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Multi-Agency Foresight with One Health Approach

Deliverable 5: Final Report

Authors

Totti Könnölä, Insight Foresight Institute

Arianna Ferrari, Austrian Institute of Technology

Susanne Giesecke, Austrian Institute of Technology

Kerstin Cuhls, Fraunhofer ISI

Miquel Banchs-Piqué, Fraunhofer ISI

Abstract

European societies are facing increasingly complex and interconnected challenges at the intersection of human, animal and environmental health. These challenges are driven by climate change, environmental degradation, technological transformation and geopolitical uncertainty. Addressing these challenges requires coordinated, anticipatory responses that transcend sectoral and agency-specific approaches. This report explores how multi-agency Foresight, grounded in a One Health perspective, can strengthen the European Union's capacity for anticipatory governance. Led by EFSA, the work was carried out by the Foresight on Demand Consortium in collaboration with members of the EU-ANSA Futures Cluster. The project combined horizon scanning, scenario development, participatory workshops, surveys and interviews. The analysis identifies changes that will shape future challenges and examines how different governance, technological and societal developments will influence preparedness, resilience and equity. Based on these findings, the report outlines strategic areas for multi-agency Foresight and suggests an adaptive, modular approach to Foresight that can be adapted to the different needs of EU agencies. The results will also be helpful to individual agencies in supporting their own strategic planning and programme development. © European Food Safety Authority, 2026

Keywords: Adaptive modular Foresight, horizon scanning, multi-agency Foresight, One Health, scenarios

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Summary

Purpose, scope, and key outputs

This report documents a pilot multi-agency Foresight process around One Health approach for the EU-ANSA Futures Cluster. It responds to a simple operational reality: cross-border threats and systemic risks (health, environment, social vulnerability, security, and technology) increasingly interact, cascade, and amplify each other. The core proposition tested in this work is that no single agency or sector can anticipate and manage these dynamics alone, and that shared Foresight can create a practical "anticipatory infrastructure" that supports preparedness and strategy across mandates.

The process produced five kinds of outputs:

1. Thematic scoping on the One Health concept and related positioning of the EU Agencies.
2. A shared evidence base of factors of change (trends, weak signals, wild cards) structured through a common analytical lens and clustered into themes to support scenario work.
3. A scenario set to 2035 (with additional AI-assisted scenarios) used to explore tensions, stress-test assumptions, and identify where multi-agency collaboration is most valuable.
4. Strategic areas for collaboration, with a shared 2035 vision and an initial understanding of vulnerabilities across contrasting futures.
5. Concrete Foresight proposals and cross-cutting recommendations to move from episodic exercises to an institutionalised, modular, reusable multi-agency capability (including shared horizon scanning as a standing module).

A central finding is that the key bottlenecks are institutional rather than methodological: fragmented data governance, misaligned mandates and planning cycles, uneven capacity, and (above all) trust and legitimacy. The scenarios repeatedly show that weak governance, opaque data practices, and low trust lead to poorer outcomes, even when technology is advanced; conversely, coordination, transparency, and inclusion unlock prevention-oriented, resilient responses.

The methods and process

The work followed a structured pipeline from scoping to evidence building, to scenario exploration, to strategic synthesis and actionable proposals.

1. Scoping and shared framing: The process began by consolidating the pilot's purpose and boundaries, focusing on One Health-relevant cross-border risks and the need for multi-agency collaboration across health, environment, and related domains. Inputs and materials were drawn from Futures Cluster agencies, ECHA and the Joint Research Centre (JRC).

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2. Horizon scanning and factor collection (AI-assisted, expert-led sense-making): A large set of source documents was scanned using an AI-assisted approach to extract and classify: Trends and megatrends, Weak signals, and Wild cards. These were distributed across PESTEL categories (Political, Economic, Social, Technological, Environmental, Legal), and then clustered into thematic areas to support scenario-building. This produced an extensive list (over 1,100 factors) and a smaller, prioritised set of the most uncertain and influential factors for scenario work.

3. Scenario development and scenario "sense-making": The scenario work combined human workshop methods with AI-supported techniques. Workshop-based scenario sprinting explored uncertainty, drivers, and implications for agencies and governance. AI-assisted morphological scenario building used a structured workflow. The method used algorithmic consistency scoring and diversity optimisation to generate additional scenario combinations and narratives, with human validation in areas of uncertainty or disagreement. The scenario discussions explicitly surfaced bias risks in both human and AI approaches, concluding that diversity of perspectives, transparency, and human accountability remain essential when AI increases speed and analytical breadth. Across divergent futures, several patterns are consistent:

    - Technology is not the main determinant of resilience. The same tools (AI, monitoring, modelling, data platforms) can enable prevention and coordination or intensify surveillance, exacerbate inequity, and erode legitimacy, depending on governance and trust.

    - Data governance is a strategic fault line. Futures characterised by data privatisation or restricted sharing reduce preparedness, amplify inequality, and weaken collective action, even when sophisticated analytics exist.

    - A drift towards "securitisation of health" is a real risk. Framing health mainly through security logics can mobilise attention and resources. Still, it can also undermine prevention, equity, and public trust if it prioritises containment and control over public goods and transparency.

    - Nationalism and fragmentation undermine the conditions for joint Foresight. In a fragmented Europe, interoperability breaks down, science is politicised, and cross-border learning loops weaken, exactly when systemic risks demand coordination.

4. Strategic area selection, 2035 visioning (plus stress-testing) and Foresight proposals: a pre-workshop survey was used to prioritise strategic areas for collaboration; then workshop groups developed shared 2035 visions for four selected areas. Each vision was stress-tested against contrasting scenarios to identify vulnerabilities and mitigation needs. The four visions elaborated in more detail are:

    a) Future Risk Modelling and Digital Twins — "A Common Digital Twin of Europe and the World"

    b) Health, equity and demographics — "An equitable, inclusive and just health system"

    c) Security, resilience, climate crisis and public engagement — "A Connected and Collaborative Security Ecosystem"

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d) One Health governance and data use/storage — "Operational One Health governance"

The report translates the strategic areas into practical Foresight proposals.

Agile modular Foresight

The fastest and most credible way to build Foresight capacity across the EU-ANSA is to do real Foresight work together. The idea is to treat joint Foresight modules (for example, horizon scanning, scenario building or roadmapping) as practical learning environments where capability grows through participation in concrete tasks with tangible outputs.

In this approach, agencies with strong expertise in each method would lead specific modules, providing templates, quality criteria, and light coaching. Other agencies would join as co-producers rather than observers, learning the method while contributing domain knowledge and mandate-specific perspectives. Over repeated cycles, this builds a shared language, common standards, and confidence in the usefulness of Foresight, thereby helping it gain internal legitimacy within each organisation.

The section also highlights that this "learning-by-doing" model directly tackles uneven capacity across the network. Instead of trying to level everyone up through generic training, it creates an operational way to share competence, reduce dependence on a few individuals, and progressively establish a stronger, more consistent Foresight baseline across agencies.

Conclusions and recommendations

Conclusions:

- Health, environment, social vulnerability, security and technology interact in ways that create cascading failure modes. Sectoral approaches will miss cross-domain feedback loops and long-term trade-offs.
- The decisive constraints are governance and trust. The scenarios repeatedly show that the same technical capabilities deliver radically different outcomes depending on transparency, accountability, inclusiveness, and data stewardship.
- Multi-agency Foresight must become a capability, not a project. The report points towards an "adaptive modular" approach: reusable modules (e.g., horizon scanning, scenario exploration, roadmapping) that agencies can plug into according to mandate, capacity, and timing—accumulating knowledge over time.
- AI is an accelerator, not an authority. AI can increase scale and speed (scanning, pattern detection, scenario generation, consistency checks), but legitimacy and accountability remain human and institutional. Shared AI governance standards are therefore essential to avoid fragmentation and loss of trust.

Cross-cutting recommendations:

1. Adopt a portfolio approach to Foresight
2. Build joint Foresight infrastructure: Institutionalise a shared horizon-scanning module
3. Explicitly separate exploratory and convergent Foresight functions

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4. Run Foresight modules in parallel where feasible
5. Strengthen EU-ANSA's role as Foresight portfolio curator
6. Embed governance and ethics in the core of Foresight
7. Use Foresight collaboration as a capacity-building mechanism
8. Align Foresight cycles with Commission and agency planning rhythms
9. Integrate social determinants, inclusiveness and equity systematically into Foresight
10. Engage experts in EU agencies and establish feedback loops from the work of agencies' policy implementation to Foresight
11. Integrate AI as an assistive layer within modular Foresight, not as a substitute for human sense-making
12. Establish shared AI governance standards for multi-agency Foresight applications

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Suggested next steps

For the EU-ANSA Futures Cluster, the next steps are to (1) keep mapping agencies' Foresight capacities (methods, horizons, staffing and outputs) to enable an adaptive modular approach and broaden participation, including exploring how to engage Member States; (2) agree practical steps for joint horizon scanning by comparing methods and defining what can be shared now, treating scanning as a continuous shared infrastructure; and (3) explore developing joint key Foresight insights and consistent policy messages that are easy to use in Commission processes.

For individual agencies, the priorities are to (1) circulate the report internally and run a short sense-making session to translate findings into action (potentially drawing on EFSA experience), and (2) submit a short Foresight note to the Futures Cluster outlining capabilities, outputs and gaps, as well as 2–3 cross-cutting topics for joint work and any reflections on joining or engaging more actively with the cluster.

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1 Introduction

European societies are facing complex and interconnected challenges that transcend traditional sectoral and institutional boundaries. Emerging infectious diseases, antimicrobial resistance, climate change, environmental degradation, chemical pollution, pressures on the food system, social inequalities and geopolitical disruptions interact in ways that amplify risks to human, animal and environmental health. These dynamics expose the limitations of siloed governance and reactive policy approaches, underlining the need for anticipatory, integrated, cross-sectoral responses at EU level.

The One Health (OH) approach recognises the interdependence of human, animal and environmental health, and is gaining prominence as a framework for addressing such systemic challenges. Within the European Union, this concept is reflected in policy initiatives, research programmes and agency cooperation in areas such as public health preparedness, food safety, chemical regulation, environmental monitoring and climate resilience. However, translating the OH concept into operational governance remains challenging, particularly when responsibilities are distributed across multiple EU agencies with distinct mandates, legal bases, and organisational cultures.

In this context, Foresight offers a critical capability for supporting strategic coordination. By systematically exploring future drivers of change, uncertainties and alternative development pathways, Foresight enables institutions to move beyond short-term risk assessment and towards anticipatory governance. For EU agencies, Foresight can provide a shared space to jointly interpret emerging signals, test assumptions, explore long-term implications of policy choices and identify robust strategic options under conditions of deep uncertainty. However, effective Foresight collaboration across agencies requires methods and governance arrangements that respect institutional diversity while enabling cumulative learning and coordination.

This report is the final deliverable of the contract issued by the European Food Safety Authority (EFSA) under the Interinstitutional Framework Contract RTD/2023/OP/0011 – Lot 1 Foresight on Demand in Science, Technology, Research and Innovation Policy dealing with multi-agency Foresight with approach, authorised by the European Commission, DG Research & Innovation, G1-Common R&I Strategy & Foresight Service. The objective of the work was to explore how multi-agency Foresight, grounded in a OH perspective, can strengthen the EU's capacity to anticipate and address future health-related challenges. The project was carried out in close interaction with members of the EU-ANSA Futures Cluster, ECHA and FRONTEX. It involved a combination of horizon scanning, scenario development, participatory workshops, surveys and interviews with EU agency representatives.

The report brings together several analytical layers. It first scopes the policy context, OH themes and existing collaboration practices among EU agencies. It then identifies key factors of change shaping future challenges and develops a set of alternative scenarios for 2035, complemented by AI-assisted scenario work. Building on these insights, a sense-making workshop was held in Lisbon in November 2025. This final report also presents strategic areas for multi-agency Foresight, develops concrete proposals for new multi-agency Foresight projects, and proposes an adaptive, modular Foresight approach tailored to the realities of EU agency collaboration. Finally, it distils cross-cutting conclusions and recommendations to strengthen the EU-ANSA Futures Cluster's role as a platform for sustained anticipatory

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governance. The results are also expected to be useful to individual agencies in supporting their own strategy work and in developing work programmes.

By embedding OH thinking into multi-agency Foresight practices, the report contributes to more coherent, preventive and resilient European responses to complex health and environmental challenges in the years ahead. Overall, the report is intended to support EU agencies, the European Commission and other stakeholders in moving from fragmented Foresight activities toward a shared, cumulative and action-oriented Foresight capability.

2 Scope of One Health Foresight

2.1 Introduction

The thematic scoping in this project contributed to the demarcation of the project's horizon scanning and scenario work, to further reflection on strategic areas for multi-agency collaboration, and to insights valuable to individual agencies in supporting their own strategy work vis-à-vis EU priorities. To explore and assess the extent and effectiveness of cooperation in this area among EU agencies, a mixed-methods approach was used. This included a comprehensive literature review, a structured survey and in-depth interviews with representatives from key agencies.

A targeted survey was developed and disseminated to EU agencies. The study aimed to capture perspectives on existing capacities and collaboration mechanisms, perceived strengths and weaknesses and future opportunities for collaboration. It also sought to gather input on resource needs and institutional barriers. To complement the survey data and gain deeper insight into practical experiences, semi-structured interviews were carried out with selected representatives from participating agencies. These interviews provided qualitative evidence on how OH principles are applied in practice, how inter-agency dynamics are managed, and what lessons can be drawn to enhance future cooperation.

2.2 One Health and the EU policy context

The OH concept recognises the close interconnection between human, animal, and environmental health. It is based on the understanding that people's health is linked to the health of animals and the ecosystems they inhabit. As threats such as emerging infectious diseases, antimicrobial resistance and climate change continue to challenge global health, a coordinated approach that breaks down traditional sectoral boundaries has become essential.

The concept promotes collaborative efforts across different sectors and disciplines at local, national, and international levels. By bringing together professionals from public health, veterinary science, environmental science and other fields, this approach aims to prevent, detect and respond to health threats more effectively and sustainably. Such integration supports the development of joint risk assessments, harmonised data collection and cross-sectoral preparedness planning. Through such a collaborative framework, the EU can strengthen its capacity to anticipate and respond to complex health challenges.

In **the European Union**, EU-funded research and innovation programs have implemented the OH approach. Still, ongoing **knowledge and implementation gaps** hinder the provision of comprehensive scientific advice on public health, environmental protection, food safety,

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and nutrition (Bronzwaer et al. 2022). These gaps limit the quality of scientific advice available for EU institutions and Member States. EU agencies, acting as both sources and users of knowledge, can bridge these gaps by making research more accessible, guiding EU research funding, engaging with ongoing projects, and integrating scientific knowledge into policy processes in collaboration with relevant EU Directorates-General.

Therefore, in June 2022, EFSA and partner EU agencies organized the ONE Conference (EFSA, 2022), which emphasized the need for a transdisciplinary "One Health – One Environment" approach to address interconnected challenges in public health, food safety, and environmental protection (Bronzwaer et al. 2022). At this conference, the establishment of a cross-agency task force was proposed to enhance strategic coordination, research collaboration, and information sharing among EU agencies, aligning with the European Green Deal's objectives and supporting policymakers in prioritising initiatives. This task force mainly concerns the agencies that are part of the EU Agencies Network on Scientific Advice (EU-ANSA) and that have a technical and scientific mandate on topics falling under the OH umbrella, that is the five agencies European Food Safety Authority (**EFSA**), European Medicines Agency (**EMA**), European Chemicals Agency (**ECHA**), European Environment Agency (**EEA**), and European Centre for Disease Prevention and Control (**ECDC**). These are also the Agencies under the remit of the European Parliament's ENVI and/or SANT Committees. The cross-agency task force on OH will facilitate strategic coordination among EU agencies to align their work with EU policies through a 2024-2026 action plan. In 2023, the Cross-Agency Task Force established a joint framework to enhance cooperation in implementing the EU OH agenda. The overarching vision of the task force is to facilitate the effective contribution of EU agencies in addressing related challenges, ensuring that the EU and its Member States are equipped to prevent and respond to emerging health threats (ECDC et al. 2023).

In **2024**, the **Commission's Group of Principal Scientific Advisers (Scientific Advisory Mechanism – SAM)** published the **scientific opinion "One Health Governance in the EU"** (European Commission 2024), an evidence-based review examining the critical interconnections between human, animal, and environmental health. In this report, they make a series of recommendations to shape European policy actions in this area.

Across all three pillars, **Sustainable Prosperity, Security, and Democracy**, the EU's strategic priorities for 2024–2029 can be connected to the OH approach (European Commission, 2024). Whether through legislation, investment or diplomacy, the EU is aligning its internal policies and global action with a vision of **integrated, preventative and inclusive health governance**.

2.3 Themes of One Health and the scientific collaboration of EU institutions

Building on the international and European developments outlined in previous sections, several scientific themes related to the OH approach were identified through an analysis of reports and publications from the European Commission and EU agencies. These themes were further expanded and refined through literature searches on Google Scholar and PubMed, with a particular focus on review articles published within the last 5 years. This task presented significant challenges, as the OH approach spans a broad, interdisciplinary spectrum, linking the health of the environment, ecosystems, animals, and humans. Consequently, a vast array of topics could potentially be considered relevant.

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To ensure coherence and relevance, the identified themes were selected based on their prominence in European policy and related scientific literature. The project team prepared 17 thematic areas for further scoping in view of multi-agency collaboration.

1. Zoonotic and (Re-)Emerging Infectious Diseases – Addressing diseases originating from animals and spreading to humans
2. Cross-Border Health Threats – managing infectious diseases, environmental hazards, or NCBR threats that spread across national borders
3. Wildlife Trafficking – Its role in zoonotic disease spread, biodiversity threats, as well as threats to animal welfare
4. Veterinary Medical Products – Regulating veterinary medicines and promoting prudent antimicrobial use, monitoring and reporting, and developing new vaccines
5. Antimicrobial Resistance (AMR) and antifungal resistance – Combating drug-resistant infections
6. Environmental Pollution Risk Factors – Managing health risks from pollution and other environmental stressors
7. Climate Change and Health – Enhancing resilience to climate-related health risks
8. Plant Health – Ensuring safe trade and mitigating climate change impacts on crops and forests
9. Animal Health – Preventing and controlling the spread of animal diseases
10. Animal Welfare – Strengthening protection standards and enforcement
11. Mental Health Strategies – Exploring the interconnectedness of nature, people, and well-being
12. Prevention Strategies – Tackling root causes of environmental harm and climate-driven health threats
13. Cancer Prevention – Addressing environmental pollution, hazardous substances, and health risk factors
14. Sustainable Food Systems – Ensuring food safety and security while reducing environmental pressures
15. Addressing Inequalities – Examining climate change's disproportionate health impacts on disadvantaged populations
16. Education and Training – Strengthening knowledge and skills for global health challenges
17. Geopolitical Disruptions and Health – Exploring how war, funding cuts, and governance issues impact transboundary and global health

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2.4 Feedback from EU agencies on One Health and Foresight collaboration

A survey was organised among the EU-ANSA Futures Cluster, including EU agencies and JRC, and invitations were also extended to ECHA and Europol. The objective was to offer officers in these organisations an opportunity to provide feedback on the selected themes and reflect on the role of their agency. The respondents answered in their personal capacity, and the responses do not reflect the official positions of the organisations. Furthermore, agencies have specific remits. As a result, the officers' insights on policy issues beyond their agency's remit may stem from either limited or indirect involvement. Responses were received from the following organisations: European Centre for Disease Prevention and Control (ECDC), European Chemicals Agency (ECHA), European Environment Agency (EEA), European Food Safety Authority (EFSA), European Institute for Gender Equality (EIGE), European Medicines Agency (EMA), European Training Foundation (ETF), European Agency for Safety and Health at Work (EU-OSHA), European Union Drugs Agency (EUDA), Europol (Europol), European Union Agency for Fundamental Rights (FRA), Joint Research Centre (JRC).

Figure 1 shows the respondents' estimations on how well current EU measures address current and future challenges in the themes related to OH that were identified at the beginning of the project.

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3. From your personal experience, please, estimate **how well current EU measures address current and future challenges in the following areas** related to One Health. (1 - Not at all > 2 - Slightly > 3 - Moderately > 4 - Very Well > 5 - Extremely Well). Leave empty, if no opinion.

