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# The use of scenarios in climate policy planning: an assessment of actors' experiences and lessons learned in Finland

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## ABSTRACT

Scenarios are often used to depict the possible outcomes of alternative future developments as part of the evaluation of climate and energy policy measures. In Finland, scenarios have become a standard practice in climate-related policy planning. However, scenario planning often results in a single cohesive narrative, which lacks transparency in why certain developments and solutions are included and others left out. This article focuses on how scenarios created during the planning of Finland's Medium-term Plan for Climate Change Policy (KAISU) were built, and how the actors involved assessed the characteristics and quality of these scenarios. We interviewed a total of 18 participants from research, administration, and policymaking domains involved in the creation of the plan and the scenarios it contains. Semi-structured interviews provided an insight into the creation and use of scenarios as part of policy formulation, as well as points of further improvement for the process. The KAISU plan was constructed as a cross-sectoral collaborative effort between policymakers, public officials, and researchers. Despite the variety of actors involved in the process, the resulting scenarios were perceived as well-executed by the participants. However, national scenario foresight could be improved in three dimensions: 1) the process where actors collaborate to build scenarios, 2) the scenario methodology, where solutions and developments are included or excluded, and 3) use of the scenarios after their construction.

## Key policy insights:

- The scenario approach used in Finland corresponds with needs at the political level. However, the approach could be improved without compromising this goal.
- The underlying scenario assumptions and the compatibility of the models used lack transparency. Many actors involved in the scenario process have a limited understanding of the models used and measures proposed outside their respective sector.
- Construction of more than one policy scenario would allow a larger variety of possible future trajectories to be evaluated in national policymaking. In this case, the aim and role of the scenario process would have to be adjusted and clarified accordingly.
- Communication regarding the role and applicability of foresight methods should be improved for citizens and politicians alike.

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Scenario planning; emissions scenarios; climate change; Finland; stakeholder participation; qualitative content analysis

## 1. Introduction

Current climate action around the globe covers mitigation, adaptation, and other aspects of climate policy, and ranges in scale from individual choices and activities to globally significant actors and large cross-border initiatives (Hale et al., 2021). The European Union has continuously increased the ambition level of climate and energy

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policy in the twenty-first century. Recently, as part of the European Green Deal, the Commission proposed on September 2020 the raising of the 2030 greenhouse gas (GHG) emission reduction target, including emissions and removals, to at least 55% compared to 1990 (EU Commission, 2021). Furthermore, the EU aims to be climate-neutral by 2050. The EU has examined the actions required across all sectors, including increased energy efficiency and renewable energy, and started the process of making detailed legislative proposals in June 2021 to implement and achieve the increased ambition. This will enable the EU to move towards a climate-neutral economy and implement its commitments under the Paris Agreement. In 2020, the European Union mandated member countries to prepare and submit their national energy and climate plans.

In Finland, climate policy is framed through a series of plans covering the various sectoral and temporal aspects of the climate domain. Government planning mostly revolves around the Energy and Climate strategy (Huttunen, 2017) and the Medium-term Climate Change Policy Plan, *KAISU*<sup>1</sup> (Ministry of the Environment, 2017), which both utilize scenarios as the basis for their policy. Together, these documents form the practical basis of national climate policy in Finland by being the most regularly updated (Table 1). Of the two documents, *KAISU* holds a more formal position in policymaking, because its mandate comes directly from the Finnish Climate Change Act (609/2015). *KAISU* outlines the expected impact of existing policy measures outside the EU Emissions Trading System (ETS) on the projected evolution of GHG emissions, renewable energy, and energy efficiency up to 2040. The plan projects the effects of the planned policy measures on the energy system, GHG emissions and sinks, economic development, the environment, and public health. The *KAISU* plan also assesses the possible impact of planned and existing policy measures on investment (Ministry of Economic Affairs and Employment (MEAE) et al., 2019).

The use of scenario planning in the preparation of climate actions helps evaluate the overall impacts of chosen policy packages, and at best shows the feasible pathways to stated goals. Scenarios are typically made in conjunction with foresight processes that assist policymaking. The literature often differentiates between the process where scenarios are constructed, including the chosen scenario framework, actors involved and models used (e.g. Wright et al., 2019), and the use of the scenarios as a tool in policy planning (e.g. Cook et al., 2014). However, the line between scenario creation and scenario-inspired decision making becomes blurred when the two processes involve common actors with political motives and decision-making power. In other words, the political dimension can hardly be absent from the scenario-building process which sets the framework for further policy planning, causing overlap between the two processes. National emissions scenarios can be strongly influenced by decision makers, who may approach the scenarios as a framework for applicable emissions reduction means or, as a strategic planning process (Tyler et al., 2013). Especially when the latter approach is adopted, a scenario-building process becomes inherently political, as the actors involved are negotiating and selecting the emissions reduction means to be implemented nationally. Wright and Goodwin (2009) found that actors chosen to conduct the scenario-building process can have a major influence on the scenario's contents and the resulting level of predictability. Ambiguous framing of the scenario, individual biases, and erroneous perceptions of causality between variables contributed heavily to the low predictability of the whole scenario.

