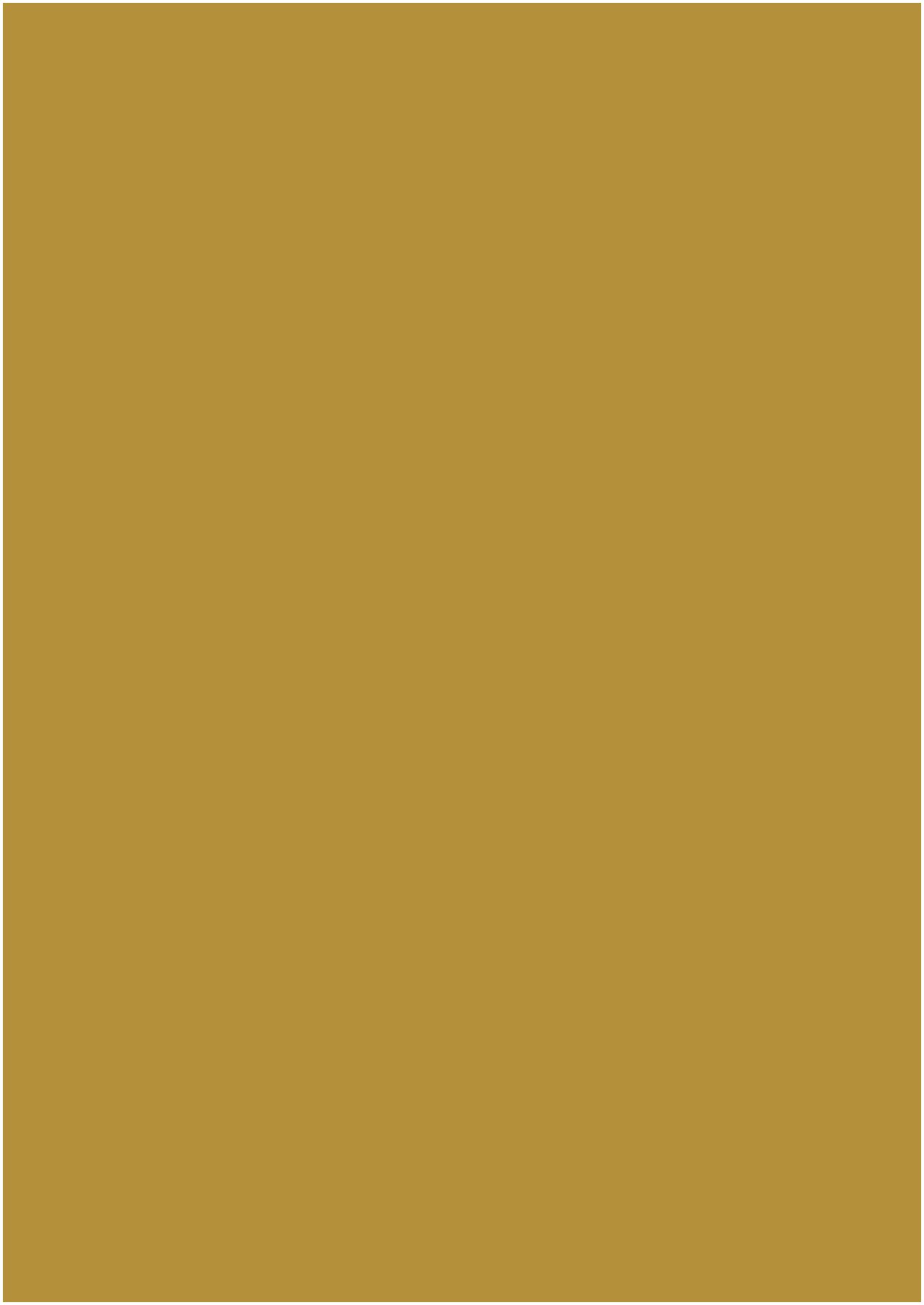
Simon Institute
for
Longterm Governance

HOW POLICYMAKERS APPROACH INFORMATION OVERLOAD AND DEEP UNCERTAINTY

An Interview Analysis

2022

www.simoninstitute.ch



Acknowledgements

This report is the result of a joint effort between the Geneva Science Policy Interface (GSPI) and the Simon Institute for Longterm Governance (SI). In particular:

1. The GSPI funded the activities required to conduct the data collection, supported data collection by providing access to its professional network to find and contact potential interviewees, and provided feedback on the interview protocol.
2. The SI funded the interview analysis and the write up of this report.

Methodology development, analysis and report writing were the responsibility of Elias Kock, who worked together with SI as an independent research affiliate. Konrad Seifert and Maxime Stauffer provided guidance and review. Jacob Arbeid and Isaak Mengesha contributed feedback to the final draft. Marta Krzeminska provided excellent editing. All remaining mistakes are the author's.

Citation

Kock, E. (2022). "Uncertainty is a danger, right?" - An interview analysis to explore how policymakers approach information overload and deep uncertainty. Simon Institute for Longterm Governance.

Contents

Executive summary **1**
The role of behavioral science for global catastrophic risk policymaking 1
Purpose and approach of this report 1
Analysis 1
Leverage points and recommendations for action 2

Introduction **3**
1 Methods **5**
A. Interview structure 5
B. Sample 5
C. Analytical framework 6
2 Analysis **8**
How to read this section 8
Uncertainty 8
A. Salience 8
B. Framing 9
C. Behavior 12
D. Summary and overview of barriers and facilitators 16
Information overload 19
A. Salience 19
B. Framing 20
C. Behavior 24
D. Summary and overview of barriers and facilitators 26

Lessons learned—leverage points for improving individuals' capacity to handle information overload and uncertainty **28**

Annexes **32**
Definitions 32
Broader literature background 32
Interview protocol 34

Endnotes **35**

Executive Summary

The role of behavioral science for global catastrophic risk policymaking

- From extreme climate change to misaligned artificial intelligence, humankind is currently facing an unprecedented array of hazards that threaten to cause a global catastrophe or even extinction.
- One way to address these global catastrophic risks (GCRs) is to develop policy responses that are unique for each risk. In spite of the differences between those risks, the psychological challenges they pose to policymakers are similar.

  Regarding all risks, policymakers need to act early and proactively. This is to prevent specific GCRs and to stop local crises from spiraling into global catastrophes. Both goals require handling the information overload inherent in policymaking, and managing the deep uncertainty that characterizes scientific research on complex topics.

  To reduce cognitive load of making decisions all humans use mental shortcuts, instead of reasoning from first principles. The shortcuts that are best in helping to deal with the environment persist over time.
- This report proposes that the shortcuts that policymakers use to navigate information overload and uncertainty are not appropriate anymore. Especially not in a world in which there is a real chance of a GCR event occurring in the next hundred years.

Purpose and approach of this report

- To identify potential leverage points for improving GCR governance, this report focuses on the way policy professionals think and act in the face of information overload and deep uncertainty.
- This report is based on a sample of twenty three interviews with policy professionals from the EU, UN, and national governments. It examines the barriers and facilitators that influence individuals' capacity to handle information overload and uncertainty. Through this, it seeks to identify leverage points for improving GCR decision-making. Barriers and facilitators were identified based on the interviewees' awareness of the issues of information overload and uncertainty, the ways they thought about these topics, and the ways they reported reacting to them.

Analysis

- Interviewees associated the idea of effective handling of uncertainty with adapting plans to a changing reality and anticipating emerging risks. Effective handling of information overload was associated with being able to find, and make sense of, relevant information quickly and to prioritize actions accordingly.
- The barriers to effective handling of uncertainty included:

  1) Underestimating the level of uncertainty involved in policy decisions due to a lack of awareness of complex system dynamics. This can lead to delayed action and doing too little to prevent a crisis.

  2) Difficulty in imagining unfamiliar future scenarios, which limits the capacity to anticipate emerging risks.

  3) Avoidance-oriented behaviors, such as frequently delegating forming judgments on uncertain issues to superiors.

4) Control-oriented behaviors, such as trying to eliminate uncertainty through spending more time on research.

- An attitude that facilitates effective handling of uncertainty is adaptation-oriented behavior—accepting uncertainty as a given.
- The barriers to effective handling of information overload included:

  1) Time-consuming information filtering processes, which create a high cognitive burden.

  2) Time pressure, which affects the depth of information processing policy professionals can engage in.

  3) Low epistemic standards of advisors, which makes it difficult for policy professionals to judge the reliability of their advice.

  4) Reduced overall cognitive and emotional surge capacity after long-term exposure to information overload.
- The facilitators that reduce the information processing burden of policy professionals include:

  1) Relying on trusted networks for filtering and making sense of information, e.g. consulting personal contacts to get expert input, or deliberating decisions in small groups.

  2) Prioritizing information sources based only on the most important criteria.

Leverage points and recommendations for action

- Many of the barriers to better handling uncertainty relate to unrealistic assumptions about the behaviors of complex systems. This includes underestimating the abruptness and the scale with which complex policy issues can change. One potential strategy to improve handling uncertainty would be to fine-tune these expectations. Serious games are a promising way to teach complex system behavior—they offer the opportunity to observe their dynamics in a safe setting and to build experiential knowledge.
- Across information overload and uncertainty, both barriers and facilitators indicate that policy professionals need to be resilient and collaborate well to thrive in the complex policymaking environments. For instance, the adverse long-term effect that information overload has on surge capacity is a barrier that highlights the importance of resilience, while shared sense-making in small groups is a facilitator that demonstrates the importance of collaboration. A large part of policy professionals' resilience and collaboration capacity depends on their ability to stay present and focused in difficult moments. Increasing their awareness of internal processes and improving their ability to control them is therefore an important leverage point. Mindfulness practice could be used to strengthen the mental foundations for thriving in complex environments. Current applications of mindfulness in settings such as the military, business, and politics suggest that this approach could be promising also in the field of policymaking.
- Existing processes used to determine the relevance and reliability of information are too time consuming to work well in information-overloaded and fast-changing environments. It's important to ensure that the processes of information synthesis can become quicker when necessary, while at the same time maintaining an acceptable level of rigor. To do this, different filtering processes need to be empirically tested for their speed and accuracy. A good result would be the development of processes with different speed-accuracy trade-offs that would match the demands of a variety of situations.

Introduction

In most policy matters, even the worst possible outcomes do not have globally catastrophic consequences. However, when talking about risks of global scale, the worst outcomes can quickly become catastrophic and threaten not just current populations, but the future of humanity as a whole. In the next one hundred years humanity is facing unprecedented global catastrophic risks (GCRs). From the adverse consequences of global warming, to engineered pandemics, to nuclear war and transformative AI—each of these events would cause at least a ten percent loss of the global population.[1]

All of GCRs share the same governance challenges: information overload and deep uncertainty (see annexes for definitions). This report investigates how to support policymakers in better handling these two challenges to increase their capacity to make effective decisions to reduce the GCRs.

