

# What is the truth about ‘uncertainty’?

## Proposal for a more sophisticated definition and use of the concept of ‘uncertainty’

**Extended abstract** for the international symposium ‘The Governance of Adaptation’ in Amsterdam, the Netherlands, March 22-23, 2012

Session (1) The framing of adaptation problems and goals

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### Introduction

‘Uncertainty’ is a widely used term in climate research and Climate Adaptation Governance. But depending on context, discipline, interest, and power, the meaning and reasoning behind it might be totally different. With regard to the context, it matters whether we talk about ‘uncertainty’ of (1) goals (where?), of (2) interrelationships, status, and dynamic (what?), or of (3) transformation strategies (how?). The differences in the worldviews of natural and social sciences, qualitative and quantitative research, or ‘experts’ and ‘lay’ persons are relatively well-known. With regard to interest and power, however, only few are aware of actively constructed ‘uncertainty’, a strategy to gain or keep power and to get one’s way.

This paper aims at providing a fruitful and practical definition of the concept of ‘uncertainty’ in the field of Climate Adaptation Governance. This issue might be explored philosophically: thinking very basically about what humans are able to perceive, how we make sense of this perception and what knowledge and uncertainty means in this context (cf. Keller, 2008). However, for the fruitful and practical scope of this paper, one single philosophical notion might be sufficient. To elicit knowledge means to make sense of the world and to make sense of the world requires some knowledge in the first place. A definition of ‘uncertainty’ requires making sense of what ‘knowledge’ is. This is, unfortunately, not as simple as it might look like at first sight. As much as we define what knowledge should fancy as ‘certain’, we also have to define what we fancy as ‘uncertain’. Doing so, we realize how fragile (or conditioned by context) this definition of ‘certainty’ or ‘uncertainty’ is.

Empirically, the paper draws on the experiences and insights gained in the running research project KLIMZUG-NORD (BMFB 2009-2014) and former inter- and transdisciplinary sustainability research. The overall objective of KLIMZUG-NORD is to develop strategies to cope with the consequences of climate change in the metropolitan area of Hamburg, Germany ([www.klimzug-nord.de](http://www.klimzug-nord.de)). Within our work package (Climate Adaptation Governance, Regional and Reflexive Governance, stakeholder panels) we have conducted about 50 qualitative interviews, some ego-centred qualitative Social Network Analyses, more than ten stakeholder panels, and several interdisciplinary workshops.

With this background and with a review of relevant literature, I have developed a proposal to distinguish typical uses of ‘uncertainty’ within climate research and adaptation governance and suggest some alternative terms to consider these differences of meanings in framing adaptation problems and goals.

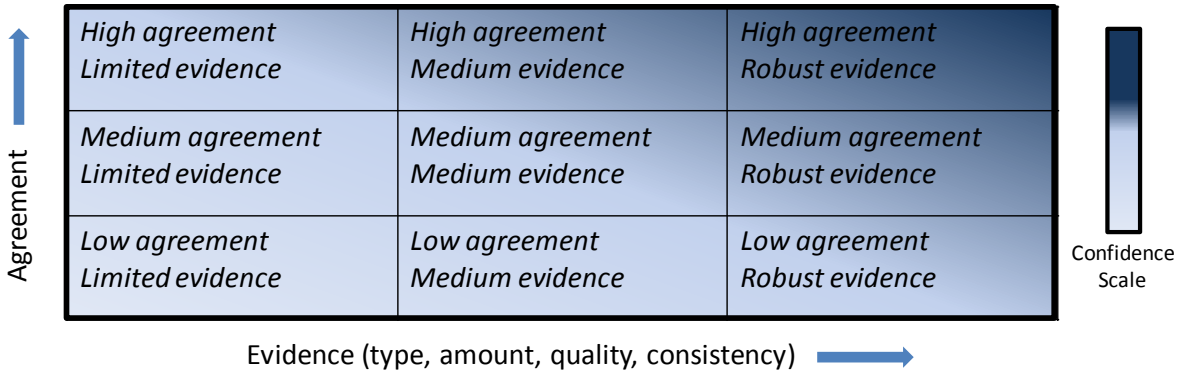
# From Scientific Knowledge to Strategic Uncertainty

The Intergovernmental Panel on Climate Change (IPCC) developed a “Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties” (Mastrandrea et al., 2010). The guidance aims at defining a common approach and calibrated language for developing expert judgement and for evaluating and communicating the degree of certainty in findings of the assessment process. The latter is divided into two metrics:

a) Confidence in the validity of a finding as a qualitative combination of ‘level of evidence’ and ‘degree of agreement’.

b) Likelihood is a probabilistically expressed quantified measure of uncertainty in a finding.

