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A Clarification of the Precautionary Principle Based on Irreversibility

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Plan of the presentation

1

General Approach

2

TIE-Irreversibility

Entropy TD

One application

3

Precautionary Principle

Thalos' suggestion
+
CBA
+
Axiology

4

Conclu-sions

General Approach

Philosophy of Physics
[entropy principle]

Concept of
Irreversibility

Topics in
Sustainability Sciences/
Sustainable Development

Precautionary Principle

Entropy

Etsy.com

- Entropy (TD) is a macroscopic variable compatible with multiple microscopic organisations.
- Entropy for an isolated system (e.g. the Universe) cannot decrease, but it *can* in a non-isolated system interacting with its environment (unless we are willing to wait 10^{100+} years…).

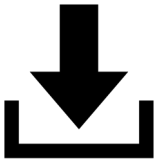
A Conceptualization of Irreversibility

Based on the thermodynamic entropy principle

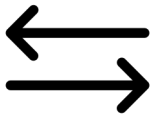
≠ non-invariance by time reversal

≃ Irrecoverability

P1.
Intervention



P2.
Equivalence



P3.
Time

Irreversibility can be seen as a (non-ordered) set such as $\langle I,E,T\rangle$, where I stands for 'intervention', E for 'equivalence' and T for 'time'–accordingly, it will be called TIE-irreversibility.

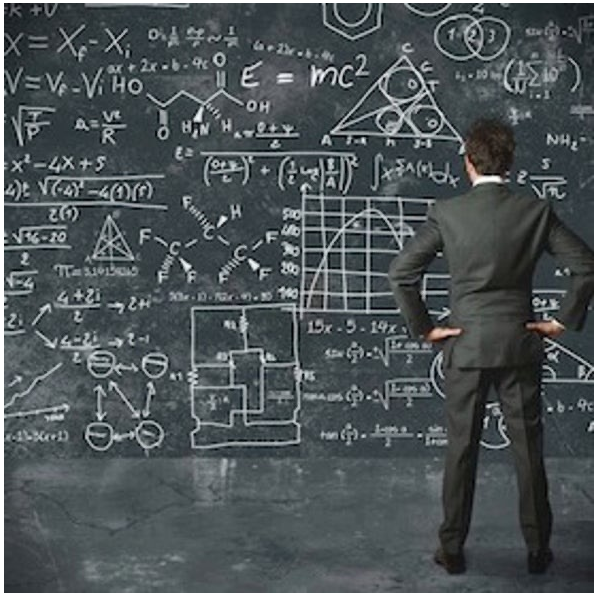
An application of tie-irreversibility: The clear-cutting of a forest

Sierra Club

- **Intervention [P1]:** reforestation ? ‘natural’ or ‘forced’?
- **Equivalence [P2]:** amount of ligneous matter, scenery…?
- **Time [P3]:** one generation…?

Precautionary Principle

- Three fundamental components (Steele 2015):
  1. a harm condition,
  2. a knowledge condition (where the knowledge demanded may fall short of certainty), and
  3. a recommended precaution.



Scientific American

Insurance Journal

Depositiphoto

(A) PP & Irreversibility

- According to Mariam Thalos, the PP should target "losses that cannot be remediated with known technology or resources" (Thalos 2012: 182).
- While promising, this caveat lacks in clarity.
- It would be ludicrous to consider oil/petroleum as a renewable energy because we can recover a certain amount after a few millions years.
- We need TIE-irreversiblity.

Time is of the essence!

(B) Precautionary Principle + Irreversibility

Present

Future1

=

Catastrophic
= circumstances "in which many millions of people could suffer severely harmful outcomes" (Hartzell-Nichols, 2012, p. 160).

