

Assessing uncertainties for climate change mitigation and adaptation pathways

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Structure of presentation

- ▶ Introduction
- ▶ Definitions
 - ▶ Risks to the implementation policies (exogenous risks)
 - ▶ Risks as negative consequences of policies (consequential risks)
 - ▶ Kinds of uncertainties
- ▶ Policy choices
- ▶ Sectors
- ▶ Results and summary
- ▶ Conclusions



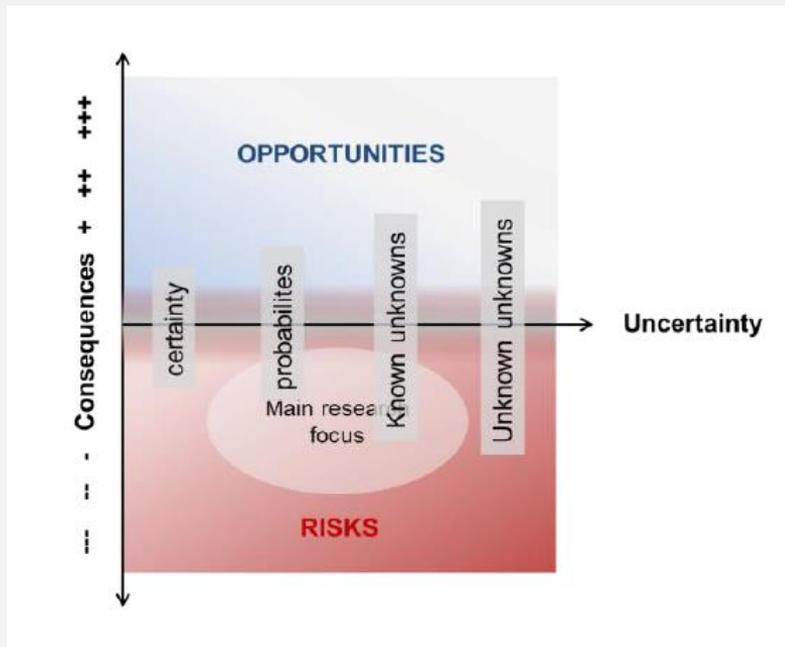
Introduction

- ▶ Mitigating climate change requires a wide range of choices to be made by different stakeholders, at different jurisdictional scales and for different time horizons.
- ▶ Risk and uncertainty are elusive terms if undefined. In light of different uses, depending on the disciplinary context, the broad definitions from the IPCC are adopted:
 - ▶ **Risk:** “[t]he potential, when the outcome is uncertain, for adverse consequences on lives, livelihoods, health, ecosystems, economic, social and cultural assets, services (including environmental services), and infrastructure” (IPCC, 2014a, p. 1772).
 - ▶ **Uncertainty:** “[a] cognitive state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable... [which can be] represented by quantitative measures (e.g., a probability density function) or by qualitative statements (e.g., reflecting the judgment of a team of experts)” (IPCC, 2014a, p. 1774).
- ▶ Current work is part of work within PhD research and the TRANSrisk project. It aims to provide a systematic overview of risks and uncertainties connected with the transition to a low carbon economy.

