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Overview of IMPRESSIONS methods and case-studies

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SC9.10 Incorporating uncertain scientific evidence into real-world adaptation decision making: what are the missing links?
Adaptation Futures 2016, Rotterdam, The Netherlands 10-13 May 2016

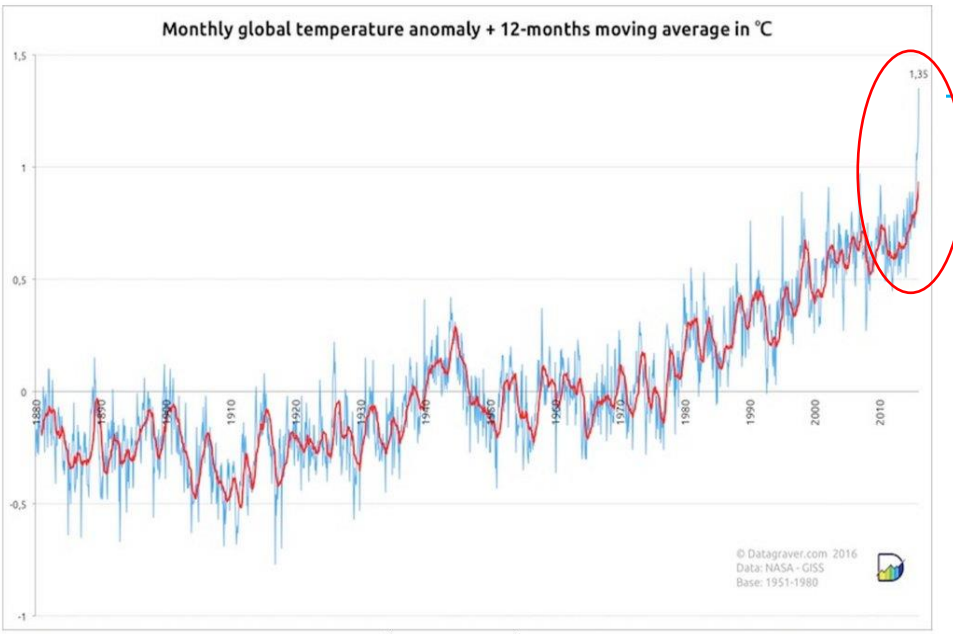

Figure 1. Monthly global surface temperatures (land and ocean) from NASA for the period 1880 to February 2016, expressed in departures from the 1951-1980 average. The red line shows the 12-month running average. Image

What is important?

"... the most important thing about climate change is the harm it is likely to cause or alternatively the utter catastrophe that it may possible – though very improbably – cause."

John Broome (2010) –
a philosopher

In reality we need to plan for both as well as everything inbetween.

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FP7 Project IMPRESSIONS

- **IMPRESSIONS** aims to advance the understanding of the implications of high-end climate change, involving temperature increases above 2°C, and to help decision-makers apply such knowledge.
- Over 20 partner organisations, coordinated by the Center for Ecology and Hydrology, UK
- 5 case studies are key (4 today)

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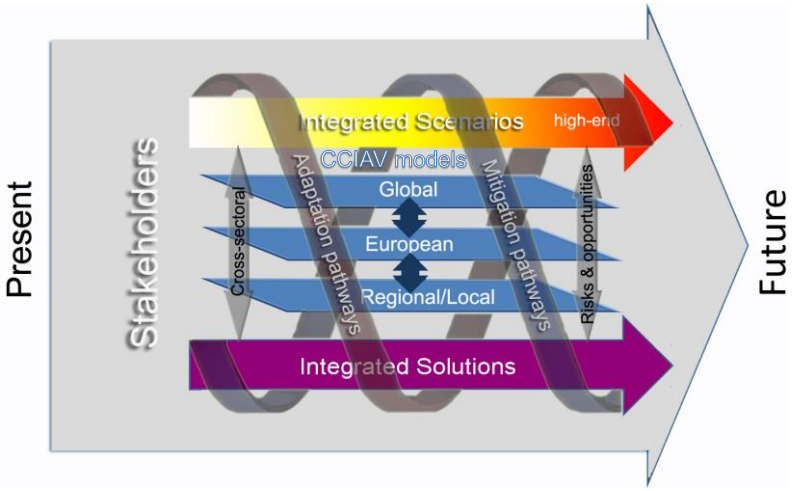
IMPRESSIONS Concept



