S1 Identify pathways analysis questions and context

S1.1 The feedback process

In total, we engaged 21 researchers from the professional network of coauthors working on disaster risk management, risk communication, climate change adaptation, and pathway thinking in different sectors, summarised in Table S1.

Table S1. Participants of validation exercise (n=21) and the key fields of expertise identified based on publicly available information

Field of expertise	Number of participants with expertise
Decision-making, governance	4
Disaster Risk Management	8
Systemic Risk	5
Adaptation Pathways	3
Climate change adaptation	4
Risk communication	5
Agriculture	2
Infrastructure	3
other	2

Interviews and workshops were prepared, conducted and evaluated according to Hove and Anda (2005). The participatory exercises were conducted in accordance with the Ethics Plan of MYRIAD-EU, meaning that: (1) the interviews were designed in a way that the tasks for participants were kept as short, simple and non-invasive as possible; (2) the collected personal data including perspectives, choices and preferences were handled with due care and in full compliance with national privacy and data protection laws (including, but not limited to, countries where research is conducted and where researchers operate); (3) participants received a participation information document and a consent form they needed to sign to indicate their agreement and knowing of the process; and (4) it was checked that the participatory exercise adhered to the guidelines of the Research Ethics Review Committee Faculty of Science (BETHCIE) of Vrije Univeritiet Amsterdam, NLD. The exercise was structured as semi-structured interviews and group discussions, ensuring that multiple perspectives were considered. Before the exercise, the interviewees were provided with a Participation Information Document, a Consent Form, and a two-pager containing relevant information about the project, the current user-type characterisations, and analysis goals. This preparation allowed participants to familiarise themselves with the topic beforehand, facilitating more productive discussions. In addition, each participatory exercise began with a brief presentation of 10 minutes to introduce the context of the investigation. For in-person sessions, initial feedback was collected using post-it notes and a handout document, while remote sessions used Miro collaborative tools (miro.com). The discussions were open and free-flowing, encouraging participants to express their ideas and opinions openly. To maintain a record of the discussions and insights, the sessions were recorded for later reference and analysis. The exercise was facilitated using guiding questions to steer the discussions towards the aspects of interest:

- Why do you find this set of user-type characterisations useful or not useful to identify different analysis needs and visualisation requirements?
- Would you characterise these user types differently?
- What overall motivation do different user types have to engage with analysis of multi-risk pathways
- What could be a specific question they would like an answer to?

These questions helped to channel the brainstorming process, ensuring that new analysis goals and user-type characterisations were relevant to the project's objectives. The facilitator played a crucial role in moderating the discussions, ensuring everyone had a chance to contribute, and keeping the discussions focused and productive. To maintain a record of the discussions and insights, the sessions were recorded for later reference and analysis. We tailored this process for focus group discussions, paying attention to the challenges of analysing focus group data, including disentangling group dynamics and the importance of the situational context of a certain statement (Kitzinger, 1994; Hydén and Bülow, 2003; Parker and Tritter, 2006). For this reason, the exercises were recorded and transcribed and analysed shortly after the activity was completed.

The data collected was analysed using a deductive approach ('thematic analysis'), which included the coding data of the transcripts into themes (Azungah, 2018). Based on these data, we identified the following themes to characterise user types for the coding process: motivation, interest, resources, and examples for each proposed user type. The initial user types characterisations were revised, and the key questions of interest were formulated.

S1.2 The inputs - user types characterisation

For the domain of multi-risk pathways, which is characterised by diverse actors and complex interrelations as elaborated in the introduction, we conceptualise a set of three user types with distinct roles, interests and resources based on existing pathways, multi-risk and systemic risk assessment approaches. We first developed an initial conceptualisation of the domain problem. Similarly to Ruppert et al. (2013), we developed a set of user types to aggregate certain generic characteristics. We started by identifying different stakeholders that are generally involved in pathways development or risk assessment processes. In the context of multi-risk, these stakeholders can play very different roles in the analysis process. For example, a local municipality might be interested in a balanced consideration of needs and requests from all its residents and businesses, while it would play a different role in an analysis process on a regional level. Similarly, stakeholders are very diverse and, as a result, farmer A (due to their unique conditions and background) might only be concerned with their own specific needs while another farmer B might be interested in learning more about the systemic risk aspects. Consequently, grouping different stakeholders along lines of key multi-risk concepts is most plausible to identify the variety of needs into multi-risk user types. The initial set of user types thus follows the concept of system-of-systems thinking (Maier, 1998; Hochrainer-Stigler et al., 2023).