National policy planning also acts as a vital mechanism for advocacy groups to legitimize, strengthen, and promote their solutions to the public agenda (Meadowcroft, 2011). Scenarios and projections can thus be understood as forums in which alternative low-carbon solutions compete for recognition and publicity in the national future narrative. As politicians, stakeholders and citizens have different views concerning the probable, preferred, and possible future scenarios, the processes of creating and using scenarios become intertwined. Hence, how the alternative scenarios are formed and discussed is a central question, both in environmental studies of deliberative democracy and in the deliberative processes in the real world (Renn, 2006). Hale et al. (2021) pinpoint that policymakers need to understand which approaches are working and which are not, promoting the diffusion of best practices and creating conditions for stronger action in the future.

In Finland, the scenarios created in the national energy and climate strategy have been an integral part of the policy process. According to the *KAISU* plan, the scenarios were formed by compiling sectoral estimations of possible emission reduction measures (Ministry of the Environment, 2017). The measures were evaluated based on their impact and cost-effectiveness to form a cohesive set of additional policy measures. However, the

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<sup>1</sup>The acronym was formed from the Finnish name of the plan *Keskipitkän aikavälin ilmastopolitiikan suunnitelma*.

**Table 1.** Administrative framework for Finnish climate policy. The framework consists of multiple interlinked documents, which vary in their sectoral and temporal scope.

Document	Purpose	Latest entry
<b>Instructive</b>		
Climate Change Act (609/2015)	To strengthen the governance of climate policy planning and monitoring	2015
Regulation of the Governance of the Energy Union and Climate Action (EU/2018/1999)	To unify governance of climate policy and policy goals within the EU in accordance with the Kyoto Agreement, Paris Agreement, and the EU Climate and Energy Package	2018
Governmental Plan	Includes goals in national energy and climate policy to be promoted in the current government's term	(Finnish Government, 2019)*
<b>Executive</b>		
Energy and Climate Strategy	To provide outlines, goals, and measures that the government deems necessary to accomplish the national goals. Updated once every parliamentary term.	(Huttunen, 2017)
Medium-term Plan for Climate Change Policy (KAISU)	To specify policy measures outside the ETS to 2030. Updated once every parliamentary term	(Ministry of the Environment, 2017)
National Energy and Climate Plan	To present national policy measures for energy efficiency, renewables, GHG reductions, interconnections, and research and innovation in 2021–2030	(Ministry of Economic Affairs and Employment (MEAE) et al., 2019)
Adaption Plan for Climate Change	To address measures and their sensitivities for climate change adaptation. Updated at least once every 10 years	(Ministry of Agriculture and Forestry, 2014)**
Long-term Plan for Climate Change Policy	To outline national policies for climate change mitigation and adaptation to 2050. Updated at least once every 10 years	n/a
<b>Monitoring</b>		
Annual Climate Report	Annually examines the meeting of the targets set for emission reduction obligations	(Lounasheimo et al., 2021)

\* During the first KAISU process, the active governmental plan was that of the government of Juha Sipilä, published in 2015

\*\* The latest adaptation plan was created prior to the Climate Change Act, but displays clear linkages with the upcoming act.

scenario-building process is poorly documented in terms of the internal choices made during the process. Bistline et al. (2021) propose that transparency should not only be understood as accessibility of data and models used, but should also include a read on the structural assumptions made during the scenario process. They suggest that efforts to increase transparency should be done especially for non-modellers, such as policymakers and stakeholders, in mind. Hence, to improve scenario work and increase the understanding of the national scenario-building processes, it is important to evaluate how the administration, policymakers, and scenario makers interact, which background assumptions guide the process and scenario models, and how scenarios influence policy decisions.

This paper inspects the creation of the Finnish Medium-term Plan for Climate Change Policy (KAISU), focusing on the construction and use of the scenarios. It gives an in-depth portrayal of a national cross-sectoral scenario-building process largely absent in the current literature, and acts as a point of comparison when studying other national scenario processes. It also presents several suggestions on how to improve the scenario process, thus providing useful insights on the potential benefits and issues related to them also outside of the Finnish context. The research questions in this article are the following:

RQ 1) How were the scenarios in the creation of the KAISU plan formed and used?

RQ 2) How was the scenario process perceived by the KAISU process participants?

