D7.1 – Report assessing the foresight methods used for the fourth foresight exercises

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1 Executive Summary

AHEAD, a Horizon Europe project (Grant No: 101121338), seeks to develop a foresight framework for the civil security sector and provide actionable strategies for decision making, testing its approach in each of the Cluster 3's operational destinations. This deliverable reports the foresight methodology conducted by the AHEAD project on the topic of critical infrastructure, specifically the security of healthcare and hospitals in Belgium. By reporting foresight methods in an applied context, this deliverable aims to encourage methodological rigor in future foresight research, as well as support a culture of forward-looking governance.

In an era of globalization, advanced technology, environmental changes, and political tensions, security concerns are growing larger and more complex (Clapp, 2022; Hoijtink, 2014). It is of increasing importance that civil security agencies anticipate and prepare for these civil security concerns through future-oriented strategic planning – known as *foresight*. Within future studies, foresight is often defined by two characteristics: the first being *anticipation,* and the second being *preparation*. This meaning, a foresight study should facilitate the identification of possible futures (i.e., anticipation), as well as strategic planning for these possible futures (i.e., preparation). Thus, the methodological framework for the foresight study on critical infrastructure reflected this definition whilst maintaining resource efficiency.

The AHEAD Cycle 4 methodology involved an initial literature review to understand existing discourse on security concerns around healthcare infrastructure. To garner more nuanced information about possible futures from experts, an online survey was developed and administered using Qualtrics. 27 respondents gave their written responses about possible future scenarios, relevant trends, their ideal future, and resources and skills needed by civil security agencies. The data collected from the surveys was uploaded to ChatGPT-Pro to write four scenarios. The four scenarios were written in quadrant matrix form with two differentiating axes, being "black sky – blue sky" and "EU integration – EU disintegration." These scenarios were used in a backcasting session with participations from national administration and decision-making roles, as well as consultants, emergency and disaster experts, and cyber experts. During the half-day backcasting session, participants worked backwards from a future scenario to the present day, mapping key differences, understanding how such a future could happen, prioritizing solutions, and discussing how to create a desired future. The deliberations from a backcasting session aim to facilitate open-mindedness when thinking about the future, as well as identifying weak signals of coming change in real life and preparing solutions before the security challenges occur. The backcasting session received generally positive feedback by participants and the overall foresight methodology was evaluated as satisfactorily achieving its goals. Feedback, evaluation, and areas for improvement are discussed in the deliverable.

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2 Introduction

It is the aim of governments to uphold civil security and be prepared to address security threats. In an era of globalization, advanced technology (Clapp, 2022; Hoijtink, 2014), environmental changes, and political tensions, security concerns are growing larger and more complex (Habegger, 2010; Havas et al., 2010). It is of increasing importance that civil security agencies anticipate and prepare for these civil security concerns through future-oriented strategic planning – known as *foresight*.

AHEAD, a Horizon Europe project (Grant No: 101121338), seeks to develop a foresight framework for the civil security sector and provide actionable strategies for decision making. This deliverable reports the foresight methodology conducted by the AHEAD project on the topic of critical infrastructure. By reporting foresight methods in an applied context, this deliverable aims to encourage methodological rigor in future foresight research, as well as support a culture of forward-looking governance.

Under the Horizon Europe programme, five core civil security areas are identified as "Cluster 3" priorities, namely crime and terrorism, border management, disaster resilience, critical infrastructure, and cybersecurity (European Commission, 2023a). Civil security, being the common safety and well-being of individuals, nations, and global systems, is upheld through political, economic, social, and environmental stability (Rothschild, 1995) but can be prone to challenges and threats. As part of the AHEAD Horizon Europe project, a foresight study is conducted on each of the five "Cluster 3" civil security areas to identify threats and propose solutions. For the fourth iteration of the project, AHEAD conducted foresight on the topic of critical infrastructure, specifically the security of healthcare and hospitals in Belgium.

It was determined that, unlike previous foresight iterations within the project, a national perspective would be taken. It was hypothesized that reducing the scope of a foresight exercise to one nation as a case study would allow for more clarity in identifying and understanding future challenges, thus also increasing cohesion amongst knowledgeable experts needed for the foresight exercise. Belgium was chosen as the national case study, as the head researchers are affiliated with a Belgian academic institution and have existing connections with decision-making agencies related to the field of critical infrastructure. However, it was important for diversity of perspectives that non-Belgian voices were also part of the foresight exercise; thus, participants from other European countries and agencies were also recruited to take part. Although the focus was on Belgium, the challenges and resulting solutions are likely also applicable to many other European countries.