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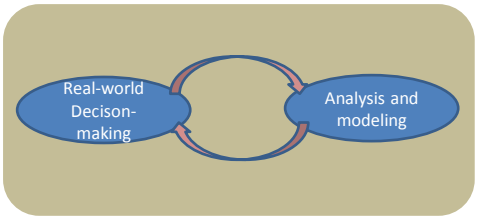
Today's session – focus on uncertainty and decision-making

We interviewed a range of decision-makers within the case studies to assess their actual decision-making processes and respective information needs.

The overall goal is to **identify needs and capacities** of European decision-makers for considering **high-end scenarios** and their associated **uncertainties** in the development of adaptation policy and practice.



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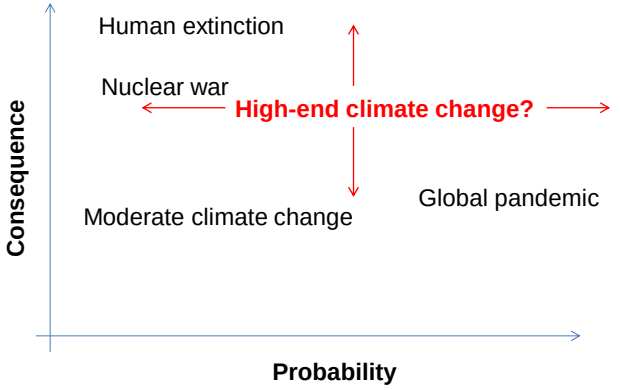
Today's norm in (academic) decsion-making thinking

Risk = Probability * Consequence

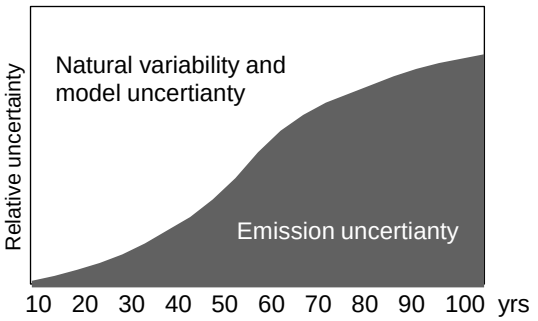


Today's norm in (academic) decsion-making thinking

Risk = Probability * Consequence

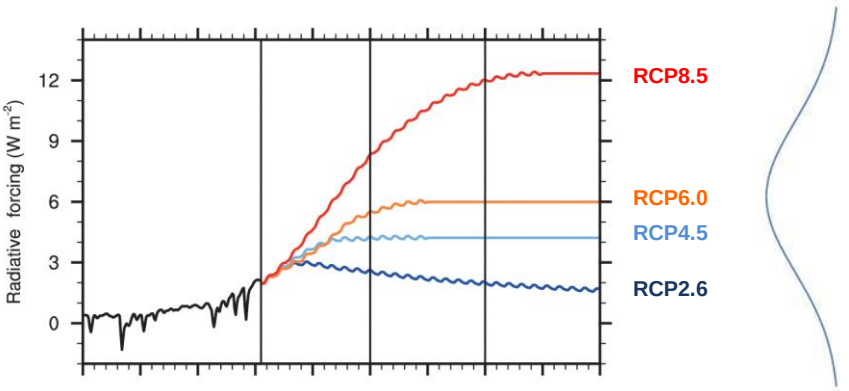
What about probabilities in climate change? Very difficult!

We know it will be warmer. But what do we know more?