## 2. Methods and materials

In this study, we interviewed 18 participants involved in the creation of the Medium-term Plan for Climate Change Policy. The respondents were chosen to represent different sectors involved in KAISU planning, and their involvement in KAISU process varied as follows:

First, four respondents represented research institutions and modelling groups involved mainly in scenario creation. Their role centred around utilizing modelling tools and providing scientific insights and guidance based on their knowledge of the field and the models in use. Moreover, modelling group representatives quantified the effect of selected policy measures.

Second, 10 respondents represented public officials and other actors directly involved with the KAISU process as part of the working group. These respondents' roles in the KAISU process were diverse, as they represented multiple ministries and other organizations. Moreover, they were responsible for different actions in the working group, in which some were more involved in the KAISU plan's coordination, management, and external communications, and others more specifically involved in scenario building by representing their corresponding sector.

Finally, four respondents represented political actors then involved in the climate policy domain. These four participants included members of parliament and their policy advisors. While neither directly involved in the scenario building nor part of the official KAISU working group, they were regularly contacted by public officials to ensure political acceptance of the measures proposed for inclusion in the KAISU plan. In certain cases, politicians also provided specific goals for inclusion in the KAISU plan, which correspondingly shaped the scenario-building process.

The interviews were conducted to backtrack the KAISU process and to discover key participants' perceptions of scenario building in the KAISU process. The interviews were semi-structured: three different interview frames were created, one for each respondent group. The interview frames contained largely similar questions, but some topics varied, based on respondent group's expertise and involvement in the KAISU process. The interview frames also followed the KAISU process in chronological order, first covering the starting point and the framework for scenario building, followed by the creation of the scenarios, and finally addressing the presentation and further use of the finalized KAISU plan. Although the interviews' focus was on the formulation and use of scenarios created in the KAISU process, respondents' perceptions of the general process were also discussed. Whereas interviews held with public officials followed a largely uniform pattern in line with the interview frames, more variance between interviews was discovered when interviewing representatives of research groups and policymakers. The interviews were held between late 2020 and early 2021 as remote video meetings that were recorded and transcribed.

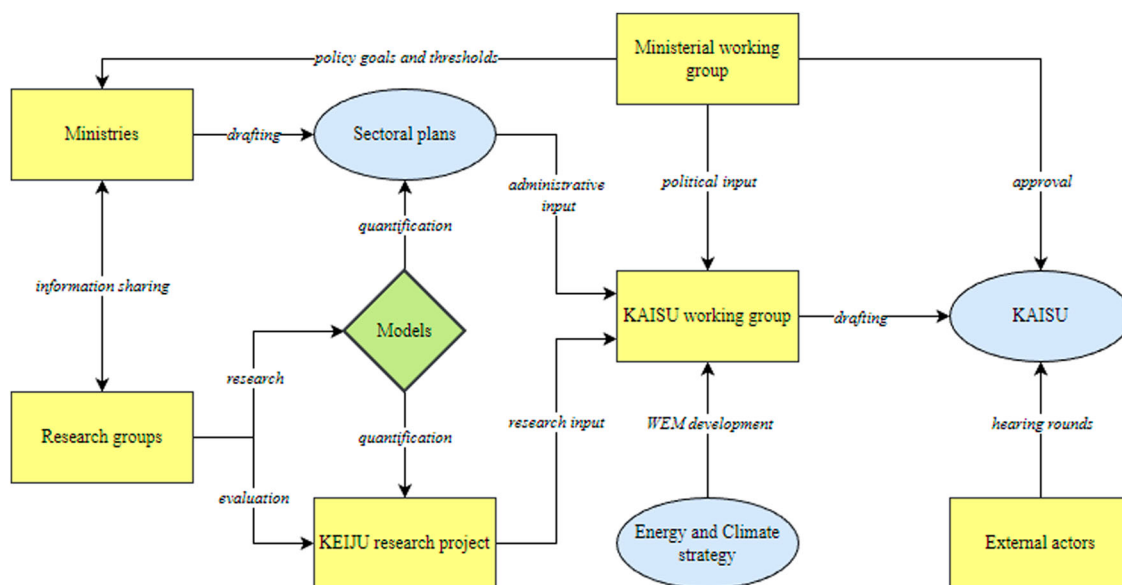
The materials were analysed using inductive content analysis (Hsieh & Shannon, 2005; Schreier, 2012) with NVivo 12 for Windows software. The purpose of the analysis was to map the KAISU process from its creation to policy use, and to discover how the participants perceived scenario formulation and use. The interview frames were utilized as the starting point of the analysis. The transcribed interviews were first divided and segmented to correspond to different parts of the scenario process. As respondents often commented on multiple items of interest simultaneously and referred to their previous answers throughout the interviews, excerpts from other parts of the interview were added to the corresponding segment group. A more nuanced analysis was conducted within the segmented groups by coding the excerpts by their content. Answers with a shared meaning were coded together inductively, and new codes were created where no existing code within a segment group could accurately grasp the answer's meaning. Some answers were coded into two or more segmented groups, as they provided an insight that could benefit different parts of the analysis. Finally, the resulting codes were organized into thematic categories within the segment groups. Thematic groups were used as the main unit for the analysis, and the study's results on the scenario process (section 3.1) and the lessons learned (section 3.2) were compiled based on a chronological and thematic reading of the resulting groups.