Based on this characterisation of the domain of disaster risk management pathways for multi-risk systems, we can identify key users of visualisations for policy analysis. These users vary in their objectives, needs, and available resources for the policy analysis process, as elaborated below. The following descriptions of three different user types, as summarised in Figure S1, were used as a starting point for discussion and feedback:

1. Sector Decision Makers (SEDM), such as representatives of farmers' unions or leading companies, have limited resources for policy analysis. Their main objective is to gain insight into the performance of long-term strategies and inform agenda setting. They seek to identify cooperative strategies with other sectors to maximise risk reduction and minimise resource use. They are also interested in determining short-term actions with the lowest regret. Sector decision makers require detailed visualisations of strategy performance across different sector objectives and time horizons. They may have their own specific objectives and performance metrics.

2. System Decision Makers (SYDM), such as representatives of local, regional, or national governments, have limited time and understanding of the dynamics of the sector. Their participation in policy analysis aims to understand the challenges and risk reduction pathways of different sectors, identify sectoral pathways for agenda-setting, and promote cross-sector collaborations. System decision makers need a high-level understanding of sectoral needs, priority pathways, and their impact on other sectors. They may not require the same level of detail on individual sectoral pathways, but rather aggregated information on preferred sectoral pathway performance.

3. Individual Sectoral Actors (ISA), such as individual farmers or residents, are interested in learning about current plans and strategies to participate in decision making within their sector. They may have limited knowledge of developing DRM pathways in multi-risk contexts and a subjective focus on specific sectoral objectives. These actors seek a high-level overview of different sectoral pathway alternatives and their performance to understand the reasoning behind final strategy-setting.

S1.3 Analysis of the feedback

We presented the initial conceptualisation to a range of experts to discuss the strengths and weaknesses of the conceptualisation and identify what is missing. Based on the feedback, we revised the domain situation definition. Feedback in interviews and focus groups regarding the characterised user types for the multi-risk DRM pathway analysis has overall been positive.

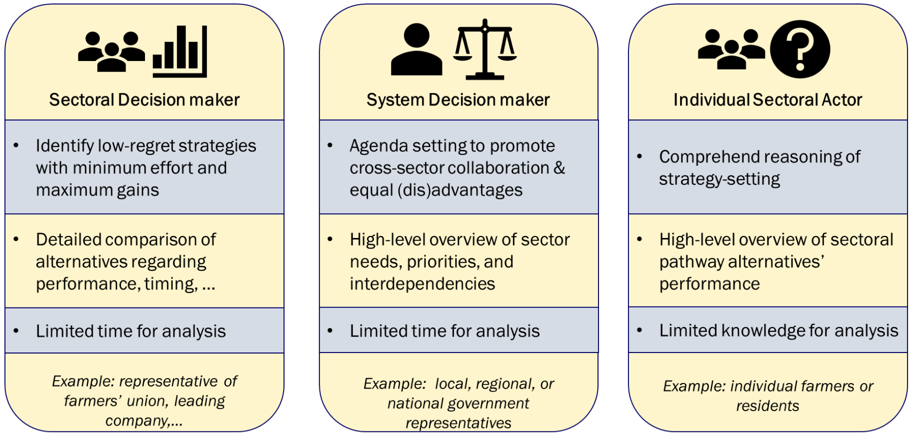

Figure S1. Initial domain situation definition for multi-risk DRM pathways analysis.

Participants agreed on the usefulness of categorising users into distinct groups to characterise different needs, interests, and objectives for the use of visualisations. However, they highlighted the need to tailor the characterisation of user types to the specific context and decision-making process, recognising that the user corresponding to each type may vary depending on the national or local context. Participants also highlighted the shared interests among user types, such as gaining an understanding of forward-looking thinking and system dynamics, while also acknowledging that users may have varying levels of interest and engagement in multi-risk pathways. Therefore, the characterisation of user types should be nuanced, recognising both their common and distinct interests. Moreover, the significance of simplicity in visualisations was emphasised, especially for user types who need specific and context-specific information. A significant point of consideration raised by participants is the need to align the visualisations with the specific purpose of the analysis, whether it is to inform decision-making, policy-making, facilitate cross-sector collaboration, or raise awareness among individual actors. By understanding the main motivation behind each user type's engagement with pathways, the visualisations can be tailored to meet their specific needs and objectives effectively. At the same time, participants also stressed the importance of data presentation and exploration in visualisations. Providing multiple ways to present data and offering interactive features for exploration can enable users to customise their view and gain deeper insights based on their specific interests.