Confidence is expressed in five qualifiers from ‘very low’ to ‘very high’. The relationship of evidence and agreement is thought to be more flexible than suggested by figure 1. For a given level of evidence and degree of agreement, different confidence levels could be assigned. However, increasing levels in both dimensions are correlated with increasing confidence (Mastrandrea, et al., 2010).



**Figure 1: Qualitative combination of degree of agreement and level of evidence. Confidence increases towards the upper-right corner (Mastrandrea, et al., 2010, p. 3).**

Confidence should not be interpreted as probabilistically or confused with ‘statistical confidence’. For this kind of scientific uncertainty, the IPCC guidance provides the term ‘likelihood’ as defined in table 1. The categories have fuzzy boundaries. If an outcome is stated as ‘likely’ (66-100%), then all alternatives have to be ‘unlikely’ (0-33%) (Mastrandrea, et al., 2010).

**Table 1: Likelihood scale for quantified uncertainty (Mastrandrea, et al., 2010, p. 3).**

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<b>Term*</b>	<b>Likelihood of the Outcome</b>
<i>Virtually certain</i>	99-100% probability
<i>Very likely</i>	90-100% probability
<i>Likely</i>	66-100% probability
<i>About as likely as not</i>	33 to 66% probability
<i>Unlikely</i>	0-33% probability
<i>Very unlikely</i>	0-10% probability
<i>Exceptionally unlikely</i>	0-1% probability

\* Additional terms that were used in limited circumstances in the AR4 (extremely likely – 95-100% probability, more likely than not – >50-100% probability, and extremely unlikely – 0-5% probability) may also be used in the AR5 when appropriate.

This IPCC guidance clarifies some important aspects and phrases. Among the questions now emerging I will concentrate on the dimension of ‘confidence’: firstly, the term ‘evidence’ is analysed more deeply. Secondly, the process of ‘agreement’ it taken out of the closed IPCC circles and observed within the context of organisations and policy arenas.

The IPCC guidance explicates ‘evidence’ with regard to type, amount, quality, and consistency; it suggests strengthening the robustness of evidence by multiple, consistent, and independent lines of high-quality evidence (Mastrandrea, et al.). Each scientific discipline has rules to control the quality of evidence and in interdisciplinary projects, this is always (and necessarily) a matter of dispute. Leaving this aside, is it possible to agree roughly on what is meant by ‘evidence’?

‘Evidence’ is arguably connected with ‘knowledge’ and might be something like the opposite of the ‘unknown’. Here, the proposal by Gross (2007) is quite informative. He analysed the sociological usage of concepts that try to grasp the unknown and aims at simplifying and integrating these different connotations. Furthermore, he outlines the dynamic relations between these types of knowledge.

Gross (2007) suggests to use single term denotations as much as possible from everyday language. These terms are easier to remember than potentially more precise but complicated terms. The categorization by Gross (Gross, 2007) in table 2 is most fruitful and practicable to reach clarification about what is meant by ‘uncertainty’. He frames the whole issue in two core types: ‘knowledge sphere’ and ‘nescience’. In this broad sense the ‘knowledge sphere’ is everything one knows or anticipates. To the contrary, ‘nescience’ means lack of any knowledge. It can only be observed by others, since, by definition, no one can refer to their own current ‘nescience’. The own ‘nescience’ is only recognisable in retrospect. When former ‘nescience’ is emerging within the knowledge sphere, it is perceived as a total surprise.

The knowledge sphere is further distinguished in knowledge and ignorance, whereas ignorance is separated in non-knowledge, negative knowledge and extended knowledge (see table 2).

**Table 2: Categorization of Knowledge (modified from Gross, 2007, p. 751)**

The categorization regards to a certain group or individual and changes over time.	
<b>Knowledge</b>	A belief that was justified or accepted as true.
Ignorance	Knowledge about the limits of knowledge in a certain area; increases with every state of new knowledge.
<i>Non-knowledge</i>	Knowledge about what is not known but taking into account future planning.
<i>Negative knowledge</i>	Knowledge about what is not known, but considered as unimportant or uncomfortable or even dangerous – may alter to non-knowledge.
<i>Extended knowledge</i>	Based on planning and/or research with non-knowledge – may also alter to non-knowledge by uncovering limits of the newly gained knowledge.
<b>Nescience</b>	Lack of any knowledge: prerequisite for a total surprise beyond any type of anticipation. Belongs to a different epistemic class than the above terms.