Traditionally, most support for policymakers is delivered as information products. Scientists, NGOs, and the media provide them with synthesized knowledge to discuss and act upon. In 2020 alone, for example, more than 100,000 academic articles on COVID-19 were published.[2] However, evidence shows that, when exceeding a certain threshold, receiving too much information may decrease decision quality.[3]

The risk landscape that humanity currently faces is characterized by another key feature: deep uncertainty. As societies become more interlinked, the chance of any regional or sectoral shock cascading into a global catastrophe increases. At the same time, our ability to forecast such shocks and accurately assess their potential to cascade into a global catastrophe is limited.[4]

Investment in prevention is essential.

Effective GCR policy relies on investing in prevention and preparedness.[5] Governments, however, typically tend to act reactively rather than proactively.[6] This report was motivated by the position that the behavior of individual policy actors matters greatly for the collective decision-making processes that shape government policy. Consequently, improving the capacity of governments to proactively work on GCR policy hinges on the psychology of individuals. This is true regardless of whether they act as the sole decision-maker or contribute to a group decision-making process.[7]

Outdated shortcuts are hurting decision-making.

We believe that policymakers—and, in fact, all humans—consciously and unconsciously rely on inherited and learned mental shortcuts (heuristics) to guide their attention and make sense of the world.[8]

Mental shortcuts evolve to allow decision-makers to make quick, yet rational decisions, within their typical environment.[9] For example, a shortcut often used in the domain of risk governance is focusing on risks whose probability can be well-quantified based on historical records.[10]

The shortcuts policymakers use today to navigate information overload and uncertainty are not adequate for the proactive decision-making that is needed to prevent global

catastrophes.[11] Current shortcuts might, for instance, make decision-making too slow to stop risk cascades before they develop an uncontrollable pace. They might also result in steering attention away from the most important risks. Judging the likelihood of a pandemic based solely on historical data, for example, underestimates the chance of such an event in the world we live in now.[12]

Against this backdrop, the goal of this report is to identify promising leverage points to improve how individuals handle information overload and deep uncertainty.

It's based on a series of twenty three interviews with international policy professionals, and gathers insights into the barriers and facilitators to effective handling of information overload and uncertainty.[13] These insights were used to formulate suggestions for promising individual-level leverage points that the policy support community could focus on to improve the capacity of governments to proactively address GCRs.

Methods

Interview structure

All interviews were semi-structured and lasted for one hour on average. For an overview of the topics covered by the interviews see annex 1. The interview protocol contains topics that go beyond the scope of this report. This is because the original purpose of the interviews was to inform the development of a decision-making training for the UN High Level Political Forum 2021.

Sample

A total of twenty eight interviews were conducted between February and April 2021. Twenty three of them are relevant to this analysis as they represent the views and experience of policy professionals. We excluded five interviewees, mostly academics from fields not directly related to policymaking.

#	Professional experience most relevant to interviews	Current function	Years of policy experience	Gender
1	International Organization	Capacity Building	30	Male
2	International Organization	Capacity Building	24	Female
3	International Organization	Capacity Building	45	Male
4	International Organization	Operations	17	Female
5	International Organization	Operations	5	Female
6	International Organization	Policy Research	13	Female
7	International Organization	Policy Research	23	Male
8	International Organization	Policy Research	24	Male
9	International Organization	Policy Research	7	Female
10	International Organization	Policy Design	26	Male
11	International Organization	Policy Design	6	Male
12	National Government	Capacity Building	18	Male
13	National Government	Diplomacy	13	Male
14	National Government	Policy Research	8	Female
15	National Government	Policy Design	9	Female
16	National Government	Policy Design	3	Female
17	National Government	Policy Design	16	Female
18	NGO	Capacity Building	8	Female
19	NGO	Capacity Building	17	Female
20	NGO	Policy Advocacy	18	Male
21	NGO	Policy Advocacy	32	Male
22	Regional Organization	Capacity Building	20	Female
23	Regional Organization	Policy Research	30	Male

Table 1

Overview of the sample.

Overview of the sample, summary:
- Gender: 12 women and 11 men.
- Policy experience: from three years to 45 years (median of 17).
- Function: six people working primarily in capacity development, two in diplomacy, two in operations, two in advocacy, six in policy research, and five in policy design.

The goal of our sampling was to capture a broad range of experiences in the domains of international and foreign policy—the target group of the UN High Level Political Forum. We paid attention to achieving a balanced representation in terms of gender and the functions interviewees held, and we included a wide range of policy experience levels. We differentiated between six function groups as follows:

1. **Capacity building**—developing, implementing, and evaluation of training programs and educational content.
2. **UN Diplomacy**—representing national governments, specialized agencies or big funders at the UN.
3. **Operations**—managing or improving organizational processes.
4. **Advocacy**—planning or implementing communication efforts to move policy issues up on the political agenda.
5. **Policy research**—developing and/or evaluating policy interventions and/or policy-relevant insights.
6. **Policymaking**—making or preparing policy decisions within the context of public institutions, such as national governments, the EU or the UN.

Interviewees were sampled through personal connections at relevant organizations, search on LinkedIn, and snowballing. Table 1 shows the composition of the final sample.

Analytical framework

To elicit barriers and facilitators to effectively handling information overload and uncertainty we systematically analyzed the interviews along three dimensions:
1) Salience, 2) Framing, and 3) Behavior.

In the salience dimension we asked:

- How aware are policy professionals of information overload and uncertainty?
- Which aspects of these issues are they aware of?
- Do the answers to these questions act as barriers or facilitators to effectively handling information overload and uncertainty?

n the framing dimension we asked:

- Do interviewees perceive information overload and uncertainty as bottlenecks to better policymaking?
- If so, which policymaking challenges do they associate with them? What are the barriers and facilitators to better handling these challenges?
- If not, why not?
- Which psychological effects did exposure to information overload and uncertainty have?

Finally, in the **behavior** dimension we asked:

- How do interviewees behave in the face of information overload and uncertainty?
- Do the answers to these questions act as barriers or facilitators to effectively handling information overload and uncertainty?

The interviews were recorded and automatically transcribed using the service otter.ai. We used thematic analysis to inductively identify relevant clusters of quotes along the aforementioned three dimensions. Each quote could contribute to several clusters.

Analysis

How to read this section

Each part of the analysis is preceded by a short summary of the main findings. Both the uncertainty and information overload sections end with a summary. Each presents the themes that emerged from the analysis, and lists the barriers and facilitators to effectively handling the issues in discussion.

Readers who want to gain a quick insight into the themes of a specific part of the analysis are advised to read the summary for that part. Those interested in getting an overview of entire sections are advised to read the section summaries. Further details on each theme and illustrative quotes are provided in the main body of the analysis.

Uncertainty

Salience

Overall, a large number of interviewees (n=18) contributed insights to this section and all of them believed that the outcomes of policy decisions are, to some degree, irreducibly uncertain. However, there were different beliefs regarding the sources of uncertainty. Some interviewees focused on the information gaps and, therefore, viewed uncertainty as practically irreducible. Others focused on the limited predictability of complex systems and, therefore, viewed uncertainty as technically irreducible. People who focused on the limited predictability of complex systems criticized those who did not do that. They asserted that the latter group was underestimating the depth of uncertainty surrounding policy decisions.

Information gaps as sources of uncertainty

Seven interviewees focused on information gaps as sources of uncertainty. A capacity builder from an international organization illustrates the general sentiment expressed by this group:

"So I guess, of course, when you make a decision, there's a wide array of uncertainties in the sense that you can't cover every angle of an issue. [...] The reality is that in decision-making, at some point, you have to say: 'Okay, this is enough information for me to make a decision, which in my view, is well enough informed to be confident that this is the right decision."

Here, the reason why the decision is affected by uncertainty is an information gap. It arises because the decision-maker decided to stop collecting information.

Other reasons interviewees mentioned as sources of information gaps include a lack of scientific research or a lack of subject matter expertise. The common denominator between these comments is an assumption that more information always translates into less uncertainty regarding the outcome of a decision.[14] Nevertheless, the interviewees believed that, given various constraints, decisions are always affected by some level of uncertainty that is practically irreducible.

Complex systems as source of uncertainty

Eight interviewees mentioned the complexity of policy problems as the main source of uncertainty. A policy researcher from a regional organization, for example, noted:

"Everything which is happening is very complex and you cannot, for example in terms of climate, predict all the details of what's going to happen next month, next year, you know, in five years, there is a lot of uncertainty in all these systems."

The complexity of the weather imposes a hard limit on how far into the future reliable forecasts can be made.[15] Using a similar analogy, members of this group believe that the complexity of policy issues limit their inherent predictability. This means that more information does not necessarily translate into better predictions and, hence, better decisions.[16] In other words, decision-makers face some uncertainty that is technically irreducible.

Different perceptions of the depth of uncertainty

Both groups seem to support the view that policymakers face a certain amount of irreducible uncertainty when they have to make a decision—whether that is due to lack of information or inherent features of the specific policy issue. However, two members of the group emphasizing the complexity of policy issues believed that the people who do not grasp complexity underestimate the extent of uncertainty surrounding policy decisions. For example, one interviewee who works in capacity development at an NGO, said:

"[...] if you're targeting the UN, then I would advise that you might want to add a section to your training, which is about: 'Writing the policy does not make the change happen.' [...] I mean, I can't tell you how many meetings I've been to where people were like: 'Well, if we draft this policy right, and we spend a year and a half drafting this policy, then that will make the change happen in the world.'"

What seems to underpin this quote is a notion that the people in policy meetings underestimate the complexity of the real world systems they are trying to affect. And, that they are not aware of the amount of uncertainty that still remains after investing a considerable amount of resources into analysis. Underappreciating the complexity of policy issues can, therefore, act as a barrier to productively engaging with uncertainty.

Framing

Overall fifteen interviewees contributed insights to this section. Most (n=13) viewed people's capacity to handle uncertainty as a bottleneck for the quality of policy decisions. Others acknowledged that uncertainty impacts decision-makers, but did not view it as a bottleneck for improving policymaking. The majority group mentioned a variety of policymaking challenges affected by uncertainty, including: adapting plans to changing circumstances, anticipating emerging risks, and the challenge of dividing attention between the two. A small group of interviewees mentioned how uncertainty can cause anxiety, along with suggestions on how this could be mitigated.

The challenge of adapting plans

Eight interviewees contributed to this theme. There was a consensus that irreducible uncertainty creates a need to regularly update plans in order to stay in touch with a changing reality. A capacity builder from a national government, for example, spoke about the need for policymakers "to understand reality in terms of constant change and to be continuously learning". A policymaker from an international organization, responded in a similar way when asked about how policymakers should react to uncertainty:

"Well, they need to develop a certain kind of review mechanism whereby they can say: 'Okay, we think this is the best way to go, but we need to test it for a certain period of time before we can be sure and then we can maybe adjust after a certain period.'"