S1.3.1 Feedback regarding Sectoral Decision Maker

Based on the feedback collected with respect to the sectoral decision maker (SEDM), several key points have emerged. The SEDM functions as a gatekeeper and translator of complex information, filtering relevant details for local farmers and other stakeholders. The interests and flow of information involve the public administration in initiating projects to collect data and sharing it with SEDM, who then distribute specific information to relevant parties. Different unions and organisations on various scales may have different levels of detail and interests, making it challenging to generalise the needs of individual sectoral actors (ISA). The main purpose of multi-risk pathways for SEDM is to explore the effects of interactions between risks, with a focus on qualitative rather than fully quantitative, risk-based analysis. Understanding trade-offs and synergies is of particular interest to SEDM, and they may also seek to identify both low-regret and best-case alternatives. It was suggested that the agricultural sector, as an example, might be particularly interested in adaptation pathways, which may be of little relevance to ISAs. To improve the characterisation of SEDM, it is essential to acknowledge their role as gatekeepers and translators of information between different levels of governance and stakeholders. Simplifying the characterisation to focus on SEDM's interests in understanding trade-offs, synergies, and exploring the effects of interactions can make the user types more manageable. Additionally, recognising that the interests of ISAs may vary greatly, and tailoring visualisations to address their specific needs and objectives can enhance the user-centred design of the analysis. In summary, the feedback on the sectoral decision maker (SEDM) highlights their pivotal role in information dissemination and translation, as well as their interests in understanding trade-offs, synergies, and exploring multi-risk interactions. By simplifying and tailoring the characterisation of SEDM and taking into account the diverse interests of ISAs, the multi-risk DRM pathway analysis can effectively cater to the needs of different stakeholders and support decision-making at various levels of governance and sectors.

S1.3.2 Feedback regarding System decision maker

Based on the feedback collected with respect to the system decision maker (SYDM), several key points have emerged. SYDMs can be understood as users who have the authority and capacity to take decisions, either at higher levels of governance or within specific departments, such as adaptation to climate change or spatial planning. They may also act as initiators of decision-making processes and are involved in interpreting and implementing general guidelines provided by higher-level bodies, such as the EU. It was observed that the level of detail of the discussion and available resources increases with decreasing governance level, with local authorities having the highest available resources but not necessarily greater knowledge than higher-level decision makers. Although SYDMs may have decision-making authority, their understanding of the dynamics of systems on the ground can vary, and their knowledge might be limited on certain topics. They are interested in exploring trade-offs and synergies and understanding the net effect of multi-risk interactions, focussing on system-wide low-regret strategies. However, the specific information needs of SYDMs may vary depending on the scale and context of decision-making. To adjust the characterisation of SYDM, it is essential to recognise their role as decision makers and initiators of processes, with a focus on trade-offs, synergies, and system-wide low-regret strategies. Simplifying the characterisation and avoiding discussions about lack of knowledge can streamline the user types. Additionally, acknowledging the diversity of interests and needs among individual sectoral actors (ISAs), while emphasising the specific objectives of system decision makers and sector decision makers (SEDMs), can refine the user-centred design of the multi-risk DRM pathway analysis. In conclusion, the feedback on the system decision maker (SYDM) highlights their role as decision makers and initiators of processes at various levels of governance. Their interests lie in understanding system-wide interactions and exploring trade-offs and synergies. By adjusting the characterisation of SYDM to focus on these key aspects and recognising the diverse needs of other user types, the multi-risk DRM pathway analysis can better support decision-making processes and foster collaboration among stakeholders in addressing interconnected risks.

S1.3.3 Feedback regarding Individual Sectoral Actor

Based on the feedback collected regarding the individual sectoral actor (ISA), several key points have emerged. ISAs' involvement in multi-risk pathway analysis may vary based on their specific context and resources. Factors such as the sise of the farm or the level of time available for experimentation and forward-thinking may influence their interest and participation in pathway discussions. It was emphasised that the same user, such as a farmer, might have varying interests and resources, making it challenging to generalise the needs of ISAs. ISAs, particularly those in the agricultural sector, may require specific and practical information rather than high-level abstractions to address their day-to-day challenges effectively. While system decision makers (SYDMs) and sector decision makers (SEDMs) might focus on system-wide strategies and sector-specific objectives, respectively, ISAs might be interested in learning how other pathways impact their sector and the practical implications of these findings. ISAs could also serve as important feedback loops, holding decision makers accountable and advocating for their preferred strategies. To adjust the characterisation of ISAs, it is important to recognise their potential decision-making role and acknowledge that they may be interested in practical and sector-specific outcomes rather than abstract concepts. The user types should not be rigid, as individual actors may also be interested in systemic analysis results and have varying needs and objectives. Providing qualitative pathway descriptions that are relevant to their specific context can enhance communication and engagement with ISAs. In conclusion, the feedback on the individual sectoral actor (ISA) highlights their potential decision-making role, need for practical information, and interest in understanding how multi-risk pathways affect their sector. Recognising the diversity of interests and needs among ISAs and providing tailored information can improve the user-centered design of the multi-risk DRM pathway analysis, fostering collaboration and engagement among stakeholders at the individual actor level.