$Pr(Y) \sim 0$

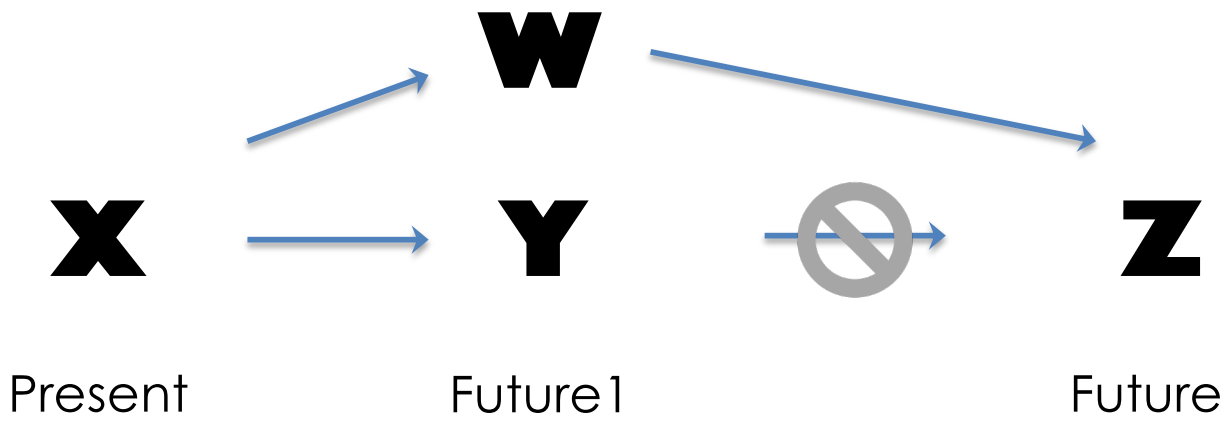
Future2

$\sim X \because \neg Y$

Z is *equivalent* to X. And there is something (axiologically) *important to avoid* in Y.

Process XY = TIE-irreversible
= No available intervention to obtain (from Y) a state equivalent to X in an (acceptable) timeframe

(B) Precautionary Principle + Irreversibility



CBA: $\sum Pr(B_y - C_y) << \sum Pr(B_w - C_w)$

Precautionary Principle

(B) Precautionary Principle + Irreversibility

IET-Irreversibility provides reasons to avoid certain outcomes (in a CBA) seen as axiologically inequivalent, thus requiring the PP.

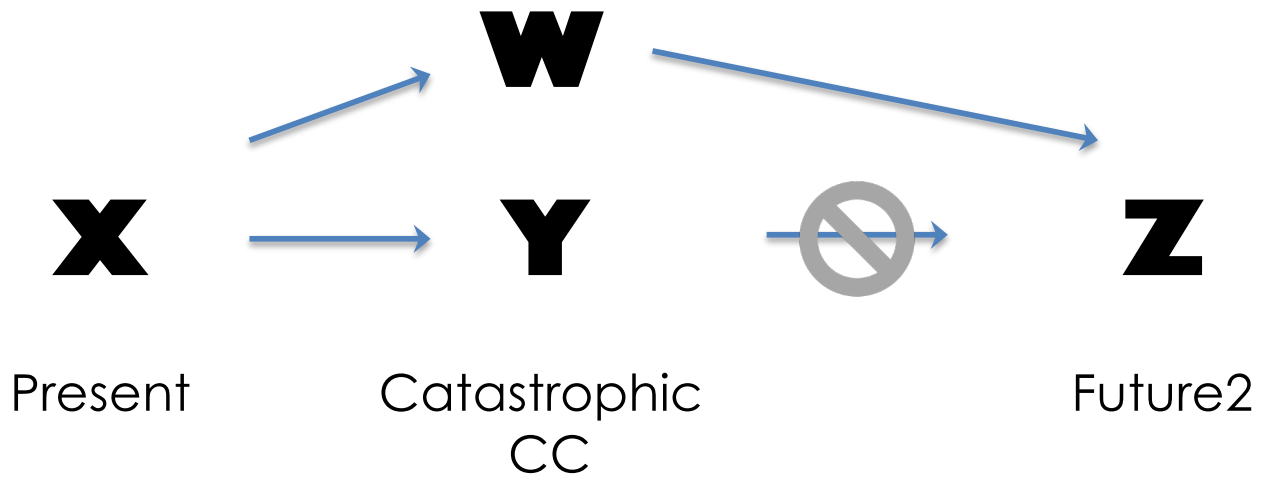
There are some things money can't buy!

(C) Precautionary Principle + Irreversibility

Manson's (2002) 'Wild story' worldwide economic depression, political instability, and finally nuclear holocaust (Manson 2002, p. 273).

Less probable than Y

TIE-*reversible* ?



Steele (2015) : But Manson's "wild story" utterly fails to satisfy the knowledge condition of a scientifically plausible mechanism with respect to actually proposed and implemented mitigation measures such as a carbon tax or cap-and-trade.

(C) Precautionary Principle + Irreversibility

IET-Irreversibility can eschew the 'knowledge condition' trap by discriminating some irreversible paths (instead of some uncertain paths).

Fear what you don't know!

Conclusions

- TD entropy provides the framework for a conceptualization of irreversibility as non-ordered set including (P1) intervention, (P2) equivalence and (3) time ⊢ called TIE-Irreversibility.
- The application of TIE-Irreversibility to SD topics such as the PP provides a clarification of the issues at hand.
  a) "Time is of the essence": TIE-Irreversibility complements Thalos' suggestion and better captures the PP for specific communities.
  b) "There are some things money can't buy": TIE-Irreversibility constrains CBA by eliminating some outcomes (and thus guide decisions making toward PP).
  c) "Fear what you don't know": degrees of (un)certainty can be more ambiguous than degrees of (ir)reversibility.

Merci!

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