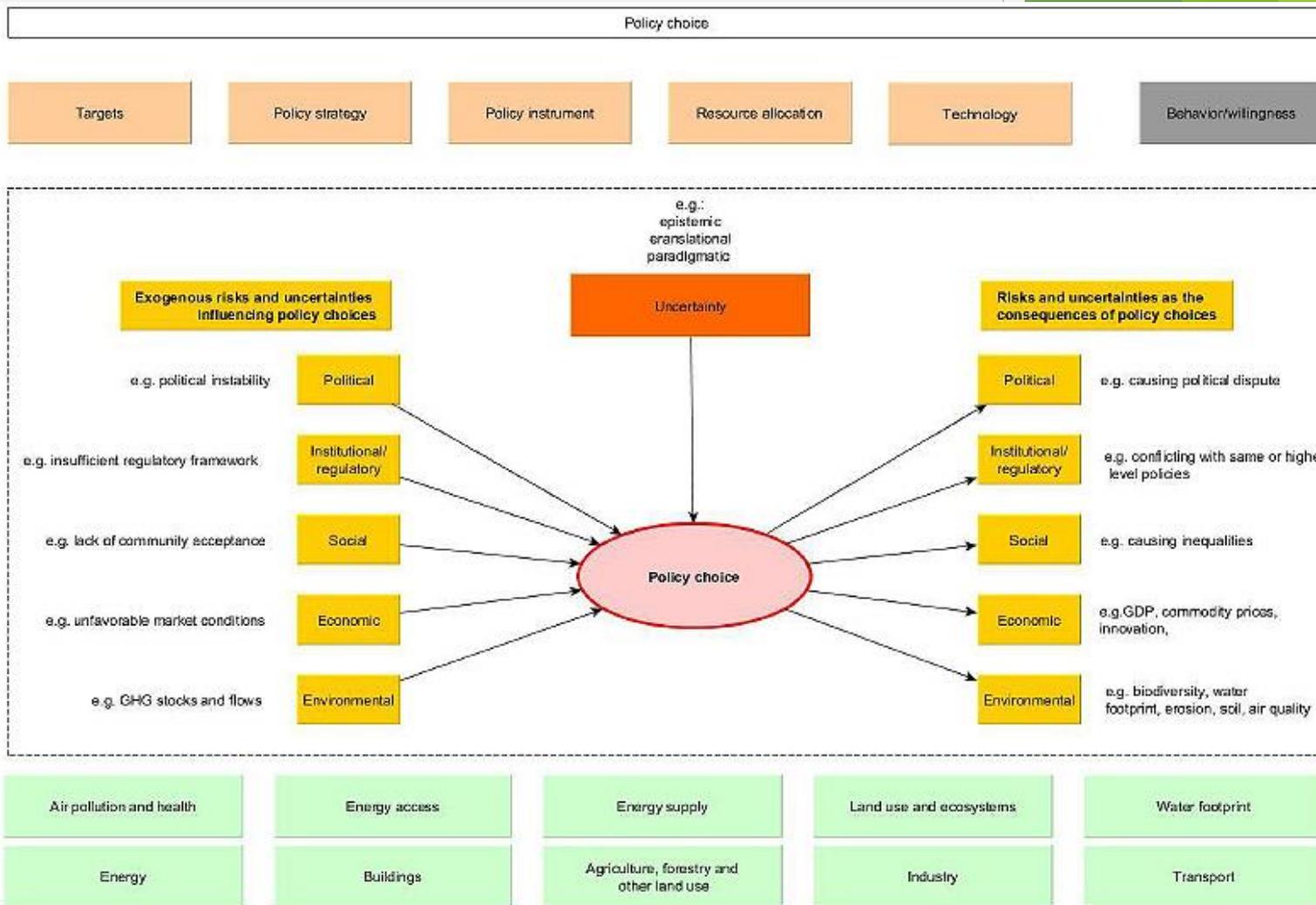
Introduction

Risk and uncertainty are partially overlapping terms:

- ▶ **Uncertainty** can be both **favourable** and **unfavourable**,
- ▶ **Risk** is associated mostly with **unfavourable** outcomes. However, risk also encompasses the (potential) damage that stems from uncertainty, and the vulnerability to that damage.



Integrated conceptual framework





Exogenous risks

(risks to implementation of policies)

- ▶ **Political risk** (an unstable political situation, or a lack of political will):
 - ▶ Political instability, terrorism, lack of political will, lack of institutional capacity, path dependencies and inertia.
- ▶ **Regulatory risk:**
 - ▶ Risks due to overly complicated bureaucratic processes. The non-existence of a stable regulatory framework. Legal risk, i.e. whether a legal institution is able to uphold the rule of law, such as intellectual property rights for technology transfer. Lack of regulations or a lack of enforcement of regulations.
- ▶ **Social risk:**
 - ▶ Opposition (active). Lack of community acceptance/support. Lack of human capital/skill. Lack of sector/technology specific training/knowledge. Lack of formal or informal community structures/networks/institutions. Lack of informal institutions, community networks.
- ▶ **Economic risk:**
 - ▶ Cost; unfavorable market conditions. Lack of financial capacities and uncertainty about market behaviour.
- ▶ **Environmental risks:**
 - ▶ Climate risks: while reducing the risk of climate change and related impacts is the overarching objective of all climate policy, related uncertainties may be a barrier to certain policy choices, particularly at the highest (treaty formation) and the lowest (behavioural change) levels.
 - ▶ Carbon stocks and flows.
 - ▶ Unfavourable environmental conditions (weather, wind, soil, geology).
 - ▶ Force majeure (flood, storm surge, earthquakes, volcanic eruptions, wind storm, avalanches).