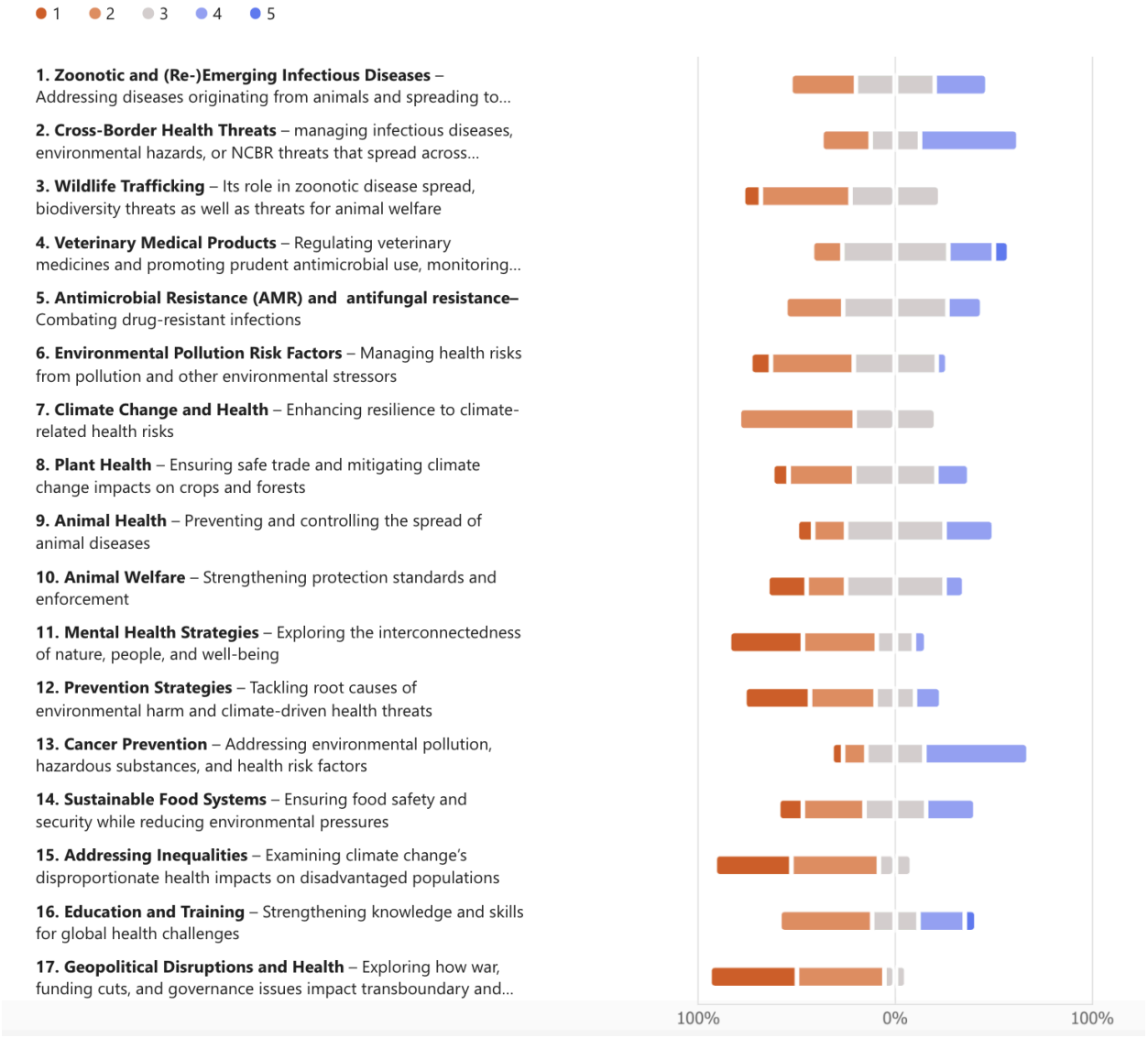


Figure 1: Perceptions on how EU measures address current and future challenges in OH-related themes.

Notably, responses were dispersed regarding perceived EU efforts on several themes, which might merit further information exchange and collaboration to understand the underlying rationales. Furthermore, the results help direct attention to themes perceived as not yet well addressed by EU efforts.

The respondents also commented on their responses and suggested further issues of strategic importance to address OH. The responses revealed common themes and priorities for advancing an integrated, cross-sectoral strategy at the EU level. What follows is an attempt to synthesise these contributions.

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Serious Cross-Border Health Threats: The Serious Cross-Border Health Threats Regulation (Regulation (EU) 2022/2371) mandates collaboration across Member States to detect, prevent, and respond to health threats that can cross national borders, whether biological, chemical, environmental or undetermined. Because threats like pandemics or hazardous chemicals do not respect national boundaries, the OH approach provides a blueprint for integrated surveillance, risk assessment and response strategies. A holistic lens helps anticipate and manage spillover effects between human, animal and environmental systems.

Chemicals and Environmental Exposures: The chemicals dimension is recognised as an essential cross-cutting aspect. Chemical pollution can harm ecosystems, animal health and human health, thereby bridging multiple domains. Aligning chemical regulation with broader sustainability and health agendas is necessary to avoid fragmentation of policy goals.

Illicit Drugs and OH: Illicit drugs intersect with OH themes. Veterinary Medicinal Products can be used as Illicit Drugs. Certain veterinary medications (e.g., ketamine, xylazine) can be diverted for human illicit use. There is a potential gap between surveillance, data sharing, and preparedness across animal and human health systems. Furthermore, the production and dumping of illicit drugs can lead to environmental damage: "deforestation, soil erosion and chemical pollution," ultimately impacting biodiversity, ecosystem functions and human livelihoods. Illegal drug production, distribution and consumption can target, exploit or create marginalised populations, reflecting broader health inequalities. A OH approach to illicit drugs would thus integrate environmental monitoring, cross-sector data-sharing, and community-level prevention programs. Incorporating illicit drugs into OH broadens the perspective from purely human health concerns (addiction, overdose) to the environmental, economic and social factors that perpetuate this challenge.

Climate Change, Inequalities and Migration: The relationship between climate change and inequalities is mutually reinforcing, with disadvantaged groups bearing disproportionate burdens of climate impacts, on the one hand, and the excessive accumulation of wealth potentially leading to behaviour with heavy climate impacts, on the other hand. Climate-driven migration is mentioned explicitly as an emerging concern that transcends any single sector. Climate change catalyses health threats (e.g., the spread of vector-borne diseases and heat-related morbidity), disrupts ecosystems (biodiversity loss and water scarcity), and intensifies inequalities, as marginalised communities have fewer resources to adapt.

Social Determinants and Governance: Unequal access to health services across social groups and regions underscores the centrality of social determinants to the OH approach. A purely biomedical perspective fails to capture these critical dimensions. This makes transdisciplinary governance and the integration of OH across all policies at the EU and global levels essential. Its effective implementation depends on close collaboration between public health, environmental, social, agricultural, law enforcement, and economic sectors. Such a transdisciplinary approach is necessary because human and environmental well-being are deeply interdependent. When policy silos persist, critical linkages—such as social factors that increase vulnerability to disease or environmental changes that amplify chemical exposures—remain insufficiently addressed.

Inequalities shape risks and exposure, so social determinants and inclusive governance must be at the forefront of OH policies. Environmental degradation underpins many health threats: preserving ecosystems safeguards humans and animals alike. By strategically connecting

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these domains, the EU can reinforce its commitment to health security, ecological resilience, and social well-being.

Figure 2 shows how respondents assessed their organisation's interest in having the themes covered in this multi-agency Foresight project.

Responses vary considerably across respondents from different organisations, indicating the precise remit of each agency responsible for specific themes. 16 out of 23 respondents left further comments, noting that they expected their organisation to be keen to develop joint Foresight activities in this area. Many respondents stressed the need to avoid duplicating efforts across agencies and the value of shared Foresight activities, particularly to handle complex and cross-sectoral issues and to prevent overlapping initiatives with more structured, multi-agency frameworks, including better clarity on distinct roles and responsibilities addressing cross-border health threats (infectious diseases, chemical safety, etc.). Based on the survey findings, the research team organised meetings with ECDC, EEA, EMA, ECHA and JRC.

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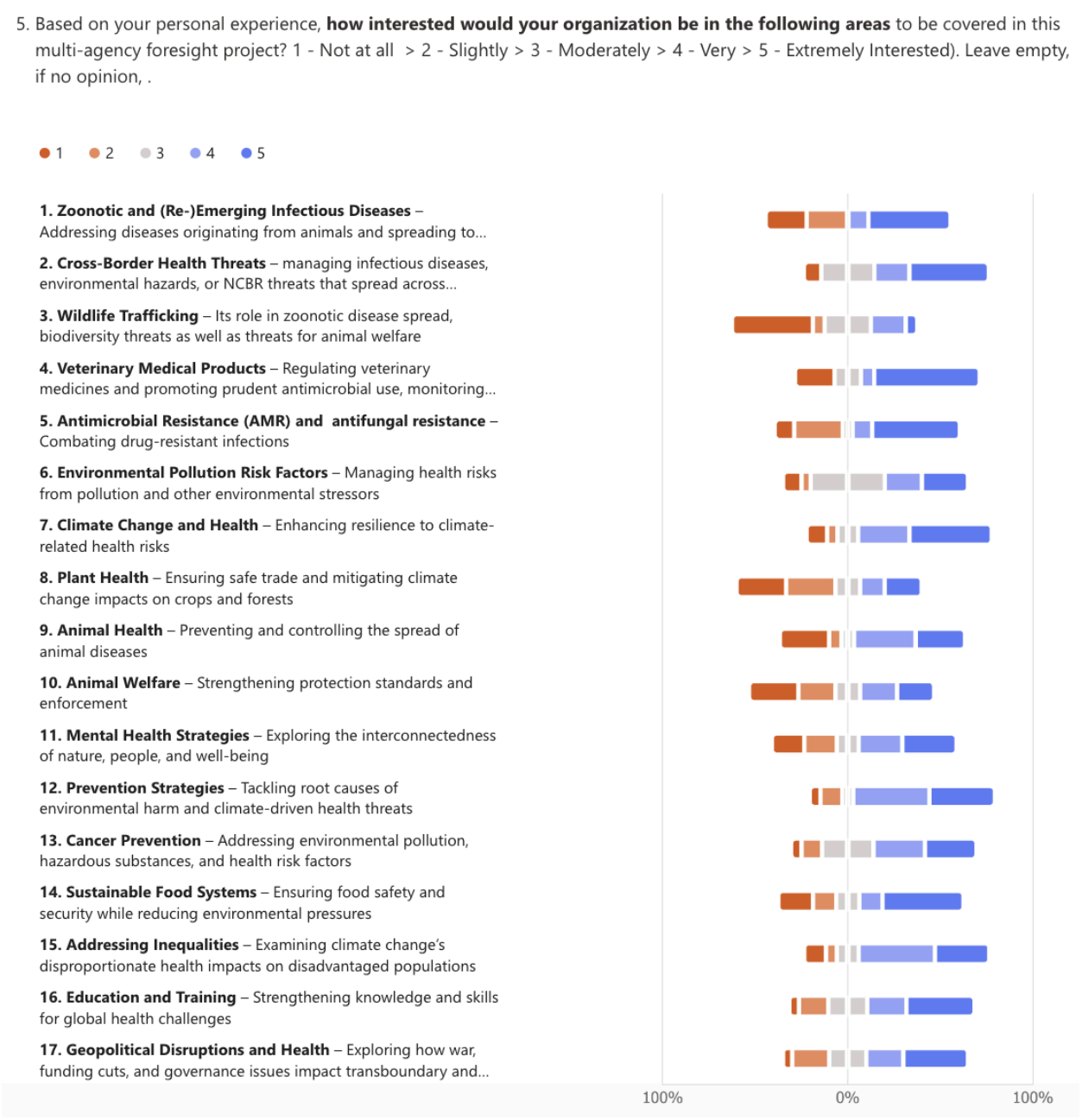


Figure 2: Perceived interest of organisations in having the themes covered in this multi-agency Foresight project.

2.5 Conclusion: the scope of One Health Foresight collaboration

OH is a practical governance framework for addressing tightly interconnected challenges spanning infectious diseases, antimicrobial resistance, environmental degradation, climate change, food systems, social inequalities, and security-related disruptions. Human, animal, plant, and ecosystem health are structurally interdependent, and effective responses require moving beyond biomedical or sector-specific approaches toward integrated, cross-sectoral action.

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Health security remains a central concern. Recurrent zoonotic outbreaks and the rise of antimicrobial and antifungal resistance underscore the need for integrated surveillance across human, animal, and environmental systems, supported by systematic data sharing and early warning capacities. These risks are amplified by environmental pressures—pollution, biodiversity loss, and climate change—which reshape disease patterns, exacerbate inequalities, and strain health and food systems. Embedding environmental and climate indicators into planning enables earlier anticipation of cascading risks before they escalate into systemic crises.

Food systems, animal welfare, and environmental stewardship emerge as closely linked levers for long-term resilience. Intensive production models and chemical-dependent agriculture generate short-term efficiencies at the cost of ecosystem degradation, climate impacts, and health risks. OH provides actionable pathways to align sustainable agriculture, animal welfare, ecosystem resilience, and human well-being, reinforcing that long-term food security depends on ecological integrity.

Militarisation, together with the growing **securitisation of health**, reinforces the need to integrate health, environmental protection, animal welfare, and peace-building within a single, coherent resilience framework. Framing health primarily through a security lens can mobilise political attention and resources, but it also risks prioritising short-term threat containment over long-term prevention, equity, and trust. The defence sector's continued reliance on fossil fuels and its limited engagement with green transformation contribute to ecological degradation, soil contamination, water pollution, and habitat destruction, with direct and indirect consequences for human, animal, and ecosystem health. Militarisation further affects health through violence, disrupted food systems, weakened healthcare access, population displacement, and heightened risks of infectious and non-communicable diseases. In this context, EU initiatives such as the One Health Joint Framework for Action and the JRC's Health Crisis Response capacities are essential steps toward preparedness. Still, their effectiveness depends on avoiding a narrow security logic and instead embedding prevention, environmental sustainability, social cohesion, and ethical governance at the core of health security strategies.

Governance is a decisive enabling factor. Transparent role allocation, strong coordination across EU, national, regional, and local levels, and durable interagency structures are necessary to prevent fragmentation and duplication. Effective governance must also prioritise transparency, citizen engagement, social determinants of health, and mental well-being, recognising that marginalisation, occupational exposures, conflict, and environmental stressors compound health risks.

Capacity building is equally critical. Collaboration depends on embedding transdisciplinary thinking across education, research, and professional training, supported by harmonised, interoperable data systems. Digitalisation and artificial intelligence also offer significant opportunities to integrate surveillance, scenario building, and risk assessment across domains, but only if accompanied by strong ethical safeguards, inclusive access, and environmental sustainability to avoid reinforcing existing inequities.

Overall, **bridging the gap between ambition and impact** requires stable investment, innovative governance models, and systematic Foresight collaboration. Applied consistently to research agendas, regulation, preparedness, and workforce development, OH strengthens

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Europe’s capacity to anticipate and manage complex, cross-border threats, while reinforcing strategic autonomy, societal resilience, and global leadership in sustainable development.

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3 Factors of change

3.1 Introduction

Following the scoping phase, the different factors of change were collected from materials provided by the EU-ANSA Futures Cluster Agencies[1], ECHA and the JRC. The scanned materials included both Agencies' own publications and those from other sources. The scanning resulted in over 1100 factors collected.

The collected factors consisted of:

- **Weak signals:** a signal with little or no impact on the present, but with the potential to lead to the identification of significant future events (e.g. over-reliance on automated risk assessment models leading to false security).
- **Wild cards**: a low-probability, large-effect event (e.g. rapid ecosystem collapse due to climate feedback loops).
- **Trends (and megatrends):** A trend is a general observable direction in which something is developing or changing gradually over time (e.g. the growing popularity of plant-based diets). Megatrends are long-term, global shifts that reshape economies, societies, and cultures (e.g., accelerating climate change).

The scanning was performed with the help of AI (**ChatGPT o3)** using a temporary chat for improved security. The reports provided by each agency were grouped in batches of approximately 5 reports, and they were each time analysed with the following prompt:

Analyse all the docs and …

1. Distribute evenly to PESTEL categories the factors you identify: 12 trends, 12 weak signals and 12 wildcards related to the One Health approach, especially connected to cross-border threats, mental health and illicit drugs and security and militarisation, with climate change and social inequalities acting as horizontal factors.

2. a) formulate in British English one-sentence, self-explanatory titles that embed the relevant context (especially cross-border threats, climate, digitalisation, inequalities, security & resilience, mental-health and/or illicit substances) and b) copy-paste a description of at least three sentences of the related text (do not modify the texts) in a separate column and include in a new separate column the citation to the right source document and its page numbers on each, no need of a link to the document.

3.2 Clustered areas of collected factors

Due to the large number of scanned factors, the experts clustered them into further thematic areas with examples of factors under each PESTEL category. The thematic areas were coined after reviewing the factors in each category, with the aim of synthesising messages for scenario work. Such sense-making is heavily reliant on expert judgement and is therefore also subject to biases. Here, the initial clustering of the factors into thematic areas provides

[1] ECDC, EEA, EFSA, EIGE, EMA, ETF, EU-OSHA, EUDA, EUROPOL and FRA.

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support for further reflection on the interconnections among factors and for identifying the key aspects of high uncertainty and relevance for the subsequent scenario work.

Political factors were clustered into the following areas:

- EU governance and cross-border coordination
- Chemical security and environmental regulation
- Digitalisation and regulatory innovation
- Political stability and crisis response
- Public engagement and societal pressure.

Economic factors were clustered into the following areas:

- Supply chain and commodity risks
- Innovation, investment and digital transformation
- Health economics and inequality
- Environmental and climate economics
- Regulatory economics and compliance costs.

Social factors were clustered into the following areas:

- Public health and substance abuse
- Social inequalities and exposure risks
- Mental health and well-being
- Digitalisation, information, and polarisation
- Cultural and community impact

Technological factors were clustered into the following areas:

- Artificial intelligence and digitalisation
- Biosecurity and biotechnology
- Data management and regulatory technology?
- Space and cybersecurity
- Environmental and sustainability technologies.

Environmental factors were clustered into the following areas:

- Climate change and ecological risks

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- Waste management and pollution control
- Chemical risks and restrictions
- Sustainable practices and innovations.

Legal factors were clustered into the following areas:

- Chemical safety and regulation
- Cross-border and international legal frameworks
- Environmental protection and climate law
- Data protection and digitalisation.

3.3 Conclusion: Factors for the scenario work

In addition to the clustering of the factors, the next step in the project was the prioritisation to achieve a brief list of the most uncertain and influential factors for the scenario work. Instead of indicating a direction of future developments, like in Wild Cards or trends, a neutral formulation of the factors was used, similar to a summary of a research area. The factors were explained by several assumptions or clarifying questions.

Political

Factor 1: Public health and disease prevention

How well-functioning are public health systems? Is it more a public or a private health system? Amount of public spending needed for the health system: will health risks increase (e.g. worsening of mental health, effects of micro-plastics) or will they decrease? Amount of public spending actually dedicated to health (e.g. will it be redirected somewhere else due to conflict?) What kind of (human and animal) disease prevention will we see, and how much is invested in public health? How will the health system look? Tensions between spending needed and actual spending.

Factor 2: (In)Equalities and governance

Within the European Union, differences in inclusion, equality, fairness and justice are observed. How does this unfold? The global pandemic has brought many different forms of individual inequality into the spotlight – underpaid essential workers, access to services (education, healthcare, financial assistance), domestic abuse, and others. Do inequalities in gender, healthcare, financial support or education persist? Do inequalities increase, stay similar, or decrease? Society's (in)tolerance for inequalities (e.g. are the marginalised getting violent?) and its effects on securitisation and governance (e.g. do governments become more authoritarian as a result of social unrest?). Impacts of socioeconomic inequalities on health. Health economics and inequality. Impacts of socio-economic inequalities on governance and environmental priorities.