The AHEAD researchers coordinated largely with Belgian national organizations, in particular the National Crisis Centre (NCCN) and the Belgian Federal Health Service, to identify participants and take part in the exercise. Thus, a more explicit customer needs-based approach was adopted. Based on consultation with the NCCN, it was determined the hospitals and healthcare

infrastructure was an area of research importance; thus, this focus was adopted for the fourth foresight iteration on critical infrastructure. Participants for this exercise were identified through connections in various Belgian and European government agencies and institutions related to critical infrastructure. Participants were also identified through online searches (e.g., Google, LinkedIn) of relevant working groups, researchers, consultants, and medical staff working in the critical infrastructure field.

The foresight exercise was conducted involving commonly used and resource-efficient foresight methodologies, being an expert survey, scenario development, and a backcasting exercise, to identify future challenges and potential solutions (Madjlessi et al., 2023). The goal of the foresight methodology was to develop well-informed possible future scenarios and to provide concrete suggestions for solutions to future challenges. In developing the foresight methodology, the researchers sought to suspend disbelief and prepare for all types of futures – possible plausible and implausible. The rationale behind this method was that, by exploring different scenarios of various likelihoods, participating individuals in decision-making roles would increase open-mindedness to identify signs of negative change, become more adaptable to complex challenges, and be equipped with the preliminary tools needed to prepare for the long-term future.
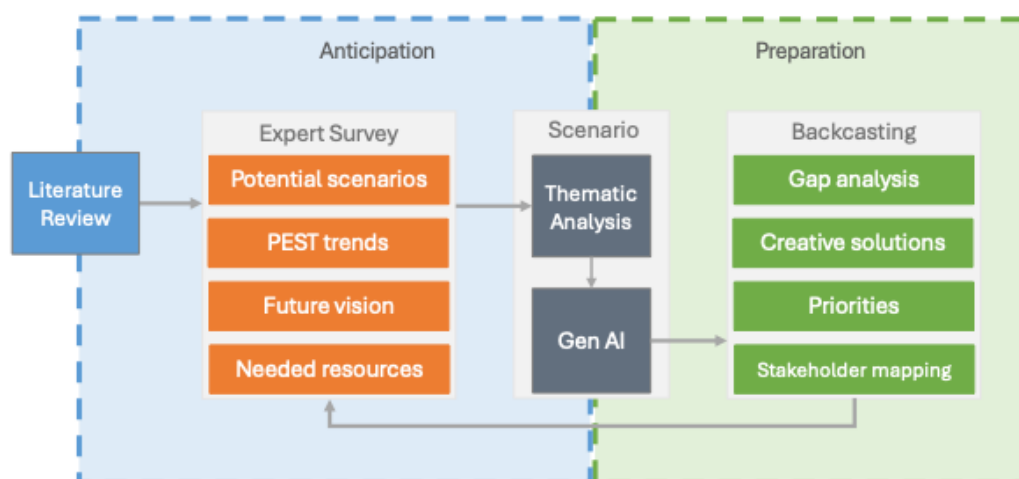
3 Methods

Within future studies, foresight is often defined by facilitating the identification of possible futures (i.e., anticipation), as well as strategic planning for these possible futures (i.e., preparation; European Commission, 2017). Thus, the methodological framework for the foresight study on critical infrastructure reflected this definition. The first step of the present foresight method aims to anticipate possible futures. The second step aims to facilitate strategic planning for the future.

There are many robust methods within foresight that can be used for anticipating possible futures. Some European organizations, like FRONTEX, use statistics to extrapolate how past and current trends will evolve in the future (Frontex, 2022). Other organizations, like Japan's National Institute of Science and Technology Policy (NISTEP), use large-scale Delphi surveys with national experts to determine future research and policy priorities (NISTEP; 2019). Similarly, the Australian Federal Police use live, collaborative Delphi surveys to get a full picture of emerging trends (Strategic Insights Centre, 2024). Yet, many civil security agencies do not have the time, budget, resources, or staff needed for methods like statistical modelling, identify knowledgeable participants, purchasing costly online Delphi survey platforms, and so on. Therefore, an equally robust, commonly used, and time-resource friendly method was used to aid struggling civil security agencies. The foresight methods used in the fourth iteration of the AHEAD project were developed by the first author based on a study of existing foresight methods (see Deliverable 2.1). Through the benchmarking report (Deliverable 2.1), it was indicated that a combination of survey, scenario-building, and backcasting is often used in foresight. This was further confirmed in a methodology workshop hosted by AHEAD with other EU agencies conducting foresight.