Consequential risks

(risks as negative consequences of policies)

- ▶ Political dissent:
 - ▶ Consequential political risk referring to policy choices that cause dissent and disputes among political actors and groups of the same or different jurisdictions.
- ▶ Consequential regulatory risk (meaning policies that are in conflict with other legislation at higher or the same levels):
 - ▶ Conflicting with existing regulations (e.g. competition, conservation law, protected areas).
 - ▶ Policy implementation risk (incomplete, poor implementation).
- ▶ Consequential social risk (negative consequences such as segregation, creating inequalities including intergenerational justice, social disruption, etc.):
 - ▶ Gender inequalities; intergenerational justice; poverty traps; health; accidents and energy security.
- ▶ Consequential economic risk (negative influence of policies on national economic indicators):
 - ▶ Market efficiency/competitiveness. Costs and commodity prices.
- ▶ Consequential environmental risks:
 - ▶ Pollution of air, water, soil.
 - ▶ Disruption of ecosystem services, endangering flora and fauna.



Uncertainties

Epistemic uncertainty which results from a lack of information or knowledge for characterizing phenomena. Can be further distinguished between:

- ▶ **uncertainty** (insufficient knowledge to assess probabilities),
- ▶ **ambiguity** (insufficient knowledge about possible outcomes), and
- ▶ **ignorance** (insufficient knowledge of likely outcomes and their probabilities).

Translational uncertainty results from scientific findings that are incomplete or conflicting, so that they can be invoked to support divergent policy positions (Sarewitz, 2010).

Paradigmatic uncertainty results from the absence of prior agreement on the framing of problems, on methods for scientifically investigating them, and on how to combine knowledge from disparate research traditions. Such uncertainties are especially common in cross-disciplinary, application-oriented research and assessment for meeting policy objectives (Gibbons, 1994).



Policy choices

Greatly vary from international level (broad and general goals) to the local and individual levels (very clear and concrete actions). In many ways, lower scale choices result from higher scale choices.

The whole hierarchy may look like:

- ▶ Long term temperature and emission targets
 - ▶ National strategies (macro level)
 - ▶ Policy instruments (meso-micro level)
 - ▶ Behaviour and investment decisions (stakeholders and general public who are influenced by perception of risks and acceptance of policies)



Policy options for national and sub-national levels

- ▶ **Economic or market-based instruments:**
 - ▶ taxes, subsidies and their removal, and emission trading schemes (ETS). Taxes and subsidies are price instruments, not targeting quantities. Removing existing subsidies from fossil fuels is often an option to reduce emissions.
 - ▶ ETS and cap-and-trade schemes are quantity instruments. Taxes can be collected on emissions or energy.
- ▶ **Regulatory approaches:**
 - ▶ Regulations and standards, which may be set for emissions, technologies, or products.
- ▶ **Information policies:**
 - ▶ Eco-labelling, certification schemes for products or technologies, and collection and disclosure of GHG emissions data by significant polluters.
- ▶ **Government provision of public goods and services and procurement:**
 - ▶ Mitigation as public good. (provision of district heating; public transportation services; funding and provision of research activities; removal of institutional and legal barriers; etc. Afforestation programs belong to this section too).
- ▶ **Voluntary action (by NGOs and private actors):**
 - ▶ Voluntary agreements, spontaneous measures and in reaction to market developments.