Two rounds of coding were conducted with three months in between. The results of the two rounds were compared and evaluated against one another to validate the findings. The final thematic categories thus comprise elements from both coding rounds.

### **3. Results**

#### ***3.1. Creation of medium-term plan for climate change***

The first Medium-term Plan for Climate Change policy was prepared and made public less than a year after the revised national Energy and Climate Strategy was published. While the two were not directly linked, it was expected that they would share a similar landscape and compatible measures across emission sectors, and many actors were involved in creating both documents. As with earlier energy and climate strategies, a quantitative emission scenario was created by the Ministry of Economic Affairs and Employment for emission



**Figure 1.** Simplified overview of the KAISU process based on the interviews. Multiple actor groups (rectangles) and documents (ellipses) influence the scenario building. (Created by authors, generated in diagrams.net).

projection purposes. This formed the ‘with existing measures’ (WEM) scenario, against which the policy scenario was to be contrasted in the KAISU plan. According to respondents, this WEM scenario’s assumptions and projections were not really discussed during the KAISU process. Instead, the WEM scenario was presented, and the group responsible for the modelling described the models’ general logic. Respondents recalled that the WEM scenario was to follow outlines provided from the EU level, which partly limited the modelling options. Additionally, as most of the modelling for the WEM scenario was conducted earlier during the creation of the Energy and Climate Strategy, the discussions took place before the KAISU process.

The ‘with additional measures’ (WAM) scenario’s creation differs significantly from the former. Whereas the WEM scenario was a mostly technical emission projection created during the Energy and Climate Strategy project, public officials’ and politicians’ roles were more central in the WAM scenario (Figure 1). Public officials were to draft a policy scenario including measures to meet the national emission reduction target set in the EU’s Effort Sharing Regulation (ESR).<sup>2</sup> The discrepancy between projected emissions and the target was estimated to be 6 Mt CO<sub>2</sub>-eq. in 2030 (Ministry of the Environment, 2017). The WAM scenario’s goal was therefore to present sufficient policy measures to meet this target in the Finnish ESR sectors. The WAM scenario’s outlines were prompted by the government working group overseeing the plan alongside the contemporary government plan. Additionally, an independent research project (KEIJU) was created to evaluate the measures in both Energy and Climate Strategy and the KAISU plan.

Four ministries were especially involved in KAISU’s creation: the Ministry of the Environment was the process’s coordinating ministry, as the preparation of KAISU plan was officially assigned to them. The Ministries of Agriculture and Forestry, Economic Affairs and Employment, and Transport and Communications participated in the central working group and were responsible for measures and policy proposals in their sectors. Each administrative sector was tasked with the creation of a *sectoral plan*, which was constructed independently within sectors in collaboration between corresponding ministries and research institutions. The resulting sectoral plans were originally supposed to list all available and even remotely feasible policy measures accompanied by their GHG emission potential for sectors in the ESR, forming KAISU’s backbone. The Finnish

<sup>2</sup>The Effort Sharing Regulation is part of the EU’s climate framework, which sets binding targets to national emission reductions outside of the Emissions Trading System. For Finland, the target set in the ESR was -39% compared to the emission level in 2005 (Ministry of the Environment, 2022).



Climate Change Panel<sup>3</sup>, as an external advisor to the process, provided a common framework in which all measures collected could be presented uniformly, thus helping evaluate different measures within and across sectors. The framework set cost-effectiveness as the foundation against which different measures were presented and evaluated. Cost-effectiveness therefore became the guiding feature in the WAM scenario's initial creation. The common framework was generally perceived as helpful, though there were some concerns about social and larger ecological issues being somewhat side-lined due to this techno-economic emphasis.

The atmosphere in the working group was highly praised by the participants. Although the working group consisted of members from a variety of ministries and organizations with different practices, respondents felt that all the participants were genuinely invested in and keen to prepare KAISU to the greatest possible detail. However, the creation of KAISU was also described as rather conservative. Outlines, targets, and the practical scenario modelling work were strongly guided by the EU Climate Framework and the contemporary governmental plan, which limited the scenario planning. Moreover, it was felt that public officials were somewhat reluctant to include measures they deemed as lacking political support. Similarly, public officials were very cautious when including emerging technologies and measures with limited estimations for their effectiveness to avoid shortfalls if the WAM scenario was to be realized. This left some respondents speculating whether certain possibly effective but unproven measures were disregarded due to a conservative attitude.