Factor 3: Geopolitics

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We live in a world of intense international exchange, where people, companies, and countries are interconnected and hyperconnected at different levels. But we thought that globalisation is set as it can also be seen as a function of cooperation. As we now see, some countries are shutting themselves off from others, and we observe the building of blocks and less interaction. Globalisation is in doubt, and geopolitics around resources is a power game. Even Europe's friends are imposing protectionist measures on their own, changing delivery chains, trust, and businesses. War, trade, energy, food, data, technology, terrorism. Direct and indirect impacts of armed conflicts and other conflicts on emissions and the environment. Competition vs partnership. Political stability and crisis response. Role of (mis-) information in geopolitics boosted by digital technologies.

Factor 4: Open Strategic Autonomy

Open Strategic Autonomy is the EU's approach to making independent decisions in global affairs while being open to international trade and cooperation, with emphasis on resilience, competitiveness, sustainability, and fairness. One example of open strategic autonomy in the food system is the EU's Protein Plan. This initiative aims to reduce the EU's dependency on imported protein crops, such as soybeans, by promoting the cultivation of protein-rich plants within Europe to enhance the EU's food security and sustainability, ensuring a stable, local supply of essential nutrients. But how will the open strategic autonomy develop until 2035? How open will Europe be in ten years? How autonomous are we in technologies, e.g. the digital ones, in food or feed supply? What can be produced in Europe and what has to be imported? What about pharmaceuticals? Are we still dependent on Indian or Chinese imports, especially as it is not economically viable to produce drugs in Europe? This is very uncertain and can develop in different directions. Will the EU be able to reduce dependencies on external resources? Will the EU be able to enhance its strategic capabilities? Will the EU be able to balance local production and imports?

Factor 5: EU governance and cross-border coordination

Europe's response to global disruptions. Is there international coordination and governance? Or on the EU level? On the national level, with the revival of nationalism? Are regions strong in governing health issues? EU identity in a changing international context (vision, values, political structures, alliances…). Global war of subsidies in the green transition. Size of EU: enlargement (new member states), shrinkage (Brexit-like), both? Coordination of member states. Degree of autonomy of the EU in various aspects (energy, food…). Coherence of EU policy and regulation – also at the regional and national levels. EU regulation as a driver for member states and/or the world. Digitally supported authoritarian governance of individual emissions and energy consumption ("green" passes). Biodiversity regulation, pollution regulation, etc.

Factor 6: Environmental and health regulation

Regulation related to the environment and pollution, and economic priorities (isolation of EU strategies vs. the rest of the world). How much regulation is in place?

Factor 7: Preparedness for crises

How is preparedness organised? Is this a legal issue or an issue of awareness? Are there regulations or education on preparedness? Is there training for responding to disasters (fires,

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earthquakes, storms...)? Is there training or education on disease prevention or on actions in case of epidemics/pandemics?

Economic

Factor 8: Infrastructures

Who owns, invests in, maintains… infrastructures? What is the general state of infrastructure? What kind of infrastructures are essential in 2035: R&I infrastructures, labs, databases, AI, energy infrastructures (new grids)? Are there differences between urban and rural areas? And between countries or regions? Infrastructures as drivers of progress vs. locked-in uses or stranded assets due to poor planning. Condition and availability of power infrastructures for electrification and renewable energies (incl. oceans). Military infrastructures and dual uses (bridges, roads, etc.). Marine transportation infrastructures.

Factor 9: Economic development

What is our economic model? How does the economy develop, and how is the economy measured? Economic system(s) (growth, post-growth, sufficiency, degrowth...). Environmental and climate economics. Regulatory economics and compliance costs. What are the underlying values behind the economy? Are countries able to deliver on those values? Do these values and economic systems differ between the EU and the rest of the world?

Factor 10: Agricultural management approaches and food systems

Approaches to farming, forestry and fisheries, and their role in deforestation, pollution, animal welfare and sustainability in general (e.g. resource use, fertilisers runoff, wastewater…). Adoption of digital tools and advanced techs (data-driven platforms, IoT, indoor production, urban farming…) in food management systems. Economic sustainability and the role of big vs. small producers. How circular is the system? Do harmful substances concentrate in these systems?

Factor 11: Nutrition and food security

Food security for all, resilience, safety and their relation to health (related to pollution). "Feed the world" vs preservation of socio/cultural aspects. Overnutrition, malnutrition, nutrition-related illnesses, etc. Healthy diets for all or for the rich only? Who knows what is "healthy"? Overuse of antibiotics in food production? Reduction of feedstock and impacts on sustainability and animal welfare.

Factor 12: Supply chains

Role of supply chains in pathogen movement. Complexity of supply chains (same, increase, decrease, different compared to 2025?). Link to geopolitics: new/different pathways, emerging role of some countries. Are supply chains resilient, reliable and fast enough even in case of disruptions (war, climate, power cut, etc.)? Are supply chains prepared to provide real-time data for outbreak detection and to monitor key issues such as antimicrobial resistance? Threat and control of alien species (ballast water management)

Factor 13: Degree of collaboration and international trade (and international travel)

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(Trade-) blocks, alliances, trade and customs policies. Global or regional focus. Who cooperates with whom? Trade policies (national vs EU vs regional non-EU vs international). Trade (and travel) and the spread of diseases. Globalisation and connectivity. Consequences of changing population distributions across regions (e.g. BRICS: half of the world population vs. EU ageing societies). Trade of endangered species.

Factor 14: Energy Supply and Demand

EU's energy needs and how it will secure them (infrastructure, raw materials). Increase in energy demand or decrease? Does supply meet the demand? Dependency on other countries (raw materials such as rare earths, fuels…). Effects of the variability associated with renewable energies. Energy storage. What are the (health) consequences if there is not enough energy (energy shortages and power outages)? Impacts of electrification, improved indoor and outdoor air, new battery-related risks or mining and use, and electromagnetic fields.

Factor 15: Energy Costs and Industrial Base

Do energy costs increase or decrease? How much do energy costs affect the European industrial base? Does production leave Europe? How much production and employment do we still have? Do we have unemployment because of energy costs?

Factor 16: Healthcare

How close or distant is healthcare to the people? Can people reach hospitals in a reasonable time? Is there enough capacity (e.g. beds in hospitals)? For example, according to Eurostat (2025), the number of hospital beds available in the EU has decreased by 7 per cent over the past 10 years. There were 511 hospital beds per 100,000 people in 2023, a slight decline from the 516 in 2022 and an even larger decrease from the 557 in 2013. Most EU countries reported fewer hospital beds in 2023 than in 2013, with the most significant decline in Finland, where overall bed numbers fell by 45 per cent over those 10 years. In only six EU countries did the number of beds increase between 2013 and 2023: Portugal, Spain, Romania, Malta, Bulgaria, and Ireland. Despite the decline, Eurostat notes that a mitigating factor might be that "scientific and technological developments have shortened the average length of stay for many in-patient procedures or replaced them with out-patient or day care alternatives." But how is this integrated into the different national healthcare systems?

Social

Factor 17: Demographic dynamics

Most European populations are ageing. Some are even shrinking. There is a shortage of educated healthcare personnel, and they are ageing too. What consequences does this have? (e.g. care personnel missing) (related to health, war and environment). How are fertility, birth, and mortality rates in Europe and European regions? And everywhere else? Do societies (try to) manage demographics? If yes, how? How do these factors affect the mobility of people? And the concentration in urban areas? Is the population increasing (because of migration), decreasing, or staying the same in the EU? And elsewhere? And its consequences (e.g. for urban concentration). Changes in pension systems and taxation to cope with ageing, from income to capital, etc.

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Factor 18: Education, training, quality of information

What is the purpose/drive of education? (knowledge, pragmatism, employment…). Education and knowledge about health issues. Is there OH awareness and environmental communication? Digital overload and information fatigue. Are most people able to distinguish between facts and opinions, fake and real? Can they fact-check? If they can, are they doing it? Role of education in one's own health and in that of others (including animals). Role of education in one's environmental footprint. Public vs private education. Good education for all vs. good education for whoever can pay for it.

Factor 19: Culture, community, polarisation, diversity

Local vs global culture/focus. Consumption patterns and health. Fragmentation of societies or not (only listening within bubbles or not). What are the values and lifestyles of the population? Individualistic society vs communitarian society. Social cohesion and social diversity (overlap with equality). Trust in institutions? [3 levels: international (UNO, science), regional/country (governments), local/community (each other, associations, town halls)]. Prejudices vs openness vs tolerance.

Factor 20: Religion

What is the role of religion in and for health? Impacts of religions on human and animal health (e.g. Jehovah's Witnesses do not accept blood transfusions, halal meat). Religion and treatments. Religion and animal consumption and animal welfare. Various types of religious rules vs innovative food production (e.g. cell-cultured meat). Religion and AI (worship of AI, virtual "gods").

Factor 21: Human-animal relationship

Animal welfare and public sentiment towards it (vegetarianism, veganism, flexitarianism…). Cognitive dissonances (e.g. loving pets vs. eating meat and favouring animal testing). Regulations regarding animal welfare considerations. Close contact between humans and (wild) animals as a disease vector? Are animals used in research?

Factor 22: Acceptance of vaccination or specific treatments

There are more and more vaccinations of all kinds available, and they are becoming ever faster. Same for new treatments and medical equipment. Do people make use of the offer? Do they oppose it? What are the learnings from the last pandemic? How do states and the EU (re-)act – is there a requirement for some vaccinations to eradicate certain diseases? Do people rather believe in "experience medicine", esoteric healing, or shamans than in classical medical treatments? How much does "Western medicine" adopt practices from other paradigms (e.g. acupuncture, chiropractic, homoeopathy), even though they are not fully evidence-based?

Factor 23: Consumption and consumer ethics

Willingness and capacity of consumers to pay more for better (animal, plant…) products. Willingness and capacity of consumers to distinguish and avoid harmful products. Do consumers support ethical production practices (sustainable, fair, diverse and equitable labour, animal welfare, etc.)? Willingness and capacity of consumers to distinguish and freely

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choose to consume or not new foods (supplements, NGTs, GMOs, precision fermentations, insects, algae…). Do consumers have a will, or are they simply addicted to certain foods? Public acceptance and use of cultured meat and meat alternatives. Related to agriculture management approaches and the food system.

Technological

Factor 24: Technology, digitalisation, innovation – particularly biosecurity and biotechnology

Do people trust in technology? Do we have innovation, or do people refuse technological solutions? What is the attitude towards new technologies, for example: techno-biological engineering, synthetic biology, CRISPR/Cas9, genetic engineering, and new breeding technologies? Are people making use of them? How do technologies influence plant and animal breeding, conservation, ecosystem restoration, and sustainability in general (e.g. engineering vegetation to help it adapt to climate change)? What about side effects and unexpected outcomes—for instance, disturbances to circadian rhythms due to screen use at unusual times—and the unintended consequences for human, animal, and ecosystem health? General innovation, investment, and digital transformation. Private-led innovation versus public-led innovation. Opportunities and challenges for the EU food production and digitalisation system. Rate of development and availability of cultured meat and meat alternatives. Impact of AI in various aspects, including brain activity, environment, and sustainability.

Factor 25: Human and Animal Improvement

Do people improve themselves? Does the beauty role model persist? Do humans improve mainly for health, longevity, or beauty? Do people improve themselves for work, leisure, or sports? Is it a requirement to be beautiful and perfect, and who sets these values? Humans have improved animals and plants through breeding for a long time—how will we modify them in the future, and what about their well-being? What is the role of influencers? Do they promote improvement to prolong the lives of humans, animals, and plants? Who is investing in and promoting these approaches? What are the consequences for individual health and for society, including inequalities between haves and have-nots?

Environmental

Factor 26: (Emerging) infectious diseases and health security

Zoonotic and (re-)emerging infectious diseases (including bacteria, viruses, and fungi). Cross-border health threats. Wildlife trafficking, introduced species, wet markets, tourism, and commerce/transportation. Melting of the Arctic, Siberia, and other regions, and increases in ocean temperatures. (Dis-)control of invasive species, for example, via ballast waters, the number and activity of biological warfare facilities (related to geopolitics).

Factor 27: Climate change and its health effects

Climate change is a driver for migration and conflict, and thus for health. Climate change has direct and indirect effects on the health of people, plants, and animals—how does that unfold? Who can cope, and who is not? Are humans, animals, or plants developing mechanisms to cope?

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Factor 28: Environment and pollution

How air pollution, water pollution, soil pollution, chemical pollution, environmental noise pollution, microplastics, waste, etc., affect human, animal, and plant health? How much do socio-economic and ecological stressors affect well-being, ageing, or mental health? Biodiversity and ecosystem services: what role do they play? Planetary boundaries and carrying capacity.

Factor 29: Resistances

Effects on antimicrobial and antifungal resistance. Do they increase or decrease? Are there other effects to be expected? Are there new antimicrobial treatments or antifungal strategies?

Factor 30: Living Spaces

Where do we live? In classic settlements, urban areas mainly, and more in rural areas, where is the population distributed? How do we live? How close do we live together? How much space does a human being need to be healthy? "Artgerechte Haltung" (species-appropriate keeping) of human beings. Construction techniques and methods. Density of settlements. Vertical expansion, mainly underground and underwater, has impacts on human health. City planning. Materials used in construction. Urban environment. Rural environment. Urban agriculture.

Factor 31: Water

Is water scarce? How is our water management? Do we have enough clean drinking water across the EU? We thought we were safe. Are there illegal water markets? Desalination and the effects of mass use. State of glaciers and aquifers and the consequences. Connection to society: water for corporations (extraction, use, etc.) versus water for local communities. Droughts and floods are related to environmental and climate change. Lack of water as a driver for migration and conflict. Water reserves as critical infrastructure. Water as a target for terrorism.

Factor 32: Resource extraction and exploitation of new frontiers

Availability of necessary resources: who has access to them and the externalities of their extraction. Exploitation of previously untouched resources (e.g. seabed mining, space, asteroids, polar regions) and their impacts, particularly on the spread of diseases or the destruction of ecosystems. Conservation versus recycling versus exploitation. Ecological implications of the new space economy. The effects of collisions in space, such as the potential for global communication disruption and a halt to the space economy for decades, are significant. Proliferation of drones and their impact on access to European airspace and critical services. Impacts of the exploitation of Arctic routes.

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4 Scenarios around One Health

There are many ways to build scenarios. In this project, we used a participatory Scenario Sprint process and a morphological scenario approach (Zwicky, 1969) that systematically incorporated all findings from the previous work packages. An AI-assisted scenario development also complemented this work.

The above-mentioned factors were discussed and short-listed by representatives from EU agencies in a first-scenario workshop. For each factor, different pathways into the future or "assumptions about the future" (projections) were formulated and discussed. The assumptions were then combined into full scenarios during a Scenario Sprint. The main steps with corresponding results of the Scenario Sprint are summarised below.

Factors of Change selection

The above-described most uncertain and influential factors were shared with the workshop participants in a background document for the preparation of two scenario workshops. During the first scenario workshop, the factors were introduced and discussed. A vote among participants from the different agencies identified the most uncertain and important factors. The 12 most-voted key factors were used for the next steps:

- Geopolitics
- EU governance and cross-border coordination
- Public health and disease prevention
- Climate change and health effects
- (Emerging) infectious diseases and health security
- Technology, digitalisation, innovation – particularly biosecurity and biotechnology
- Preparedness for crises
- Agricultural management approaches and food systems
- Education, training, and quality of information
- Healthcare
- (In) Equalities
- Human-animal relationship

Energy supply and climate change were to be considered in all assumptions. This list was later refined and assessed in an influence matrix.

Assumptions about the future of 2035

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For each driving factor, 3 to 5 assumptions (or projections) about how the future might unfold were developed on a board during the first online workshop. These assumptions were derived from the previous material and/or generated creatively during the online workshop. If the assumptions are not very different, the Tetralemma method can be used to create 4 or 5 distinct assumptions. But in this workshop, this differentiation was not needed as the participants had enough (even too many) ideas for different assumptions about how the future might unfold until 2035. In this step, the different views about the future and how it might unfold are brought in – and not discussed. The various views remain distinct as they are.

The number of assumptions in this case differed from five to eight. Here is an example of the human-animal relationship with eight assumptions:

1. **Alternative proteins**, e.g., lab-grown meat, gradually changed human-animal relations; **animals are no longer kept for the exploitation** of meat, milk, fur, etc.
2. **Phasing out animal testing in research and development** - keeping the balance between safety for humans and respect for animals.
3. **The Internet of Animals** relies on placing **sensors** in individual wild and domestic animals, as well as in swarms, to monitor their behaviour. This serves as a warning system not only for animal health but also for changes in nature (air quality, soil, water, fires, floods, earthquakes, etc.).
4. **Animals are granted legal entities,** and their rights are implemented and protected by legal institutions.
5. **Decrease in protected areas and wildlife reserves**, and an increase in the probability of spillover to humans and domestic animals from wildlife diseases; deforestation, biodiversity loss, and the spread of diseases due to climate change.
6. The **increasing exploitation of animals**, breeding and keeping them in mass **foster the spread of diseases and zoonoses.**
7. Advancing **understanding of chemical effects on insect pollinators**, development of approaches and tools for monitoring, better protecting insect pollinators and avoiding their decline.
8. **Growing veganism and vegetarianism**

Influence Matrix

In an influence matrix, the most influential key factor was determined by giving weights for influence (from no influence 0 to strong influence +2) on the other factors. Participants completed this matrix during the first scenario workshop. The sum of the matrix lines was calculated. The highest value indicates the key factor with the strongest influence on the other factors. This was the starting point for the Scenario Sprint on the board. In this case, the factor with the strongest influence was: Technology, digitalisation, innovation – particularly biosecurity and biotechnology, the second highest was EU Governance.

Scenario building in a Sprint – combining different assumptions

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The task is to combine and 'package' potential alternative assumptions (projections) into future scenarios for 2035, using a fast and efficient methodology. The most influential two factors, as defined in the influence matrix, are placed at the beginning of the Sprint row. The first assumption of the first factor is combined with a fitting one from the second factor, another one from the third factor, and so on. This combination is visualised by drawing lines of a particular colour that trace a path connecting the assumptions. Figure 3 is for visualisation only.

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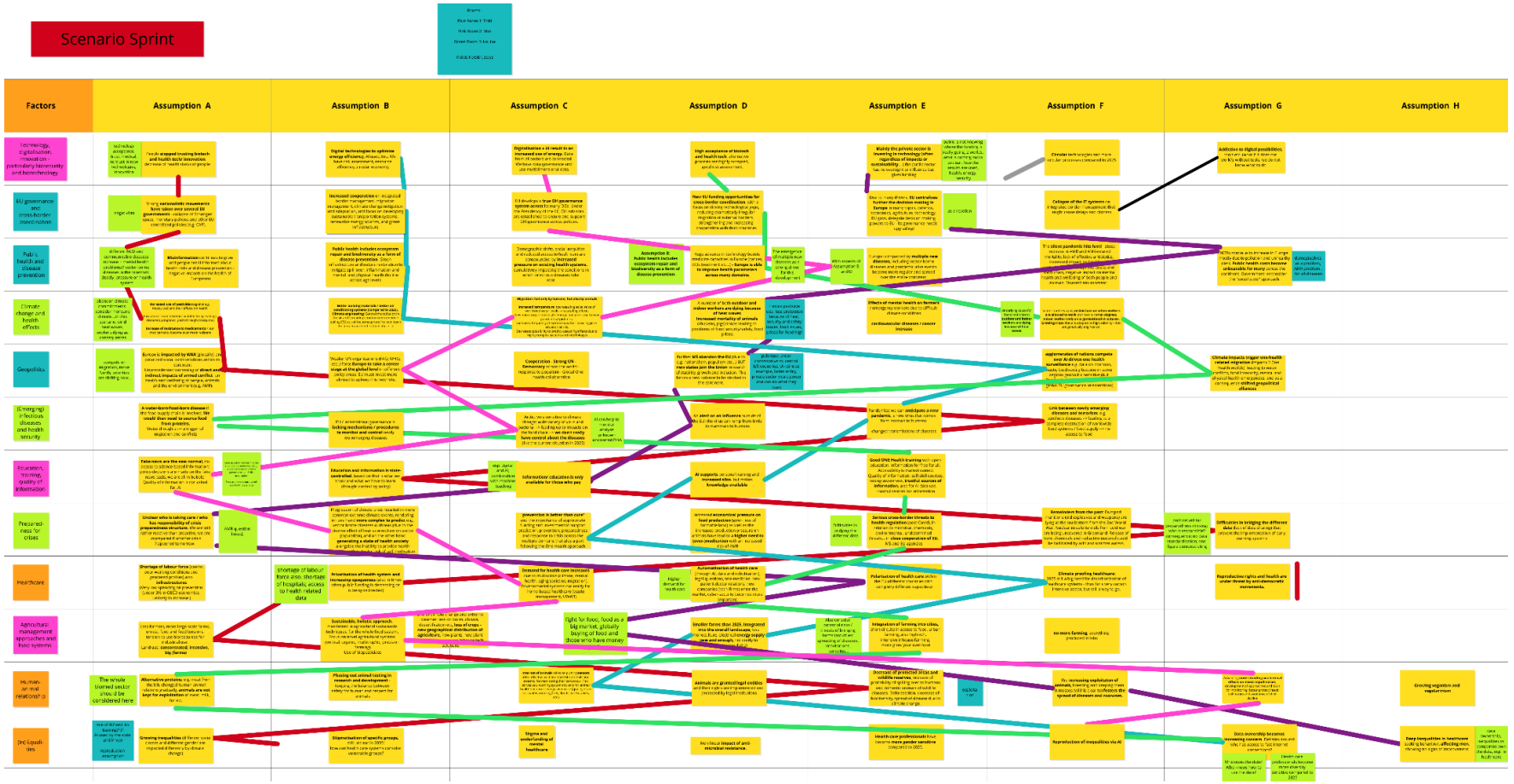


Figure 3: Demonstration of the work on the board with alternative pathways and connected assumptions – the pathways are summarised to the scenarios in the next section

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All participants of the workshop discussed what fits (can co-exist in one world) and what does not for the first scenario combination. With 12 factors and many assumptions, this took a relatively long time. Therefore, the following scenario lines (red, blue, pink, green, violet) were drawn in smaller groups, starting from the second assumption of the first factor in one group, starting from the third in another group and so on, following the same procedure with a different colour for each group and each scenario. The grey and black lines were no longer followed during the workshop.