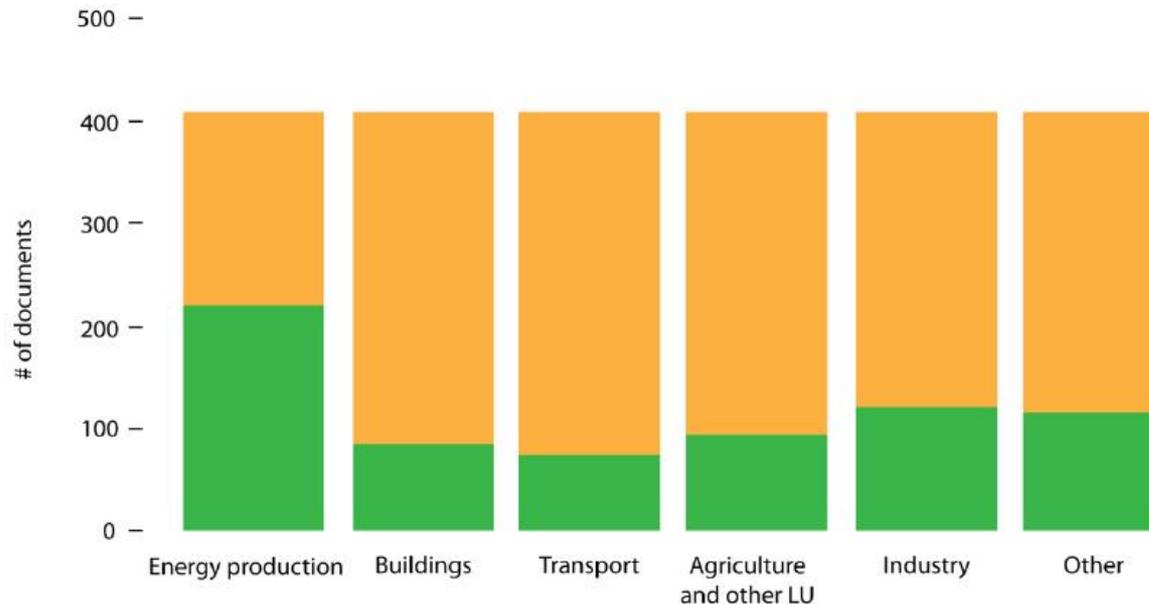


Sectors of economy

Figure below provides an overview of the various sectors covered by the policies analysed.

The **energy production** is the best researched area, roughly reflects the share of GHG emissions from these sectors (IPCC, 2014b). Energy production is especially discussed in documents that study at national scale. By contrast, **industry** is disproportionately discussed at an international scale, which probably reflects the transnational nature of heavy industry.

Studies analysing **investments** overwhelmingly focus on the **energy sector**, with equally little attention paid to the other sectors covered. **Policy instruments** also show a strong focus on the **energy sector**, but with equal emphasis on **industry** more broadly. For **policy strategies** **energy** followed by **agriculture** and other land uses are dominant sectors.



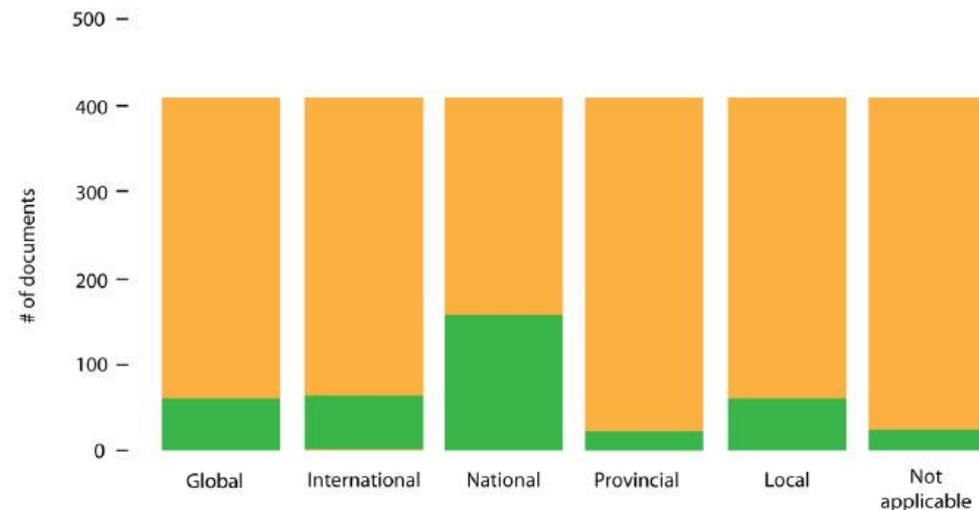
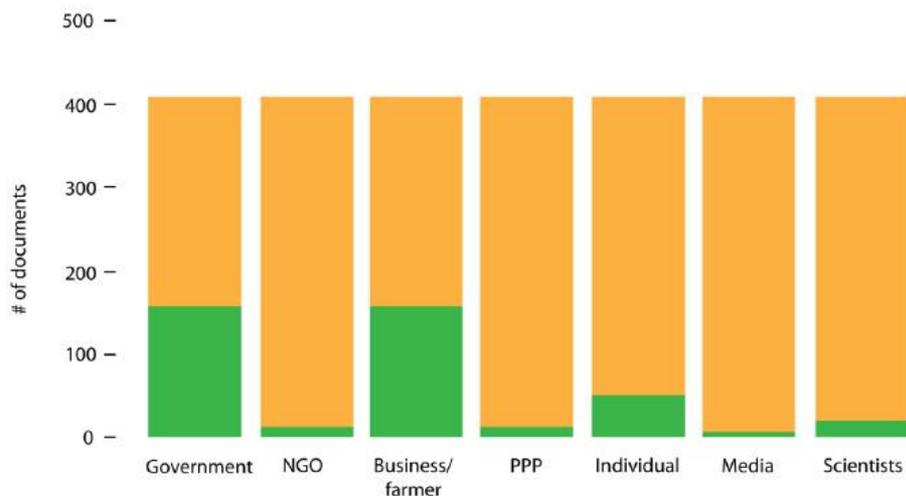


Who creates and bears risks?