A policy researcher from a regional organization pointed out, however, that adaptive decision-making does not necessarily mean making only small steps—some steps can be larger than others. He mentioned two barriers to being adaptive in an environment in which sudden, large-scale shifts can occur. One of them is a low capacity to notice that the "rules of the game" have changed.[17] What to him demonstrated the need for investing more into resilience towards unpredictable shocks was the example of COVID-19. This also prompted him to reflect more generally on people's ability to notice and adapt to fundamental shifts:

"It's difficult, but I think that if people are primed, they understand more quickly what is going on when a shock happens. If they have considered things like that, even if they were not considering them as likely or very plausible, the mere fact of having gone through the mental exercise, makes them more likely to take quicker action when they see something happening next. An impression I have very often is that when these events arrive, lots of people just look at them incredulously. They just say: 'What is this?' They're just not able to put a meaning on them. It's just basic crisis response: 'Oh yeah let's rebuild and then go on as usual.'"

He also pointed out that underestimating the pace of change can be an obstacle for considering a possibility that a major shift can be under way in any given moment:

"I don't think people realize how fast things are changing and that change is not progressive. It's not incremental. Change happens in jumps. All of a sudden you pass a threshold and then you enter a completely different game."

The challenge of anticipating emerging risks

Two interviewees contributed insights to this theme. They spoke about the difficulty of anticipating emerging risks, and the relevance of this process when facing high-levels of uncertainty about a broad range of possible futures. A capacity builder from a national government highlighted the importance of critical reflection as a way to expand the space of futures that one considers possible:

"So, reality is changing. This is pretty hard for us human beings. Our minds suffer from a variety of cognitive biases. If we don't pay attention to the gaps that develop between our old mindset and the ever-changing reality, the relevancy gap is exposed. It is

about what we think is possible. It's not that on the evening of the 10th of September the Americans didn't know who Bin Laden is, or what Al Qaeda is. It's that they didn't make a connection between them and their homeland security, so it is important to emphasize that this is about how we perceive reality. By ignoring weak signals along the way, the relevancy gap is widening and suddenly a strategic surprise can occur like September 11."

A policy researcher from a regional organization expanded on the reasons why imagining a wide range of futures is difficult. He focused on the effect of implicit assumptions:

"It is difficult for people to think about the long term. By practicing foresight for a number of years, I've seen that it's not an easy exercise. Most people are really not well equipped to do this. That's why you need foresight methodologies to help people do this. The way I view foresight as being important is as a catalyst, to help people imagine other things and create new narratives, which are internally coherent."

Maintaining his focus on foresight as one of the tools to stimulate scenario development, he pointed to another bottleneck limiting people's ability to imagine unfamiliar scenarios—low awareness of other people's perspectives:

"Many years ago, I went to run a foresight session in Berlin to show them the tools and to reflect about sustainability. Somebody had to take the role of industry and somebody else had to take the role of the policymaker, but all participants were NGO types in their actual jobs. What made me happy was that at the end of the session this guy, who had taken a policymaker role, came to me and told me: 'I never realized it's so difficult to be a policymaker.' So, there I said: 'Yes!' There was a lot of awareness raising, people looking at the world from a different angle. That made them think more richly than they were thinking before."

The challenge of dividing attention between adaptation and anticipation

Adapting to a changing reality and anticipating emerging threats require making decisions in the face of irreducible uncertainty. Future events are uncertain by nature and fundamental shifts might only be confirmed long after a decision had to be made. Decision-makers cannot adapt and anticipate both at once. A policymaker from an international organization summarizes the continuous trade-off between adaptive and anticipatory thinking:

"I think in a perfect world you take stock of the whole system around you, you look at all the sort of recursive feedback loops and terrible things that might happen and then you make the decision. But, [by then] time has also moved on as well."

Uncertainty as a threat to feeling safe

A policy researcher from a regional organization emphasized how the feeling of safety is threatened by uncertainty:

"You know, I think one of the main problems that people are facing with uncertainty is that

that they find it scary and fear is really not a good advisor. If people have been exposed to circumstances, however, in which they discover that uncertainty can lead to interesting things, then all of a sudden their psychological attitude toward uncertainty changes."

As a result, he thinks that an important outcome of decision-making training should be to "help people become more comfortable in their own capacity to deal with what's gonna happen before they know what's gonna happen."

"Not sure."—critical views on the importance of uncertainty

Many people we spoke to believed that uncertainty had important implications for decision-makers. However, not all interviewees considered it a key bottleneck for better decision-making. A capacity builder from an international organization, for example, suggested that many decision-makers believe that uncertainty can be sufficiently reduced before making a decision. Therefore, in most cases, handling uncertainty is not a bottleneck for decision quality:

"I guess—and that's an assumption of mine—probably a lot of decision-makers would tell you: 'I only make decisions based on sufficient evidence to actually move forward.'"

Another interviewee fundamentally doubted the usefulness of focusing on abstract features of decision-making as a method to improve the performance of organizations:

"Of course, the world is uncertain and decisions need to be made, but I'm not sure whether what really slows down decision-making is the uncertainty as much as the decision-making processes in general. That's certainly been my experience in the UN. Often we know what needs to be done but the problem is the bureaucracy. [Thinking pause] I'm sure there's also a question of: If you have limited resources and face an uncertain future, then how do you decide how to spend them? At the same time, the process for getting a decision through can be so onerous that I think sometimes that might prevent people from doing certain things —just because they don't want to go through the whole rigmarole. So yeah, I don't know. I do think uncertainty and information overload are good things to talk about but I wonder if they miss some of the realities of what a decision-maker is facing. So a part of me is wondering if you can have discussions about the decision-making context, without having discussions about the real factors that play into what actually makes a decision, you know? Not sure."

Behavior

Overall, eight interviewees contributed insights to this section. Among them, three core themes emerged about types of behaviors that occur when responding to uncertainty. Those are:

1) avoidance-oriented,
2) control-oriented, and
3) adaptation-oriented behaviors.

Note that the themes relate solely to behavior and don't speak about traits or attitudes.

They are not meant to differentiate between individuals or groups.

Avoidance-oriented behavior

The interviewees that contributed to this theme (n=6) described two ways of avoiding uncertainty: 1) avoiding decisions that involve uncertainty, and 2) downplaying or ignoring uncertainty. They also described two consequences of avoiding uncertain decisions. A capacity builder from an international organization, for example, explained how avoidance leads to "delegation cascades":

"So we have a tendency to sort of push it up: 'Okay, I don't make the decision. Let the boss make the decision.' Then when it gets to the boss, he does not make a decision either so it goes up, up, up—even for a very small thing. Sometimes I see it even in my own organization: it basically lands on my desk."

Another interviewee who works in operations at an international organization described how avoiding uncertainty can lead to ignoring decision-relevant criteria. When making recommendations regarding an intervention, her organization typically applies a consistent set of criteria, including, for example, effectiveness and cost. In the beginning of the COVID-19 pandemic, however, this interviewee observed that some of her colleagues, when pressed for time, disregarded some of these criteria. In her view, their motivation was to avoid potential criticism and damage to their reputation:

"Sometimes when you don't have the evidence, you have to use a committee that is representative and that is varied enough and then they make a decision based on their professional experience and then you're transparent about it. So I asked them: 'Why are you not doing that?' They say: 'No, but we cannot…'—basically they were scared that other people would say: 'Oh, but there is evidence on that and you haven't found it.'"

The concern for maintaining a good reputation was also mentioned by other people. An interviewee who works in capacity building at an international organization explained:

"Like in any other bureaucracy, people are not too comfortable with making decisions because of the potential side effects. 'If I make a decision and it doesn't work, how would it affect my career, my reputation in the organization?'"

Finally, speaking about political decision-makers, a capacity builder from a regional organization remarked:

"What our scientists are often saying is that we have to teach the policymakers to deal with the uncertainty because it's there—we can't eliminate it. I think that for policy-makers, uncertainty is a danger, right? Because it's a political risk. I mean, they can be attacked, if they make a decision and it goes the opposite way."

In addition to concerns about reputation, interviewees mentioned three other reasons why uncertainty might be downplayed. A diplomat, for example, described that his colleagues were uninterested when, a few weeks before the global COVID-19 outbreak, he approached them to talk about the possibility of a pandemic. He hypothesized that the reason for their low interest was that the issue was too distressing to think about:

"A couple of weeks before the first lock-down, I met people working on a project called [redacted]. It was super interesting, because they were quite serious people, I mean, university professors and things like that. They were telling me: 'There might be a big crisis coming up and no one's prepared.' They came from very technical things like big insurance companies, who actually have quite a good grasp of the concrete risks that we face. I was like: 'That's super interesting.' But when I was speaking about this project with people at the Capitol, they were like: 'Yeah, that's maybe intellectually interesting.' They didn't at all see the emergency or the urgency to talk about that. Maybe one month later, there was the first lock-down of the pandemic. Maybe it's human nature. We don't want to hear the bad news or the bad things that could happen."

A policymaker from an international organization interpreted this issue as a question of colliding incentives. He explained how some people can be more prone to ignoring uncertainty than others:

"Different people need different things from these processes and so that's going to drive their anxiousness or their patience or lack thereof. I think that, when it comes to science and policy, a lot of it is this kind of: 'Who's pushing me to get what response?' 'So, I am a supply chain person and I can't order thousands and thousands of units of something because you haven't done your evidence review. Well, too bad because if I don't order this, you know, I have money to spend now that I need to spend and I have people who need this product, whether you recommend it or not. So, we're gonna go ahead and make that decision, and then, we're gonna pressure you to finish your evidence review so that we can fulfill the requirements to get our product out.' Meanwhile, you're sitting there saying: 'Well, the scientific process is what it is. We need to make sure we get broad consultation and diverse expertise. [...]' I see this sort of tango that happens when people are trying to make sure that their organization shows up well and is delivering on the things that they're expected to do."

Finally, another policy researcher from an international organization pointed to the subconscious tendencies of the human mind as a reason for avoidance-oriented behavior. Responding to a question of the influence of uncertainty on people's behavior during the COVID-19 pandemic, she said:

"I mean, uncertainty was always there, but we didn't recognize it. It's this thing called present bias. To some degree, the more pronounced uncertainty during COVID pushed us more into a present bias."

Reflecting on the rationality of this tendency, she added:

"It is not necessarily ecologically irrational for us on an individual level to focus on the present, but as policymakers—decision-makers who are really being asked to look out for our societies in the long term—it's particularly important for them to kind of get out of that mode, but not entirely, because I think addressing the needs and the fears of people nowadays is an equally important consideration as [addressing their] longer term needs."