Figure 1: Cycle 4 Methodology

The first step of AHEAD Cycle 4 methodology, *Anticipation*, involves an online expert survey to gather information about possible futures. Significant research has been done on survey methods, particularly in the psychology and social sciences domain (Ponto, 2015), thus there are
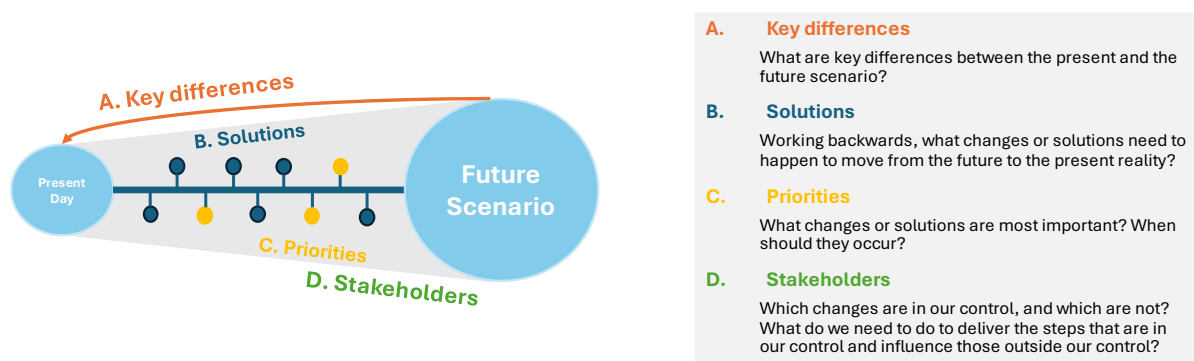
sufficient guidelines in how to use this method in a scientifically rigorous manner. Accounting for limited time or resources, survey development can be done through group discussions in online meetings, survey administration can be conducted for free using email or online survey platforms, and survey analysis can be done using existing scientific guidelines data analysis, such as thematic analysis. To translate large survey data into usable material for strategic planning, scenarios can be made easily. The data collected from the surveys or the subsequent analysis can be uploaded to GenAI applications, such as local versions of CoPilot on isolated servers, to write scenarios based on the organization's needs.

There also exist many robust methods within foresight that can be used for strategic planning for the long-term future. One such method which is increasingly used is backcasting (e.g., European Defence Agency, 2021; Geurs and Wee, 2004; Matti et al., 2023; Olsson et al., 2015). Backcasting refers to working backwards from a future scenario to the present day, mapping key differences, understanding how such a future could happen, prioritizing solutions, and discussing how to create a desired future. The deliberations from a backcasting session can allow civil security agencies to garner signals of coming change, identify future challenges, and prioritize solutions.

Backcasting is considered well-suited for long-term problem solving and planning (Debrog, 1996), especially when the problems at hand are complex (Holmber and Rober 2000). Backcasting is also simple to conduct on a logistical level. There are existing in-depth guidelines on conducting backcasting and multiple scenarios can be explored in a half-day meeting (UK.GOV; see also European Commission, 2023b). This ability to conduct a work session in a short period of time is an advantage, given AHEAD's goal to offer a methodology that is easy to implement. Further, repeated backcasting on multiple scenarios makes civil security agencies more adaptable to address complex challenges in uncertain times. Through this exercise, organization can better identify signs of change in real life, anticipate if negative changes are about to occur, and be prepared with pre-determines solutions.

Figure 2: Backcasting Method

A. Key differences
B. Solutions
C. Priorities
D. Stakeholders
Present Day
Future Scenario

A.   Key differences
What are key differences between the present and the future scenario?

B.   Solutions
Working backwards, what changes or solutions need to happen to move from the future to the present reality?

C.   Priorities
What changes or solutions are most important? When should they occur?

D.   Stakeholders
Which changes are in our control, and which are not? What do we need to do to deliver the steps that are in our control and influence those outside our control?

These methods deviated from previous iterations of the AHEAD foresight exercises, which tested various scenario development techniques, and utilized a game board. The deviation reflects a desire to place greater emphasis on long-term thinking, evidence-based methods, as well as the strategic planning outcomes of the process. It further reflects the research team's reflexive and responsive attitude towards the recommendations and comments formulated following the mid-term review of this project. Therefore, the current methods were chosen from pre-existing, commonly used, and validated scientific practices. Every effort was made to ensure the methods followed systematic and scientific protocols, were as objective and unbiased as possible, focused on the long-term future, and allowed for complexity of security threats to include those outside of crime and policing.