S1.3.4 Suggestions to add additional user types

Based on the feedback received, there are several suggestions for adding additional user types to the existing characterisation:

1. Social Planner: This user type could represent individuals or groups responsible for balancing the needs and interests of various stakeholders. They may have sufficient knowledge to understand the analysis outputs and use them to inform policy decisions that benefit multiple sectors or actors.

2. Analyst: This user type could encompass professionals involved in creating pathways and analyzing data. They would be responsible for designing visualisations and tailoring them to meet the needs of different end users. Adding an analyst role can ensure that the visualisations are effectively designed and communicate complex information to various user types.

By including these additional user types, the characterisation becomes more comprehensive and addresses the needs and roles of various stakeholders involved in the multi-risk DRM pathway analysis. The social planner and analyst roles can bridge the gap between decision makers, experts, and end users, facilitating effective communication and collaboration in the policy analysis process.

S1.4 Final user type characterisations

The group of users for pathways analysis in multi-risk settings can be expected to be diverse, including actors from different disciplines and administrative levels. In general, four different user types could be involved as shown in Figure S2. A central service provider (e.g. consultancy, research project) processes the data based on information and preferences indicated by different actors involved in the activity. A system actor (e.g. EU, national/regional/local government) might be interested to explore multi-risk effects to understand the implications on a system-wide level to inform the formulation of research strategies or policies enhancing integrated management. As such, they are interested in exploring strategies with strong synergistic effects, but also those that reduce trade-off effects across strategies. At the same time a sectoral actor (e.g. local farmer exposed to flood-drought risk or water-board responsible for dike management) are mostly interested in identifying low-regret pathways that minimise their own effort and maximise their gain. There could be two ways for such an actor to account for multi-risk interactions: identifying pathways options that work most reliably independent of specific interactions or identifying specific combinations of pathways that increase, reduce their efforts and/or maximise their gains. For sectoral actors with low strategic responsibility, sectoral gate opener (e.g. a regional farmers cooperative, or leading company) might take on the role of an sectoral actor and/or system actor to investigate the implications of pathways-thinking and multi-risk interactions and disseminate learnings amongst relevant actors.

S2 Determine data transformations

Data for pathways analysis typically comes from model-based stress-testing, where Disaster Risk Management (DRM) pathways are tested across a range of scenarios characterised by both external uncertainties (e.g., climate change, socio-economic development, climate variability) and internal uncertainties (e.g., combinations of measures implemented by different actors). This results in multi-dimensional data for decision-making under deep uncertainty.

S2.1 The case study

The case study is implemented as a coupled hydrological-impact model used for stress-testing DRM pathways options (Schlumberger et al., 2024). The model operates on a temporal resolution of 10 days, projecting sector-specific impacts based on different objectives over the 100-year period. The pathways are evaluated based on a set of objectives for each sector, across different combinations of sectoral DRM pathways and accounting for climate variability and climate change as primary sources of uncertainty (Schlumberger et al., 2024). The raw model-output follows a long-table format as shown in Figure S3.