Control-oriented behavior

Three interviewees contributed insights on control-oriented behavior, and three themes emerged. The first one centers on the importance governments place on risk analysis to reduce the level of uncertainty surrounding policy decisions. For example, a diplomat described his work as follows:

"I work for the government and government officials, they hate uncertainty. They want to have plans, to have risk analysis, to have options. Actually, it's quite a big part of my job to give my bosses risk analyses: What are the opportunities? What are the threats, the risk, etc.? So, we spend quite a lot of time on that."

The second theme describes how this approach can be misused. A policy researcher from a regional organization exemplified this talking about how representatives of the tobacco industry tried to influence policy:

"I think uncertainty is instrumentalized by actors to prevent change. For instance, the tobacco industry was always arguing: 'We don't know everything, you know, in order to make sure that we make the right decision, we have to reduce all this uncertainty and we first have to finance more research.' Essentially, by doing this, what you do is you postpone decision-making."

He also observed a similar dynamic in climate policy:

"My position is that we know enough to take action without having to know the latest detail, but a lot of the decision-makers don't have the scientific training to be able to actually deal with this."

Following this train of thought, it seems that striving to make decisions on objective grounds can make policymakers vulnerable to manipulation from well-resourced non-governmental actors. Or, it can create conditions for a tug of war that prolongs decision-making processes.

Adaptation-oriented behavior

Five interviewees contributed insights to this section, which resulted in two broad themes. The first theme centered on the idea of regularly adapting plans to an evolving situation, and the mindsets and behaviors that enable decision-makers to do this.

This was already mentioned by a national policymaker working in the domain of public health. She pointed out that to effectively respond to ongoing developments during the COVID-19 pandemic "[...] you have to prioritize a lot and only act on the most pressing issues." She also mentioned a big amount of uncertainty regarding what the most pressing issues are:

"[...] you have to let go of what is not a priority, which isn't so complicated to do, but then you have a whole range in between things that are quite clearly not a priority, and those that would be nice to have."

On a personal level, she had to embrace accepting responsibility without having full control over the situation:

"It sounds a bit basic, but I do feel that it really recapped it for me. To be able to actually do things you do have to be able to deal with taking responsibility, although you don't control everything at hand. [...] I feel that if you don't manage that step, then it's not possible to be working in such a dynamic for such a long time. It's just humanly not possible."

Another interviewee, who works as a diplomat, shared this view. He described three qualities policymakers need to effectively manage uncertain and fast-paced environments:

1. Selecting the right advisors for a decision.
2. Quickly forming balanced opinions based on the advisors' input.
3. Making pragmatic decisions.

"Usually they [policymakers] are good listeners. They will start by putting together a group and listening to them. And then, they have this ability to say: 'Well, that's maybe not the absolute perfect, optimal solution, but that's where we are now and that's what we need to move forward.' [...] They know how to surround themselves with experts and good thinkers and then when the deadline is there to just stop the discussion and say: 'Okay, now I take the responsibility and that's the decision.'"

The second theme focused on investing in maintaining a flexible surge capacity, on an organizational level. Here, a policy researcher from an international organization provided two examples of how his organization changed its processes during COVID-19. These adjustments increased the organization's capacity to respond to emerging developments. The first change was about the evidence synthesis process. Before, the organization would establish a bespoke expert committee specifically for each policy guideline. The new approach is to set up a broad expert panel to handle quality control and approval for all guidelines to be produced, occasionally adding specific expertise when needed. The second change was a new process to ensure cross-departmental coordination and prevention of contradictory messaging in written outputs.

Summary and overview of barriers and facilitators

Almost all of the eighteen interviewees contributed to the salience section. That is, they had a high level of awareness that decision outcomes are subject to some level of irreducible uncertainty.

With regards to the main source of that uncertainty, there was a roughly equal split between interviewees. For one group (n=7) the main source were the practical constraints that limit the availability of decision-relevant information in the moment of decision-making. The other group (n=8) thought the complexity of policy issues was the main contributor to the fact that some level of uncertainty cannot be reduced, even technically. Subscribers to the latter view have criticized those who favored the former for underestimating the level of irreducible uncertainty that decision-makers face. A lack of understanding of complexity could, therefore, act as a barrier to improving decision-making under uncertainty.

Fifteen interviewees described their framing of uncertainty. Most (n=13) viewed

productively handling uncertainty as a bottleneck for effective policy decision-making. Interviewees spoke about the need for continuously adapting to change and for anticipating emerging risks. They noted the inherent challenge decision-makers face, needing to continuously trade off between the two.

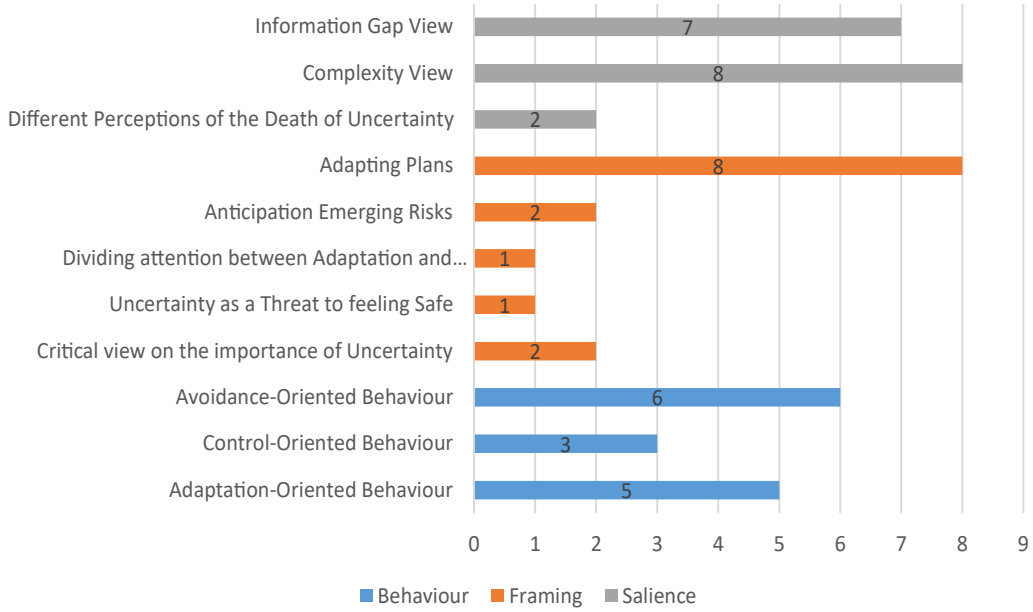


Figure 1

Graphical overview of the number of contributors per theme in the uncertainty section.

One interviewee spoke about the need to invest in the resilience of critical systems that face deep uncertainty in order to increase their capacity to withstand unanticipated shocks. Barriers towards more adaptive behavior in a deeply uncertain environment included failing to recognize moments of radical change and underestimating its pace. As barriers to better foresight interviewees mentioned not questioning implicit assumptions and not using different perspectives in understanding policy issues. One group of interviewees spoke about the tendency to view uncertainty as a threat to one's reputation, creating the feeling of insecurity.

Two interviewees did not agree that a better handling of uncertainty is a bottleneck for effective policy decision-making. One of them believes that decision-makers can reduce uncertainty sufficiently, and so handling it is not a bottleneck to decision quality. The other saw bureaucracy and power politics as more pressing bottlenecks for better policymaking.

The six interviewees who contributed descriptions of behavioral responses to uncertainty spoke about three types of responses: avoidance-oriented, control-oriented, and adaptation oriented behaviors.

Avoidance-oriented behavior consists of avoiding decisions that involve uncertainty, downplaying or ignoring it. Interviewees proposed different reasons for behaviors

that prevent from productively engaging with uncertainty. They include: concern for one's reputation, the emotional strain of worst case scenarios, organizational incentives, and the present bias.

Control-oriented behavior is characterized by using analysis in an effort to reduce uncertainty surrounding policy decisions. Interviewees discussed two challenges in this regard: 1) the time it takes to produce research findings, and 2) the instrumentalization of uncertainty to prevent or delay policy action. Both are underpinned by the same expectations:

1. That uncertainty about future events can be quantified reliably.
2. That the quantification is trustworthy enough to produce forecasts.
3. That it's trustworthy enough to justify an investment in building detailed plans based on these forecasts.

In short, that more research enables better forecasts, which enables better decisions. This expectation is a barrier to productively engaging with uncertainty. This is because for many real-world policy issues [18] the conditions required to put reliable bounds on uncertainty are not met.

Barriers	Facilitators
Underestimation of the level of uncertainty A lack of awareness of complex system dynamics can lead to underestimating the level of uncertainty involved in policy decisions. That is, one might underestimate how sudden and how large the system's shifts can be. Especially in uncommon or unfamiliar situations, this can lead policy professionals to respond insufficiently, and too late to effectively mitigate the worst impacts of an imminent crisis.	**Adaptation-oriented behavior** Adaptation-oriented behavior is characterized by regularly adapting plans to an evolving situation. On an individual level, facilitators of adaptation-oriented behavior include accepting responsibility for decisions without having full control over their outcomes, active listening, and proactive consultation with different advisors. On an organizational level, prioritizing a few decision-making units covering a broad range of issues over many specialized decision units can reduce operational complexity and, therefore, increase adaptive capacity.
Difficulty in imagining unfamiliar scenarios Anticipating emerging risks requires imagining multiply plausible, but at times unfamiliar, future scenarios. Policy professionals' imagination can be limited if they don't notice implicit assumptions in their thinking and if they don't understand how and why other stakeholders might hold different views.	
Avoidance-oriented behavior Policy professionals might avoid working on policy issues that involve a high level of uncertainty or ignore inherent uncertainty for several reasons. The first one is anxiety triggered by being unsure about the future, about how to act, and imagining worst-case scenarios. The second is the fear of losing face when making an unsuccessful decision. The third is the organizational incentives pushing policymakers to move quickly and express full confidence in their choices. Disregarding uncertain long-term consequences could also be attributed to the natural human tendency to focus attention on short-term rewards ("present bias").	
Control-oriented behavior Control-oriented behavior focuses on reducing uncertainty through analysis. This hinges on the expectation that more research enables better forecasts, which, in turn, enables better decisions. This expectation can act as a barrier to effectively handling uncertainty if one doesn't consider the limits of the predictability of complex systems.	

Table 2

Barriers and facilitators to effective handling of uncertainty, an overview.

Finally, adaptation-oriented behavior is characterized by regularly adapting plans to an evolving situation. A mindset mentioned by two interviewees that supports this type of behavior is accepting responsibility for decisions without having full control over their outcomes. Active listening and proactive consultation with different advisors were mentioned as facilitators of effective decision-making in uncertain and fast-paced contexts.

On an organizational level, a different grouping of decision-making units was proposed to increase adaptive capacity by reducing operational complexity. Having several decision-making units covering a broad range of issues was suggested to be a better approach, rather than relying on specialized decision groups.