One rule is that each assumption shall be used only once to make a real difference. Scenarios can be built until all alternatives are used. In this case, five scenarios were constructed.

Each colour line brings together the assumptions that form one raw scenario, which, later in the workshop, were rephrased and elaborated into a complete 2035 scenario narrative, including a headline and a title. Due to the limited time in this second workshop, the FOD team added some headlines and titles later.

Scenario narrations, titles and illustrations

In the final step, the FOD team and the agencies further elaborated on each scenario. This includes a consistency check, narrative enhancement, formulation of the scenario title, and creation of an image for the scenario. In general, this can be done by drawing it, selecting an image from a database, or prompting it with AI assistance. Here, AI was used. These visuals try to capture the core themes and implications of each scenario, providing a compelling visual representation of its narrative. Readers' associations with images may differ.

The "story" of the scenario was completed by the FOD team and sent to the participants for final additions and cross-checking.

Up to this step, the FOD team carefully edited and refined the text of each scenario to ensure clarity, consistency and accessibility. The language was streamlined for summarising the scenarios effectively, avoiding unnecessary complexity and technical jargon. As there are multiple perspectives on the scenarios and intentionally different views on the futures within the workshops, not all expressions or directions the scenarios are taking meet the reader's taste. Scenarios are there to provoke thought, to open up space for reflection, and to work with them as different, coherent images of the future.

The goal is to make the scenarios engaging and understandable to agencies and to a broad audience, including policymakers, stakeholders, and the general public, so they can continue working with them in their specific contexts.

The scenarios developed in the Scenario Sprint include one or more news headlines that illustrate developments up to 2035. To maintain an overview of the five scenarios, Figure 4 summarises the scenarios in a factor matrix according to two factors, "EU governance and cross-border coordination" and "Technology and innovation dynamic", which were identified as the most influential factors from the uncertain and important key factors discussed during workshop 1. The factor technology and innovation dynamic dominated the scenario discussions, with expectations of relatively high dynamics. In contrast, EU governance is distributed along the whole spectrum, from high governance and cross-border coordination to low governance.

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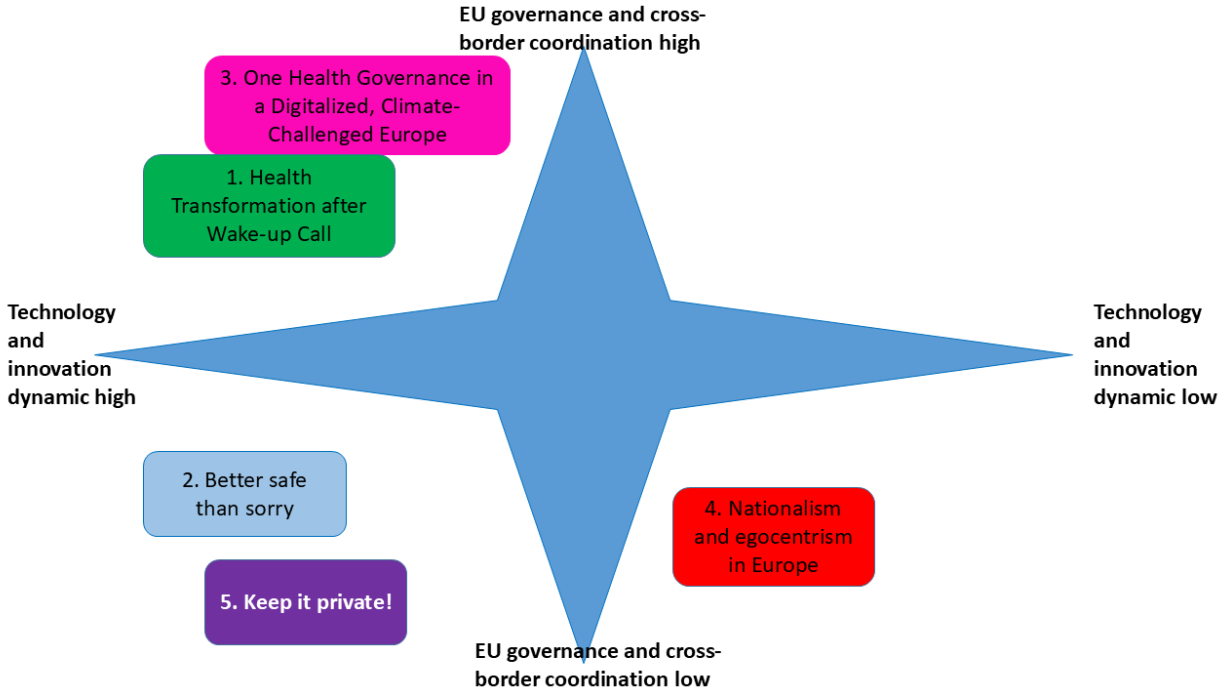


Figure 4: Matrix of the two most influential factors for visualisation (factors with the highest rank in the Influence Matrix, starters of the Scenario Sprint; the axes are based on the factors with "high" on the left-hand side and above and "low" on the right-hand side and below)

Some of the differences in the scenarios are highlighted in Table 1.

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Table 1: Differences in the scenarios according to categories mentioned in all scenarios (not according to factors)

Scenarios	**Role of the EU/ European Commission**	**Policies**	**Technology and innovation**	**Food security**	**Health**
Scenario 1: Health Transformation after Wake-up Call	Public policy guide and funding – after disasters	Ecosystem repair and biodiversity protection; migration	New funding mechanisms, also for technology, new technologies like quantum technologies, new biotechnologies, etc.	Restored	Rising demand for healthcare – trying to meet it
Scenario 2: Better safe than sorry	Does not intervene much in the market	Companies invest; policies play a minor role, laissez-faire	Ubiquitous, digital twins for everything	Food production more local and circular, but still underway, and not secure	Data-driven, prevention in the forefront
Scenario 3: One Health Governance in a Digitalised, Climate-Challenged Europe	EU drives towards AI and data integration	Data, green infrastructure, and nature restoration projects are prioritised	Data integration – but challenged	Food security is a problem	New One Health governance; many health challenges from new and old pathogens
Scenario 4: Nationalism and egocentrism in Europe	The EU, with many nationalistic tendencies, members left, and others came	Top-down rigid policies in the EU and Member States	Science loser; back to old technology, but: AI and tracking	Food insecurity	Massive health problems; no antibiotics
Scenario 5: Keep it private!	The EU lost overview, and companies follow their pathways	Centralised and dominated by economic considerations	Agglomerates of nations compete over AI-driven surveillance systems; research when profit expected	Food secure but not nutritious; old problems back; good food for high-income people	Health costs high; not everybody is able to pay for healthcare, and health divide

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4.1 Scenario 1: Health Transformation after Wake-up Call

News Headlines 2035:

"Europe embraces One Health: Linking Nature, Technology and Human Well-being"

"Heat Protection by Law: EU bans Outdoor Work During Extreme Heat"

"Climate Pressure Reshapes Work Culture: 9-to-5 Model in Decline"

"Water turns Geopolitical: Europe invests in Global Water Security"

"EU pushes for Digital Health Sovereignty amid Data Privacy Concerns"

"From Reaction to Prevention: Europe plans for Future Pandemics"

"Data Silos hamper Crisis Response: Interoperability still a Weak Spot"

By 2035, Europe has undergone a profound transformation in its **public health landscape**. Triggered by the **emergence of multiple new infectious diseases, a surge in mental health conditions** and compounded by escalating climate stressors, public health strategies are aligned with a "new One Health" approach. This holistic "One Health" approach now recognises the interdependence of human, animal and environmental health. All European Union activities are now deeply integrated with ecosystem restoration and biodiversity protection. Investments in biotechnologies and health technologies have surged in response to the threats, enabling the EU to make huge strides in combating cancer, emerging infectious diseases, new mental health challenges and other previously intractable conditions.

A steadily **rising demand for healthcare,** driven by ageing populations, climate-induced health crises (heat is a stress factor in an elderly society, and communicable diseases are on the rise), and the surge of novel diseases, has pushed Europe to embrace deep technological innovation in the health sector. To meet the growing need for accessible and efficient care, AI-powered diagnostics, telemedicine, and robot-assisted treatment have become widespread, also to replace the shortage of personnel. These tools have reshaped the traditional patient-doctor relationship and opened the door for technology companies to play a central role in healthcare delivery. Alongside these advancements, new legal and ethical questions have emerged, particularly around liability, privacy and cybersecurity. As trust in digital tools has become vital, Europe has invested in trustworthy information centres and regulatory safeguards. Medical professionals are now systematically trained in digital literacy, soft skills and cultural competencies, ensuring they can navigate both the technical landscape and the diverse, evolving needs of the populations they serve.

As Europe becomes increasingly data-driven, debates over digital equity, inclusive technological innovation and data ownership have intensified. Questions such as "Who has access to fast internet?", "Is no one left behind?" and "Who controls and understands health data?" have become central to democratic discourse. These issues intersect with broader concerns around algorithmic bias, the centralisation of AI systems and equitable distribution of health benefits. A diversity-sensitive approach to healthcare, far more advanced than in 2025, is now a foundational principle – backed by regulation, education, inclusive technology design, and healthcare governance (see also Figure 5).

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Figure 5. Scenario 1: Health Transformation after Wake-up Call.

Intensifying climate impacts have become the key driver of structural transformation across Europe. The increasing frequency and severity of heatwaves have led governments to introduce legally binding restrictions on outdoor work and to reorganise indoor labour through enhanced institutional and technological support systems. Escalating droughts, salinised soils, and diminishing freshwater reserves have accelerated the shift toward climate-resilient agriculture, including the adoption of genetically modified and salt-tolerant crops. These environmental pressures have also triggered large-scale waves of migration. Cascading effects on water security, food systems, and physical and mental health cause displacement.

Political priorities had to shift again as threats of mass migration were discussed, leading to greater attention to neighbouring countries and a re-evaluation of international partnerships. The fragility of many value chains became – again – obvious in these situations. In response, the EU has intensified its coordination with third countries, focusing on sustainable water management, resilient health infrastructures and cooperative migration strategies that reflect the new geopolitical realities of a climate-altered world. New geopolitical realities also mean many new players in the new world order – it is not the former industrialised countries that "lead". Those countries that are already used to droughts, such as the Arabian countries, China, and Latin American regions, have adapted earlier and use their public funds from former fossil fuel industry taxes to invest heavily in climate change mitigation, infrastructure, and living standards.

In the face of food and water insecurity, food systems across Europe have become more decentralised, often small-scale and technologically integrated. Urban and indoor farming, powered by automation and biotech, have flourished – enabling cities to grow food locally and reduce reliance on long-distance supply chains. But this takes time, and the change is still

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underway in 2035. But with the high acceptance of biotechnologies, many innovations can be seen on the market. Alternative proteins replace a large part of meat production because animals cannot withstand the extreme temperatures in Europe anymore, and consumers do not want animals to suffer. Some producers shifted to lab-grown meat that is independent of weather and can be produced in a controlled environment. They now start to dominate consumer markets, transforming human-animal relations and reducing the exploitation of animals for meat, milk, or fur. However, the urban integration of farming has introduced **new challenges**: potential disease outbreaks, contamination risks and the need for robust biosecurity within city environments. Regulatory frameworks have been adapted to ensure safety, though not without occasional setbacks.

But also in healthcare, there is much automation, robots for care, and small helpers that are being step-by-step integrated into society, which is very open to this kind of innovation now. However, for certain groups (older people, migrants, Roma communities), it is a real challenge to keep up with technological advances. Automation in healthcare also led to significant job losses for women, who traditionally made up a large share of the healthcare workforce.

The EU, in recognising the interconnected nature of health, environment and migration, has launched a **new generation of funding mechanisms** aimed at closing technological gaps and enhancing cross-border coordination. Special attention is paid to serious health threats – microbial, chemical, environmental or yet-unknown ones, especially for communities in disadvantaged situations – in close cooperation with EU agencies and Member States. Data interoperability remains a challenge, with differences in national systems and a lack of data on 'hard to reach' communities slowing down response efforts. Still, joint exercises and scenario planning have improved, and open education and accessible public health information have become mainstream as part of a broader resilience strategy.

4.2 Scenario 2: Better safe than sorry: Nature-Smart Europe in the Age of Prevention

News Headlines 2035:

"Wildlife Wi-Fi Stops 'Disease X' in Its Tracks: Europe's Internet-of-Animals Triggers First-Ever Pre-Outbreak Lockdown."

"Digital Twins Slash EU Waste by 40 %—Circular Revenues Flow to Small Mixed Farms and Green Infrastructure."

"EU launches Resilience Fund to tackle Cross-Border Health Threats"

By 2035, technology **businesses thrive,** and **people are empowered to apply their solutions,** supported by companies and influencers. Public procurement has further boosted the technology uptake. Special programmes have been funded to technologically empower and digitally upskill economically disadvantaged communities that are at the highest health risk. **Europe is powered by quiet intelligence and green energy.** Quiet intelligence uses digital tools to generate information for any kind of control or tracking, trying to prevent social unrest, dissent in society's opinions, and the emergence of undesired actor groups. It remains invisible, and nobody is talking about it. Every lamppost, tractor and kettle is connected to a **digital twin,** and these twins work together to reduce waste in the grid. AI grades the costs, benefits, and risks of each action, such as shifting heat from a bakery to a school or putting

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scrap steel back into a 3-D printer. This keeps energy bills low and materials in constant circulation. Every gram saved today means less crisis tomorrow, so "**prevention is better than cure**" isn't just a slogan.

Preventive thinking has completely changed the health playbook, too. Sensors are integrated into the bed, the kitchen, the toilet, and even the car. Wearables are integrated into clothes and jewellery for constant monitoring. Doctors give personalised pills, but first they recommend capturing health benefits by spending some time in the shade of the city's new oak trees or by enjoying a slow walk through the reedbeds and other lovely plants that help filter storm water and provide a home for herons. Biodiversity is perceived as more than just a pretty picture: when you restore wetlands and tree lines, it can help reduce inflammation and anxiety, and clean the air and water. Green corridors cool overheated streets and guide e-buses, turning nature restoration into essential public infrastructure (see also Figure 6).



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Figure 6: Scenario 2: Better safe than sorry: Nature-Smart Europe in the Age of Prevention.

Technology is evermore ubiquitous and empowering people. Personal AIs are used to tutor languages or yoga. They lifted the immense burden of informal care from carers, particularly women, allowing more time for self-care and health-enhancing activities. They are closing skill gaps but opening social silos, which are alleviated a bit by "cross-skill nights" hosted by café owners, where a coder can swap tips with a carpenter, for instance. Even tiny farms, scruffier than the monocultures of 2025, run fleets of soft robots that weed mixed crops, nurturing biodiversity under solar trellises. Cheap local wind electricity generators and shared batteries power the many sensors. Agroecology has become a good and common business, maybe in a different way than people still assumed in 2025.

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Signals from nature now travel at fibre speed. Sensors on foxes, storks, and bee swarms send pulse, position, and cough data to the **Early Warning Mesh**. When a bunch of wild boars in Andalusia got a fever last spring, vets gave the farmhands their jabs weeks before "Virus Nova" could jump species. The same mesh flags methane leaks, flash floods and brush fires, showing that wildlife is now Europe's most trusted perimeter sensor.

The data we all gain is gold, and gold invites quarrels. Groups of countries see OH dashboards – which contain extensive information on zoonotic genomes, waste flows, and butterfly counts – as essential tools now. The finally ratified WHO Pandemic Accord now dictates that, in emergencies, data must be released within 6 hours. Still, some capitals make it harder to see what's going on or charge "model fees". Townhalls want household meter readings to help with planning, tech giants want to make a profit, and citizens now expect a cut. There's a lot of debate about who owns the data.

Debates over many issues, not only who owns the data, persist, but it remains unsolved how to share and use data in governance. Brussels and Member States have failed to agree on their responsibilities until now (2035), and debates have returned to the very first concept of OH, especially around how to address animal rights. Lack of agreement hampers horizontal and cross-border coordination. With the hotter climate, ticks are doing really well in Sweden, and there are concerns about a growing risk of dengue fever outbreaks in Greece and France. However, border responses fail to swap climate, health and migration data to be fully prepared.

Finance has caught up with reality: **every Euro spent on prevention saves ten on response**. Ministers put money into a OH Prevention Fund that funds risk scans, disease predictors, sensor upgrades, and citizen science. Pre-medication is supported but not with significant funds; the expectation is rather that people change their lifestyles if something is detected. People who have voted are less happy with the results of their political influence, as they face shortcomings in stable political power and longer hospital waiting times. “Circular economy”, meaning more circular businesses making use of waste as a resource and trying to close some of the loops in recycling, reuse, and the full use of what was formerly “waste”, thrives, but not always. In many cases, bureaucratic rules, regulations or procedures still hamper the practical business.

Data royalties are still causing arguments in Brussels, and another animal-borne virus might be on the way. But there is one thing that continues to challenge policy from farm gate to server rack, and that's the fact that **smart code and living systems work better together**. Companies’ and public authorities’ interests converge towards more order and control. Industry’s selling point is that it's better to stop trouble before it happens than to deal with it afterwards. This simple insight is what keeps the continent buzzing and blooming.

4.3 Scenario 3: One Health Governance in a Digitalised, Climate-Challenged Europe

News Headlines 2035:

“Europe Leads Global Health Amidst Rising Uncertainty”

“Cyberhack in Tallinn – millions of health data stolen”

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"New cancer therapy developed in Europe – based on European patient data"

In 2035, Europe finds itself profoundly transformed by digitalisation and Artificial Intelligence (AI). Now, data from all sectors on their impact on human and animal health and the environment is seamlessly linked and managed under multidimensional, **robust data governance frameworks**. This data integration and the analytical systems enable both advanced monitoring and targeted interventions, but also **create new vulnerabilities** and contribute to a new rise in energy consumption. The continent struggles with the rapid acceleration of the climate crisis, matching the worst scenarios we ever imagined (see also Figure 7).



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Figure 7: Scenario 3: One Health Governance in a Digitalised, Climate-Challenged Europe.

Technological breakthroughs, especially in medicine – ranging from cancer therapies to treatments for emerging infectious diseases (EIDs) and mental health conditions – have significantly boosted Europe's capacity to improve health outcomes. Public health, as defined in 2035, now explicitly includes ecosystem repair and biodiversity conservation. **Green infrastructure and nature restoration projects are prioritised** to mitigate disease spillover, inflammation, and declines in both mental and physical health among women and men across all age groups. AI is used across all applications, but it is not yet fully adapted to the needs of people in all their diversity. It still contains many biases from earlier times.

