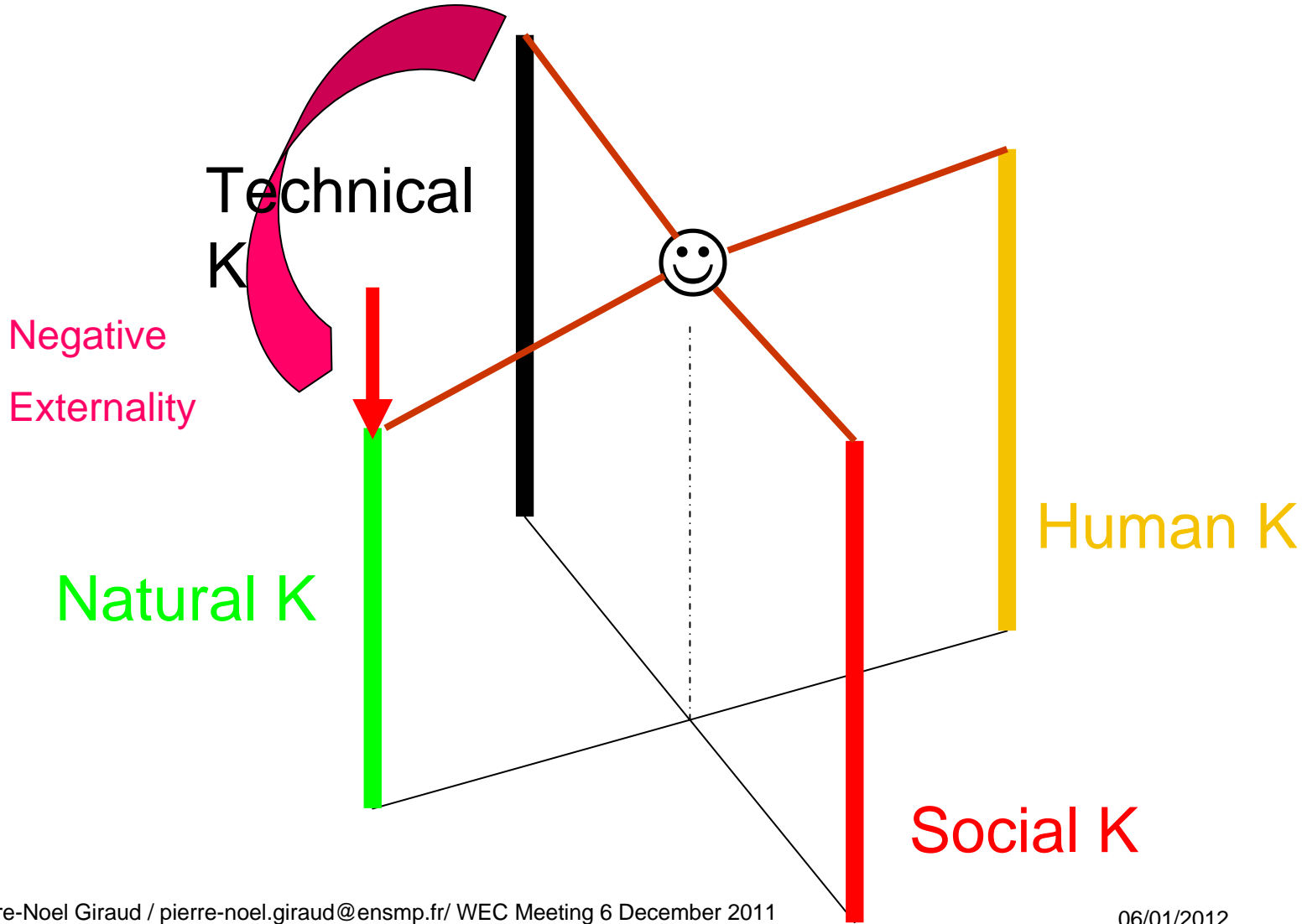
## **Natural capital is subjected to:**

- Non linearity and thresholds