The scenarios' initial formulation was largely done within ministries. As the sectors covered in the ESR are highly diverse, policy measures were generally evaluated by research institutions and public officials within administrative sectors. The identified measures were then presented to and approved by the corresponding minister's staff. This effectively meant that the KAISU working group was more about coordinating responsibilities between ministries than evaluating individual policy measures in detail. Most of the reported topics for discussion within the working group were more involved in the general framing of the KAISU plan: how to account for future development of emissions sectors outside of the ESR, and how to develop a just distribution of the burden between sectors within ESR. Although the division of labour was originally designed for all sectors to collect measures to reduce a similar gross percentage of emissions, this was found to be difficult in practice. Respondents especially mentioned the agriculture and transport sectors. Whereas the public officials in the transport sector had adopted a somewhat proactive stance on climate policy by evaluating the effectiveness of different climate policy measures before the KAISU plan, agricultural sector representatives felt that not many politically feasible measures would be found in agriculture, and therefore showed more reluctance about the process. Ultimately, the transport sector was assigned to an ambitious –50% emission reduction target by 2030. The choice was above all political but relieved pressure from the other sectors, especially agriculture. This implies that political feasibility and policy goals were ultimately prioritized over cost-effectiveness.

Politically, the scenarios were discussed in a ministerial working group, which ensured the political feasibility of the overall scenario and provided a formal discussion forum for politicians and the KAISU working group. Additionally, respondents noted the importance of the political advisory level, which acted as a more pragmatic link between politicians and public officials. Political advisors thus pre-assessed the means proposed for the KAISU plan as clearing the burden from ministers who were more focused on the plan's broader outlines.

Citizens, non-governmental organizations, and other stakeholders were encouraged to participate in the KAISU process during the plan's preparation: workshops were organized during the creation of sectoral plans, and a public hearing round was held for the KAISU draft. While public participation was deemed important by the respondents, many of them considered these public involvement efforts as largely insignificant. As actors in respective policy fields were often well acquainted with each other, respondents felt these participatory efforts added little to what was already known and discussed in the ministries or in the KAISU working group. In particular, the consultation round was considered ill-timed: by the time it was held at the end of the process, there was little enthusiasm for modifying the draft on the working group's behalf. While the respondents had not encountered attempts to affect the scenario-building process, some speculated that if

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<sup>3</sup>The Finnish Climate Change Panel is an independent advisory institution that supports and evaluates climate change policymaking. The Panel consists of 15 distinguished academic scientists, and its official position is established in the Climate Change Act (Finnish Climate Change Panel, 2021).

**Table 2.** Proposed means to improve scenario building and use.

Scenario process	<ul style="list-style-type: none"> <li>Improve coordination across different processes during scenario building</li> <li>Provide transparent reading of models and sectoral plans used</li> <li>Ensure sufficient resources and time allocation</li> <li>Expand group of experts involved</li> </ul>
Scenario components	<ul style="list-style-type: none"> <li>Provide transparent assessment of sensitivities and uncertainties</li> <li>Enhance the role of qualitative assessments</li> <li>Utilize a wider range of scenarios</li> </ul>
Use of scenarios	<ul style="list-style-type: none"> <li>Improve communication of scenarios to wider audience</li> <li>Clarify role of scenarios to policymakers</li> <li>Utilize ex post assessments</li> <li>Update scenarios regularly</li> </ul>

there had been any external forces in play, those efforts would have happened outside and before the formal process. Politically, lobbying was not considered harmful to the process, but a normal two-way interaction with stakeholders. Active political lobbying was considered part of a healthy democratic process, and it could bring new ideas and perspectives to the table.

The KAISU plan was accepted in late 2017 and presented to parliament. At the time of its public release, it received limited attention in the media, but it soon had a major impact on the Finnish national climate policy framework. It outlined the national climate policy's direction, including technologies and division of labour between different emission sectors. The WAM scenario constructed in KAISU was considered the most probable and politically feasible future trajectory and has greatly influenced Finnish climate policy. Outside parliamentary policymaking, other actors in Finland take an interest in KAISU, often using the plan in their rhetoric and policy documents. Additionally, KAISU's WAM scenario is often studied and referred to as the Finnish parliament's official statement on the goals and means it actively works to achieve.

### 3.2. Lessons learned and further improvements

In general, the KAISU plan's formulation was considered well executed. Relevant ministries and research organizations provided sufficient high-quality estimations of the potential GHG mitigation measures and their effectiveness. Moreover, respondents found the process insightful and effective. Many also praised the working group's positive and genuinely collaborative atmosphere, despite the many organizations and ministries participating. However, respondents identified multiple points where the scenario-building process, the scenarios' content, and the eventual use of the KAISU plan could be improved (see [Table 2](#)).