Information overload

Salience

All twenty three interviewees contributed to this section—all were conscious of information overload. They mentioned three different aspects of their environment that contribute to this issue: information volume, variety, and interconnectedness.

Information volume

All interviewees believed that the amount of information at their disposal greatly exceeds their processing capacity. Illustrating the perception of many others, a national policymaker remarked, for example:

"I had this conversation with one of my colleagues the other day about how there's a lot of research being done. There's a lot of information to actually use, but I wonder: What is the usability of all that information? Like, for me, it has to be easily accessible. I would love to be able to read a 50 page report, but I won't have the time. [...] That's why I always look for summaries that highlight the issues and possible solutions. Also, everything that's visualized and easily comprehensible is great. I know this sounds like kindergarten, but everything that I can understand without having to spend too much time [on it] just fits into my work more easily."

A capacity builder working for a regional organization on programs to strengthen the science–policy interface builds on this point. She explained the importance of tailoring the information to the needs of individual policymakers:

"Okay, what is the emotional connection? What is the frustration of this policymaker? What is their level of knowledge? What are their deadlines? You know, you need to go further because....otherwise, it will just be another paper, even if it's a synthesis."

The fact that it requires tailoring information so much for it to be considered at all indicates how much information overload policymakers are subject to.

Information variety and interconnectedness

Nine interviewees discussed the variety and interconnectedness of knowledge required to address policy challenges. A Central European diplomat, for example, stressed

the variety of technical knowledge required for developing policy, and the many links between policy issues:

"We're facing so many challenges that are interlinked, that require so [many] different technical skills to actually grasp. Even just in the digital world, there's so many technical things that are being discussed. No one can really be an expert on both blockchain, AI, cryptocurrency and I don't know what. Things are so complex that no one can be an expert in everything."

A policy researcher from an international organization made a point about the variety of knowledge required to develop policy. He illustrated it by describing how the simple question "Should people wear masks to prevent COVID?" requires combining a wide range of information and evidence:

"It's not just about: what type of mask? It is also about: how the mask is made, how often it is worn, what the possible side effects of wearing a mask all the time are, whether it will cause breathing difficulties for elderly populations, what the possibility of self infection is, if you're playing with a mask, etc. And then, the evidence can be everything: from looking at Geneva and trying to see where infections happened and trying to track who was wearing a mask in which part of Geneva and how that correlates with how much COVID there was, to laboratory experiments where you spray particles through bits of material to decide whether the material works or not, to the scientific understanding of aerobiology—how the particles spread in the environment. So, lots of different types of evidence with lots of different study designs, with pros and cons associated with each, and you can't just look at any one of those things individually. You have to bring it all together and be able to ultimately say something sensible about a very diverse range of different types of evidence with different tools to appraise their quality."

Framing

Overall, twenty interviewees contributed to this section. 18 of them found that people's capacity to process high volumes of complex information under time pressure was a bottleneck for improving decision quality. Two people agreed that a lot of information needs to be processed to develop good policies, but did not perceive people's capacity to do so as a bottleneck for decision quality. Interviewees in the majority group referenced different aspects of how information overload can impact policymaking. These included three main challenges: finding the right information, combining and making sense of it, and the challenge of prioritizing actions. Two interviewees also spoke about the long-term effects of information overload.

The challenge of finding the right information

Four interviewees spoke about the influence that information overload has on policymakers' confidence in the relevance of the information they access. A policymaker from an international organization described the situation:

"From what I can see, there really is information overload and people don't have the time to find a lot of the information in the first place, so it sometimes is a little bit random, what information actually makes it in front of their eyes, so to speak. Even if they do get the right information, they simply don't have the time to sift through it all and to find what is relevant and what is on point."

Officials who focus full-time on compiling scientific advice also described being overwhelmed by the amount of information. For example, an operations analyst supporting evidence synthesis processes at an international organization's during COVID-19 expressed her frustration about filtering information based on its scientific quality:

"The problem was not only that there was so much information, it was also impossible to do a proper quality assessment of everything that was coming out. [...] At one point they also asked for preprints. So, there were agreements with all of the major journals to have the preprint. [...] And, in the beginning, you look at everything, and then you count, and it's just so difficult to find the real good one, you waste so much time looking at all of the other shitty stuff that was coming."

A capacity builder from an NGO made a similar point and stressed the potential of cognitive overload:

"Information in quantities is there and it is easy to touch. Meaningful and reliable information is hard to find. The user will frequently fall into the trap of manipulation and intoxication. Indeed, uncertainty about the quality and the risk of intoxication are challenging the capacity of decision-makers to optimize their decisions."

Finally, a capacity builder from an NGO emphasized that another important challenge lies in proactively seeking out information outside of one's filter bubble:

"[...] it's not just about the amount of information. It's about the types of information that you have very easily available to you because you happen to be in that particular thought bubble or groupthink. How do you actually make sure that even in the teeth of feeling overwhelmed by the information you do have, you find a way to look outwards and say: 'What are the types of evidence and the utility of the evidence that is just systematically not in my immediate environment?' I would say that that is critical, and it's critically difficult [...]"

This points to the related challenge of attaching meaning to information.

The challenge of combining and making sense of information

Seven interviewees talked about the influence of information overload on decision-makers' ability to make sense of policy issues. A policy researcher from a regional organization, for example, emphasized the natural limits in people's speed of understanding new topics:

"If you want to have the depth of reflection, it takes time. Our brain is limited. We can only internalize so much per unit of time, so people have to assimilate things through."

A national policymaker echoed this point when describing her experience with comparing and combining information from different experts. Especially during the

COVID-19 pandemic, it was difficult to separate opinions from the assumptions that informed them and the data:

"Something that is stronger in a crisis situation, such as a pandemic, is the multitude of actors [...] who do feel they should have a say. Always trying to bring this discussion to a very evidence-based level is really challenging. On one side you have a very complex question at hand, which you need to decide something on, and on the other side you have a multitude of experts who are of the opinion that they know about it, when they probably don't necessarily do."

Frequently switching between novel topics is another way to hamper sense-making. When describing the work profile of international diplomats a capacity builder from an NGO explained:

"So, a lot of them, and especially diplomats from small developing countries [...], they have to cover a lot of different issues. They literally might be running from a Human Rights Council meeting to some economic reporting meeting or some other kind of meeting. They have a lot of different topics to cover, in which they cannot possibly know all the details or can't even spend time reading around the topic and informing themselves to any substantial degree. Still, they have to make sense of that and report back to their home country, so I think that is really a challenge."

The challenge of prioritizing actions

Four interviewees talked about the influence of information overload on the ability of decision-makers to prioritize actions. For example, a national policymaker working in public health described the challenges she faced when trying to set the right priorities early during the COVID-19 pandemic. Asked about the amount of time she had to make decisions during that period, she replied:

"Never weeks. Ever. I think it's very, very complicated. You have to be able to cope with digesting information very fast [....] you have to prioritize a lot and only act on the most pressing issues. [...] you have to let go of what is not a priority, which isn't so complicated to do, but then you have a whole range in between: 'what is not a priority and is quite clear' and 'what would be nice to have'."

This resonates with the experience of other policymakers during the pandemic. For example, the timelines for staff of international organizations to produce evidence-informed advice shrank significantly. Depending on the type of advice required they shortened from 1.5 years to several weeks, or from six months to 24 hours. As a consequence, some decision-makers struggled to maintain focus. An operations analyst from an international organization, for example, described the reaction of her direct superiors to this situation:

"[...] they had no idea what they were doing, no idea what's important, how to make decisions, how to prioritize. I mean, my director was like: 'Oh, maybe this? Maybe that?'— taking so long to make any decision."

The following quote by another national policymaker indicates that this challenge is not limited to decision-making in crisis:

"I think, especially with regards to sustainable development, where I feel like…-maybe it was always the case…but, where it's very much like everything is linked to everything, and there are synergies and trade-offs everywhere. So, how do you make sense of all that in a way that does not just lead you to drift off into some philosophical discussion about sustainable development, but that actually leads you to a clear outcome? How do you deal with that complexity with a goal in mind and time constraints?"

Psychological impact: Long-term effects of information overload

Two interviewees spoke about the long-term effects of information overload. The key challenge mentioned here was maintaining bandwidth and preventing exhaustion. A policy researcher from an international organization described how cognitive overload affects people's capacity to cope with shocks:

"I've heard a lot of people refer to this concept of 'surge capacity': the capacity of people to handle additional shocks and stressors psychologically. Under normal circumstances, a stressful event might have only a small impact that you might not even notice, but during the period of COVID, that same stressor would completely knock you over because we don't have enough surge capacity. Decision-makers were already working in somewhat high-pressure jobs and now, given the circumstances, their surge capacity is further reduced."

Given the disproportionate effect of straining one's processing capacity, the importance of investing in resilience has also been recognised by the interviewees. For example, the national policymaker working in public health quoted earlier reflected on her decision-making challenges during COVID-19:

"So, one very anecdotal example is how you deal with the information stream. Dealing with your emails in a first wave, when there is lots of adrenaline and everybody's scared, and it's the beginning, and you still have this energy to overwork, and to be able to listen, and being in that situation on a daily basis is one thing. It is not the same psychologically when you've been doing that for more than a year. So, finding approaches or instruments to actually help you to cope in the longer term, and the emails, and very complex information coming in, and the pressure, and the media attention, etc, etc. [Thinking Pause] You go through different motions."

Overload overemphasized?: Critical views on information overload as a bottleneck for decision quality

All interviewees believed that policymaking required processing high volumes of complex information under time pressure. However, two interviewees disagreed that people's capacity to do so was a bottleneck for the quality of their decisions. One of them, experienced in both policy research and international diplomacy, reflected on the idea that diplomats are subject to too much information:

"Yeah, I mean, I think that's true to an extent, but I think it can be overemphasized. That is my experience. I mean, I started my career as a diplomat. I was a foreign service officer doing strategic export controls and weapons issues. Then I was posted to Geneva. I spent four years here as a disarmament negotiator—so I've been on that side of the fence. [...] Then I joined a research institute where I have been more or less since then. I've seen both sides of the fence and what I think is that the majority of diplomats don't read enough and they don't work hard enough to develop the skills that they need for specific negotiations because they see themselves as generalists, or they see themselves as coordinators or mouthpieces for their systems."

This response tones down the impression of the ever-busy diplomat with too little time to make sense of the topics they are working on. It paints the diplomats' professional self-image and incentive system as variables influencing their response to high volumes of information.

The second interviewee works for a regional organization on capacity building programs to strengthen the science–policy interface. For her, the reason why information overload was not a major bottleneck, was because senior policymakers have support staff that filters the information for them. Reflecting on the importance of information overload in comparison to other challenges that decision-makers face she said:

"I would say information overload is probably less problematic because policymakers just get the information that was targeted at their needs, like in a synthesis. [...] I imagine that policymakers, if they have a good team around them, can filter out the important information."