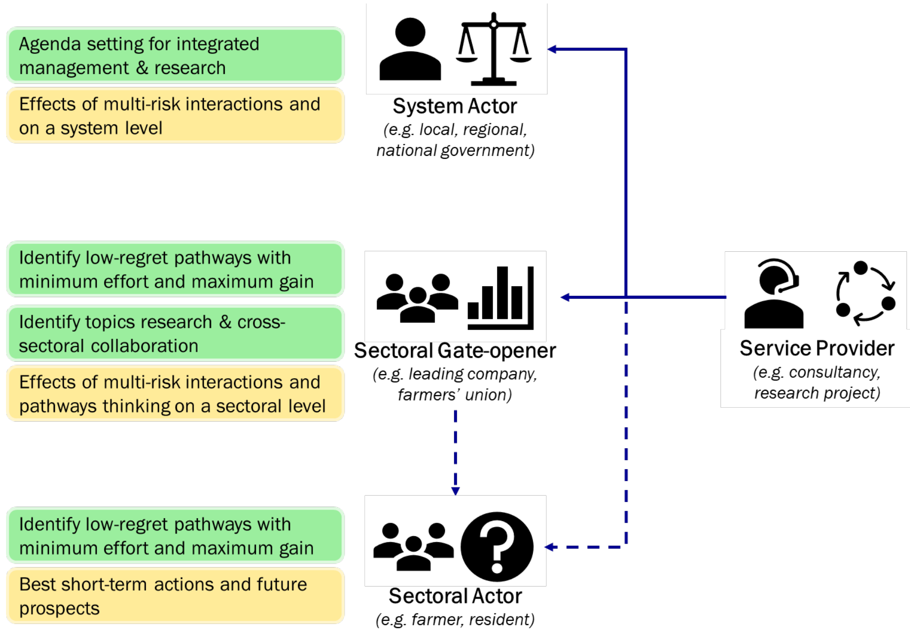

Figure S2. Domain definition for multi-risk DRM decision-making under deep uncertainty. The domain is a collaborative learning context, where actor types with different motivation (green boxes), analysis objectives (yellow boxes) are involved. Depending on the respective sector, actors might be involved directly or indirectly by receiving information through a sectoral gate opener (dashed lines).

Value	Perfor-mance key	Multi-risk keys				Deep uncertainty keys		Time key
Value	DRM objective	Farmer - flood pathway option	Farmer - drought pathway option	City – flood pathway option	Shipping - drought pathway option	Climate change scenario	Climate Variability scenario	Year
100.5	Yield Loss	2	6	0	1	1.5C	1	75
94	Yield Loss	2	6	0	1	1.5C	1	50
180	Yield Loss	1	6	0	1	1.5C	1	75

Figure S3. Stylised model-output in long-table format from the case study. The value is a dependent attribute of a specific combination of keys. There are different types of keys: 1) Performance keys capturing various objective parameters (e.g. impacts, maintenance cost); 2) Time key capturing the timing of a certain realisation of the objective parameters within the planning horizon; 3) Uncertainty keys regarding the considered deep uncertainties (e.g. climate change scenarios and climate variability); 4) Multi-risk keys regarding the specific combination of multi-risk pathways (e.g. farmer flood pathways, shipping drought pathways).

S2.2 Common practices for dimensionality reduction

Visualising multidimensional datasets such as this model-output is a challenge, as studies suggest that visualisations can effectively handle a maximum of five dimensions as long as the information density is not too high (Siirtola, 2007; Mackinlay, 1986). There are three primary avenues to address this challenge:

1. *Dimensionality reduction*: There is a rich field of mathematical methods for dimensionality reduction (van der Maaten et al., 2009). For example, Principal Component Analysis, a method to transform data into a set of orthogonal components, reduces dimensions by keeping the most variance-explaining components. This technique has been used in the context of DMDU to reduce dimensionality in case of many-objective problems (e.g., Giuliani et al., 2014).

2. *Statistical summary methods* are widely applied for evaluation of policy options in DMDU. A common approach is the consideration of robustness, meaning the ability of a policy option to perform well across an ensemble of scenarios (could be combinations of different policy options and/or combinations of uncertainty sources). This approach is aimed at identifying strategies that minimise regret. Various robustness indicators can be calculated using different ways to combine statistical properties of the dataset such as the mean and variance across a (sub-)set of scenarios (Bartholomew and Kwakkel, 2020). Alternatively to robustness calculation, some studies apply a satisficing criteria determining the percentage of ensemble scenarios in which a certain objective threshold is (not) reached (Kwakkel et al., 2016).

3. *Reducing the number of data points* to be shown in a visualisation can be achieved through data transformations such as filtering. Filtering does not reduce the dimensionality of the dataset, but it can be a helpful way to limit the information density of a visualisation (Brehmer and Munzner, 2013). For example, while the performance of different pathways could be analyzed for each year of the planning horizon, specifying (a set of) timings of interest reduces the number of relevant data points to be considered for the analysis (e.g., Kwakkel et al., 2015; Schlumberger et al., 2024). Similarly posterior filtering of options can reduce the number of options to be compared, e.g. focusing only on those pathways options where no objective can be improved without compromising at least one other objective (Reed et al., 2022)

S2.3 Key assumptions made for the study

The key questions and context of pathways analysis help clarify the dimensions along which the analysis will take place:

- **User**: Different users have varying pathways options, evaluation approaches, and criteria.
- **Time Horizon**: Insights are needed at different points within the planning horizon.
- **Scenario**: Pathways performance and timing must be explored under different combinations of uncertainties.
- **Combinations of DRM Pathways**: Some analyses focus on sectoral pathways, while others evaluate combinations of multiple pathways.