3.1   Anticipating Possible Futures: An Expert Survey

To identify possible futures, an online expert survey was conducted. This method was chosen as expert surveys (e.g., Delphi surveys) are often used in foresight studies and is generally well-validated within the scientific community (Beiderbeck et al., 2021). Through an online survey, we could garner a wide array of diverse participants across sectors and disciples, with little time and resource investment on the side of both the researcher and the participant.

3.1.1   Participants

A list of participants was compiled based on connections of the UGent researchers and online searches (e.g., Google, LinkedIn). Those contacted included head of policy, senior directors, European project managers, senior research scientists, strategy directors, operations managers, advisors, and emergency specialists at medical centers, universities, European working groups, private companies, and consultancy firms. The participants were contacted over email to request their participation in an online anonymous survey. Initially, 48 individuals were contacted. In the end, 28 participants completed the survey, which equals a 58.33% response rate and reflects the participant's strong engagement with the topic and survey (Wu, 2022).

3.1.2   Survey Development

The aim of the survey was to gather information about possible futures, a necessary step for building scenarios to be used in the Backcasting exercise. Four survey questions were drafted by WP3 (FIMOI) and WP7 (UGent) with this aim in mind (see Appendix A). Question 1 and 2 were meant to garner opinions on potential future challenges that need to be prepared for, as well as the trends that contribute to their occurrence. These two questions were aimed at garnering input for scenario generation. Question 3 garnered input for an ideal future scenario for the Backcasting exercise. Question 4 was aimed at creating a validation procedure to see if outputs of the Backcasting exercise matched those of the survey. The questions were tailored to be understandable, brief, and general in scope.

After the questions were drafted, a validation procedure involving cognitive interviews and expert approval was conducted based on prior literature on survey development (Alaze et al., 2025). The cognitive interviews were conducted in an online meeting with five LEAs in the AHEAD consortium. The five participating LEAs in the AHEAD consortium answered each survey question and gave their feedback on March 13 and 14 in an online meeting. These cognitive interviews were used to evaluate and refine survey questions by understanding how respondents interpret and answer them, based on existing literature on survey development (Alaze et al., 2025). The aims of the cognitive interviews included:

(1) Clarity – Do respondents interpret questions as intended?
(2) Misunderstandings – Is there confusion or misinterpretations?
(3) Response Process – How do respondents recall information and choose their answers?
(4) Response Accuracy – Are there errors caused by unclear wording or poor recall?

The meeting indicated that the questions were clear, but that further editing was needed for the instructions, as well as word choice for Question 4 (see Figure 3). Following the cognitive interviews, a FIMOI Delphi survey expert familiar with the AHEAD project was consulted for feedback on the survey and gave approval.

Once the cognitive interviews and expert consult was completed, participants were emailed and directed to the survey administered through the Qualtrics survey platform. Participants were asked to respond to four questions in a short text format. There were no formal requirements for their answers, and no maximum word limit was imposed. Participants had the option to complete the survey in French, Dutch, or English. The participants had one month to respond to the survey before closure.

Figure 3: Cognitive Interviews

3.1.3   Survey Analysis

Thematic analysis was used to analyze the results of the survey into themes for scenario development. Thematic analysis is a commonly used and well-validated method for systematically analyzing qualitative data (Ahmed et al., 2025; Braun & Clarke, 2006). Theoretical thematic analysis was used, meaning data was analyzed with addressing a specific research question in mind. The method involves highlighting points relevant to the research question and creating codes to extrapolating larger themes that connect the codes together.

The survey data excerpts were presented as provided by the participants without any corrections for spelling or grammatical errors. The answers were preserved in their original form to ensure the most accurate possible coding of the responses. During an initial review of the answers, it became evident that some responses contained what could be described as a "double meaning." Several answers alluded to issues not explicitly mentioned within the response itself but were indirectly addressed. To account for these nuances during coding, such responses have been recorded twice. In addition to an initial semantic coding, latent coding was applied to certain answers.

We illustrate the distinction with an example from the survey. The data excerpt "On the other hand, there is always the possible capacity problem in other large-scale incidents with fatalities and injuries. The blood supply also plays a role in this. (originally in Dutch)" can be semantically coded under the categories 'physical infrastructure' and 'logistics' since these two aspects are explicitly mentioned. However, if we use latent coding, we will also consider any underlying meanings conveyed by the respondent. For example, we can infer that the respondent refers to

a staff shortage, which pertains to 'organizational and training' aspects. This code would not have been identified if only semantic coding was used.