#### 3.2.1. Scenario process

*Coordination between processes* was somewhat discussed by respondents. As the KAISU plan shared strong and obvious linkages with the Energy and Climate Strategy, some respondents wondered why the processes were not constructed and coordinated more closely. Similar remarks were made concerning the numerous research projects and scenario exercises conducted for the KAISU and Energy and Climate strategy. Understanding the roles, linkages, and aims of different processes were found confusing, especially by those only involved in one process. Respondents proposed that the creation of KAISU and Energy and Climate strategy should be further integrated in future to avoid obvious overlaps in the two processes and generate a more holistic stance on Finnish climate policy and the available measures across the three pillars.

Of course, a strict boundary between the Effort-Sharing Sector and Emission-Trading Sector keeps emerging as problematic. It's the same with the Effort-Sharing Sector and Land-Use Sector, as the constant motion [of emissions] across boundaries is obvious (Respondent B6).

*Transparency of data and sectoral plans* were mentioned several times during the interviews. As every administrative sector formulated its own sectoral plan mostly independently before the integrated KAISU plan, respondents from other administrative sectors often felt unable to comment on the selected measures and their rationale. Respondents also implied that they trusted their colleagues to be experts in their respective



fields, thus reducing enthusiasm to challenge their assumptions and policy proposals. However, it was noted that more transparency in the selection of measures might have generated a more holistic and trans-sectoral approach to the KAISU plan, instead of treating each administrative sector independently.

It's rather hard to question representatives of other sectors over, say, whether certain cultivation methods could reduce emissions. In this case, the knowledge would be on the Ministry of Agriculture and Forestry's side (Respondent B7).

*The compatibility and limitations of the models* used were also mentioned in the interviews. As models are complex systems requiring expertise to operate and interpret, few respondents felt qualified to evaluate their functionality and effectiveness. However, the use of multiple largely disconnected models within the same scenario exercise raised some concerns about possible systematic errors resulting from differences in data and general assumptions. While this problem was somewhat addressed by maintaining the shared assumptions and communication efforts between modelling teams, it was a time-consuming process requiring significant resources. However, the idea of a single, more holistic, and interconnected assessment model was deemed too difficult and complex to be practical. A model this large was deemed to easily turn against its purpose, as it would require many compromises and generalizations in its internal logic to be practical, risking the loss of many nuances embedded in the current models.

Notable criticism was given to the short timeframe, where scenarios had to be modelled, evaluated and compiled. Especially the modelling tasks for WAM scenario and the impact assessment (KEIJU) were conducted with short notice and given a limited timeframe. Respondents hoped that *expanding the group involved in scenario making* could help manage the problem if more people were acquainted with the scenario tools and models in both the research and administrative domains. As an added benefit, it would allow a wider range of actors to conduct scenario work more independently, thus reducing the heavy workload of current experts and generating a wider range of scenarios with different assumptions.

Operating heavy-duty models and soft-linking between them is very resource-intensive, and would require multiple iteration rounds to find a stronger, broader linkage to connect them. In my opinion, a lot of questions remained regarding the coherence between different analyses (Respondent C4).

### 3.2.2. Scenario components

*Addressing sensitivities and uncertainties* within the results lacked transparency according to several respondents. Respondents found that uncertainties regarding the effectiveness of particular policy measures were poorly explored and described, and done only for the final set of measures. Some respondents feared a large number of small fluctuations across different measures might cause a stark gap between the targeted GHG reduction level and the proposed measures. They felt a more careful assessment of different measures' sensitivities could help generate a more robust climate plan, in which the risk resulting from certain estimation errors could be better nullified with a selection of measures not strongly interlinked with one another. It should be noted that some respondents recalled that sensitivities and their causes were presented during the process, and felt that confusion over them was due to limited understanding on how scenarios work in general. Many respondents also emphasized that scenarios can never present an accurate future, and the existence of sensitivities should therefore be understood as a default from the outset.

Some sensitivity assessment was done at the end of the process. However, I found it somewhat vague to be honest (Respondent B9).

Some respondents felt the creation of a *wider range of scenarios* would help highlight the uncertainties of the future and overall scenario work. It was suggested that presenting only a single policy scenario was a potential cause of harmful lock-ins to certain developments and technologies, which might lead to suboptimal policy-making in an uncertain future. Moreover, some respondents suggested that multiple groups acting independently should undertake the initial scenario modelling. Comparing independently created scenarios would help to pinpoint commonly agreed trajectories across experts and possible risks regarding certain policy proposals, as well as to discover any new climate policy developments. Some respondents suggested the creation of multiple scenarios, portraying diverging paths to the future using different sets of policy measures. A

perceived benefit of multiple detached scenarios was their ability to better clarify the role of scenarios as visions of possible future pathways rather than being addressed solely as estimations of the future.

I would, without a doubt, consider using a scenario spectrum, where we would try to recognize the most effective and certain measures. In a way, we would take the uncertainty of the future as a fact and try to incorporate this uncertainty into the process rather than excluding it (Respondent B7).