In a participatory exercise, these factors would be determined prior to the analysis, shaping the data transformation process. Since the case study used in this research offers no specific guidance on these choices, we assume that stakeholders are interested in exploring performance under different climate change scenarios independently. We also assume stakeholders want to explore short-term (next 20 years), mid-term (next 60 years), and long-term (next 100 years) horizons. Additionally, we assume that when aggregating performance across objectives, stakeholders prefer to normalise performance for each objective and apply equal importance weights over the use of sophisticated, abstract mathematical techniques. These assumptions are made consistently for all stakeholders, though preferences could diverge and require parallel data processing flows in real test cases.

The raw model-output follows a long-table format as shown in Figure S3. It is a nine-dimensional dataset where e.g. the amount of experienced damage depends on the considered time-frame, the presence of different DRM pathways, and a specific uncertainty scenario (a combination of climate change and climate variability realisation).

The process flow from input data to visualised datasets is outlined in Figure S4. Depending on how robustness is defined and stakeholder interests, up to four dimensions can be reduced to assess performance robustness for each climate scenario across objectives. This can be done at the system level (evaluating combinations of pathways) or sectoral level (aggregating interaction effects per sectoral pathway). While the choice of scenarios and time horizons reduces the number of data points to be analyzed, filtering the data for one specific time horizon or scenario (e.g. showing data only for a 60 year time-horizon) further reduces dimensionality. The same applies to selecting specific combinations of pathways, which can reduce performance robustness by three dimensions. Additionally, using importance weights to aggregate different objectives into a single performance indicator can further simplify the dataset. As a result, it is possible to reduce the original nine-dimensional dataset to three or even two dimensions for both sectoral and system-level questions.