The latent coding of these responses was performed intuitively rather than based on a literature review. By communicating this transparently and clearly identifying these responses, we enable users to disregard them in further analyses if they choose. Nonetheless, the latent coding of the responses has shown that such coding adds substantial value to the research. Therefore, we recommend including the latent codes in any subsequent analyses. The importance of latent coding is evidenced by the aforementioned example.

3.2 Scenario development

The thematic analysis was written into a report [see Deliverable 7.2], which was used to inform scenario development by FIMOI, the AHEAD partner responsible for WP3. A plus version of ChatGPT was used to aggregate information and write the scenarios. ChatGPT was selected as the large language model (LLM) for this work because it is one of the leading options currently available, and we already had an active subscription. While alternatives such as Copilot or Google Gemini could also have been used, ChatGPT was judged to be the most practical choice for limited resources and time constraints. Our primary objective was to explore the potential of an LLM in practice and to demonstrate, in a generalizable way, how such a model can be used for foresight.

The ChatGPT prompting involved the "think aloud" method, in which the prompter gives detailed instructions, converses, and provides feedback repeatedly with the AI until the output is correct. This includes explaining which parts of the output are sufficient and which parts need improvement. This use of ChatGPT demonstrated that even practitioners with no experience in foresight can successfully generate scenarios.

ChatGPT was asked to write four scenarios for a back casting workshop focusing on Belgian healthcare and hospitals from critical infrastructure perspective. The time horizon 2035 was chosen to indicate a long-term future. Four scenarios were developed to include black-sky and blue-sky scenarios with a key driver of EU integration and EU disintegration.

Figure 4: Scenarios
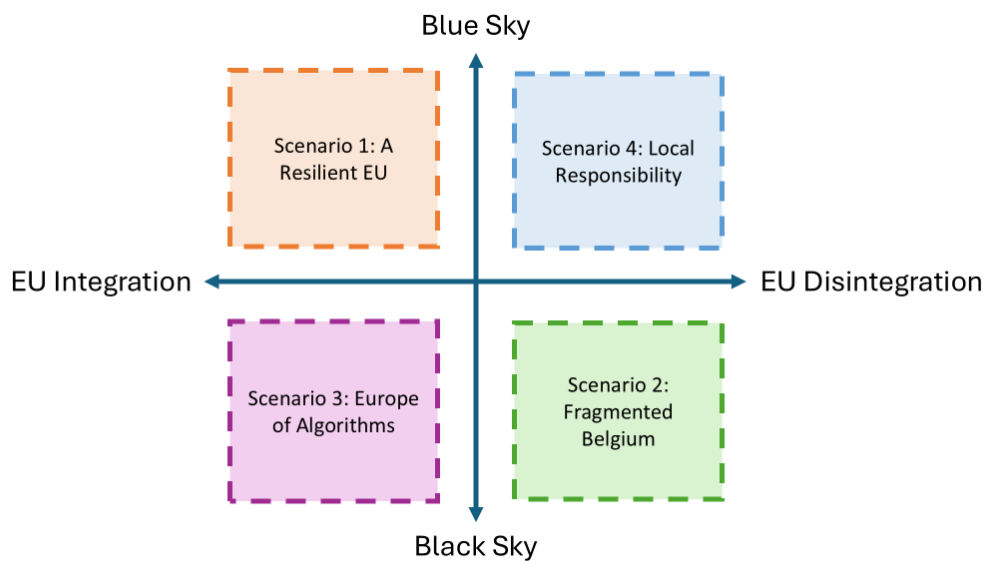
ChatGPT was given the themes and sub-themes from the expert survey. Attachments were also uploaded to give a reference for the format, style, and general elements of scenario writing (these included the Business Finland Post-Corona Scenarios, Digihumaus-raport 2022 Digital and Population Data Services Agency, and National emergency Supply Agency Scenarios 2030). In addition, another set of attachments were included to add more content elements regarding critical infrastructure concerns (EU megatrends from the European Commission's megatrend hub, JRC Interlinkages for a Megatrend on Accelerating Technological Change and Hyperconnectivity, an EU CIP report, Sitra report on disruption of security environment).

ChatGPT was instructed to tell a coherent story whilst preserving the themes of the uploaded materials. Not every theme needed to be explicit but could be deduced indirectly from the text. The aim is that the text motivates the reader to think critically and creatively without providing the reader direct answers. The prompting also ensured vividness of storytelling and easily readable components. After scenario generation, some small editing of diction was done to ensure understanding, as English was not the first language of the participants. For example, the word "deluge" was replaced with "torrential rains and flooding" in Scenario 4.