- Irreversibility

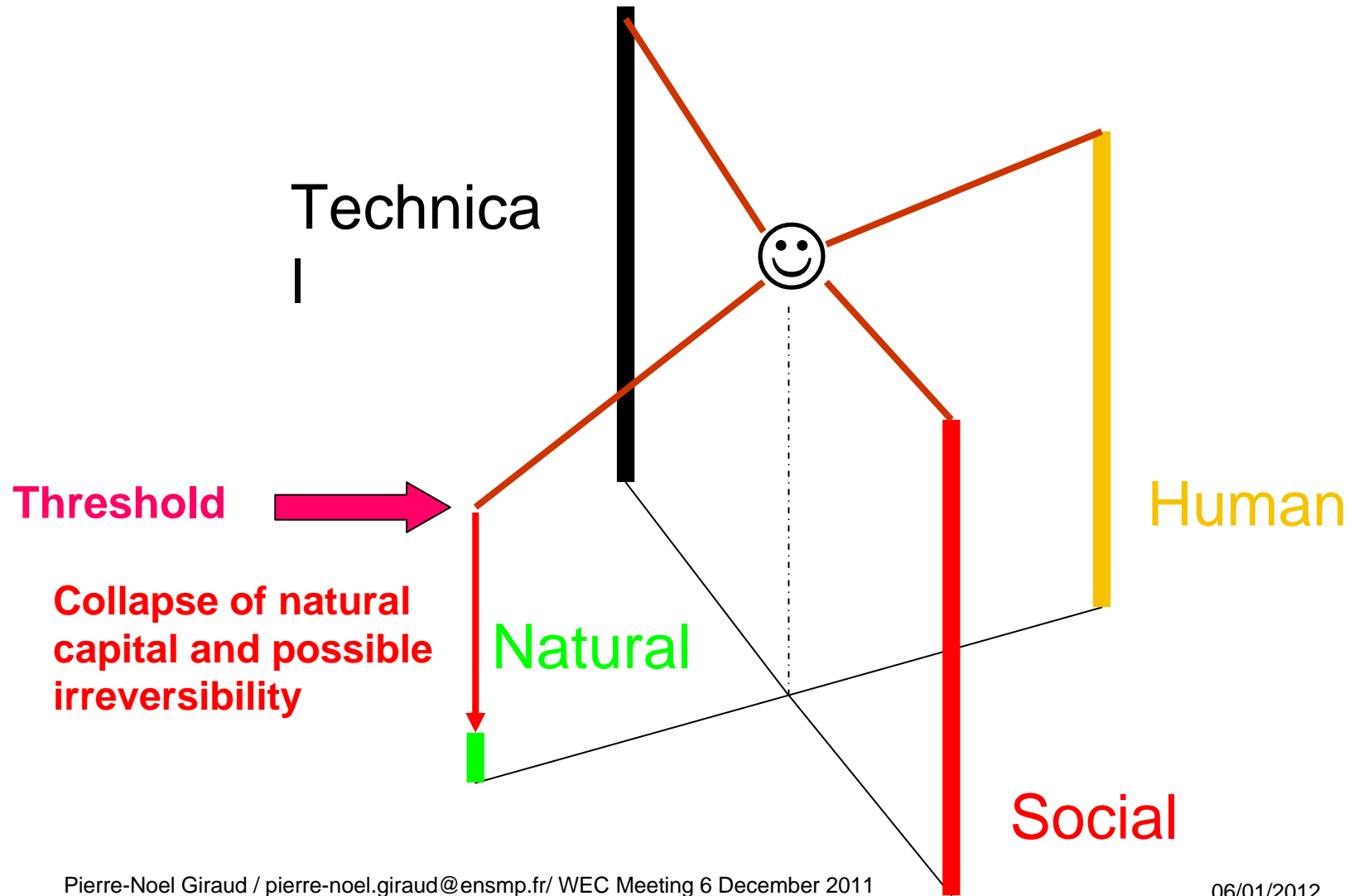
# ILLUSTRATION: THE « ELASTIC » MODEL (GIRAUD, LOYER)