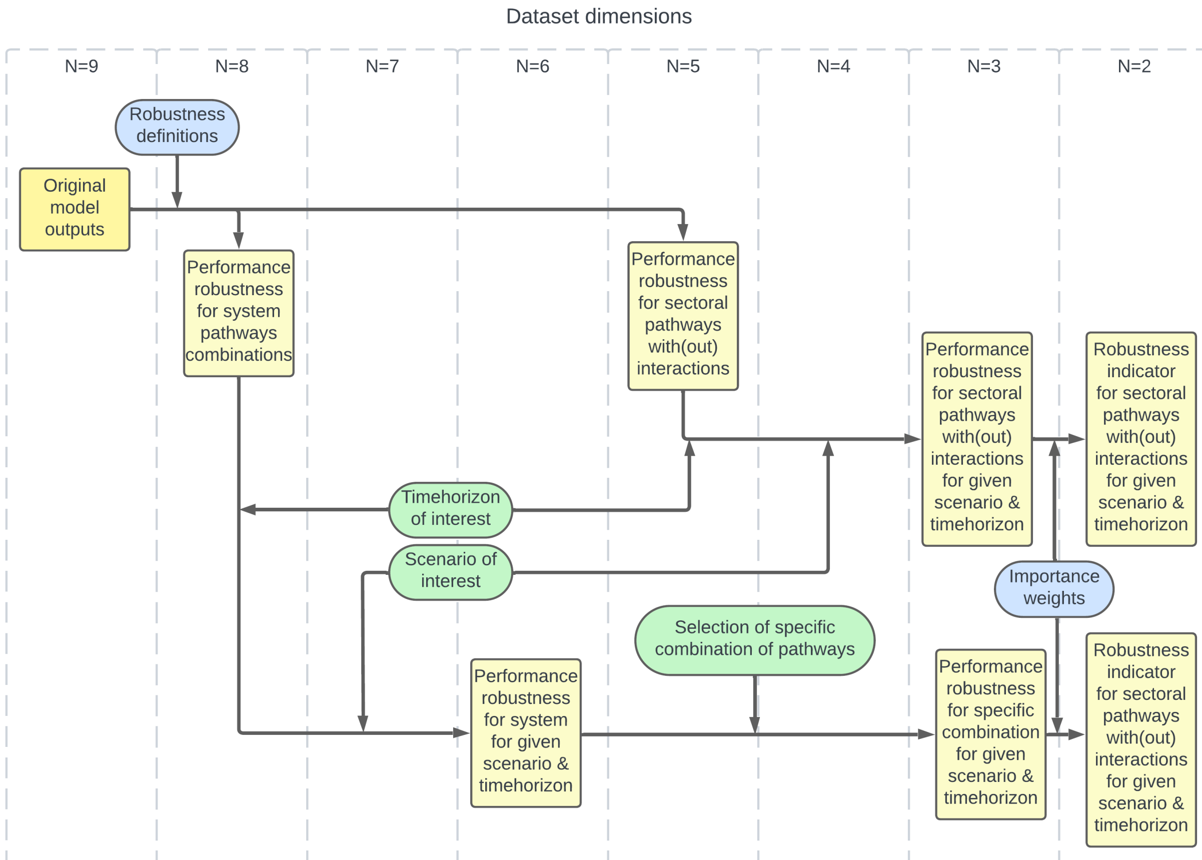

Figure S4. Process flow for generating datasets for visualisations. Transformations because of a priori collected definitions (blue) and selection during the filter process (green) result in reduction of dimensions to be visualised.

S3 Identify and design suited visualisations

S3.1 Process to identify suited visualisations

Research in information visualisation and cognitive science offers a wide array of guidelines to develop fit-for-purpose visualisations (e.g., Munzner, 2009; Padilla et al., 2018). Effective visualisations must balance human perceptual limits, especially when encoding complex, multi-dimensional data. Research has shown that humans can process up to five dimensions using spatial encodings, such as position on an axis, combined with visual cues like color or shape (Siirtola, 2007). However, visual clarity declines when more than seven colors are used, particularly for users with visual impairments (Munzner, 2014). Therefore, balancing the expressiveness of visualisations - how much data is conveyed - with their effectiveness - how easily insights are grasped - requires careful consideration (Mackinlay, 1986). Initially, we focused on static visual encodings. These proved too limited for the amount of data (dimensions) and range of analysis operations we sought to address. Consequently, we shifted towards interactive visualisations that allowed for the same visual encodings but provided greater flexibility by offering information on demand and highlighting specific properties of the data. Ultimately, the design process resulted in the development of a dashboard environment, which offers the highest degree of interaction with the visualisations as well as contextual support for interpreting the data, while minimising the cognitive load on the visualisations themselves (Franconeri et al., 2021; Ceneda et al., 2017). Following inspiration from Munzner (2014), to identify a list of visualisations that can handle the data dimensions/density and analysis operations as summarised in Table S2. We aimed at identifying one visualisation type per theme. We don't claim that we took all possible visualisation types into consideration, but got inspiration from common visualisation research and best practice in the DMDU research community. During the process, we came across multiple visualisation types which we deemed unsuited after first testing and reflection, mostly because they could cope less well with the number of dimensions or information density.

S3.2 The Pathways Analysis Dashboard

The initial version of the dashboard layout looked as shown in Figure S5. The intention behind was to be able to show all relevant information for the analysis steps at once, combining information on the options with their performance and timing through time, along with showing the effects of interactions. We presented this mock-up to different testers within the team of co-authors and colleagues and observed their reactions to it. However, we experienced that the information density was too high and it was difficult for testers to know where to focus their attention. For example, the information-on-demand elements were often disregarded and users immediately jumped into the visualisations or just focused on the interactive options. Similarly, this layout worked better on large screens but had significant limitations with regards to readability on smaller screens. As a result, we disregarded this first version of dashboard layout to arrive at the one that is presented in the main paper.

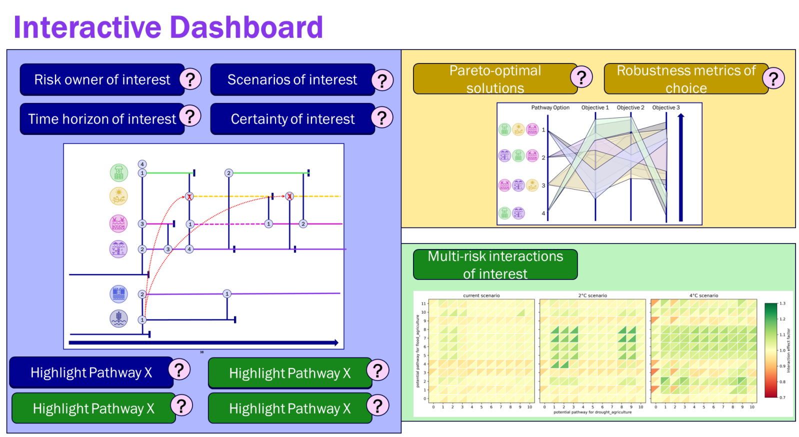

Figure S5. First version of the interactive dashboard template. The screen would be split into three components offering space to three different visualisations to answer all pathways analysis questions at once.