Behavior

Four interviewees contributed descriptions of behavioral responses to information overload. A theme that cuts across all these insights is the role of the management of mental bandwidth. Interviewees described two different approaches to simplifying the task of filtering through high volumes of information: relying on trusted networks for making sense of information and prioritizing information sources using only the most important criteria.

Approach No.1: Relying on trusted networks for filtering and making sense of information

Two interviewees spoke about the ways in which policymakers use their networks to filter information. A capacity builder from an NGO described how international diplomats form informal support networks:

"So, in the UN system you have groupings and, from what I understand, practitioners really do work within these groupings, to the extent that they help each other with things like: 'Oh, I can't go to this meeting, but you're going, so can you send me your notes?' Literally things like that, or things like: 'Oh, I'm covering this in this meeting. Can you cover this other thing in this other meeting for me?'"

She elaborated on the composition of these support networks

"It's literally people you get along with. Personal relationships. I would say there is a tendency for these networks of support to be within the form of groupings, like Caribbean States or Small Island States or African countries, but it really depends on personal relationships. Networks don't seem to cross political dividing lines, however. I wouldn't think that a diplomat from a small European country would necessarily have this kind of informal support network with a Chinese diplomat, for example. Taking a very obvious example here, but I do think there is that."

A policymaker for an international organization made a similar observation. He described how policymakers often focus their attention on evidence from known and trusted sources. For instance, they'd rely on academics they know from their time at university or have met at conferences.

The network approach is not limited to filtering information, however. It also extends to making sense of it. For example, a policy researcher from an international organization described how, early in the COVID-19 pandemic, his organization's formal decision-making processes broke down, and were replaced by ad-hoc group decisions:

"[...] what you would tend to do is rely on a small group consensus to just make decisions. So, let's say there isn't an agreed tool for how to summarize diverse sets of information, and you want to develop a tool that makes sense. You need a fast-track way of doing that, so you consult with a small group of people in real time to just make a decision."

Approach No. 2: Prioritizing information sources based only on most the important criteria

Two interviewees described relying on a small set of criteria to decide what to engage with in detail. The policy researcher who previously spoke about the breakdown of formal processes in the beginning of the COVID-19 described the shortcuts taken in his research:

"What we have done in COVID, is just...taking as many shortcuts as we possibly can. [...] Traditionally there'll be a 25-point scale of how to assess the quality of a study. Well, if you can't do that, you need to just think: what's the minimum quality criteria I can have? In COVID there are a lot of preprints in the literature, so one binary judgment you can make is: has it been peer reviewed or not? Then, if it's a randomized trial, where you can fall back to the tools you have, pick one or two criteria that are more important than the others and just apply those two criteria."

This approach does not seem to be limited to moments of crisis. An interviewee who works as a policymaker for a national government described how she usually decides between different sources:

"I mean, that will be a prioritization exercise. First of all: sources. Where are the reports coming from? Are they coming from organizations that we have as partners? Are they from very objective organizations? If it's a UN report, for example, then maybe it

takes precedence over a report coming from a specific NGO or think tank. It's having those sorts of insights and then making decisions based on them."

Summary and overview of the barriers and facilitators

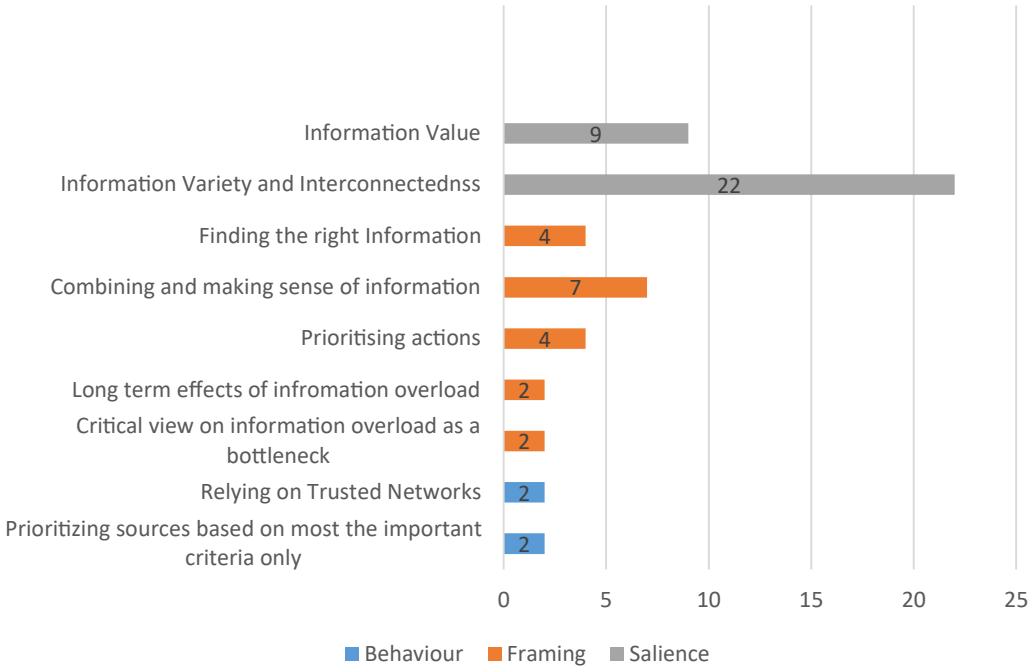


Figure 2

Graphical overview of the number of contributors per theme in the information overload section.

Among the twenty two interviewees who contributed to the salience section, there was unanimous agreement that there is a mismatch between the volume of information available to support policymaking and the processing capacity of policy officials. Moreover, a substantial subset of interviewees (n=9) believed that addressing current policy challenges required combining insights from a large variety of disciplines and perspectives.

There was broad support for the view that handling information overload is both an important requirement for effective policy decision-making and a bottleneck for it. Interviewees differentiated between three challenges that information overload contributes to:

1) finding the right information,

2) combining and making sense of information, and

3) setting priorities.

One of the barriers to improving information search was the high workload associated with vetting information sources for their quality. The other was a lack of time and cognitive capacity to critically reflect on systematic gaps in the information that was reviewed.

Cognitive capacity and time were also described as limiting factors in making sense of information and deriving priorities from it. One policymaker described bad epistemic practices of advisors as another barrier to effective combination of information. Finally, two interviewees highlighted that long-term exposure to information overload and time pressure can reduce people's cognitive (and emotional) surge capacity. This, in turn, can affect their overall capacity in handling information overload.

Not all interviewees viewed information overload as a bottleneck. One interviewee referenced the professional self-image and work ethic of diplomats as an alternative explanation for a mismatch between the supply and the use of policy research. In the domain of regional policy, one interviewee said that existing organizational processes effectively translate research findings into policy briefs tailored for decision-makers.

Four interviewees shared descriptions of behavioral responses to information overload that enabled them to handle it better. Two approaches were mentioned: relying on trusted networks for filtering and making sense of information, and prioritizing information sources based only on the most important criteria.

Barriers	Facilitators
Slow filtering processes Policy professionals need to sieve through a lot of information to find what they need. Existing approaches to determine the relevance and reliability of information are too time-consuming to work in environments that are fast-changing and overloaded with information.	**Informal social networks** Focusing on information provided by trusted contacts and networks reduces the information processing burden for policy professionals. Deliberating in small groups accelerates sense-making and decision-making.
Time pressure Time pressure challenges policy professionals in their capacity to make sense of information, critically reflect on which information they might be missing, and in their ability to prioritize actions.	**Simple prioritization of sources** Quickly sorting information sources based only on the most important criteria reduces the information processing burden.
Low epistemic standards of advisors Some policy advisors do not explain well enough which evidence and assumptions inform their advice. This makes it difficult for policy professionals to judge the reliability of the received advice.	
Reduced surge capacity Long-term exposure to information overload reduces policy professionals' cognitive and emotional surge capacity.	

Table 3

Barriers and facilitators to effective handling of information overload, an overview.

Lessons learned:

leverage points for improving individuals' capacity to handle information overload and uncertainty

The goal of this report was to identify leverage points for improving the process of policymaking in situations with information overload and deep uncertainty. To that end, we analyzed four sub-topics:

1. The extent to which policy professionals are aware of these issues.
2. Whether they view them as bottlenecks to better policymaking.
3. The concrete challenges policymakers associated with information overload and uncertainty, and how these challenges affected them psychologically.
4. How policymakers behaved in the presence of these issues.

From these we extracted barriers and facilitators to effective handling of information overload and uncertainty.

The following section combines insights from the analysis to develop practice-informed hypotheses on potential leverage points. The policy support community could respond to these ideas and suggest which ones seem promising to focus on. Based on related literature the final part offers suggestions on how to apply the leverage points.

It's important to remember that the sample size in this report was small and the data collection was semi-structured. Therefore, the conclusions we present should not be seen as general claims, valid across all policymaking contexts. Rather, the purpose of this report is to inform further empirical research that examines the hypotheses proposed here. It's also aimed to inspire policy professionals to investigate if and how the leverage points apply to their professional context, and how the suggested interventions could positively impact them and their colleagues.

With that, we propose three leverage points:

1. Raising awareness of uncertainty that stems from complex system dynamics.
2. Strengthening the individual-level foundations of resilience and collective intelligence.
3. Speeding up information search.

Raising awareness of uncertainty that stems from complex system dynamics

There was a strong awareness of information overload, and poor information processing was seen as a bottleneck for better policymaking. This suggests that creating awareness and interest in better handling information overload should not be a priority for the policy support community. Nonetheless, two interviewees dissented from the view that information processing is a bottleneck for better policymaking. This shows that the perceived importance of this issue can vary among different people and professional contexts.

The perceptions of the issue of uncertainty differed. There was a high level of awareness that policy decisions are subject to uncertainty. However, the interviewees had different interpretations of the depth of uncertainty policymakers face. These different expectations stemmed from different beliefs about the sources of uncertainty. A substantial number of interviewees (n=9) saw the complexity of policy issues as the main source of uncertainty, and a similar number (n=8) focused on gaps in policy-relevant knowledge.

The risk landscape that humanity currently faces is characterized by interconnectedness and complexity. The more interconnected societies become, the higher the chance of any regional or sectoral risk cascading into a global catastrophe. At the same time, the number of possible pathways leading to extreme risk events expands. This means that the uncertainty about which risks are most pressing and how they could unfold increases too.

In short, complexity plays a key role in creating irreducible uncertainty. Underappreciating this role can lead to neglecting the importance of handling low-probability, high-impact risk events—anticipating, preparing for, and adapting to them. It therefore becomes easy to underestimate how quickly and drastically environmental or societal systems can change. This can cause insufficient investment in the resilience of society's critical support systems (e.g. finance or agriculture), or the political institutions governing them.