The European Union (EU) has developed a **comprehensive OH governance system**. This system unites the efforts of numerous Directorates-General (DGs) with specialised OH advisors, ensuring that OH principles are systematically embedded across all relevant policies. Governance is vital here, as Europe now faces frequent and unpredictable outbreaks of new diseases and deteriorating mental health conditions. Vector-borne illnesses and pandemic-

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like events have become regular, spreading rapidly across borders due to climate change, migration, armed conflicts and natural, business or innovation ecosystems.

The effects of anthropogenic climate change have accelerated worldwide. The impact on the Arctic is one example of how these have become new **severe health challenges**. As permafrost thaws, a wide variety of ancient viruses and bacteria are released, disrupting food chains and introducing diseases beyond our current control. The interconnectedness and complexity of these systems reduced the possibility of accurately forecasting cascading effects. We use a lot of technology, but the AI's predictive capabilities fail.

As another second-order consequence of climate change and the evolving crisis, **migration has escalated**, involving not just humans but also animals, as shifting climate zones force species to relocate. Melting glaciers and rising sea levels trigger cascading effects: new microorganisms are released, some of which spark new epidemics and pandemics. Extreme weather events are more frequent, threatening basic hygiene and sanitation and making outbreaks not only harder to predict but also to fight.

The ongoing **climate change and cascading crises** complicate forecasts of vector-borne disease outbreaks, as the effects of heat, wind, and rain on vector populations are highly variable. This unpredictability, combined with frequent extreme weather, leads to widespread **health anxiety** and an **overburdened health system**, pushing some to self-medicate. The demand for healthcare continues to climb, driven by multi-layered crises – climate, mental health, ageing populations, security and migration – while environmental systems are not (entirely) prepared for the rise in home-based healthcare needs (e.g., waste management, urban wastewater treatment).

The **weakening of global organisations** such as the FAO and WHO has compelled the **EU to assume a leadership role on the world stage**, investing more in global health and environmental initiatives. Sustainability and holistic approaches are at the core of EU strategies. Agricultural systems have shifted towards vertical, organic, multitrophic and precision farming. The use of biopesticides and new monitoring tools aims to protect insect pollinators and avoid their decline. In contrast, an advanced understanding of chemical effects on these insects informs policy and practice.

While AI has enabled more robust monitoring and analysis within multidimensional data governance frameworks, the validity of data is increasingly put under public scrutiny. **Misinformation and fake news intermingle with science-based information**. Policy decisions are sometimes based on unreliable sources, creating social bubbles in which the line between truth and falsehood blurs. The quality of information is rarely questioned. AI systems themselves are sometimes co-opted to generate or spread misinformation, further complicating governance. In addition, AI reinforces existing social inequalities, both in access to healthcare and to information. This environment creates open questions about the relationship between strong, evidence-based, AI-driven governance and a society where trust in facts is eroded.

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4.4 Scenario 4: Nationalism and egocentrism in Europe

News Headlines 2035:

"New tracker software developed – Europalantir is used in all EU states now"

"Demonstrations in all capitals for more rights of citizens"

Nationalistic movements have gained influence in several EU governments, holding many seats in parliaments and EU institutions. The Schengen agreement is a thing of the past. We instead observe centralised EU policies, including a comeback of the Common Agricultural Policy (CAP). Leadership is essential, and people are following. We all have a place in the new hierarchies (see also Figure 8).



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Figure 8. Scenario 4: Nationalism and egocentrism in Europe.

In such an environment, misinformation is spreading. It becomes increasingly complex to tell who is trustworthy and who is not. **Science was the first loser** in the second half of the 2020s. Now, in 2035, it is nearly impossible to build up new trust in biotechnology and health technologies. This started 10 years earlier. Now, researchers do not dare to invest their careers in such a scientific endeavour that does not pay off. It also means that research is not advancing, and basic science is experiencing a backlash in terms of freedom. New health technologies are not fostered, and biotechnology is only used in rare cases. Old-school treatments remain, and many medications are unavailable, leading to a decline in the population's health status, especially for new or microbial diseases.

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We mistrust politics and our neighbours, but we know we need them. Trust in education is also fading away. Education and information are so heavily state-controlled that we talk about them as if they were forms of thought control—greetings from Orwell 1984. The role of artificial intelligence (AI) and its training raises concerns, particularly regarding its use by the state and in warfare, but at least the state we live in has European AI. Better not ask… because we see conflicts everywhere. Europe is facing global disputes and even conflicts within Europe that are polarising the continent, with dramatic negative consequences for the health and well-being of people, animals, and the environment (e.g., antimicrobial resistance).

It becomes clear that the different states have different interests in what to learn and how to profit. **Health is not a priority.** This led to inadequate awareness of health risks and disease prevention, with further negative impacts on Europeans' health. Health inequalities are on the rise. We see a significant increase in non-communicable diseases (NCDs) – especially those raised by stressors like cardiovascular diseases – and communicable diseases, alongside increasing mental health issues. Women's access to reproductive health and rights is severely restricted. Groups in socially and economically disadvantaged situations (e.g. people with disabilities, older people, but also young people, migrants) are most at risk. Vector-borne diseases are at the forefront; the more they put pressure on the healthcare system, the more trust in new technologies and innovations wanes.

Our **early warning systems exist,** but they are not very effective. Challenges in data management and a lack of accountability hinder the implementation, but that is not so important. The privatisation of the healthcare system has led to increased opacity, while there is a shortage of labour, care personnel, and hospital capacity. All that is not new; most hospitals were closed at the end of the 2020s because they were too costly.

Commitments for fighting climate change have been abandoned; there are other problems. If others are not fulfilling their duties, why should we Europeans? So climate change is occurring at an accelerating pace, and the European climate is becoming increasingly favourable to the spread of diseases caused by pathogens and pests. Additionally, resistance to medications is rising, further complicating treatment options. Weather phenomena such as monsoons and cold or heatwaves lead to worker fatalities and a shift in priorities as migration toward northern regions increases. Weaker UN organisations (FAO, WHO, etc.) force Europe to take centre stage in various policy areas, necessitating increased investments abroad. We Europeans still feel strong enough to take over the role.

In such an environment, solutions of the past, quick fixes and **strong, fast decisions** are back. For example, fostering our agriculture, here and now, is one of the solutions. One of the most significant decisions is the **widespread use of fertilisers and pesticides in agriculture** to boost productivity. The intensified use of pesticides and insecticides – the successful ones from the 1990s – particularly against the uprising of European mosquitoes, has health implications. But why bother? We have to get rid of them. We Europeans have to eat, and the question is increasingly what is there to eat. Societies organise themselves, and people try to survive – **food is available, but good nutrition is scarce** and expensive. Only the rich can afford really healthy diets. We rely on self-organisation and do-it-yourself as much as possible.

Inequalities are growing under these circumstances, with different social classes, age groups, genders or ethnic groups being affected differently by climate change. The stigmatisation of specific groups remains or is even growing. We have to take care of

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ourselves, so why look at these unadapted citizens or minority groups? Our healthcare systems can address only the needs of the majority and provide standard care, not the specific needs of vulnerable populations.

Fewer farmers and big farms are there, but they are **incapable of producing as much as is needed**, so we import a large share of our food and, of course, feed, too. Our large-scale enterprises face a challenge in importing sufficient bioresources. There are ongoing tensions with farmers over bioresource use and land use, which are becoming increasingly concentrated and intensive. Of course, there was a decrease in protected areas as we needed the space. So, we try to use whatever arable land we have; indoor farming turned out to be too resource-intensive.

But we set many new pathogens free, we provoked new risks, and even a link between newly emerging diseases, armed conflicts and terrorism has become evident. We fear a destruction of the exchange in the global food systems and supply chains when permanent terrorist disruptions and armed conflicts are ongoing. With the strange weather and long droughts of the years 2026 to 2029, the likelihood of wildlife diseases spilling over to humans and domestic animals has increased drastically, as has the number of wildfires we saw last year, when Athens burned down.

Europe is facing numerous challenges.

4.5 Scenario 5: Keep it private!

News Headlines 2035:

"Public Sector loses oversight on technology developments!"

"EU GDP rise to new records"

In 2035, **Europe is dominated by economic considerations**. While the private sector heavily invests in (new) technologies with high expectations of innovation, profit, and higher margins, often disregarding sustainability or social impacts, the public sector remains largely unaware of what is funded and how funding from public sources, such as the Framework Programme 12, is truly utilised. As a consequence, the **EU has further centralised its decision-making processes** across many areas, including defence, economics, agriculture, and technology. National governments increasingly delegate responsibilities to the EU, but its governance is not optimally equipped to address the many challenges ahead (see also Figure 9).

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Figure 9. Scenario 5: Keep it private!

As companies essentially run the health system, health costs are skyrocketing. Social exclusion is gaining firm ground. Noncommunicable diseases continue to increase in Europe, primarily due to pollution and unhealthy diets. **Public health costs become unbearable for many** across the continent. Governments of the Member States reconsider the "social state" approach. **The high costs evoke deep inequalities in healthcare** and in healthcare-seeking behaviour. Instead, women use more healthcare services and follow preventive health recommendations. At the same time, men delay or avoid seeking care, thus amplifying gender inequalities in health outcomes and showing no signs of improvement. Men die earlier; that is clear statistics. **The polarisation of health care** is also evident within the EU, where countries have widely different capacities in healthcare. Some use AI and databases for diagnosis, but the issue of data ownership remains unresolved. In most cases, companies own the data and profit from it, exacerbating inequalities.

At the same time, both outdoor and indoor workers are increasingly affected by heatwaves, leading to alarming death tolls. Livestock mortality and crop failures exacerbate food security issues and drive up food prices.

While some Member States leave the EU due to nationalism, populism, or other factors, new states seek stability and growth by joining the European Union. This creates a **new power balance in Europe:** a polarised Union, with more conservative countries versus those that, in the old days, would have been called "central left" countries. Politicians unite in issues, popular slogans and big claims; this "left" and "right" thinking is gone – only the chairs in parliaments remain. With the experience of Brexit years ago, it is easier now to leave or join the EU – Ukraine was the first example of a "fast entry" state. Companies play a role in

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politics; they are powerful players and often neglect the regulations set by public institutions. They do what they want.

Agglomerates of nations **compete over AI-driven surveillance** systems that track people, animals, and plants, so that, e.g., data on zoonoses, waste, or biodiversity becomes geopolitically sensitive in some regions. We see some attempts at improvement, e.g., the Pandemic Agreement or Pandemic Accord (for WHO) for interventions and global EU governance. Still, they do not solve the problems arising from increased surveillance. One reason for the surveillance and for the lack of preparation for the future may be the lack of information, training, or education, because **such resources are only available to those who pay.** And for those who have the money, information and education are not at the forefront. For those who pay, we offer a good education in nice surroundings, with teachers and digital tools, or even AI solutions. The combinations with machine teaching are manifold.

This brings us back to the people. Europe's demographic problem remains severe, with even faster ageing societies and especially ageing-related and chronic diseases increasing further**. Antimicrobial resistance remains a problem** as the last remaining antibiotics have lost effectiveness, and for companies, it is still not profitable to develop new products in this field. They rather concentrate on products with high margins or big markets.

In this political situation, the EU is reverting to what was possible in the past; for example, in agriculture, food security is a premise that allows for **more pesticide use**. Protection in times of heat, security and safety issues are not in the forefront – or better: often ignored. A number of **outdoor and indoor workers are dying from heat waves,** especially in agriculture. There are thus many food issues. Food prices are very high, and nutrients are scarce. We also see an **increased mortality of animals** (chickens, pigs). The **increased exploitation of animals**, breeding and keeping them in masses, is clearly **fostering the potential spread of diseases and zoonoses.** Crops suffer, too; harvests are low, leading to sharpening the problems of food security and safety and driving food prices further. We fight for food – and the food market is a big, powerful, and profitable market for some monopolies and for those who can buy food on the global market—those who have money profit. People in countries at the bottom of the buyout-chain are suffering most.

In these times, we have an **alert about an influenza** virus outside the EU: it can jump from birds to mammals to humans!

It is very unclear who is responsible for crisis management in this or other cases, or who is responsible for **crisis preparedness.** In most countries, there is no structure to address crises such as pandemics or natural disasters. Europeans are still more reactive than proactive; we are somewhat unprepared if another crisis were to happen tomorrow. This keeps us anxious, and most of us are not so optimistic about the future. Let's survive the next year and see then…

4.6 Time-travel to the 2035 scenario on 'One Health governance in a digitalised, climate-challenged Europe'

The further scenario work in the Lisbon workshop with representatives from EU agencies involved time-travelling into one of the scenarios (Scenario 3: One Health Governance in a Digitalised, Climate-Challenged Europe). The selection was arbitrary as we could only travel into one of the scenarios, and scenario 3 was describing a world well-advanced in the direction

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of "one health governance", a scenario easy to work with. After the time travel, the groupwork began by having participants derive recommendations based on what they observed in the future (in the scenario). The different groups provided feedback on the time-travel exercise, the exercise as such, their emotional reactions, and their observations for the future. The following comments – summarised by the facilitators - were raised:

In one of the groups, health monitoring was generally perceived as a positive development, particularly in its ability to motivate individuals to adopt healthier behaviours and maintain personal well-being. However, concerns also emerged about the more intrusive aspects of surveillance, especially when insurance companies gain access to personal health metrics or when mandatory exercise requirements are imposed. Such measures may be experienced as coercive, undermining autonomy and potentially turning well-being activities into obligations rather than enjoyable practices. For some, the risk is that a hobby could become a burden, eroding rather than enhancing quality of life. This raises a deeper societal question: what does OH mean at the individual level? Even with advanced monitoring systems and personalised health insights, it remains unclear whether people can genuinely achieve better health outcomes while maintaining traditional structures such as a 40-hour working week. Without broader changes in work–life balance, environmental conditions and social support systems, technological solutions alone may not be sufficient to improve holistic well-being.

Participants of this group also noted a persistent frustration that, even in a technologically advanced future, it may still be difficult for consumers to determine whether everyday products, such as children's toys, are truly of high quality or produced according to safe and sustainable standards. This suggests an ongoing gap between data availability and meaningful, user-friendly transparency for citizens. Moreover, while data management capabilities had progressed rapidly, enabling real-time analysis and personalised insights, the supporting physical infrastructure, such as sanitation systems, public health facilities, or environmental monitoring equipment, was limited in its practical impact on these technological advancements

Another group noted that the session placed strong emphasis on the individual perspective—inviting them to imagine themselves in very concrete terms 10 years into the future. This level of personal detail (e.g., "How do you feel?", "What did you eat?") felt overwhelming for some, especially given the rapid shifts between deeply personal questions and broad systemic descriptions of the future world. Participants also raised questions about data control and ownership in a highly monitored environment. As mental time travel is supposed to expand an individual's imagination, it took the participants out of their comfort zone.

The third group described a "Sleepy Hollow" experience: a sense of waking up in a changed world where everything around them had evolved, yet they themselves had not. They felt they had little or no agency over the developments shaping their environment, becoming passive bystanders who react rather than act. Many also expressed a need for meaningful human interactions. They felt constrained by rules and surveillance technologies that dictate behaviour without offering the possibility to influence or reshape those rules. This is an interesting observation, as one of the other groups criticised the lack of any changes at all.

The fourth group envisioned a future that felt less like a rupture and more like a slow, steady drift: Tracking people and monitoring health and environment will develop, but slowly, and in 10 years, more is possible – and more is hybrid human and machine. Several participants described the boundaries between medical treatment and recreational drug use as becoming

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increasingly blurred. Monitoring devices—such as smartwatches—could be used equally to track prescribed therapies or to track themselves, to use drugs as medicine or as substances that enhance capabilities or change mood, making it harder to distinguish between care, optimisation and self-medication. In the time travel, gender and intersecting inequalities were not addressed, which is missing (in the scenario). The same was observed for social imbalances (also related to drug use above), as well as those who are neglected in all treatments or those who are going "undigital". They are left out of any communication, help and treatment. A vicious circle starts.

4.7 Reflections on scenarios

Following the time-travel exercise, workshop participants selected two contrasting scenarios for deeper reflection and compared them with the shared reference scenario. The analysis focused on identifying what fundamentally differs across futures, what additional implications emerge, and where multi-agency collaboration would be most valuable. Discussions centred on how these scenarios would reshape EU agencies' mandates, governance models and interactions with citizens, private actors and EU institutions.

The scenario "Better Safe Than Sorry" depicts a future dominated by prevention, data-driven technologies, and strong private-sector involvement. Participants recognised the potential for earlier risk detection and more proactive public health interventions, but highlighted significant ethical and governance challenges. Continuous data collection and behavioural monitoring could normalise surveillance and "nudging," raising concerns about individual autonomy, data ownership and commercial exploitation. The rise of personalised health and prevention challenges the current European safety framework, which is designed to protect populations rather than individuals, and risks shifting responsibility from public systems to citizens. At the institutional level, the scenario implies stronger centralisation around the European Commission and increased inter-agency collaboration, but also greater dependence of agencies and heightened risks of profit-driven bias and pressure to lower safety standards. At the same time, opportunities emerge for advanced early-warning systems, improved disease-spread monitoring and more responsive, preventive public-health approaches — provided governance safeguards are in place.

The scenario Nationalism and Egocentrism presents a fragmented landscape characterised by declining trust, geopolitical tension and constrained resources. Participants emphasised uncertainty around the governance of artificial intelligence, opaque data practices and weak coordination, which undermine credibility and public confidence in science and institutions. Questions arise about oversight of autonomous food and animal production systems, increasing bureaucratisation and surveillance, and sustained pressure on health budgets. Rising nationalism shifts priorities toward border control and security, potentially at the expense of long-term health planning. Nevertheless, this scenario also offers opportunities, including increased investment in security-related research, expanded EU-funded programmes in agriculture, natural resources and health, growth potential for human-centred SMEs, and stronger environmental legislation that could stimulate green innovation and nature-based solutions.

Across both scenarios, a central conclusion emerges: technological capacity alone does not determine preparedness or resilience. In prevention-focused futures, the main risks lie in over-surveillance, individualisation of responsibility and private-sector dominance; in

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nationalist futures, fragmentation, opacity and loss of trust erode collective action. In both cases, participants highlighted the critical importance of transparent data governance, responsible AI use, and sustained multi-agency collaboration. Strengthening shared Foresight, governance and trust-building mechanisms was seen as essential for enabling EU agencies to navigate uncertainty and maintain legitimacy across highly divergent futures.

4.8 AI-assisted scenario development

During the first workshop day in Lisbon, there was also a session on AI-based scenarios. An AI-supported morphological scenario process was implemented to add scenarios to the discussion and to demonstrate the capabilities of AI-based work. This approach mirrors the classical morphological process employed by Fraunhofer ISI but replaced manual steps with AI-driven automation, potentially enhancing efficiency, consistency and analytical depth. In this **machine-based procedure**, a consistency matrix was filled, matching assumptions, and automatically generating a measure of the consistency of the assumptions. This AI-driven consistency analysis of the morphological futures table used pattern recognition and probabilistic modelling to assess logical coherence across factor-outcome combinations.