Based on Hawkins and Suttton (2009)

What about the scenarios/pathways?



”The scenarios should be considered plausible and illustrative, and do not have probabilities attached to them” (WG1 AR5 TS).

Or ’equally probable’?? Or ’equally sounds’??

Risk = Probability * Consequence

What about impacts (damage)? Very difficult!

”When it comes to damage functions (GDP vs. temp), however, we know almost nothing....”

Pindyck (2013)
an economist

Ex: DICE model

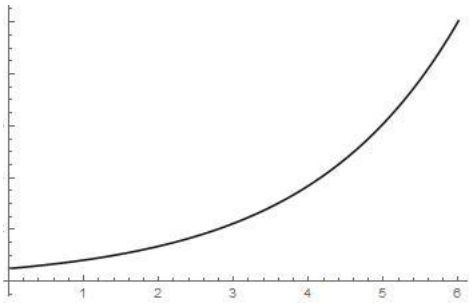
$$\text{Damage} \sim const_1 * T + con\ st_2 * T^2$$

(” There was never any more compelling rationale for this particular loss function than the comfort that economists feel from having worked with it before”)

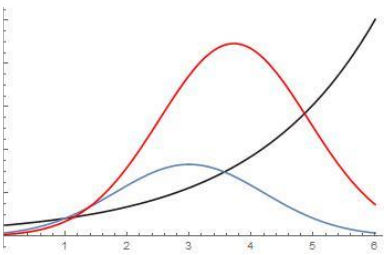
Others use exponentials, e.g. Weitzman (2009):

$$\text{Damage} \sim \exp(-const * T^2)$$

The point is that they tend to increase with temperature

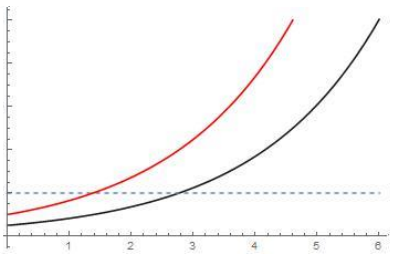


Back to risk calculus



A 'risk optimum'

Monotonic risk increase



But all this is based on probabilities

Is probabilism universal?

If we include subjective probabilities (Bayesianism), some people argue so, e.g:

"…it as a moral obligation of experts supporting decisions to present the decision-makers with a single probability distribution integrating both epistemic uncertainty and natural variability. "

Aven (2010)
a risk analyst

The limits of probabilism

What if we acknowldge that we cannot always find a trustworthy probability distribution?

"Accepting the limits of probabilitic methods and refusing to make probabilitis forecasts where those limits are exceeded, originates, ultimately, from the virtue of trustfulness, and from the requirements of scientific policy advice in a democratic society"

Betz (2010)
another philosopher

Probabilism vs. possibilism

According to possibilism:

All situations deemed possible should be manageable.

Hence, probabilities are not used!

Three alternatives:

- Verified possibilities
- Verified impossibilities
- Possibilistic hypothesis (articulated possibilities, neither shown to be possible, nor impossible)

Learning from other policy areas

Defence planning: Planning without probabilities is natural.

”Dimensioning scenarios”

Capabilities	1	2	3	4	5	6	7
A		X		X			
B		X	X		X		
C	X				X		
D			X	X		X	
E				x			x
	OK	OK	OK	OK	OK	OK	OK

Hence, the *portfolio* (A,..,E) can handle the set of dimensioning scenarios

However

- The defence planning example is a 'discrete planning case' – war or not war
- Adaptation-related decison-making is a continuous planning problem.

But, I think we can learn something.

And, with irreversibilities and potential tipping points adaptation may also become something similar to a discrete planning case with a binary option.

Finally...

How to combine probabilistic and possibilistic thinking?

One hypothesis is that it natural combining possibilism with regard to *what* can happen with probabilism with regard to *how* the most cost-effective solution is identified and implemented.

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Acknowledgments to the IMPRESSIONS team

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