Underappreciating the role of complexity can also create unrealistic expectations. For example, it can lead to creating fixed uncertainty bounds around the evolution of complex phenomena—like climate change—and forgetting that limited predictability is an inherent feature of such complex systems.[19] For this reason, decision-makers need to keep in mind that a substantial unquantifiable amount of uncertainty will always remain, even despite a careful analysis of risk (i.e. based on historical data or simulated scenarios). Scientific predictions might, thus, never offer sufficient evidence to confidently move forward. However, decisions need to be made despite large amounts of unquantifiable uncertainty. This is especially important in a world where the uncertainty increasingly includes the possibility of a global catastrophe.

For these reasons, building stronger awareness of the dynamics of complex systems and of the potential of cascading risks seems to be an important leverage point that could improve policymaking under deep uncertainty. Serious games are a promising way to raise the awareness of policymakers in this regard. They offer the opportunity to observe the dynamics of complex systems in a safe setting and a chance to build experiential knowledge.[20]

Strengthening the individual-level foundations of resilience and collective intelligence

Two themes cut across the analyses of information overload and uncertainty. The first one focuses on the coping capacity of individuals, such as resilience in face of information overload, or the emotional response to uncertainty and extreme risks. One example illustrating the importance of personal resilience was the account given by a senior Swiss policymaker. She described how, during the COVID-19 crisis, her mental capacity to engage with information overload has decreased over time. A good example of emotional challenges and extreme risks that can be involved in decision-making in the face of uncertainty was provided by a Swiss diplomat. He highlighted that, prior to the COVID-19 pandemic, some of his colleagues found thinking about the possibility of a global pandemic too distressing.

The second theme centers on the capacity of individuals and groups to make sense of complex policy issues and their ability to prioritize actions. On an individual level, several interviewees spoke about the importance of self-reflection for decision-making. This is the ability to identify, and consciously evaluate, the implicit assumptions present in key judgements that inform a decision. On a group level, a Swiss policymaker spoke about how, sometimes, there can be a lack of transparency about the evidence and judgements underpinning an opinion. This, he highlighted, can limit trust and, consequently, stop people from supporting each other in understanding an issue.

Both coping-capacity and sense-making, as well as decision-making capacity—whether on an individual or group level—rely on the cognitive and emotional processes of individuals.[21] A series of studies on collective problem-solving, for example, has shown that the quality of coordination and communication between team members matters almost twice as much for overall team performance as the skill level of individual team members.[22] Therefore, improving people's awareness of their response to internal processes, as well as their agency in it, seems like an important leverage point to improve the capacity of policy professionals to address information overload and uncertainty. Traditionally considered a tool to support psychological therapy, mindfulness practices have been increasingly used to build and strengthen the cognitive and emotional foundations of individuals and teams to help them thrive in complex environments.[23] Mindfulness training has been used in practice in a range of settings from the military, to business, and politics.[24] [25] [26]

Speeding up information search

One way to address the information overload that policy professionals face and to increase trust in the findings of scientific advice is to facilitate quick and systematic filtering for relevant and reliable information. Limits to the speed of information filtering might have caused, for example, the omission of decision-relevant criteria from intervention guidelines during the COVID-19 crisis. That's a behavior an operation analyst from an international organization observed in some of her colleagues. Pressured for time, they were not confident that the literature searches uncovered all relevant sources. But, to avoid being seen as incapable of conducting an adequate literature review, they skipped summarizing the decision-relevant criteria altogether.

Scientific advice cannot always be based on a complete and detailed review of all available evidence, in spite of the widely-present expectation for it to be the case. Especially in moments of crisis, when the production of scientific evidence surges, this expectation collides with the natural processing constraints of human minds. To address the urgent need for scientific advice in these moments, expectations about the process of evidence synthesis need to change. It's important to avoid choosing between the extremes—a full scale systematic literature review and no review at all. Rather, we need to be able to make more nuanced and transparent trade-offs between the speed and comprehensiveness of evidence synthesis. This need does not seem to be limited to scientific advice in crisis

synthesis is a more widespread phenomenon.[27]

Developing pragmatic, yet systematic, approaches to filtering large volumes of sources is, therefore, a promising leverage point to support the production of scientific advice on quickly-evolving policy issues. In fact, as illustrated through the working style of a policy researcher from an international organization during COVID-19, policy professionals are already making pragmatic decisions to filter sources more quickly.

When time is scarce, fast and frugal decision trees are a promising option to formalize the development of pragmatic evaluation methods. Thes can complement traditional multi-criteria based approaches, such as GRADE or AMSTA.[28] [29] These trees limit the, often long, list of assessment criteria of evaluation methods to the most important ones. By connecting them to decisions, through a series of if-then relationships, they help establish whether a source should be considered for further review. The underlying goal for developing such decision trees is to become transparent and deliberate about trading off decision speed and accuracy.

Using fast and frugal decision trees substantially increases the speed of filtering information, without lowering the levels of accuracy. A fast and frugal tree developed to filter systematic reviews, for example, has a false positive rate of only six percent and correctly identifies one hundred percent of high quality systematic reviews.[30] Making speed-accuracy trade-offs explicit and empirically testing the impact of different process options, is an idea that can also be applied to other aspects of the evidence synthesis process.[31]

Annexes

Definitions

Complexity

We call a system complex when it combines the following three features:

1.Consists of many parts,

2.The parts interact with each other creating feedback loops that either dampen or amplify a behavior of the system,

3.The parts can adapt, that is, change their configuration (links and interactions).

The Swiss economy is a complex system. A delicate Swiss watch consisting of many interlinked parts is not—it fails to meet the third point.

Complex systems have special characteristics that need to be considered when trying to govern them. One of such aspects is emergent behavior, which requires basing policies on an understanding of the behavior of a system as a whole. Another is the possibility of non-linear change and the existence of tipping points. Addressing it involves preventing or mitigating the effect of catastrophic risks and chaos, which limit the predictability of systems over time. Working with this limitation requires considering multiple possible futures.

To better understand the concepts that define complex systems, we recommend two sources:

- De Domenico, M., Brockmann, D., Camargo, C., Gershenson, C., Goldsmith, D., Jeschonnek, S., Kay, L., Nichele, S., Nicolas, J., Schmickl, Stella, M., Brandoff, J., Martinez Salinas, A. J., & Sayama, H. (2019). Complexity Explained. Open Science Framework. https://complexityexplained.github.io/

- Gives an accessible, animated introduction to the main concepts defining complex systems.

- Siegenfeld, A., & Bar-Yam, Y. (2020). An Introduction to Complex Systems Science and its Applications. Complexity, 20. https://doi.org/10.1155/2020/6105872

Gives a more in-depth, but still beginner-friendly, introduction to the field of complexity science and provides pointers regarding its application to policy design.

Uncertainty

The chance of rolling one on a normal dice is not deeply uncertain. It's one sixth. Bounded uncertainty like this is often referred to as risk. Deep uncertainty, however, does not lend itself to probabilistic descriptions. When will the next pandemic be? How serious will it be? Where will it originate from? Will a local epidemic turn into a global pandemic? These are all questions to which the answers are deeply uncertain.

There are various reasons for why such uncertainty exists including, but not limited to, the complexity of the systems of interest. More complex systems tend to be less predictable. All in all, many questions policymakers face have at least some elements of deep uncertainty. Whenever we refer to uncertainty throughout the report, we mean this type of uncertainty.

To further understand the relevance of deep uncertainty and to familiarize oneself with its common conceptualisations, we recommend the following sources:

- Kohler, K. (2021). Strategic Foresight: Knowledge, Tools, and Methods for the Future. CSS Risk and Resilience Reports. https://doi.org/10.3929/ethz-b-000505468

-- Chapter 3 gives an overview of different reasons for why deep uncertainty exists, different ways that uncertainty has been classified, and metaphors that are commonly used to talk about deep uncertainty.

- Kay, J. (2020). Radical Uncertainty. SUERF The European Money and Finance Forum. https://www.suerf.org/suer-policy-brief/16053/radical-uncertainty

-- Proposes a classification of different types of uncertainty and complements the list of reasons for the existence of deep uncertainty put together by Kohler (2021).

- Maier, H. R., Guillaume, J. H. A., Delden, H. van, Riddell, G. A., Haasnoot, M., & Kwakkel, J. H. (2018). An uncertain future, deep uncertainty, scenarios, robustness and adaptation: How do they fit together? Annual Review of Policy Design, 6(1), 1–20. https://doi.org/10.1016/j.envsoft.2016.03.014

-- Gives an overview of terms used to refer to deep uncertainty and of the methods used to develop and adapt plans in the face of deep uncertainty.

Information overload

Information overload is typically defined as the mismatch between the amount of information processing needed and the capacity of an individual to do it. It can cause several problems including psychological stress, mistakes in decision-making, or disregarding relevant information.

For an overview of the recent psychological literature on the effects of information overload on decision-making we recommend:

- Roetzel, P. (2018). Information overload in the information age: a review of the literature from business administration, business psychology, and related disciplines with a bibliometric approach and framework development. Business Research, 12(2), 479-522. https://doi.org/10.1007/s40685-018-0069-z

To learn more about how policy professionals deal with information overload:

- Walgrave, S., & Dejaeghere, Y. (2016). Surviving Information Overload: How Elite Politicians Select Information. Governance, 30(2), 229-244. https://-doi.org/10.1111/gove.12209

Broader literature background

In a broad sense, this report seeks to contribute to two policy-related fields. One focuses on the application of behavioral insights to government decision-making, and the other on the facilitation of fruitful cooperation between the scientific and the policy community. Relevant examples of previous work in the former include the reports by Hallsworth et al. (2018) and the PhD thesis by Lilley (2020). Hallsworth et al. (2018)

noticing, deliberating, and acting on relevant policy issues. Lilley (2020) conducted several in-depth ethnographic, interview-based, and survey-based studies on how issues related to cognition, emotion and perception hinder the ability of civil servants in the Welsh Government to address complex problems. For further reading in the field of science-policy cooperation, Rojas et al. (2021) and Renn et al. (2019) are recommended. Renn et al. (2019) provides a comprehensive review of different factors that influence the government science advice, focusing specifically on the role of complexity, uncertainty, and ambiguity. Rojas et al. (2021) directly targets GCR researchers, and gives an overview of successful GCR policy engagements together with some practical guidance on how to engage with policymakers.