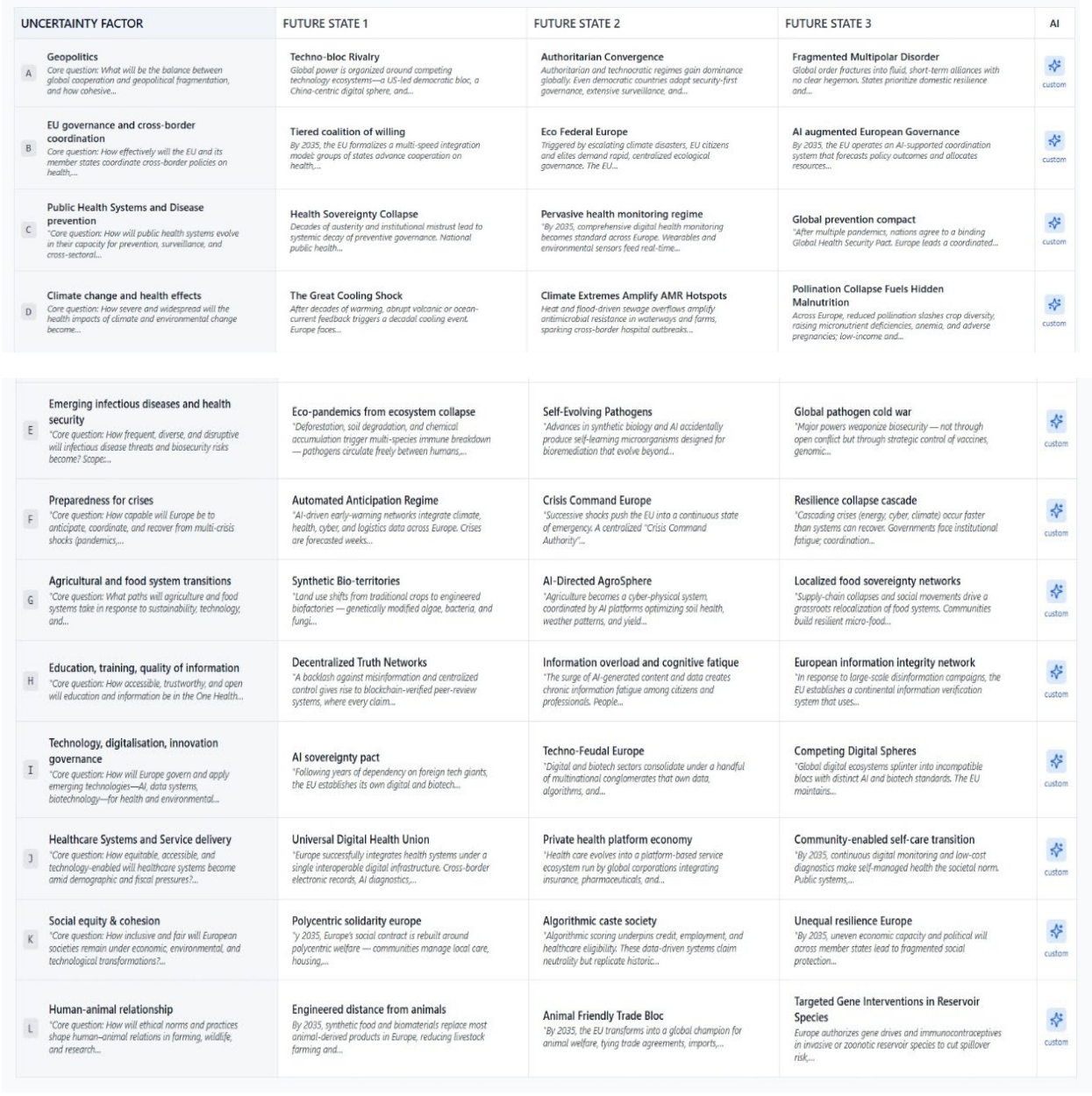
Within this process, human intervention can be used to ensure that the foundations for the consistency matrix are intact, thereby enhancing the validity of the automated process. A key differentiator of the AI-driven approach is its algorithm-based assumptions and, thus, scenario selection. Unlike manual approaches that rely on "expert intuition", AI maximises scenario plausibility and uniqueness by applying optimisation techniques, thereby ensuring robust, non-redundant scenario sets. In this way, additional scenarios were generated. The AI-assisted workflow can be divided into five phases: Context definition, Morphological analysis, Consistency analysis, Scenario Selection and Narrative writing.

In phase 1 (**context definition**), the AI-supported scenario process utilised materials synthesised from previous project stages as context data. In addition, some utilised Large Language Models (LLMs) were trained with relevant material; for example, they had a relatively good understanding of OH without any additional information. Utilised LLMs included OpenAI (GPT-5 and GPT-5-mini), Anthropic Claude 4.5, Gemini 2.5 Flash.

In the second phase (**morphological analysis**) (see figure below), the previously identified 12 factors during scenario sprint were taken as given. AI was instructed to find additional plausible future states. To avoid overlapping with the future states identified during the summer's scenario sprint, AI was given as input all the previously identified future states and specifically instructed to find new plausible future states that haven't yet been determined (Figure 10).

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UNCERTAINTY FACTOR	FUTURE STATE 1	FUTURE STATE 2	FUTURE STATE 3	AI
A **Geopolitics** *Core question: What will be the balance between global cooperation and geopolitical fragmentation, and how cohesive...*	**Techno-bloc Rivalry** *Global power is organized around competing technology ecosystems—a US-led democratic bloc, a China-centric digital sphere, and...*	**Authoritarian Convergence** *Authoritarian and technocratic regimes gain dominance globally. Even democratic countries adopt security-first governance, extensive surveillance, and...*	**Fragmented Multipolar Disorder** *Global order fractures into fluid, short-term alliances with no clear hegemon. States prioritize domestic resilience and...*	custom
B **EU governance and cross-border coordination** *Core question: How effectively will the EU and its member states coordinate cross-border policies on health,...*	**Tiered coalition of willing** *By 2035, the EU formalizes a multi-speed integration model: groups of states advance cooperation on health,...*	**Eco Federal Europe** *Triggered by escalating climate disasters, EU citizens and elites demand rapid, centralized ecological governance. The EU...*	**AI augmented European Governance** *By 2035, the EU operates an AI-supported coordination system that forecasts policy outcomes and allocates resources...*	custom
C **Public Health Systems and Disease prevention** *"Core question: How will public health systems evolve in their capacity for prevention, surveillance, and cross-sectoral...*	**Health Sovereignty Collapse** *Decades of austerity and institutional mistrust lead to systemic decay of preventive governance. National public health...*	**Pervasive health monitoring regime** *"By 2035, comprehensive digital health monitoring becomes standard across Europe. Wearables and environmental sensors feed real-time...*	**Global prevention compact** *"After multiple pandemics, nations agree to a binding Global Health Security Pact. Europe leads a coordinated...*	custom
D **Climate change and health effects** *Core question: How severe and widespread will the health impacts of climate and environmental change become...*	**The Great Cooling Shock** *After decades of warming, abrupt volcanic or ocean-current feedback triggers a decadal cooling event. Europe faces...*	**Climate Extremes Amplify AMR Hotspots** *Heat and flood-driven sewage overflows amplify antimicrobial resistance in waterways and farms, sparking cross-border hospital outbreaks...*	**Pollination Collapse Fuels Hidden Malnutrition** *Across Europe, reduced pollination slashes crop diversity, raising micronutrient deficiencies, anemia, and adverse pregnancies; low-income and...*	custom
E **Emerging infectious diseases and health security** *"Core question: How frequent, diverse, and disruptive will infectious disease threats and biosecurity risks become? Scope:...*	**Eco-pandemics from ecosystem collapse** *"Deforestation, soil degradation, and chemical accumulation trigger multi-species immune breakdown — pathogens circulate freely between humans,...*	**Self-Evolving Pathogens** *"Advances in synthetic biology and AI accidentally produce self-learning microorganisms designed for bioremediation that evolve beyond...*	**Global pathogen cold war** *"Major powers weaponize biosecurity — not through open conflict but through strategic control of vaccines, genomic...*	custom
F **Preparedness for crises** *"Core question: How capable will Europe be to anticipate, coordinate, and recover from multi-crisis shocks (pandemics,...*	**Automated Anticipation Regime** *"AI-driven early-warning networks integrate climate, health, cyber, and logistics data across Europe. Crises are forecasted weeks...*	**Crisis Command Europe** *"Successive shocks push the EU into a continuous state of emergency. A centralized "Crisis Command Authority"...*	**Resilience collapse cascade** *"Cascading crises (energy, cyber, climate) occur faster than systems can recover. Governments face institutional fatigue; coordination...*	custom
G **Agricultural and food system transitions** *"Core question: What paths will agriculture and food systems take in response to sustainability, technology, and...*	**Synthetic Bio-territories** *"Land use shifts from traditional crops to engineered biofactories — genetically modified algae, bacteria, and fungi...*	**AI-Directed AgroSphere** *"Agriculture becomes a cyber-physical system, coordinated by AI platforms optimizing soil health, weather patterns, and yield...*	**Localized food sovereignty networks** *"Supply-chain collapses and social movements drive a grassroots relocalization of food systems. Communities build resilient micro-food...*	custom
H **Education, training, quality of information** *"Core question: How accessible, trustworthy, and open will education and information be in the One Health...*	**Decentralized Truth Networks** *"A backlash against misinformation and centralized control gives rise to blockchain-verified peer-review systems, where every claim...*	**Information overload and cognitive fatigue** *"The surge of AI-generated content and data creates chronic information fatigue among citizens and professionals. People...*	**European information integrity network** *"In response to large-scale disinformation campaigns, the EU establishes a continental information verification system that uses...*	custom
I **Technology, digitalisation, innovation governance** *"Core question: How will Europe govern and apply emerging technologies—AI, data systems, biotechnology—for health and environmental...*	**AI sovereignty pact** *"Following years of dependency on foreign tech giants, the EU establishes its own digital and biotech...*	**Techno-Feudal Europe** *"Digital and biotech sectors consolidate under a handful of multinational conglomerates that own data, algorithms, and...*	**Competing Digital Spheres** *"Global digital ecosystems splinter into incompatible blocs with distinct AI and biotech standards. The EU maintains...*	custom
J **Healthcare Systems and Service delivery** *"Core question: How equitable, accessible, and technology-enabled will healthcare systems become amid demographic and fiscal pressures?...*	**Universal Digital Health Union** *"Europe successfully integrates health systems under a single interoperable digital infrastructure. Cross-border electronic records, AI diagnostics,...*	**Private health platform economy** *"Health care evolves into a platform-based service ecosystem run by global corporations integrating insurance, pharmaceuticals, and...*	**Community-enabled self-care transition** *"By 2035, continuous digital monitoring and low-cost diagnostics make self-managed health the societal norm. Public systems,...*	custom
K **Social equity & cohesion** *"Core question: How inclusive and fair will European societies remain under economic, environmental, and technological transformations?...*	**Polycentric solidarity europe** *"y 2035, Europe's social contract is rebuilt around polycentric welfare — communities manage local care, housing,...*	**Algorithmic caste society** *"Algorithmic scoring underpins credit, employment, and healthcare eligibility. These data-driven systems claim neutrality but replicate historic...*	**Unequal resilience Europe** *"By 2035, uneven economic capacity and political will across member states lead to fragmented social protection...*	custom
L **Human-animal relationship** *"Core question: How will ethical norms and practices shape human–animal relations in farming, wildlife, and research...*	**Engineered distance from animals** *By 2035, synthetic food and biomaterials replace most animal-derived products in Europe, reducing livestock farming and...*	**Animal Friendly Trade Bloc** *"By 2035, the EU transforms into a global champion for animal welfare, tying trade agreements, imports,...*	**Targeted Gene Interventions in Reservoir Species** *Europe authorizes gene drives and immunocontraceptives in invasive or zoonotic reservoir species to cut spillover risk,...*	custom

Figure 10. Screenshots from ScenAIrios software about AI-assisted morphological analysis

In this **consistency analysis phase** (3), a consistency matrix was analysed automatically using a multi-agent approach (Figure 11). We initially ran a consistency analysis using data from the summer's scenario sprint, but since scenarios had already been selected, we didn't use that data for any further analysis. Instead, we ran a new consistency analysis using newly created future states and used the results as a basis for 3 new AI-assisted scenarios.

The consistency analysis process goes as follows: LLM agents are given tasks to conduct hundreds of pairwise analyses. The individual task is basically about how consistent two future states are in the same future, and score this on a scale from -3 (highly inconsistent) to +3 (highly consistent). To support further analysis, AI agents are also tasked with explaining the rationale behind the given score. This AI-driven consistency analysis utilises large-language

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models' known capability to analyse probable answers to written statements about the future. Within this process, the first two complete rounds of analysis were conducted with two different LLMs (ChatGPT 5-mini and Claude Sonner 4.5). After that, for areas where LLM opinions differed notably (large score standard deviation), a new round of analysis was conducted with the third model, Gemini 2.5.

Finally, the Meta-evaluator LLM agent was tested in those areas where the standard deviation of answers was high. The role of this meta-agent was to analyse answers, identify whether some answers appear to be hallucinations, and assign a final score based on all contextual data and individual responses. To validate LLM responses, human validation was used in areas where the standard deviation of evaluation scores was high. This multi-step process ensures that the foundations for the consistency matrix are intact and improves the validity of the automated analysis results.



Uncertainty Factors		B - EU governance and cross-border coordination			C - Public Health Systems and Disease prevention			D - Climate change and health effects			E - Emerging infectious diseases and health			F - Preparedness for crises			G - Agricultural and food system transitions			H - Education, quality of info	
	States	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2
A - Geopolitics	1	0.40	-2.00	-0.40	2.00	1.60	-2.00	0.60	1.50	1.50	1.60	1.40	2.50	1.20	2.00	2.00	2.50	2.50	-2.00	1.40	2.00
	2	-0.25	2.00	2.50	-0.40	2.50	1.60	2.50	2.00	2.00	2.50	2.50	3.00	1.50	3.00	-0.60	2.50	2.50	-2.00	-2.00	2.00
	3	2.00	-2.00	-0.25	2.50	-2.00	-2.50	1.80	2.00	1.60	2.00	2.00	1.80	-1.00	1.40	2.50	2.00	-1.50	2.50	2.00	2.00
B - EU governance	1				-2.00	-1.20	-2.50	-0.40	1.20	1.20	0.40	0.00	-1.50	-0.20	-2.00	-2.50	0.60	-0.60	1.00	1.40	0.20
	2				-2.50	2.50	2.50	-0.80	2.50	2.50	2.50	0.75	-2.00	2.00	2.50	-2.50	2.50	2.50	-2.00	-2.00	-0.40
	3				-2.00	2.50	2.00	2.00	2.00	1.50	2.00	-1.20	1.20	2.50	1.60	-2.50	2.00	2.50	-2.00	-2.00	2.00
C - Public Health	1							1.80	2.50	2.50	2.50	1.80	0.60	-1.50	1.60	3.00	2.00	0.33	2.00	1.40	2.00
	2							2.00	2.50	1.50	2.00	-2.00	1.80	2.50	2.50	-2.00	1.50	2.50	0.33	0.40	2.50
	3							0.40	2.50	1.50	-1.00	-2.00	-2.50	1.50	2.50	-3.00	2.00	2.50	-2.00	-2.00	-0.60
D - Climate change and	1										1.50	0.80	1.50	1.00	2.00	2.50	-1.00	0.00	2.00	0.33	1.20
	2										2.00	-0.50	1.50	1.50	2.00	2.50	-1.50	-0.67	1.00	0.00	0.60
	3										2.00	-0.50	1.00	1.50	1.50	2.50	-1.60	0.33	-0.60	0.50	1.00
E - Emerging infectious	1													0.40	2.50	2.50	-0.60	-1.50	-0.80	-1.00	2.00
	2													0.67	2.50	1.60	2.00	0.80	0.20	0.00	2.00

Figure 11. Screenshot of consistency analysis matrix from ScenAIrios software.

Using the consistency matrix results, more than 500,000 new scenario combinations were identified, and their overall consistency scores were calculated.

In the fourth phase (**scenario selection**) to select the best scenario combinations from this massive set, ScenAIrios software utilises an algorithm to search from the whole solution space for the set of three scenario combinations that fulfil two conditions:

- Ensure maximal diversity (there are no overlapping future states in scenarios)[2]
- Maximises the sum of overall consistency scores

[2] The algorithm was focused only on newly generated set of future states. However, new set was chosen to avoid overlaps (AI was instructed to avoid overlaps and human validated that), so all states should have been (at this state) diverse from the original set. In some cases, in final scenario narrative writing phase, the AI scenarios may have shifted towards initial set of scenarios, as there are new ingredients brought into narrative "on the fly" when it is written - to spice it up.

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Based on the algorithmic search, three new scenario combinations were selected for the final phase. The idea was not to replace already identified scenarios, but to provide additional fresh perspectives.

In the final phase (5), **scenario narratives were generated** from the previously identified scenario combinations. Initial narratives were generated using the chain prompting method via ChatGPT 5.0's API. Input to the LLM consisted of a set of system instructions and user prompts, building on accumulated data about scenarios (context, drivers, factors, states). In the first round, the main goal was to define the format and ensure the entire scenario is grounded in the context. For structure, we used a standard template of our ScenAIrios software (including executive summary, introduction, change dynamics, day in the future, trajectory and outcomes). Then, the chain prompting procedure utilised the LLM itself to analyse its results and reflect on how well it succeeded with its tasks. Then, the LLM conducted additional rounds of refinement to improve its output. The number of rounds required to achieve final narratives ranged from 3 to 5.

Conclusions on the use of AI in scenario work

A discussion followed on the differences between biases generated by AI systems and those inherent in human decision-making. Participants highlighted that biases are present in both cases, but they manifest in fundamentally different ways. AI models inherit biases primarily from the data on which they are trained, raising questions about how, and under which conditions, alternative or more diverse training datasets can be incorporated to mitigate such distortions. In contrast, human biases stem from individual experiences, cultural backgrounds, and cognitive heuristics. A commonly applied countermeasure is to involve diverse stakeholders in dialogue to broaden perspectives and reduce the influence of any single viewpoint. However, it was also noted that even this approach has limitations, as stakeholders are often grouped or categorised, which may inadvertently reproduce certain forms of bias despite efforts to ensure diversity.

4.9 Summaries of the AI-assisted scenarios

The following presents summaries of the AI-assisted scenario narratives obtained.

Summary of AI-assisted scenario narrative - The Clockwork Continent

By 2035, the EU has perfected prediction — but lost its sense of surprise. Security-first politics and AI-driven governance define daily life, coordinated through an Automated Anticipation Regime that forecasts risks and redistributes resources with machine efficiency. The system works — until it doesn't. In this Age of Authoritarian Convergence, disease, data and climate shocks are treated as security threats, and the line between public safety and social control blurs.

Across the continent, citizens wear devices that monitor their biology and behaviour; public health is proactive, yet privacy feels archaic. Floods and heatwaves spark new waves of antimicrobial resistance, and the EU's borders tighten under the banner of bio-intelligence sovereignty. Meanwhile, a techno-feudal order emerges — governments depend on corporate platforms for health, food, and data. People live longer, healthier lives — but under algorithms they no longer fully trust.

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Summary of AI-assisted scenario narrative - The Federated Garden

By 2035, the EU functions like a living ecosystem, tightly connected, efficient, and closely managed. Environmental, agricultural, and health policies are unified under a European Sustainability Directorate, while a Crisis Command Authority reacts instantly to emerging threats. Disease outbreaks are contained within hours, food systems adapt automatically, and cross-border health records move seamlessly.

Yet this resilience comes at a cost. Privacy and local autonomy give way to algorithmic control, and the EU's digital dependence on foreign systems leaves it exposed to unseen fragilities. As ecological decline fuels new health and nutrition risks, the continent's strength begins to feel brittle. The EU has learned to manage complexity, but not to escape it. Its "federated garden" thrives under constant care, even as citizens wonder who truly tends it, and for whom it grows.

Summary of the AI-assisted scenario narrative - Cold Winds and Warm Hands

By 2035, the EU lives within a fragmented world of shifting alliances. The EU balances between bursts of cooperation and periods of isolation, navigating crises one at a time. Within this uncertainty, small coalitions of willing nations keep limited collaboration alive — especially in health, food, and technology — but outcomes differ sharply from one region to another.

The EU is increasingly divided by a severe shift in temperatures driven by climate change, as the slowdown of the North Atlantic Current is lowering temperatures in the north and shortening growing seasons. Governments focus on preserving the bare continuity of essential services as a resilience cascade strains every system at once. Traditional public health institutions weaken in a slow Health Sovereignty Collapse, just as self-adapting pathogens spread, mutating with unnerving autonomy.

Amid this pressure, new forms of community-based resilience emerge. Neighbourhood networks and local cooperatives rely on open-source AI assistants to guide care and manage resources. Food sovereignty becomes tangible again — greenhouses glow in winter, and short supply chains replace global ones. Decentralised "truth networks" ensure transparency but fragment trust, leaving people to navigate many versions of verified reality. EU's OH future becomes a mosaic: accountable, local, and uneven.