3.3 Preparation: A Backcasting Exercise

Eighteen participants took part in an in-person half-day backcasting exercise in Brussels on 13 June 2025. Four participants were from the AHEAD consortium, four participants were from the NCCN, four participants were from the Federal Health Service, and the remaining were doctors, disaster and emergency specialists, and consultants. Two university students were hired as note-takers alongside two AHEAD researchers from the university.

Each group had one note-taker, and one participant assigned to fill out the questions sheets and report key take-aways of the group at the conclusion of the session. As four scenarios were used, it was determined that groups of five to six participants were needed for each scenario. This number of participants would be sufficiently small enough for participants to feel comfortable speaking, yet the group would be large enough to have diverse perspectives. Prior to the Backcasting session, the participant lists were grouped in advance, allowing for individuals from the same organization or with similar backgrounds to be evenly spread out. This also allowed for the researchers to control for the gender makeup of each group. As one-third of participants were women, an effort was made to ensure that each group had two women in it, whether a participant or a note-taker. This ensures diversity within groups while maintaining participants comfort and ease of discussion.

Due to the participants limited availability, it was decided to hold a half-day in-person session in Brussels. This timing was possible under the condition that each participant only deliberated on one scenario for the entirety of the session. With separate groups, four scenarios could be discussed during the four hours allotted.

AHEAD's Backcasting exercise was based on the UK GOV guidelines on Backcasting (Government Office for Science, 2024; see Appendix B). The session began with an introduction to the AHEAD Horizon Europe project, an explanation of the foresight methods used in the fourth iteration, and instructions for the Backcasting exercise. It was decided to provide a brief overview of the methods used develop the scenarios without giving too much detail and potential bias to participants. It was also highlighted to the participants that they should not deliberate on how likely the scenarios are to occur, but the think critically about how such a scenario could happen and potential solutions for impacting positive change. To start the Backcasting session, participants were given time to read the scenarios, discuss key themes that stood out to them, and ask the researchers questions if they had any. Based on previous foresight iterations, it was determined best not to assume that participants would read the scenario in advance. Thus, the scenarios were not sent, and this measure prevented any potential bias.

The remainder of the backcasting session was spent answering the following four questions:

1. What are key differences between the present and the future scenario?
2. Working backwards, what changes or solutions need to happen to move from the future to the present?
3. What changes or solutions are most important? When should they occur?
4. Which changes are in our control, and which are not? What do we need to do to deliver the steps that are in our control and influence those outside our control?

Participants were given a set time for each question but were allowed to move on to the next question if they finished the previous one early. These questions were designed in line with existing Backcasting guidelines, and with the intention to extract potential weak signals, trends, security challenges, and solutions. During the session, two AHEAD researchers facilitated the session by attending between groups to observe, answer questions, and ask prompting questions if participants were stuck.

After answering the four guiding questions, with multiple breaks in between, the participants briefly described their discussion to the whole group and were given the opportunity for written feedback on the session. The Backcasting exercise included a small lunch beforehand and beverages at the end. This contributed to participants socializing and feeling comfortable, which helps foster engagement and collaboration.

3.4 Validation Procedure

The methodology of the fourth cycle was designed so that each step would be cross validated with each other. The literature reviews were conducted to brief the researchers on the topic, as well as to validate other steps of the process based on the existing literature. Thus, the possible scenarios and trends from the expert survey were compared with major themes from the literature, with large overlap. Additionally, the final survey question, "What tools, resources, or skills will government and healthcare agencies need to ensure success and mitigate future disruptions?" was deliberately included to compare the answers with those discussed in the backcasting exercise – again with large overlap. The results of the cross validation can be read more in-depth in Deliverable 7.2.

4 Assessment and Limitations

The strengths of the methods used in this foresight cycle are that they are based on existing, validated scientific procedures which promote open-minded, creative thinking about the long-term future. Foresight is often considered an art, and not a science, but scientific methods can be used to make foresight more transparent and robust. European Research Council President Prof. Maria Leptin said, "Our success depends on treating science not merely as a tool for competitiveness, but as a foundation to Europe's long-term strategy" (European Research Council, 2025). In line with this ideology, each aspect of the foresight can be traced back to understand how it was achieved or ideated. For example, each solution discussed was informed by problems and factors arising from the scenario, which can be traced backwards to the expert input in the survey, which can be corroborated with existing literature.