References

- Hallsworth, M., Egan, M., Rutter, J., & McCrae, J. (2018). Behavioral Government: Using behavioral science to improve how governments make decisions. The Behavioural Insights Team. https://www.bi.team/publications/behavioural-government/

- Lilley, R. (2020). Rethinking government capacities to tackle wicked problems: Mind, emotion, bias and decision-making : an experimental trial using mindfulness and behavioral economics [Ph.D., Aberystwyth University]. http://hdl.handle.net/2160/c119949d-43de-43eb-ab85-6ca2a3aba425

- Renn, O., Baghramian, M., Capaccioli, M., de Rijcke, S., Drotner, K., Dubertret, L., Irwin, A., Luty, T., Makarow, M., Moberg, C., Morega, A.-M., Owens, S. E., Sahlin, N.-E., Stirling, A., van der Sluijs, J., Vretenar, D., Fischoff, B., Hart, A., & Parkhurst, J. (2019). Making sense of science for policy under conditions of complexity and uncertainty – SAPEA. SAPEA. https://doi.org/10.26356/MASOS

- Rojas, C. R., Rhodes, C., & Richards, C. (2021). Pathways to Linking Science and Policy in the Field of Global Risk. CSER https://www.cser.ac.uk/resources/pathways-linking-science-and-policy-field-global-risk/

Interview protocol

1. Introduction (5min)

a. Greet, introduce ourselves, thank for accepting the interview
b. Are you ok if this interview is recorded, is it ok if we use 60min?
c. Give a general overview of what we're aiming at as well as the context (HLPF, research uptake, GSPI, SI, information processing training)
   i. use the "beyond information" framing
   ii. focus on simple tools to help people search, filter and use information.
   iii. focus on decision-making over EBPM procedures
   iv. fast and reliable decision-making
   v. Part of other trainings: MCDA and TTX

2. Introduction question (5min)

a. What do you currently work on? What is currently on your mind?

3. Delve into specific training questions (30min)

a. General questions

i. Do you think information overload and uncertainty are an issue? Why? Can you think of instances where it is not an issue?

1. How big of an issue is information overload in comparison to other barriers to evidence-based policymaking (i.e. politics, lack of information, ...)?

b. Our trade-offs

i. How can we make participants reflect on their thought pattern and information processing strategies during a short 2-hour training?

1.Why?

ii. What are the most effective ways you have learned or observed for dealing with the inherent complexity of policymaking?

1. Why?

iii. Training duration: what is a participant's willingness to invest and what is the trainer's ideal time?

1. Why?

iv. Should we focus on concrete tools or general skills? Context-specific versus generalizable knowledge?

1. Why?

v. How do participants remember tools and which ones do they use in practice?

1. Why?

vi. What should / can be different if the training is online?

c. Key concepts (use visuals to explain them?)

i. Search - "how to look for information?"

ii. Filter - "how to select information?"

iii. Use - "how to use information?"

4. Delve into deployment questions (10min)

a. Audience

i. Is the training relevant for senior IO staff? Why?

1. And is it attractive?

ii. Is the training relevant for parliamentarians and/or diplomats Why?

1. And is it attractive?

iii. How is it perceived?

b. How to make such training maximally attractive? And maximally relevant for the audience?

i. Should we even use the term 'training'? What is best for the UN system?

ii. Why?

5. Delve into engagement questions (10min)

a. Do you know people who would benefit from this information processing training?

b. Can we keep you updated on our plans?

c. Who else should we interview?

d. Any last comment you would like to make?

Endnotes

1. Ord, T. (2020). The Precipice: Existential Risk and the Future of Humanity. Bloomsbury Publishing.

2. Else, H. (2020). How a torrent of COVID science changed research publishing—In seven charts. Nature, 588(7839), 553–553. https://doi.org/10.1038/d41586-020-03564-y

3. Melinat, P., Kreuzkam, T., & Stamer, D. (2014). Information overload: a systematic literature review. In International Conference on Business Informatics Research (pp. 72-86). Springer, Cham.

4. Siegenfeld, A., & Bar-Yam, Y. (2020). An Introduction to Complex Systems Science and its Applications. Complexity, 20. https://doi.org/10.1155/2020/6105872

5. Cotton-Barratt, O., Daniel, M., & Sandberg, A. (2020). Defense in Depth Against Human Extinction: Prevention, Response, Resilience, and Why They All Matter. Global Policy, 10.1111/1758-5899.12786. https://doi.org/10.1111/1758-5899.12786

6. Cairney, P., & Denny, E. (2020). Why isn't government policy more preventive?. Oxford University Press.

7. The current UN Global Assessment Report on Disaster Risk Reduction also emphasizes the role of human psychology in risk governance. For detailed descriptions of its role see, e.g. chapters: 2.1, 5.1.2, 5.1.3, 6 and 7.

Report: United Nations Office for Disaster Risk Reduction (2022). Global Assessment Report on Disaster Risk Reduction 2022: Our World at Risk: Transforming Governance for a Resilient Future. Geneva.

8. Simon, H. A. (1971). Designing Organizations for an Information-Rich World. Martin Greenberger, Computers, Communication, and the Public Interest, Baltimore. MD: The Johns Hopkins Press. pp. 40–41.

9. Hertwig, R., Leuker, C., Pachur, T., Spiliopoulos, L., & Pleskac, T. (2021). Studies in Ecological Rationality. Topics In Cognitive Science. 14 (2022): 467–49 https://-doi.org/10.1111/tops.12567

10. Hilton, S., & Baylon, C. (2020). Risk management in the UK: What can we learn from COVID-19 and are we prepared for the next disaster?, CSER https://www.cser.ac.uk/resources/risk-management-uk/

10. Hilton, S., & Baylon, C. (2020). Risk management in the UK: What can we learn from COVID-19 and are we prepared for the next disaster?, CSER https://www.cser.ac.uk/resources/risk-management-uk/

11. See section 3 of: Fisher, L., & Sandberg, A. (2022). A Safe Governance Space for Humanity: Necessary Conditions for the Governance of Global Catastrophic Risks. Global Policy, 00:1-16. https://doi.org/10.1111/1758-5899.13030

12. Manheim, D. (2018). Questioning Estimates of Natural Pandemic Risk. Health Security, 16. https://doi.org/10.1089/hs.2018.0039

13. "Behavioral Solutions for Evidence-based decision-making", session delivered at the UN High-Level Political Forum in July 2021. https://www.simoninstitute.ch/blog/post/2021-sdgs-learning-training-practice/

14. This view does not necessarily mean that delaying decisions to collect more information is always better. It just means that in the moment of making a decision, more information leads to better predictions regarding the consequences of available choices.

15. Zhang, F., Sun, Y. Q., Magnusson, L., Buizza, R., Lin, S.-J., Chen, J.-H., & Emanuel, K. (2019). What Is the Predictability Limit of Midlatitude Weather? Journal of the Atmospheric Sciences, 76(4), 1077–1091.

16. As with the "information gap view", this is meant to describe the situation in the moment of making the decision.

17. This relates to the concept of phase transition: https://en.wikipedia.org/wiki/Phase_transition

18. Makridakis, S., & Taleb, N. (2009). Decision-making and planning under low levels of predictability. International Journal Of Forecasting, 25(4), 716-733. https://doi.org/10.1016/j.ijforecast.2009.05.013

19. Siegenfeld, A., & Bar-Yam, Y. (2020). An Introduction to Complex Systems Science and its Applications. Complexity, 20. https://doi.org/10.1155/2020/6105872

20. Case study: Lawrence, J., & Haasnoot, M. (2017). What it took to catalyze uptake of dynamic adaptive pathways planning to address climate change uncertainty. Environmental Science & Policy, 68, 47–57. https://doi.org/10.1016/j.envsci.2016.12.003

21. For an overview of the psychological mechanisms underlying resilience, see: Wu, G., Feder, A., Cohen, H., Kim, J. J., Calderon, S., Charney, D. S., & Mathé, A. A. (2013). Understanding resilience. Frontiers in Behavioral Neuroscience, 7. https://-doi.org/10.3389/fnbeh.2013.00010

For an overview of the connection between emotions and decision-making, see: Lerner, J. S., Li, Y., Valdesolo, P., & Kassam, K. S. (2015). Emotion and decision-making. Annual Review of Psychology, 66(1), 799–823. https://doi.org/10.1146/an-nurev-psych-010213-115043

22. Riedl, C., Kim, Y. J., Gupta, P., Malone, T., & Woolley, A. (2021). Quantifying collective intelligence in human groups. Proceedings of the National Academy of Sciences, 118, e2005737118. https://doi.org/10.1073/pnas.2005737118

23. Bristow, J., Bell, R., Nixon, D. (2020). Mindfulness: developing agency in urgent times. The Mindfulness Initiative. https://www.themindfulnessinitiative.org/agency-in-ur-gent-times/

24. Carter, A. & Tobias Mortlock, J. (2019). Mindfulness in the military: improving mental fitness in the UK Armed Forces using next generation team mindfulness training. Institute of Employment Studies project report 00090-5367. https://openac-cess.city.ac.uk/id/eprint/22198/

25. Martini, J-P., Stephan, L., Tamdjidi, C., (2020) Tap Your Company's Collective Intelligence with Mindfulness. BCG.com. Available at: https://archive.ph/HS4ja

26. Bristow, J. (2019). Mindfulness in politics and public policy. Current Opinion in Psychology, 28:87–91 https://doi.org/10.1016/j.copsyc.2018.11.003

27. See this source for an example of this trend in medical science: Shojania, K. G., Sampson, M., Ansari, M. T., Ji, J., Doucette, S., & Moher, D. (2007). How Quickly Do Systematic Reviews Go Out of Date? A Survival Analysis. Annals of Internal Medicine, 147(4), 224–233. https://doi.org/10.7326/0003-4819-147-4-200708210-00179

28. Goldet, G., & Howick, J. (2013). Understanding GRADE: an introduction. Journal Of Evidence-Based Medicine, 6(1), 50-54. https://doi.org/10.1111/jebm.12018

29. Shea, B., Reeves, B., Wells, G., Thuku, M., Hamel, C., & Moran, J. et al. (2017). AMSTAR 2: a critical appraisal tool for systematic reviews that include randomized or non-randomised studies of healthcare interventions, or both. BMJ 2017;358:j4008. https://doi.org/10.1136/bmj.j4008

30. Lorenz, R., Jenny, M., Jacobs, A., & Matthias, K. (2021). Fast and frugal decision tree for the critical appraisal of systematic reviews in situations with limited time periods. Ger Med Sci; 22. Jahrestagung des Deutschen Netzwerks Evidenzbasierte Medizin e. V; February 24-26, 2021; Digital. https://doi.org/10.3205/21ebm039

31. Two other examples in this regard:

Mateen, F. J., Oh, J., Tergas, A. I., Bhayani, N. H., & Kamdar, B. B. (2013). Titles versus titles and abstracts for initial screening of articles for systematic reviews. Clinical Epidemiology, 5, 89–95. https://doi.org/10.2147/CLEP.S43118

Rathbone, J., Albarqouni, L., Bakhit, M., Beller, E., Byambasuren, O., Hoffmann, T., Scott, A. M., & Glasziou, P. (2017). Expediting citation screening using PICo-based title-only screening for identifying studies in scoping searches and rapid reviews. Systematic Reviews, 6. https://doi.org/10.1186/s13643-017-0629-x



Simon Institute
for
Longterm Governance

www.simoninstitute.ch