With ‘extended knowledge’, Gross (2007) wants to cover the dynamic which occurs if new knowledge enriches the knowledge sphere. Nowadays, it is commonly known that new knowledge also leads to ignorance. In this sense, ‘extended knowledge’ means all types of knowledge gained at a certain point of time in the future.

Most interesting with regard to the objective of this paper is the category of ‘negative knowledge’. It is defined by Gross as “knowledge about what is not known, but considered as unimportant or even dangerous” (Gross, 2007, p. 751). Here, a huge share of the dispute about ‘uncertainty’ is located. It is also closely connected with the ‘level of agreement’ mentioned above within the context of the IPCC confidence negotiation process. Which part of ignorance should be considered as ‘non-knowledge’ and which one as ‘negative knowledge’?

To illuminate this, the work of Rayner (2012) about ‘uncomfortable knowledge’ is helpful. With that we move further from the worldview of natural science to the worldview of social science. Rayner explores a particular sort of ‘negative knowledge’: “those which societies or institutions actively exclude because they threaten to undermine key organizational arrangements or the ability of institutions to pursue their goals” (Rayner, 2012, p. 108). Ignorance is a necessary social achievement and not a simple background failure to acquire, store and retrieve knowledge (Rayner, 2012, p. 108). The organizational strategies to manage ‘uncomfortable knowledge’ are distinguished into:

- Denial: refusal or inability of organizations at any level to acknowledge information, even if actors actively seek to bring it to the collective attention (Rayner, 2012, p. 114).
- Dismissal: implies at least some level of explicit engagement with ‘uncomfortable knowledge’, even if it is only to justify its rejection (Rayner, 2012, p. 116).
- Diversion: decoy activity to distract attention from the ‘uncomfortable knowledge’ so that this knowledge is not (further) created or shared (Rayner, 2012, p. 118).

- Displacement: process by which an object or activity is established between the organization and the 'uncomfortable knowledge' so that this object or activity is a matter of dispute and not the 'uncomfortable knowledge' (Rayner, 2012, p. 120).

In analogy to the above stated assumption that 'uncertainty' is part of the knowledge sphere, it might also be assumed that the strategies to deal with 'uncomfortable knowledge' are the same as for dealing with uncomfortable 'uncertainty'. Or the other way around: for organisations, some 'uncertainties' are 'uncomfortable knowledge'. With that, it is realizable why the definition and use of (scientific) 'uncertainty' is a matter of power struggle and not purely an issue of rational science.

If we walk a step further to the worldview of policy science, the whole issue becomes even more fuzzy and complicated. With this perspective 'uncertainty' might not only be avoided or refused but rather strategically used or even constructed (c.f. Späth, 2008; Stankiewicz, 2010). The International Risk Governance Council (IRGC) discusses "Misrepresenting information about risk. The provision of biased, selective or incomplete information" as one of ten deficits in risk assessment (IRGC, 2009, pp. 5-6, 22). The IRGC recognizes strategic manipulation of information as a classic interest-group strategy (IRGC, 2009, p. 22).

Another starting point might be the widely spread core sentences from Foucault that knowledge is power and power forms knowledge. Putting this in the context of 'uncertainty' one could assume that 'uncertainty' weakens knowledge and that it therefore weakens power. This might be true in an ideal rational decision situations. However, in real situations, 'uncertainty' as part of the knowledge sphere is not less powerful than knowledge. Furthermore, power might not only form knowledge but also 'uncertainty'.

As an empirical example of the strategic use of 'uncertainty', the debate on genetically modified organisms (GMO) in Poland has been analysed (Stankiewicz, 2010). Stankiewicz emphasises the role of a lack of knowledge about GMO and its potential risks for human health and concludes that relevant actors may use and even construct public 'uncertainties' in order to support their respective interests. In this context, the exclusion of risks from the debate is central (Stankiewicz, 2010, p. 362).