A similar division was found in qualitative assessments in scenario work. As scenarios were built mostly on statistical data and estimations, *qualitative assessment* regarding the measures and assumptions used was found lacking by some respondents. Respondents deemed qualitative assessment helpful for discovering underlying social, cultural, and environmental conditions and trajectories, which could help analyse the preconditions and effects of the proposed policy measures. Many respondents felt that numerical estimations were easier to digest by policymakers and were thus an expected result of scenario work. Questions were, however, raised about the increased level of uncertainty when including more qualitative assessments in the scenario framework. Qualitative assessments, regardless of how well conducted and thorough they were, would still have to be transformed into numerical values for them to be properly included in the predominantly quantitative scenario. If this was not done, it was often the case that qualitative estimations were largely side-lined in the scenarios included in KAISU, and received only a little attention from policymakers, who were more interested in the quantitative techno-economic assessments of larger trajectories.

Qualitative understanding is highly important, of course, because using numbers always has a simplifying effect. So I'd say that it's more important to understand the effects of the selected measures, what we're changing, and what the effects of those changes are. And here it's important to have a qualitative understanding. Yet it might be something we often don't take seriously enough (Respondent B1).

### 3.2.3. Use of scenarios

Several respondents suggested more frequent *revisiting* and *ex post assessment* of previously created scenarios. Respondents found that scenario work would greatly benefit from regular revisions where the scenarios could be re-evaluated against contemporary developments. This might enable regular subtle adjustments instead of generating new scenarios every four years. Moreover, some respondents found scenario work in its current form inadequate in providing significant help to policymakers. KAISU plan scenarios were only done once in a parliamentary term. As the level of uncertainty in scenario projections increased significantly with every year, scenarios might lose their practicality quite quickly. To accumulate further understanding from the previous modelling efforts, scenarios should be exposed to *ex post* analysis. Comparing previous scenarios with contemporary developments would highlight discrepancies between the two. This in turn could help understand limitations within the models and data used, and create more robust future scenario modelling.

If they hit us once every four years with this vast project, where we then rush to formulate WEM and WAM scenarios, it's bound to be challenging (Respondent C1).

Finally, *external communication* regarding the scenarios was found lacking, especially for wider audiences such as citizens and the media. While respondents regarded the participation efforts during the KAISU process and external relations after its publication as better than average, they also felt more resources should be allocated to external briefing in future. It was deemed quite difficult for an ordinary citizen to holistically understand the policy framework in climate- and energy-related affairs, and accurately situate KAISU scenarios in this framework.

From a communication perspective, it is key that citizens understand the outlines [of climate policy]. Currently, it's quite hard to grasp, as the pieces are in silos all over the place (Respondent B8).

Moreover, the respondents found it hard to explain the applicability and limitations of scenarios for policymakers, who were not familiar with the methodology. Policymakers were prone to treat the WAM scenario as a deterministic narrative, which downplayed the uncertainty embedded in the foresight method. Additionally, policymakers sometimes pinpointed a certain estimation or causality as incorrect, thus generating a reserved posture toward the rest of the scenario. While this phenomenon could be somewhat addressed by utilizing

multiple scenarios with different assumptions, some respondents felt that generating multiple policy scenarios would cause only more confusion and would easily reduce the role of scenarios from a strategic tool to a narrative battleground. A single, well-considered, and carefully assessed policy scenario was therefore found more appealing, as it streamlined the policy process and made the KAISU plan more approachable overall.

#### 4. Discussion

Scenario planning approaches have become a widely accepted way of understanding and communicating climate change outcomes (Rogelj et al., 2012). Over the years, such scenarios as the Representative Concentration Pathways (RCPs) were developed to provide internally consistent sets of projections of the components of radiative forcing for use in analysis by both climate models and IAMs (van Vuuren et al., 2011). Shared socioeconomic pathways (SSPs) were developed ex post to be consistent with the RCPs by integrating the descriptions of socioeconomic development with climate change projections and assumptions about climate mitigation and adaptation policies (Ebi et al., 2014). Broader scenario planning use within climate mitigation and adaptation could be seen as supporting the evaluation of both required actions and their societal impacts. One way to improve climate policy planning is to ensure that the insight of such global scenario studies can be included more closely in policy planning to provide foresight information during the planning process.

The experts who produce evidence-based research information for planning and decision making can be seen as representatives of a wider scenario setup, and thus a wider future alternative insight than just the WEM and WAM scenario approaches. In the KAISU process, the scenarios were used as a platform for integrating the understanding of the different trajectories of climate policy effects. They also serve as a medium of internal and external communication on the needed and expected additional climate policy measures. Other potential benefits of scenario work, such as the ability to prepare and manage uncertainties, identify discontinuities (Volkery & Ribeiro, 2009) or weak signals, did not appear as priorities in this process.