Another strength was the resource efficiency of the methodology. Anyone can conduct foresight, even with limited time, resources, and staff. This cycle demonstrated that surveys, scenario development, and in-person exercises can be done quickly, without significant expense, and by one or two researchers. In addition, the explicit customer needs based approach indicates that the methods are flexible and easily adaptable to any topic. Lastly, the number of participants involved, as well as the quality and diversity of their expertise and knowledge, was beyond satisfactory for the effective execution of a foresight exercise, both in the survey and backcasting session. Although the number, diversity, and expertise of the experts was satisfactory, it could be even further improved. A greater number of similarly diverse and domain-specific experts can be attempted in future cycles.

Feedback was provided about the methodology for the backcasting exercise conducted in Brussels, 13 June 2025. The feedback was provided by the general participants through a written feedback questionnaire at the end of the session, the notetakers at the end of the session, and the participants from the NCCN through written feedback over email following the session.

All 18 participants completed the feedback questionnaire at the end of the session. The written responses were coded into an excel sheet. Overall, the feedback was positive. Nearly half of participants (nine participants) were new to foresight, which suggests the session was accessible and engaging to both experienced and first-time foresight participants. Feedback also suggested that there was room for improvement on ensuring the goals and instructions for the session were easy to understand. The most positive feedback was on inspiring creative and open-minded thinking, as well as comfort in contributing ideas.

Question	Mean	Median	Std. Dev.
Q1 – Session inspired creative/open-minded thinking	6.33	7.0	1.15
Q2 – Prompted new ideas or perspectives	6.00	6.0	1.53
Q3 – Comfortable contributing ideas	6.83	7.0	0.50
Q4 – Goals were easy to understand	5.72	6.0	1.28

Question	Mean	Median	Std. Dev.
Q5 – Instructions were clear	5.86	6.0	1.31
Q6 – Group had right mix of experience	6.17	6.17	0.96
Q7 – Scenario was relevant/engaging	6.11	6.11	1.24

Note: Rated on a 1–7 scale (1 = Strongly Disagree, 7 = Strongly Agree)

For the open-ended portion of the feedback questionnaire at the end of the session, the backcasting exercise and scenarios used were described as "realistic," "valid," "interesting," and "thought-provoking." Positive feedback included the use of a blue-sky future, rather than commonly used pessimistic forecasts. Many appreciated the scenario design, discussion quality, and international diversity. Regarding limitations, some felt the scenario set in 2035 was too soon and some requested more sector-specific details, especially in healthcare and technology. When asked about the participant composition, several responses noted no significant omissions in perspectives. However, some indicated an added advantage of including more cybersecurity and intelligence services, local government and infrastructure experts, healthcare workers, legislation and first responders, and societal contexts.

The note-takers for the session were also given the opportunity to provide feedback at the end of the backcasting session. Two university students and one AHEAD researcher provided their feedback. The note-taking process was described as intensive, but multiple breaks were helpful. Positive feedback included that the scenarios were easy to understand, and the discussions were interesting and well-guided. The organization of the session went smoothly, and the timetable was realistic. There were two areas of conflicting feedback. Some found the group size of around five participants to be effective for diverse opinions, whereas some felt diversity in perspectives (either in professional background or in individual age) could have enriched the discussion. Additionally, some felt the instructions were clear whereas some participants could have benefitted from clearer explanations beforehand. Note-takers also suggested matching participants to scenarios and spending more time reviewing different scenarios. It was also mentioned that assigning one person to write the conclusions of the group reduced their individual participation in the discussion[1].

The participants from the NCCN kindly provided in-depth written feedback over email following the Backcasting exercise. The original feedback was written in Dutch and has been translated to English.

> To my surprise, the scenario seemed quite far-fetched and difficult to achieve, but by thinking about it more concretely, we certainly came up with an interesting set of intermediate steps and actions that made the whole thing much more feasible (from the EU Disintegration + Blue Sky Scenario).

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[1] One participant per group was asked to write down the conclusions of the discussion to relay the key take-aways of the group at the conclusion of the backcasting session. It is important to note that the nominated participant in all four groups was female. It is necessary to keep these gender dynamics in mind for future exercises to ensure that all participants can equally engage in discussion.