Implications of the AI-generated scenario: Cold Winds and Warm Hands

In the Cold winds and warm hands scenario, participants explored a future shaped by severe climate disruption, social stress and institutional fragmentation, with profound implications for the work of EU agencies. A defining feature of this scenario is the shift toward synthetic and decentralised production systems, particularly for food and illicit drugs, as climate impacts disrupt traditional supply chains. Distributed laboratory networks emerge as adaptive responses, but they generate significant regulatory, safety and enforcement challenges, stretching existing governance frameworks beyond their current scope.

Health impacts are intensified and diversified. Participants highlighted the emergence of new biological, environmental and occupational hazards, alongside a marked deterioration in mental health driven by chronic stress, insecurity and repeated crises. Rising levels of self-medication, substance misuse and informal coping mechanisms increase pressure on public-health systems already operating under constrained resources. These dynamics are

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compounded by growing societal restlessness and polarisation, as food scarcity and psychological strain erode social cohesion, deepen inequalities and undermine trust, particularly in vulnerable regions. Such conditions make coordinated emergency responses more difficult precisely when collective action is most critical.

At the governance level, the scenario points to deep fragmentation and unprecedented demands on EU agencies, potentially even challenging the EU's current constitutionality. Agencies would need to operate within more complex, multi-level governance arrangements, engaging not only EU and national authorities but also regional actors, community networks and informal service providers. In such conditions, adaptive regulatory approaches, new partnership models, and innovative mechanisms would ensure legitimacy and oversight.

Despite its severity, the scenario also reveals opportunities. Crisis conditions could accelerate innovation and business transformation, catalyse stronger inter-agency collaboration and rapid-response capabilities, and position EU agencies as regulatory leaders capable of averting environmental and societal tipping points. Moreover, the breakdown of traditional structures creates space for more inclusive and participatory governance, recognising the role of local and community-based networks in building resilience, restoring trust and supporting more equitable policy outcomes.

4.10 Conclusion: Insights from scenario work

The scenarios function less as end-states and more as strategic mirrors, inviting agencies and policymakers to reflect on present choices that may lock Europe into fundamentally different trajectories by 2035. They demonstrate that OH can no longer be treated as a conceptual add-on to sectoral policies but must be understood as a structural condition for governance in a climate-altered, digitally mediated Europe. Across all scenarios, the interaction between technological acceleration, climate stress, and societal trust repeatedly appears as a decisive determinant of health outcomes. Future preparedness is less about predicting specific crises and more about building institutional capacity to navigate systemic uncertainty, cascading risks and ethical trade-offs.

A central concluding insight is that governance quality—rather than technology availability alone—shapes whether futures are inclusive, preventive and resilient, or fragmented and inequitable. High levels of digitalisation and data integration do not automatically translate into better health or environmental outcomes; without clear mandates, shared standards and trust-based coordination, they risk reinforcing surveillance, exclusion and institutional opacity. Conversely, where governance structures enable interoperability, joint responsibility and reflexive learning, technology becomes an enabler of prevention, early warning and cross-border solidarity.

The scenarios also reveal a persistent tension between individual-level optimisation and collective responsibility. Many future pathways shift responsibility for prevention, risk management, and behavioural change onto individuals, often mediated by private actors and algorithmic systems. Without explicit safeguards, OH risks drifting from a solidarity-based framework toward a market-driven or coercive model, particularly affecting vulnerable groups and widening existing inequalities.

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Strategic insights from scenarios:

Strategic insights for EU Agencies

1. **Safeguard autonomy, privacy, and transparency in data-driven monitoring systems:** The scaling of health, environmental, and behavioural monitoring technologies should be matched with robust governance frameworks for data access, ownership, and use, ensuring transparency, preventing coercive surveillance, and maintaining public trust across public–private ecosystems.

2. **Bridge gaps between digital innovation, physical infrastructure and social inclusion:** Digital capabilities are advancing faster than physical systems and social safeguards. Coordinated investment is needed to upgrade public infrastructure, ensure usability and transparency, and address inequalities, such as digital exclusion, that risk creating new forms of marginalisation.

3. **Embed participatory, community-centred governance to reinforce citizen agency and trust:** Feelings of passivity and loss of control underline the need for participatory design, co-creation and continuous feedback loops that actively involve citizens, grass-roots networks and vulnerable groups in governance.

4. **Ensure ethical, accountable use of autonomous production systems:** Clear standards are needed for transparency, data provenance, interoperability, and oversight of autonomous or self-replicating food and animal production systems to ensure safety, auditability, and public confidence.

5. **Rebuild societal trust in science through transparency, evidence integrity and reduced friction:** Open communication about scientific processes, strong safeguards against data manipulation, and user-centred administrative simplification can help counter scepticism, declining trust and pressures from constrained public budgets.

6. **Leverage EU investment and regulatory momentum to drive secure, sustainable innovation:** Growing investments in security, agriculture, natural resources and health—combined with new environmental frameworks—create opportunities to accelerate cross-sector research and support SMEs that embed ethical safeguards, human-centred design and societal needs into innovation pathways.

Strategic insights for cross-agency collaboration

1. **Strengthen anticipatory, cross-agency early-warning and prevention capacities:** Climate-driven shocks, zoonotic spillovers and systemic risks require integrated early-warning systems, shared data infrastructures and agile joint response mechanisms to manage cross-border threats and avoid environmental or societal tipping points.

2. **Prepare governance systems for societal fragmentation and decentralised risk landscapes:** Increasingly decentralised food, health and production systems call for adaptive, multi-level governance models that can operate across fragmented

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socio-political contexts while maintaining legitimacy, coherence and regulatory effectiveness.

3. **Reinforce EU-wide OH leadership through coordinated, evidence-based action:** To avoid inward fragmentation and contradictory narratives, agencies could strengthen central coordination, improve OH literacy, counter misinformation, and deepen collaboration both among EU agencies and with Member States, while clarifying Europe's global positioning.

4. **Cross-agency collaboration, shared data infrastructures and anticipatory governance:** These capacities are no longer optional enhancements but core requirements for relevance and legitimacy. The scenario exercise confirms that EU agencies will face growing pressure to operate beyond their traditional mandates, which requires further collaboration.

Methodologically, the combination of participatory Scenario Sprint processes with AI-assisted scenario generation proved valuable but not neutral. While AI enhanced consistency, diversity and scale, it also surfaced new forms of bias, opacity and dependency that require critical oversight. The conclusion is not to replace human judgement, but to embed AI as a complementary instrument within transparent, pluralistic Foresight practices. Human sense-making, ethical deliberation and institutional memory remain indispensable.

Strategic insights on the use of AI in Foresight work:

1. **AI radically expands the Foresight solution space, while shifting the bottleneck to interpretative governance:** AI-supported scenario processes enable orders-of-magnitude increases in speed, scale, and combinatorial depth, making it possible to explore vast spaces of internally consistent futures that are unattainable through human-led methods alone. As generation, consistency scoring, and narrative drafting become automated, the strategic constraint moves decisively to human-led interpretation: determining relevance, framing implications, and translating scenarios into policy-relevant sensemaking, especially where political, ethical, and societal consequences are at stake.

2. **Epistemic robustness in AI-driven Foresight depends on structured pluralism rather than single-model authority:** The use of multiple AI models, combined with meta-evaluation and targeted human validation, demonstrates that divergence across models should be treated as a diagnostic asset. Differences highlight conceptual uncertainty, contested assumptions, and fragile causal logics. Robust Foresight therefore emerges from triangulation, explicit confidence assessment, and transparent cross-checking, positioning AI as a plural analytical ensemble rather than a neutral or authoritative oracle.

3. **AI introduces structurally different forms of bias that require new mitigation logics:** Unlike human bias, which is rooted in experience, institutional culture, and cognitive heuristics, AI bias is latent and systemic, embedded in training data, model architectures, and optimisation objectives. Scenario outputs may therefore amplify techno-authoritarian, corporate-centric, or data-asymmetric futures not solely because they are plausible, but because they are overrepresented

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in underlying data. Addressing these risks requires data governance, model transparency, and auditability, not participatory diversity alone.

4. **Disagreement between AI outputs is a signal of uncertainty, not a methodological failure:** Variation across AI-generated scenarios helps identify weak signals, ambiguous drivers, and contested trajectories. Treating disagreement as analytically meaningful improves Foresight quality by exposing hidden assumptions and preventing premature convergence on seemingly "coherent" futures that may, in fact, be artefacts of model logic.

5. **AI-supported Foresight must be explicitly anchored in EU values, accountability, and human oversight:** Without deliberate safeguards, AI-generated scenarios risk reinforcing embedded assumptions, power asymmetries, or normative drift. Maintaining legitimacy requires transparent governance of model choice, transparency of assumptions, and explicit human responsibility for interpretation and use, ensuring that AI augments—rather than displaces—democratic judgement and public-interest decision-making.

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5 Strategic areas for multi-agency Foresight

5.1 Introduction to strategic areas

A comprehensive review of publications from the European Commission and European agencies was conducted to identify scientific themes relevant to the OH approach (Figure 2). Two main criteria guided the initial selection of themes: 1) the prominence within European policy documents, and 2) the centrality within the scientific literature addressing cross-sectoral health interconnections. The preliminary themes were subsequently expanded and refined through systematic literature searches on Google Scholar and PubMed, with a particular emphasis on review articles published within the last five years.

The themes were further refined during the Scenario Sprint, during which the most influential and uncertain factors shaping the future of European health, environment, and food systems governance were identified. These factors – such as technology and digitalisation, public health and disease prevention, climate change, EU governance and inequalities – served as the building blocks for the scenario construction process.

Based on the scoping, formulation of factors of change, and the exploration of different scenarios, the FOD team refined potential strategic areas for Foresight collaboration. Each of the strategic areas as expected to stand on its own and address a complex matter that would be crucial to the future well-being of people, animals, and ecosystems in the EU. At the same time, they were also to be subsumed under the OH approach and considered relevant areas for future reorientation of health governance and related areas. The areas were thus deliberately designed to be generic yet actionable, providing a shared strategic language for a broad range of European agencies with different mandates.

In essence, each formulated area represents a nexus of key drivers – technological, ecological, socio-economic, or governance-related – identified in the influence matrix during the Scenario Sprint. They are not thematic silos but interlinked collaboration domains designed to guide European agencies in jointly navigating uncertainty, building Foresight capacity and developing integrated responses to the grand challenges of 2035 and beyond. The following 14 strategic areas for Foresight collaboration were coined:

1. **Data, AI, and Digital Governance:** Emerging AI capabilities; Secure, interoperable data systems across health, food, and environment; Standards for AI in surveillance, risk assessment, and decision-making; Addressing algorithmic bias, privacy, and equity; Harmonising digital standards across EU agencies.

2. **Future Risk Modelling & Digital Twins:** Use of simulation, AI, and digital twins for cross-sector Foresight; Scenario-based early warning (pandemics, food insecurity, climate crises); Building Foresight capacity into agencies.

3. **OH Integration & Governance:** Operationalising the concept across human, animal, plant, and ecosystem health; Address zoonoses, AMR, biosecurity, and ecosystem repair; Cross-agency frameworks for resilience and prevention.

4. **Health Systems, Equity, and Demographics:** Ensuring equitable access to healthcare and safe food; Anticipating chronic, mental, and climate-related health burdens; Responding to demographic change and ageing populations.

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5. **Food Security, Safety, and Sustainability:** Resilient and safe food systems under climate and supply-chain stress; Anticipating risks from intensive agriculture and pesticides; Addressing nutritional inequalities and affordability; Biotechnology & Sustainable Food Innovation; Scaling alternative proteins (cellular agriculture, fermentation, biotech crops); Evaluating risks, safety, and sustainability of new food technologies.

6. **Circular Bioeconomy & Resource Use:** Transition to sustainable, circular resource management; Waste reduction, pollution prevention, and planetary boundaries; Bio-based systems that link food, energy, and environment.

7. **Climate, Crisis & Public Engagement:** Climate Change Adaptation & Crisis Preparedness; Building climate-resilient agriculture, food, and health systems; Early warning and crisis management for extreme weather and disasters; Addressing migration-related health and security challenges.

8. **Biodiversity & Ecosystem Services:** Monitoring and protecting biodiversity under climate stress; Restoring ecosystems for resilience and prevention; Embedding ecosystem services into risk and policy frameworks; Cross-cutting topics determined by the multi-agency Foresight collaboration.

9. **Green Transition:** Anticipating regulatory, technological, and behavioural shifts toward climate neutrality; Aligning cross-sector strategies for decarbonisation, biodiversity, and pollution prevention; Economic transformation and just transition for affected sectors and regions.

10. **Twin Transition (Green + Digital):** Identifying synergies and trade-offs between ecological goals and digital innovation; Governance frameworks for twin-transition across policy domains; Mapping systemic risks (e.g., energy demand from AI, digital waste).

11. **Future of Work & Skills:** Projecting labour market shifts due to automation, ageing, and remote work; Identifying critical Foresight, digital, and green skills for the EU public sector; Designing life-long learning and anticipatory governance frameworks.

12. **Housing:** Understanding future housing needs under demographic and climate change; Cross-sector risk Foresight (e.g., housing-health nexus, urban heat, displacement); Foresight-informed planning for sustainable, inclusive, and resilient housing systems.

13. **Digital Health:** Scenario-based planning for telemedicine, health data ecosystems, and digital diagnostics; Ensuring interoperability, privacy, and equity in future digital health systems; Cross-border health data governance and public trust.

14. **Security & Resilience:** Anticipating hybrid threats (cyber, bio, climate-linked) and institutional vulnerabilities; Cross-agency collaboration on Foresight for strategic autonomy and critical infrastructure; Stress-testing Foresight visions under high-uncertainty security scenarios.

The pre-workshop survey for the Lisbon workshop was launched to gather feedback on strategic areas from the EU-ANSA Futures Cluster, including EU agencies and the Joint

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Research Centre (JRC). 22 responses were received from the respondents participating in their personal capacity. Hence, the views expressed do not represent official organisational positions. The survey assessed the relevance of the above-listed possible strategic areas for the future collaboration between the agencies (Figure 12).

Survey Question 2: Based on your personal experience, assess how relevant the following areas are for multi-agency collaboration (EU-ANSA Futures cluster) to be addressed in the next ten years. (1 - Not at all; > 2 – Slightly; > 3 – Moderately; > 4 – Very; > 5 - Extremely). Leave empty if no opinion.

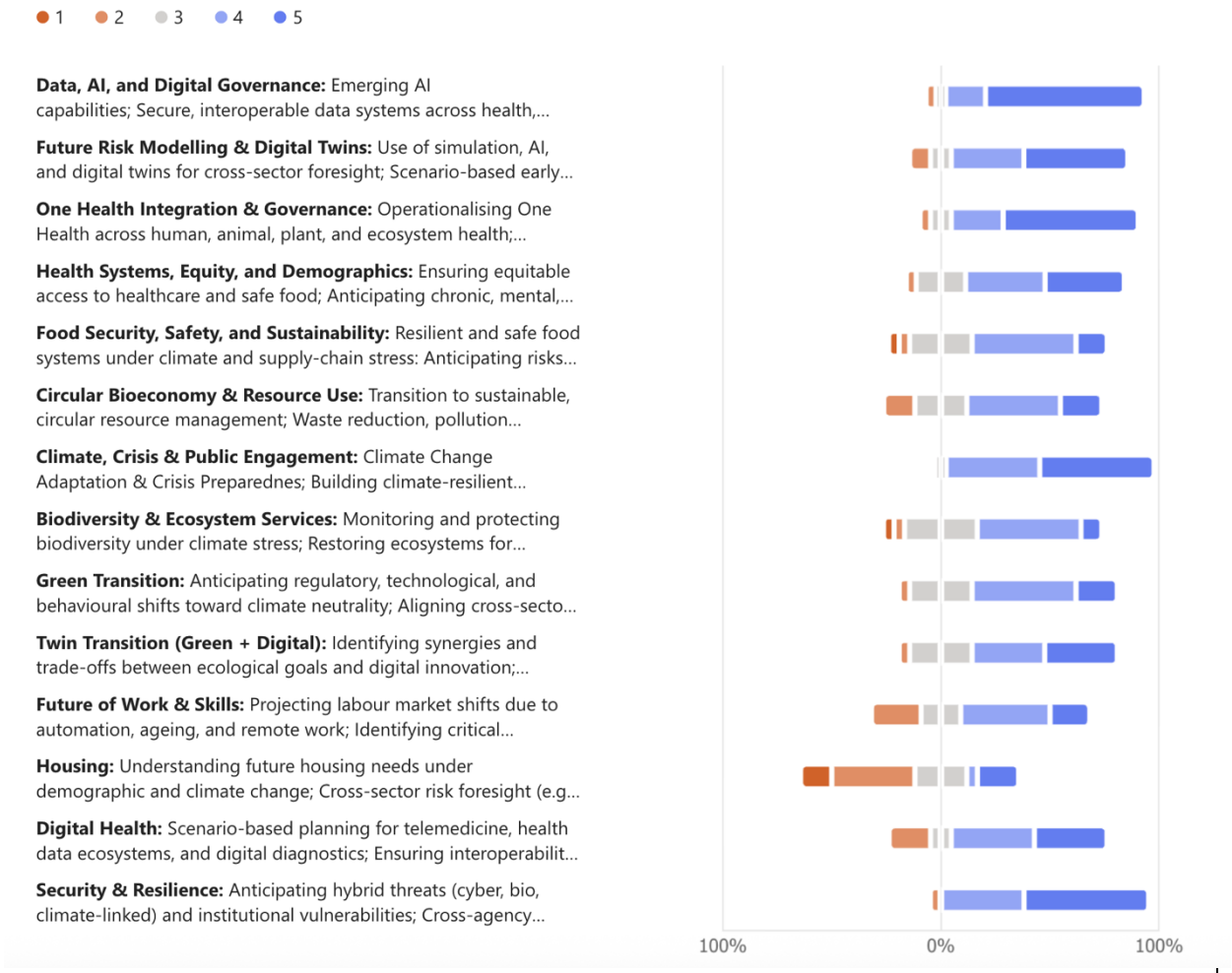


Figure 12. Survey responses on the relevance of strategic areas for agency collaboration.

5.2 Strategic areas for Foresight collaboration

In the Lisbon workshop with representatives of EU Agencies, the results of the pre-workshop survey, especially the five highest-ranked areas in Figure 12 above, were briefly discussed and selected for further exploration in the workshop. Only four small groups could be organised. Hence, the strategic areas "Climate, Crisis and Public Engagement" and "Security

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and Resilience" were combined into a single strategic area, resulting in the following four strategic areas:

1. Future Risk Modelling and Digital Twins
2. Health, equity and demographics
3. Security, resilience, climate crisis and public engagement
4. OH Governance structure and Data Use and Storage.

These areas were defined by their 2035 vision. The goal of visioning was to develop a shared vision for each strategic area. The participants developed shared images of the future (vision), which is based on a future that is desirable or preferred by all (or most) participants. Each of the four groups focused on one strategic area to develop a preferred, positive vision for future collaboration, looking ahead to 2035. Guiding questions were provided to help participants structure and shape their visions.

Guiding questions for visioning:

- Define the implications: What are the concrete consequences for multi-agency Foresight collaboration in an ideal world?
- Identify sub-topics: Which sub-topics must be addressed within this strategic area?
- Map the actors: Which agencies and experts need to be included? Which additional actors outside the Futures cluster must be involved?
- Capacity-building: What training and capacity-building measures are required to prepare effectively?
- Infrastructure and tools: Which instruments, infrastructures and datasets are necessary to develop or strengthen?
- Institutional framework: What common frameworks or formal bodies are needed to institutionalise collaboration in this area?
- Synergies: What concrete synergies can we generate with other initiatives, networks, or stakeholders?
- Stakeholder impact: Who will be affected by this collaboration? Who are the main clients and beneficiaries?
- Indicators of success: Which indicators will allow us to monitor and evaluate whether our collaboration is successful?

The visioning proceeded in two or three rounds, depending on group size. After this session, the visions developed were tested against three scenarios selected collectively ("keep it private", "better safe than sorry" and "nationalism and egocentrism"), which provided the broadest range of future developments. Due to time limitations, it was not possible to discuss all scenarios.