- ▶ Most of studies mentioned stakeholders in the roles of risk/uncertainty bearers or creators. More attention is paid to individuals or groups affected by policies rather than those creating risks or uncertainties for policy choices.
- ▶ The majority of stakeholders analysed are governments, and businesses and farmers operating at the national level. Aside from national stakeholders, international stakeholders are more frequently covered compared to sub-national stakeholders.

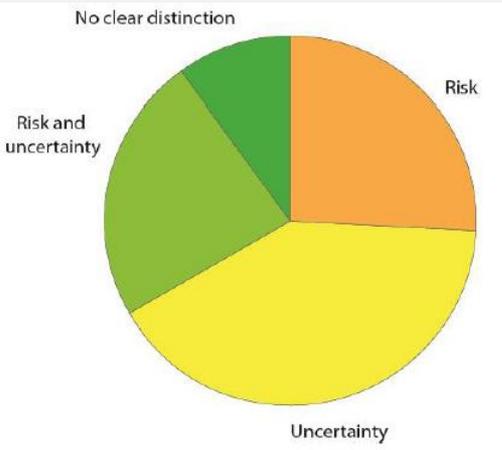
Types of stakeholders

Scale of influence





Risk and uncertainty in works

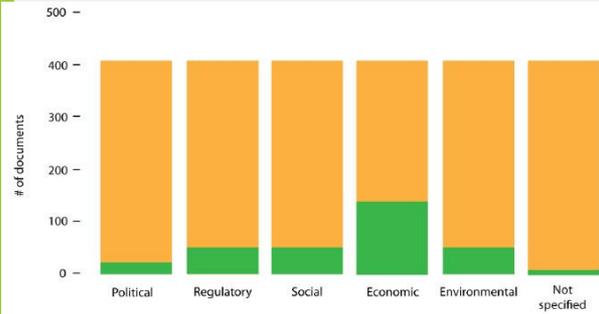


Almost two-thirds of the articles analysed explicitly discussed uncertainty, and about half discussed risk

- ▶ Distribution is not even across policy choices: 24 out of 56 documents on technology were about risk, 25 out of 57 documents about investment/resource allocation were about both risk and uncertainty, and 22 out of 35 documents on targets were solely about uncertainty.

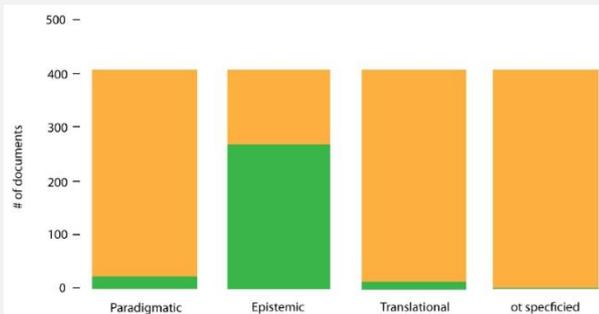
Risk

- ▶ coverage leans heavily towards economic risks, especially in documents that discuss consequential risk
- ▶ papers covering risk leans towards quantitative indicators



Uncertainty

- ▶ overwhelmingly biased towards epistemic uncertainty, with few publications addressing the uncertainty of choosing between epistemological paradigms, and ever fewer on how to translate findings to other stakeholders in climate policy.
- ▶ a large majority of the documents had quantitative indicators, but only a small number had qualitative ones





Conclusions

- ▶ The search was performed to provide a comprehensive literature review of the risks and uncertainties associated with climate policy.
- ▶ The following broad insights are based on a preliminary review of 410 research articles and book chapters published since 2006.
- ▶ During filtering in the 'risk/uncertainty dimension' most of results came from combinations with 'Cost', 'Problem', 'Risk' as well as 'Loss*2 (all very broad synonyms for risks).
- ▶ Most articles covered European policy choices, followed by US and Canada, as well as Asia and the South Pacific (excluding Middle Eastern countries). Only few studies cover policies specific to the Middle East and North Africa (MENA), Africa and Latin America.
 - ▶ The geographical focus on developed, i.e. industrialised regions of the world is not surprising, as these are the principal regions where climate change mitigation is to happen. A similar focus lies on government, business, and farmers as stakeholders who bear, or create, risks and uncertainties in a similar vein.
- ▶ Energy sector has the main attention while others are usually added into the calculations.
- ▶ Review indicated an overwhelming focus on **epistemic uncertainties**, i.e. insufficient knowledge or even ignorance as to the probabilities of certain positive or negative impacts.
- ▶ Overrepresentation of **quantitative risk** may be caused by the fact that in the qualitative analysis of risks, other synonyms may have been used, such as 'negative effects' and 'negative impacts'.



Thank you!

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