Regarding the scenario content and design, the mix of optimistic and pessimistic scenarios was well-received, with good length and structure. The approach helped participants develop realistic, actionable steps, even if initial scenarios felt abstract or far-fetched. However, some NCCN participants wished for more sector-specific elements, especially AI and hospitals.[2]

Regarding group dynamics, there were mixed experiences. Some groups were well-balanced and respectful, whereas others had dominant voices or uneven participation. It was mentioned that some international participants struggled with the abstract framing and some AHEAD members seemed unclear or confused about the session. It was suggested that the facilitators better ensure equal participation and focus. Regarding workshop organization and guidance, the timing and structure were considered generally effective, allowing enough time for discussion and reflection. UGent's support was appreciated for being available without being intrusive. However, there was a suggestion for more structured facilitation, including moderators for each group.[3]

Overall, participants praised the backcasting method for its value in foresight by offering a fresh way to think about risk and planning. Some indicated that it was a challenge to think at a strategic level, tending toward operational thinking. Participants expressed desire to know more about the link between the online survey and the session, how workshop outcomes would be used, and whether a manual would be possible for using the methodology independently. This last question highlights the usefulness that will have the AHEAD handbook, which is one of the key deliverables of the project.

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[2] AI and hospitals were included in the scenarios but were not equally present or heavily emphasized across all scenarios.

[3] The decision not to use facilitators in each group was intentional, being to prevent potential bias in discussions.

5 Conclusion

Many countries have a robust institutional culture of thinking open-mindedly and applying their agency today to promote positive change for the future. For example, the Japanese government has facilitated the cross-pollination and consensus of experts in S&T domains to inform future policy. Across agencies, the Finnish government assesses major trends with empathy and people-focused framing to develop solutions for emerging problems. These countries exemplify that such an endeavor as national strategic foresight is possible, and very much needed.

Yet, many civil security agencies face difficulties with foresight, in part due to the reactive nature of law enforcement that emphasizes immediacy in resolving current crises (Lee, 2018). Further, sporadic assessments of trends, based on the intuition of those in charge, as has been the practice in the past, reflects a close-mindedness that is no longer sufficient (Habegger, 2010). With global trends increasing in complexity and uncertainty, the lack of strategic and operational capacities becomes dangerous (Habegger, 2010). Many problems cannot be solved once they have already occurred. It is the decision makers today who can best mitigate the problems of tomorrow. By using foresight, a proactive method, decision makers can understand how problems can be mitigated before the they occur and thus better protect civil society.

This deliverable relayed the methodological framework of the fourth foresight iteration of the AHEAD project, with the aim of guiding other foresight practitioners and supporting a culture of forward-looking governance. In addition, the researcher sought to provide civil security agencies struggling with understanding and implementing foresight guidance on conducting foresight with limited time and resources while maintaining quality. This fourth cycle, by applying and testing foresight methods other than those used in previous AHEAD cycles has also enriched the project's methodology.

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7 Appendix A

Survey Instructions: Healthcare infrastructure is generally defined as facilities (hospitals, clinics), equipment (diagnostics, IT systems), workforce (doctors, nurses), supplies (medicines, vaccines), public health systems, policies, and digital health (telemedicine, data management). It is a critical infrastructure for efficient, accessible care and crisis response.

We will ask you four questions about the future security of healthcare infrastructure in Belgium and the EU. Your answers will be used to help draft scenarios for a strategic planning exercise. Please answer to the best of your ability and be as detailed as possible in your response. There is no right or wrong answer.

1. Do you have a future scenario in mind that we should be prepared for regarding the security of healthcare infrastructure in Belgian and the EU?
2. What key trends contribute to the occurrence of the scenario? Please be as detailed as possible in your answer. E.g. climate change, shifting geopolitics, emerging technologies
3. In your view, what does an ideal, successful, and resilient healthcare infrastructure system look like in the future?
4. What tools, resources, or skills will government and healthcare agencies need to ensure success and mitigate future disruptions?

8 Appendix B

Table 1: Backcasting Schedule

Start Time	Duration	Activity	Content
13:00	–00:30	Introduction	Introduction to the AHEAD Horizon Europe Project Why We Use This Foresight Approach How the Backcasting Exercise Will Work
13:30	–00:10	Scenario exploration	Review the scenario and identify key components
13:40	–00:30	Key differences	Using the timeline sheet, work backwards from the future to the present: what changes, events, or steps needed to happen for this future to occur?
14:10	–00:10	Break	
14:20	–00:30	Discussing solutions	Working backwards, what changes or solutions need to happen to move from the future to the present?
14:50	–00:20	Assessing priorities	What changes or solutions are most important? When should they occur?
15:10	–00:30	Identifying stakeholders	Which changes are in our control, and which are not? What needs to be done to deliver the steps that are in our control and influence those outside our control?
15:40	–00:20	Consolidation	Groups consolidate their findings and review them
16:00	–00:15	Feedback session	Participants may offer feedback on the backcasting exercise