Wright et al. (2020) identify the challenge of understanding risks and opportunities following emerging technological development in policy formulation. In particular, the impact of emerging technologies on different domains in society can be difficult to grasp by policymakers, and this difficulty may lead to disregarding emerging issues when designing policies. In a similar fashion, Pye et al. (2021) propose that current modelling approaches often lack radicalism in the solutions included, as many potentially effective, yet politically unfeasible, solutions are left unaccounted for in the models or side-lined in the scenario process. In our findings, lack of radicalism can be found in the strict modelling boundaries, which gave hardly any leeway to imagine vastly different economic or energy systems, and the precautionary tendencies of the participants to avoid measures with higher levels of uncertainty. As a solution, Wright et al. (2020) suggest forming scenarios accompanied by comparative analyses with regard to different policy aspects and policy recommendations from stakeholders.

Hanna and Gross (2021) point to several instances where energy scenario modelling has failed to anticipate changes that have taken place within the energy domain. Similar shortfalls were apparent in the KAISU process as, especially where the WAM scenario is concerned, the pressure to quantify GHG impacts may lead to distortion when selecting policy measures. If the models available for the scenario work cannot be used for a quantitative impact analysis of a certain type of policy measure, there is an obvious temptation to replace such policy measures with measures that can be modelled quantitatively more easily. This underlines the potential disparity in the applicability of qualitative and quantitative scenario approaches, when goals steering the scenario design are set in quantitative terms.

Another difficulty with scenarios arises from the modelling and quantification of the impact of proposed measures. In this case, many of the interviewees felt that in the scenario work various models which were used to quantify the impacts of applied policy measures or GHG emission reduction techniques were difficult to perceive and not very transparent in terms of their embedded causality. Of course, this is to some extent an inevitable outcome, because modelling becomes very complex when all the sectors in the economy and their GHG emissions and sinks are included. Not even the researchers and experts responsible for the use of models can master all the models simultaneously, but rather the ones in which they happen to be specialized. This means actors in all the different preparation spheres (research, administration, policymaking) must trust each other. This was the case in the KAISU process, which was indicated in several interview responses.

The idea of having a reference scenario based on currently applied policy measures (WEM) and a policy scenario including policy measures required to achieve the new policy goals set (WAM) is doubtless a practical way to prepare an action plan. However, with only one alternative WAM scenario, the choice of policy options and instruments becomes limited and may lead to an emphasis on already existing, and thus evident, policy measures. According to Koskimaa et al. (2021) the central role of semi-autonomous public officials strengthens the long-term perspective in environmental policy planning, as it balances out the more short-term perspective stemming from representative and party politics. However, our results suggest that this emphasis on long-term developments can also act as a restraint on new emerging climate solutions. Constructing a single alternative scenario is likely to amplify this restraining effect when public officials are more inclined to apply a stricter principle of precaution. Keeping this in mind, we can conclude that, although most interviewees agreed that the WEM-WAM scenario approach was beneficial in the KAISU process as such, a more extensive array of policy scenarios would be desirable when the long- and medium-term climate policy goals and related measures are to be determined.

## 5. Conclusions

The complexity of combining cross-sectoral climate policy, the uncertainty inherently embedded in scenario studies, and value-based policymaking demand a high level of planning, cooperation, and context-driven approaches to scenario building. Despite this complexity, the KAISU process appears quite well executed, based on this study's empirical evidence. The researchers, public officials and political actors involved described the KAISU working group as highly motivated and genuinely engaged with the scenario work, thus mediating the complexity of an intersectoral process. The 2017 KAISU plan generated the framework for Finnish climate policy for several years, creating a more predictable policy landscape for citizens, investors, and other stakeholders. Despite the success of the initial process, many issues were mentioned for potential future improvement. Practical scenario building could benefit from better overall integration, transparency, and additional allocated resources. In terms of the scenarios themselves, more variety in scenarios and scenario-specific assessments might prepare better for uncertainties. Concerning scenario use, approaching scenarios as a continuous learning and communication process might strengthen their role and practicality as policy planning tools.

However, it should be remembered that it is vital to maintain the practicality of scenarios created for policy-making. Holding high academic ideals in a policy process may prompt new ideas for imagining the future, but it may also result in the scenarios being unusable in political decision making and evaluation processes. The scenario approach selected for KAISU appeared quite straightforward with its emphasis on quantitative assessment and a baseline - policy scenario dynamic. While the approach may seem low in creativity and leaves room for further improvement, the selected approach and the fundamental goals set for its creation have given policy-makers a cohesive and consistent roadmap to follow. Improving the use of scenarios as part of a policy process thus requires balancing of scientifically considered ideals with the practical realities of representative politics. Finding a middle-road between the two calls for unambiguous goal setting and transparent methodology, as well as understanding on how the scenarios will be used in the context of policy planning.

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