The IRGC report mentions further empirical examples of how certain groups have used uncertainty and scientific dissent strategically. These examples are (IRGC, 2009, pp. 23-25):

- The tobacco industry which is said to have paid scientists for the search for evidence questioning the health risks related to tobacco products' use (related articles: Barnes & Bero, 1996; Grimm, 2008; Paddock, 2007).
- The erroneous claim by Greenpeace about the amount of oil and chemicals stored in Shell's Brent Spar platform in the context of Brent Spar's disposal in the 1990s (related article: Löfstedt & Renn, 1997).
- The UK government's refusal to communicate openly about the potential risks for human health related to the BSE crisis in the 1990s (related articles: Ashraf, 2000; van Zwanenberg & Millstone, 2001).

## **'Uncertainty' in the context of transdisciplinary research**

While simplifying the whole issue of 'uncertainty' even more, the line of reasoning in this paper is so far:

- Rational uncertainty: 'uncertainty' is minimised by combining a 'level of evidence' with a 'degree of agreement' to form a 'level of confidence'.
- Dynamic uncertainty: 'uncertainty' is dynamically connected with knowledge, nescience, and shapes of ignorance and is – like the others – conditioned by context.
- Blissful uncertainty: 'uncertainty' is a necessary social achievement.
- Strategic uncertainty: 'uncertainty' is used or constructed to gain or defend power.

All these types of 'uncertainty' are assumed to be relevant for Climate Adaptation Governance. What happens if all these types are brought together in the context of transdisciplinary research? To do so, a typical transdisciplinary knowledge structuration is used (Gottschick, 2005, p. 20). Based on the work of Swiss sustainability scientists (CASS & ProClim, 1997), knowledge might be structured in:

- Target Knowledge: knowledge about aims and visions. In relation to the current situation, target knowledge is needed to identify problems or required changes, as well as improved practices.
- Systems Knowledge: knowledge about structures, processes and interrelationships of social and natural systems, and about the definition of the current state of the system.
- Transformation Knowledge: knowledge how to get from one system state to another.

It is tempting to combine the arguments above mentioned with each knowledge type. Actually, it seems plausible to connect System Knowledge with 'rational' and 'dynamic uncertainty' and Target and Transformation Knowledge with 'blissful' and 'strategic' uncertainty. However, this ignores the interrelationship between these three knowledge types and overemphasizes the rationality of system analysis. None of the knowledge types has the ability to develop independently of the others. Target Knowledge is framed by the understanding of the systems as well as by the possibility to transform the system towards the target. System analysis is framed by the existence of problems which emerge out of the difference or known current system state and Target Knowledge. Transition Knowledge depends on System Knowledge, which not only describes a system but offers starting points for strategies to purposefully change the system.

Once again, this finding of knowledge typology applies to 'uncertainties'. 'Uncertainties' with regard to Target Knowledge are coupled with 'uncertainties' with regard to System Knowledge and coupled with 'uncertainties' with regard to Transformation Knowledge.

Table 3: Types of ‘uncertainty’ from disciplines and types of uncertainty from transdisciplinary research.

		Transdisciplinary Types of Uncertainty		
		Target	System	Transformation
Uncertainty	Rational			
	Dynamic			
	Blissful			
	Strategic			

Table 3 combines the types of ‘uncertainty’ from different disciplinary worldviews with types of ‘uncertainty’ from transdisciplinary research.

In my talk at the international symposium ‘The Governance of Adaptation’ (March 22-23 2012), I will use this proposal for some narratives. These will be drawn from our empirical research of Climate Adaptation Governance in the metropolitan area of Hamburg and insights of and our attempt to lure natural science colleagues to the necessity of transdisciplinary research. But even more importantly, this framework might be helpful to structure the discussion about narratives and findings of the participants at the workshop in Amsterdam.

To the momentarily end of this paper one quotation selected by accident might be introduced to explore the use of this framework. In his paper Späth stated: “As long as it is uncertain which areas will be affected particularly strongly by climate change, mitigation might be more useful than adaptation”<sup>1</sup> (Späth, 2008, p. 348). If we apply the ‘uncertainty’ framework from table 3 to this statement some interesting questions arise. Is this argument focusing on Target, System, or Transformation Knowledge? It is best framed by the notion of Rational, Dynamic, Blissful, or Strategic ‘uncertainty’? What do you think? What narratives do you have? I am looking forward to the discussions in Amsterdam!

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<sup>1</sup> Translation by the author.

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