Table S2. Matching questions of interest, analysis operations and data and suited visualisations.

A. What are the pathways options?	
Question of interest	What measures are available for addressing the identified risk?
Analysis operation	**Select** individual candidates to **lookup** different attributes of the candidates
What data	2D table (name, description)
Scale (number of items)	tens
Possible visualisations	Decision Tree
Question of interest	Which measures are short-term actions or long-term options?
Analysis operation	**Arrange** relevant candidates to **identify** the distribution of candidates
What data	2D table (name, position in sequence)
Scale (number of items)	tens
Possible visualisations	Decision Tree
Question of interest	How do pathways options differ?
Analysis operation	**Select** candidates to **lookup** and **compare** attributes of the candidates.
What data	2D table (name, position in sequence)
Scale (number of items)	tens
Possible visualisations	Decision Tree

B. How do the pathways options perform?	
Question of interest	How does each pathway perform across key performance criteria?
Analysis operation	**Filter or select** candidates based on attributes (1) to **compare** trends in attributes across candidates and (2) to **identify** candidates with attribute outliers
What data	4D table (option, objectives, scenario, time-horizon)
Scale (number of items)	hundreds (filtered: tens)
Possible visualisations	Heatmap, Parallel Coordinates, Stacked Bar (all interactive)
Question of interest	How robust are these pathways under different future scenarios and on different time horizons?
Analysis operation	**Change** between different data subsets to **explore** correlation and similarity of candidate attributes across different subsets.
What data	2D table (option, objectives)
Scale (number of items)	tens
Possible visualisations	Heatmap, Parallel Coordinates, Stacked Bar
Question of interest	What are synergies or conflicts between different performance criteria?
Analysis operation	**Order** attributes of different candidates to **identify** correlations between attributes
What data	2D table (option, objectives)
Scale (number of items)	tens
Possible visualisations	Heatmap, Parallel Coordinates, Stacked Bar
Question of interest	How does the performance of pathways change when accounting for multi-risk interactions?
Analysis operation	**Select** individual candidates to **lookup** different attributes of the candidates
What data	3D table (option, objective values, objective values without interaction)
Scale (number of items)	tens
Possible visualisations	Heatmap, Parallel Coordinates, Stacked Bar (all interactive)

C. How do these pathways options map out in time?	
Question of interest	When are the critical points where a change in strategy is required?
Analysis operation	**Select** candidates to **lookup** attributes (time, name, additional information). **Arrange** attributes of candidates to **identify** the distribution of attributes
What data	4D table (option, year, new measure, scenario, description)
Scale (number of items)	hundreds (filtered: tens)
Possible visualisations	Pathways Map (interactive)
Question of interest	How does the timing of these points change for different future scenarios?
Analysis operation	**Change** between different data subsets to **explore** candidates with attributes of high and low similarity across the data-sets
What data	4D table (option, year, new measure, description)
Scale (number of items)	tens
Possible visualisations	Pathways Map (interactive)
Question of interest	How do multi-risk interactions affect the timing of these points?
Analysis operation	**Change** between different data subsets, **overlay** candidate attributes of different subsets to **explore** the similarity of candidate attributes across the data-sets
What data	5D table (option, year, year without interaction, new measure, description)
Scale (number of items)	tens
Possible visualisations	Pathways Map (interactive)

D. Which combinations of strategies serve multiple hazards and sectors?	
Question of interest	How do individual pathway options align or conflict with those of other actors?
Analysis operation	**Select** candidates, **overlay** candidate attributes of different data subsets ... to **identify** trends in similarity across attributes. **Change** between different candidates, **overlay** candidate attributes of different subsets to **compare** outliers in similarity across attributes and candidates.
What data	6D table (option, other options, objectives, objectives without interaction, scenario, time-horizon)
Scale (number of items)	hundred thousands (filtered: tens to hundreds)
Possible visualisations	Heatmap, Parallel Coordinates, Stacked Bar (all interactive), Pathways Map (interactive)
Question of interest	What are synergies and conflicts of collaborating with other actors?
Analysis operation	**Change** between different candidates, **overlay** candidate attributes of different subsets to **compare** outliers in similarity across attributes and candidates
What data	6D table (option, other options, objectives, objectives without interaction, scenario, time-horizon)
Scale (number of items)	hundred thousands (filtered: tens to hundreds)
Possible visualisations	Heatmap, Parallel Coordinates, Stacked Bar (all interactive), Pathways Map (interactive)

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