# NEGATIVE EXTERNALITIES

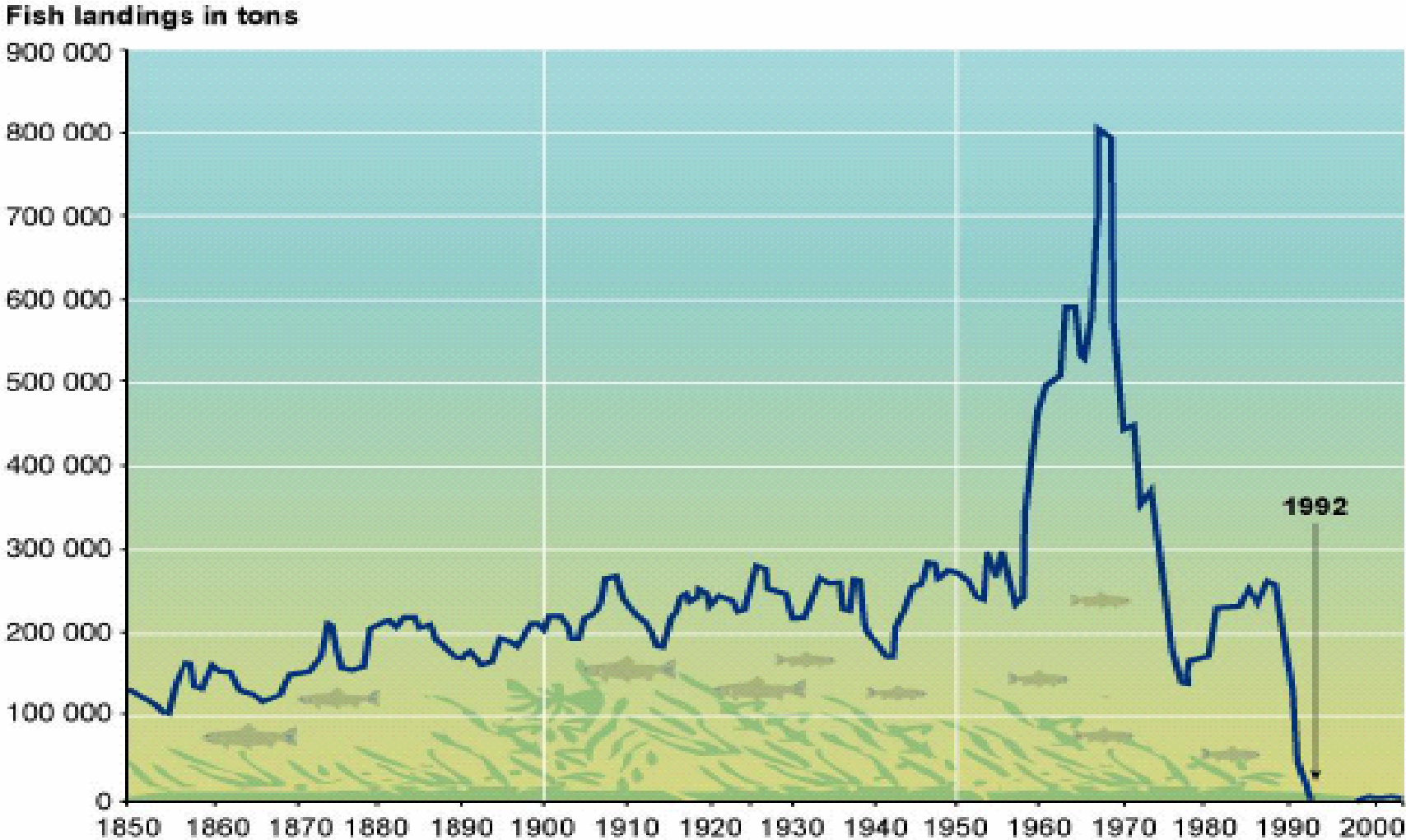


# EXISTENCE OF A THRESHOLD





# EXAMPLE OF THRESHOLD: COD



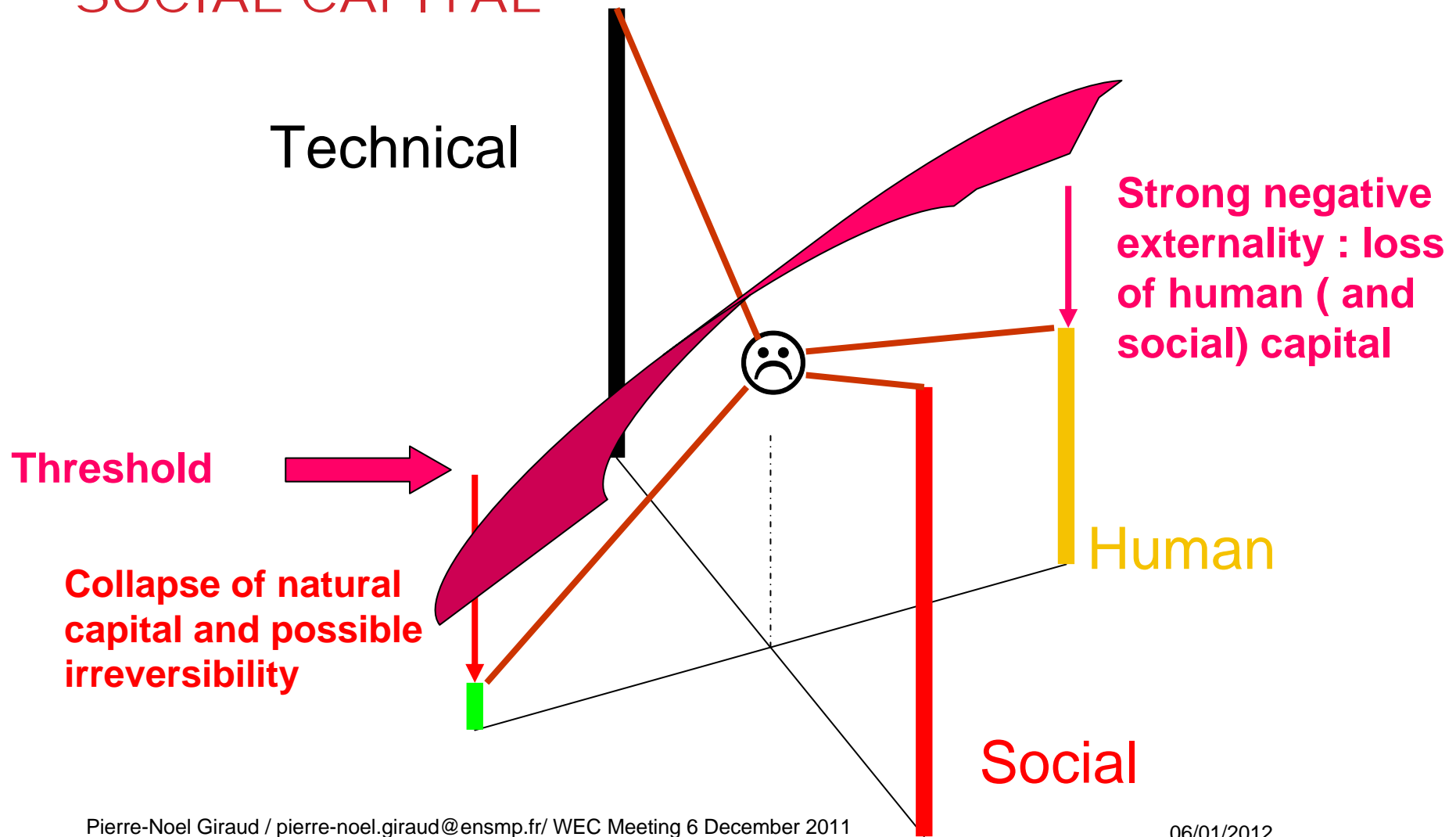
Source: Millennium Ecosystem Assessment

# ANOTHER EXAMPLE OF THRESHOLD

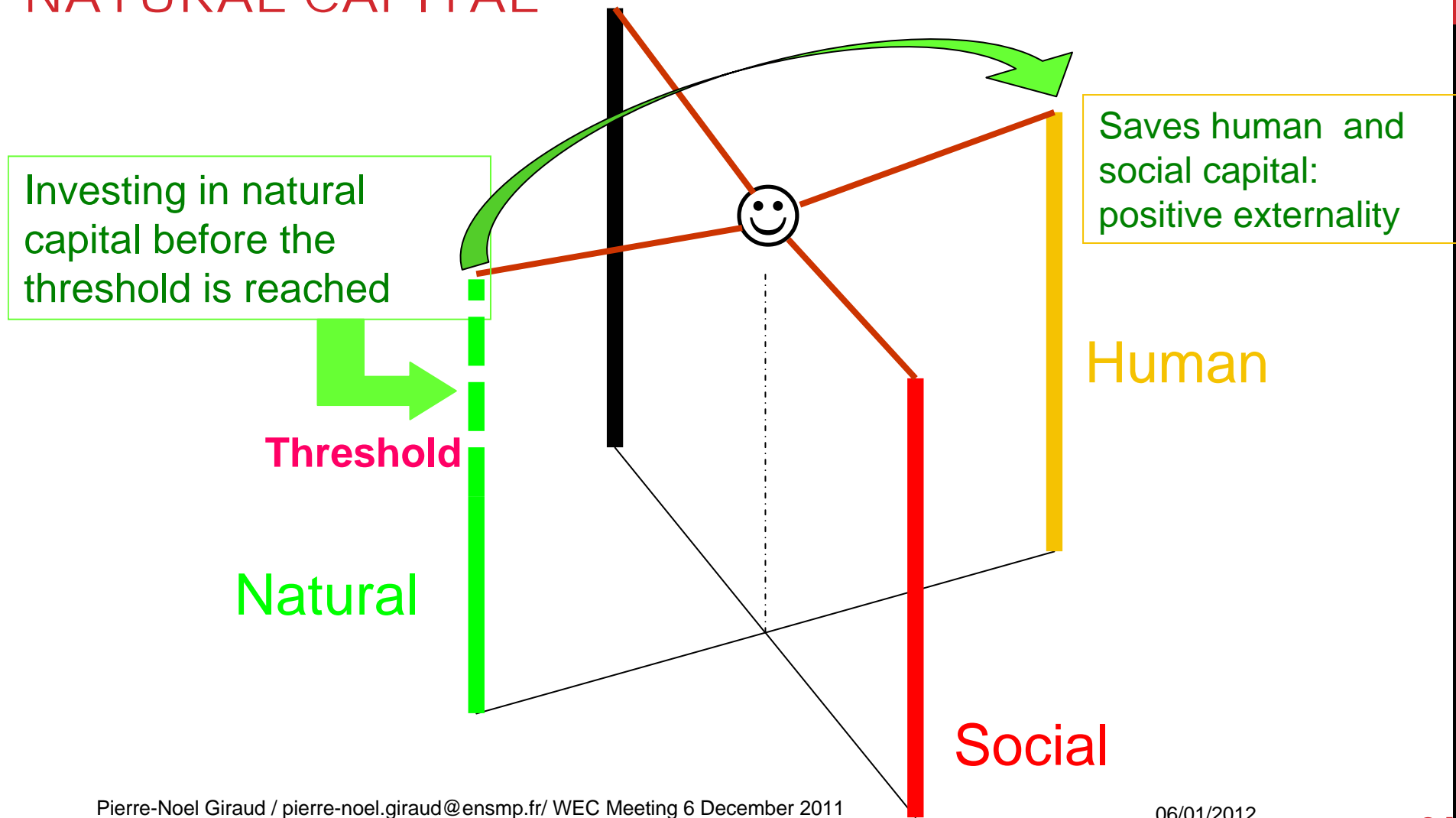
WHAT DOES THIS PICTURE SHOW?



# COLLAPSE OF NATURAL CAPITAL AND NEGATIVE EXTERNALITIES ON HUMAN AND SOCIAL CAPITAL



# NON LINEAR RETURNS IN INVESTING IN NATURAL CAPITAL



# CONCLUSIONS

**What do we need to account for the specificity of natural capital in our energy and climate change scenarios?**

- Economic growth models with non linearity and irreversibility
- Models of natural capital dynamics, identifying and quantifying thresholds and irreversibilities
- Coupling the two

**Essential for cost benefit analysis and an adequate use of the “precautionary principle”**

**To my own personal view, as an economist, economics is lagging behind... But it is feasible.**