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5.3 Strategic Area 1: Future Risk Modelling and Digital Twins

Vision: A Common Digital Twin of Europe and the World

By 2035, the European Union could operate a Common Digital Twin of Europe and the World as a central capability for anticipatory governance that would enable EU Agencies, Directorates-General, and the Joint Research Centre to jointly anticipate, model, and respond to complex, interconnected risks across health, environment, economy, technology, security, and geopolitics. More than a technological tool, it would serve as the backbone of a multi-agency Foresight ecosystem, supporting near-real-time monitoring, simulation, scenario exploration, and evidence-informed decision-making.

The digital twin would integrate diverse systems into a coherent simulation environment, built on a shared EU data lake, harmonised assumptions and common methodological standards. This setup would allow early detection of emerging threats, exploration of alternative futures, stress-testing of policies and infrastructure, and analysis of cascading effects across sectors, such as climate–energy–food–health interactions. Its value lies in strengthening preparedness, coordination and resilience across the EU institutional landscape.

The proposed architecture combines a jointly governed Core Digital Twin with agency-specific sandboxes. The core contains validated models, interoperable data structures and trusted reference datasets, ensuring coherence and comparability. Agency sandboxes allow organisations to tailor analyses to their mandates, test specialised scenarios and integrate sector-specific data, while feeding innovations back into the shared core. A trusted, multi-source data ecosystem underpins the system, drawing on EU institutions, satellite and remote sensing, research networks, citizen science, environmental monitoring and real-time socio-economic and health indicators. The design is explicitly human-centric: AI enhances analytical capacity but operates under shared EU rules for ethical, transparent and accountable use, preserving trust and institutional responsibility.

Stress-testing against alternative futures highlights key vulnerabilities. Private dominance over data, excessive precaution and prevention of political interference, and rising nationalism could all undermine data flows, modelling integrity, and trust. Across scenarios, the most critical risks concern fragile data governance, erosion of ethics and legitimacy, and breakdown of shared governance between the core system and agency sandboxes. Mitigation requires strong EU-level mandates for data quality and interoperability, transparency and auditability of models, safeguards against manipulation, strengthened Foresight capacity across agencies, and independent ethical oversight. Implemented effectively, the digital twin would position Europe at the forefront of anticipatory, resilient and human-centred governance.

5.4 Strategic area 2: Health equity and demographics

Vision of an equitable, inclusive, and just health system

The vision for health equity and demographics centres on creating an equitable, inclusive and just health system, built through intensive collaboration among EU agencies, Member States and other relevant actors. At its core is a decisive shift toward prevention, with explicit focus on the upstream social, environmental and economic determinants of health that shape well-being long before illness occurs. Addressing inequalities, demographic change, and structural

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vulnerabilities requires moving beyond treatment-focused models toward anticipatory approaches that reduce health risks across the life course and population groups.

This vision emphasises a proactive, forward-looking health system capable of adapting to ageing populations, changing migration patterns, emerging health threats, and increasing pressure on services. Achieving this requires improved data quality and comparability, including international alignment on standards, the development of composite indicators and enhanced mechanisms for data and knowledge sharing. Strengthened cooperation with statistical bodies, such as Eurostat, is seen as critical for building a reliable evidence base. Within this framework, OH is positioned as a core element of collective security, supported by integrated early-warning systems that detect signals of health-system stress, deterioration or inequitable outcomes before crises escalate.

Institutionally, the vision calls for more systematic monitoring and assessment of national health systems, including regular country visits and peer-review processes to identify vulnerabilities early and strengthen preparedness and resilience. Over time, this may necessitate a more harmonised or federalised approach to data collection and reporting across Member States, ensuring transparency, comparability and timely access to information for EU-level analysis and coordination.

Stress-testing this vision against alternative futures highlights both opportunities and risks. In a Better Safe Than Sorry context, there is strong potential to create an inter-agency early-warning system that integrates health, social, and environmental signals across EU agencies, supporting a prevention-oriented healthcare model. An EU Prevention Fund could enable sustained, cross-sectoral investment in preventive measures, complemented by joint ex-ante impact assessments based on interoperable data. However, risks include unclear divisions of responsibility between agencies and the possibility that excessive emphasis on prevention could weaken preparedness and response capacities if resources are shifted upstream in excess.

In a Keep It Private future, strategic cooperation with private actors offers opportunities to leverage expertise and capacity. Still, significant risks arise from restricted data access, funding dependencies and conflicts of interest. A critical wild card is the potential loss of independence in scientific advice due to the growing influence of powerful private individuals. In the context of Nationalism and Egocentrism, opportunities arise for EU agencies to collaborate in defending scientific values and to engage directly with communities to rebuild trust. Yet persistent misinformation, politicisation and fragmented governance pose substantial challenges to sustaining evidence-based, equitable health policies.

Securitisation of health

The above vision brings together several key strategic areas—most notably Health, equity and demographics; security, resilience, climate crisis, and public engagement—and their associated Foresight plans. These strands converge in the emerging concept of the securitisation of health, which describes a shift toward **framing health primarily through security logics rather than as a public good**. When health information is withheld, distorted, or treated as a strategic asset, essential public health functions are weakened. These include equity, accountability, surveillance and preparedness, environmental and climate monitoring, and the effective delivery and coordination of services. From this

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perspective, peace is not an external factor but a fundamental condition for achieving equitable, resilient, and accessible health systems.

Conflict and insecurity undermine public trust and, in turn, the legitimacy and uptake of health policies. While ending wars is the responsibility of governments, the health community has a clear role in documenting harm, protecting the integrity of health systems and data, advocating for the protection of civilians and health infrastructure, and ensuring that conflict is recognised as a significant determinant of health. If these responsibilities are neglected, confidence in institutions erodes, compliance with public health measures declines, and the foundations of effective health governance are weakened (The Lancet, 2025).

In this context, current strategies must directly address the realities of a securitised health environment. This raises key questions: how can public health actors operate effectively when security concerns dominate health decision-making? How can preparedness, quality, and reliability be maintained under conditions of insecurity? And how can public trust be rebuilt or sustained? Foresight can play a central role in responding to these challenges—not only by anticipating risks and system pressures, but also by supporting transparent, participatory, and credible decision-making processes that strengthen trust, reinforce institutional legitimacy, and keep health policy grounded in equity, prevention, and the public interest.

5.5 Strategic area 3: Security, resilience, climate crisis and public engagement

Vision: A Connected and Collaborative Security Ecosystem

This strategic area articulates a vision of a connected and collaborative European security ecosystem, in which EU-ANSA acts as a central facilitator of coordination among EU agencies, Member States and relevant Directorates-General. The vision responds to the growing interdependence of health security, border management, climate impacts, critical infrastructure protection and hybrid threats. Through shared intelligence, interoperable data systems and coordinated Foresight, the network aims to strengthen Europe's capacity to anticipate, prevent and manage complex, cross-sectoral crises.

A core element of the vision is the systematic integration of science-driven Foresight into policy cycles at both EU and national levels. By linking operational agencies with research and innovation communities, EU-ANSA would translate emerging scientific knowledge into actionable policy guidance. This strengthens anticipatory governance by ensuring that preparedness strategies remain adaptive and evidence-based, rather than reactive to crises after they occur.

Early warning and rapid response capabilities form the operational backbone of the ecosystem. The vision foresees a network of interconnected early warning systems coordinated by EU-ANSA and involving a broad range of stakeholders, including civil society, academia, private actors and local authorities. These systems would enable timely detection of risks spanning security, health, climate and critical infrastructure, and support coordinated, proportional responses across borders and sectors.

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Equally important is the emphasis on societal resilience and public trust. Citizens are recognised as active partners in prevention and preparedness, contributing through transparent information sharing, community-based monitoring and participatory Foresight. Effective risk communication and public engagement are seen as essential for maintaining legitimacy and ensuring collective action in times of crisis.

The network is also envisaged as a European platform for capacity building and knowledge sharing, pooling expertise across agencies and DGs. Joint training, shared methodologies and cross-border learning would enhance professional skills, standardise risk assessment and response practices, and improve consistency in crisis management across the Union.

Stress-testing this vision against a Nationalism and Egocentrism scenario reveals significant vulnerabilities. In a fragmented, distrustful Europe marked by weakened science, restricted data sharing and strong nationalist agendas, early warning systems become ineffective, and EU-level coordination is severely constrained. Interoperability breaks down, and the envisioned network risks becoming symbolic rather than operational. Mitigation under such conditions would require technical solutions that reduce dependence on direct data sharing—such as secure data enclaves and federated learning—alongside sustained trust-building measures, including joint simulations, crisis exercises and transparent communication protocols, to preserve at least a minimal level of functional cooperation.

5.6 Strategic area 4: One Health governance structure, data usage and storage

Vision: One Health Governance Structure and Data Health Integration

This strategic area articulates a vision for a stable, well-coordinated governance structure within the EU, capable of operating effectively across sectors, mandates, and institutional boundaries. The central objective is to translate OH from a conceptual framework into an operational governance model by strengthening coordination, capacity building and data integration across EU agencies, national authorities and relevant partners. By addressing persistent fragmentation in data governance and institutional cooperation, the structure would enable more coherent, timely and trustworthy cross-sectoral intelligence.

Interoperable data usage, storage and management support OH objectives and bridge existing data gaps, improve data quality and ensure comparability across Member States and agencies. The governance structure would prioritise joint communication and public awareness, recognising that citizen understanding and trust are essential for the legitimacy and effectiveness of policies. EU-ANSA and the cross-agency task force on OH would also act as advisory bodies to the European Commission, advocating for policies aligned with OH principles and supporting early-warning systems, training programmes and staff exchanges to foster long-term institutional collaboration. Stress-testing the vision against alternative futures reveals both enabling conditions and vulnerabilities. In a *Better Safe Than Sorry* context, existing data-modelling capacities, standard-setting for data verification and strong media engagement could support implementation. Still, concerns about over-surveillance, data quality, energy dependence and the reactive nature of current policies pose significant barriers. In a future of *Nationalism and Egocentrism*, the vision risks collapse due to weakened science, staff shortages, and political fragmentation. However, strengthened cooperation among remaining actors could help preserve scientific values. In a '*Keep It Private*!' scenario,

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private-sector innovation and citizen participation offer opportunities for rapid data collection and technological advancement, but raise serious risks related to data governance, power imbalances, loss of oversight, social inequalities and erosion of trust.

Across all scenarios, the analysis highlights that technology and data availability alone are insufficient. The success of a OH governance structure depends fundamentally on ethical safeguards, transparency, trust and sustained institutional coordination. Without robust governance arrangements, expanded data collection and advanced analytics could deepen inequalities and fragmentation rather than improve health outcomes. The strategic implication is that governance must be built as a shared, human-centred and resilient institutional framework, capable of functioning even under adverse political and societal conditions.

5.7 Conclusion: Insights on strategic areas

The strategic areas identified confirm that multi-agency Foresight under a OH framework is no longer a discretionary coordination exercise but a structural necessity for European governance. The work demonstrates that the complexity of future risks—spanning health, climate, food systems, security, technology and social cohesion—exceeds the capacity of single agencies, sectoral mandates or linear risk-assessment models. Effective anticipation, therefore, depends on shared strategic spaces where agencies can jointly frame uncertainty, align assumptions and test responses across institutional boundaries.

A key concluding insight is that Foresight capacity should be treated as a shared European public good. The visions developed—particularly around digital twins, integrated risk modelling, health equity, and OH governance—highlight, that technological tools only deliver value when embedded in trusted governance arrangements, transparent data practices and sustained human expertise. Without these enabling conditions, modelling can reinforce fragmentation, surveillance concerns or dependency on private actors, rather than strengthening collective preparedness.

The conducted stress testing across contrasting scenarios reinforces that governance fragility, rather than technological failure, represents the primary risk to future collaboration. Across scenarios characterised by privatisation, nationalism or excessive precaution and prevention, common vulnerabilities repeatedly emerge: erosion of data access, weakening of trust in institutions and science, and breakdowns in shared decision-making. These findings underline that Foresight must explicitly address political economy, legitimacy and ethical boundaries.

Even under adverse circumstances, limited but meaningful cooperation remains possible if agencies invest in trust-building mechanisms, interoperable but protected data infrastructures, and shared learning processes. Multi-agency Foresight thus acts both as an anticipatory function and as an institutional glue, preserving coordination capacities. The agencies can continuously revise, adapt and operationalise the strategic areas as conditions evolve. In this sense, Europe's ability to navigate through the challenges by 2035 will depend less on choosing the "right" future and more on sustaining collective Foresight as a core capability of European governance.

Strategic insights from the work on strategic areas

Strategic insights for EU agencies:

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1. **Trust, legitimacy, and ethical robustness constitute critical enabling infrastructures for anticipatory governance.** The most fragile element of advanced analytical systems is not data availability itself, but confidence in how data, models, and outputs are governed and used. Whether threatened by corporate data monopolies, political precautionism, or nationalist manipulation, the predictive value of digital-twin-enabled systems collapses when transparency, auditability, and human-centric safeguards weaken. Ethics, integrity, and oversight must therefore be embedded as core operational requirements rather than treated as external constraints.

2. **Societal trust and resilience should be rebuilt through transparent engagement and joint capability development.** Agencies can promote credibility and cooperation by investing in trust-building mechanisms—such as shared crisis exercises, transparent communication protocols, and participatory Foresight—and by supporting European platforms for continuous capacity building that sustain professional standards despite political or informational fragmentation.

3. **A preventive and anticipatory OH approach should be embedded as a pillar of collective security, but not taken over by the security agenda.** Positioning OH at the core of health governance enables systems to adapt proactively to demographic change, emerging risks, and structural pressures. International alignment on data-quality standards, including shared composite indicators, and strengthened data and knowledge exchange—such as through closer cooperation with Eurostat—are essential to underpin integrated early-warning systems capable of detecting early signals of system stress and deterioration before crises escalate. However, it is crucial to be aware of the risks of health securitisation, framing health primarily through security logics rather than as a public good.

4. **Adaptive data-governance and verification ecosystems are needed to function under divergent political and market conditions.** Investments in interoperable data infrastructures, federated data models, public–private partnerships, and credible verification standards provide pathways to navigate uncertainty arising from mistrust, fragmentation, or privatised data ecosystems. Approaches such as secure data enclaves, city-level sensor governance, and plural health-knowledge frameworks help maintain analytical integrity amid disruption, misinformation, or energy constraints.

5. **An adaptive, jointly governed ecosystem for ethical, interoperable, and transparent modelling should be established.** Aligning ethical AI principles, data-governance standards, and model transparency through shared sandboxes, federated experimentation environments, and interoperable simulation architectures enables agencies to test approaches collectively while accommodating sector-specific needs within a coherent system.

Strategic insight for cross-agency collaboration:

1. **A shared conceptual foundation for equitable, inclusive, and just health systems should anchor long-term collaboration.** Joint clarification of these concepts across agencies, DGs, professionals, and civil society provides a stable reference point for Foresight activities, supports alignment around long-term

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outcomes (e.g. 2035 horizons), and reduces fragmentation across institutional perspectives.

2. **An interoperable, anticipatory security and resilience architecture is required for effective collective crisis management.** EU agencies can enhance preparedness by deepening data interoperability, strengthening shared Foresight processes, and supporting flexible early-warning arrangements that remain functional in politically fragmented contexts, including federated national nodes and secure data-sharing models.

3. **The Digital Twin primarily functions as an institutional integration and co-governance instrument, not merely as a technological system.** A Common Digital Twin can fundamentally redefine how EU agencies interact by shifting collaboration from episodic coordination to continuous, model-based co-governance. Its core value lies not only in predictive analytics but in enforcing convergence on shared assumptions, data standards, and risk framings across agencies with distinct mandates. The principal implementation challenge is therefore epistemic and institutional alignment—agreeing on valid evidence, acceptable uncertainty, and legitimate Foresight outputs—rather than computational capacity.

4. **A prevention-oriented OH ecosystem should be strengthened through coordinated data, early warning, and equity-focused action.** Agencies can advance anticipatory health governance by aligning data-quality standards, enhancing early-warning capabilities, and placing greater emphasis on social and environmental determinants of health to support an equitable, prevention-focused system.

5. **Resilience must be cultivated through trust-building, societal engagement, and scenario-informed safeguards for equity and scientific independence.** Expanding citizen engagement, transparent communication, and collaboration with media strengthens public trust, while preparation for wild cards—such as resistance to tracking, cyberattacks, energy loss, or biosecurity incidents—is essential. Coordinated cross-agency voices are particularly critical in nationalist or privatised futures to protect scientific independence, reduce information asymmetries, and address emerging inequalities.

6. **Trustworthy, inclusive, and resilient governance across public and private actors is essential for sustained analytical credibility.** Strategic cooperation with private organisations, cross-agency alliances, and community-level engagement can reinforce scientific integrity and societal trust, while proactively managing risks related to data access, conflicts of interest, and politicisation.

7. **EU-ANSA should be consolidated as a flexible hub for cooperation on prevention, data governance, and joint operational readiness.** Agencies can deepen collaboration through shared training, staff exchanges, coordinated early-warning arrangements, and joint communication efforts, while establishing structured engagement with relevant private and civil-society actors. Targeted cross-agency and public–private cooperation in areas such as medicinal products, narcotics supply chains, and data-gap identification can reinforce a stable,

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prevention-oriented architecture while preserving public oversight and accountability.

8. **Early demonstrators and shared use cases are essential to anchor multi-agency collaboration.** Identifying common priorities and developing simple cross-agency demonstrators—such as shared horizon scanning or integrated risk dashboards—helps make the added value of joint digital-twin-enabled Foresight visible and establishes a unifying purpose across diverse institutional cultures.

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6 Proposals for multi-agency Foresight

The Lisbon workshop participants worked within the strategic areas, developing initial ideas for possible multi-agency Foresight projects. Each group had a facilitator who guided the group in designing a Foresight project by addressing some guiding questions typically used when designing Foresight exercises:

Guiding questions for Foresight planning:

- **Context, thematic scope and time frame:** What issues to explore in a Foresight exercise and why? How far into the future to look and why?
- **Objectives:** What to achieve with the exercise? What are the general and more specific objectives?
- **Key actors:** Which agencies to take leading roles, which to participate, and why (tools and competences)? What DGs and other clients/end-users to consider and why? What other stakeholders to engage and why?
- **Methods and implementation:** What kind of activities (methods) are needed? How to focus the efforts and why? For instance, between emerging issues (scanning), sense-making of how the issues could interact (scenarios), normative reflections (roadmapping, priority-setting, recommendations). What could be a reasonable sequence of activities (implementation of methods)? When and how to engage participants? How many months could the project last? What new or improved tools and competences are needed?
- **Outcomes (monitoring and evaluation):** What kind of short, medium and long-term outcomes to expect? How to monitor the progress and evaluate outcomes to measure if the objectives are met?

6.1 Proposal 1: Foresight on 'Future Risk Modelling & Digital Twins'

Building on the 2035 vision for a shared EU-wide digital twin for anticipatory governance, this Foresight plan sets out a structured approach to explore feasibility, co-design the system, and prepare EU agencies and Directorates-General for its implementation and long-term use. The plan supports the EU-ANSA Futures Cluster and its home DGs in understanding the strategic value, institutional implications and operational requirements of a cross-sector, real-time and human-centric digital twin capable of modelling complex risks and enabling proactive decision-making.

The Foresight horizon extends to 2035, when the digital twin is expected to be fully operational, with an outlook to 2040. By this time, agencies should have accumulated sufficient experience to demonstrate its added value across regulatory, policy and operational domains. The plan is designed to move from vision to action by progressively aligning mandates, governance, technology and capacity building.

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The plan pursues four core objectives. First, it aims to clarify the added value of a joint digital twin for EU agencies by demonstrating how it can improve preparedness, harmonise methodologies, enable earlier detection of emerging risks and support cross-sectoral Foresight. Second, it seeks to define agency needs, priority use cases and a Minimum Viable Product (MVP), combining quick-win demonstrators—such as cross-agency horizon scanning and integrated risk dashboards—with more systemic use cases, including early warning, food–energy–climate stress testing and cross-border supply chain disruption modelling. Third, it establishes the foundations for shared governance and co-development, covering joint ownership, data governance, ethical AI principles, transparent assumptions and coordinated development through common and agency-specific sandboxes. Finally, it prepares a realistic roadmap to 2035, detailing technical, institutional, financial and capability-building requirements.

The EU-ANSA Futures Cluster acts as lead coordinator, ensuring methodological coherence and alignment with EU strategic Foresight priorities. All EU agencies and relevant DGs contribute domain expertise, data models and organisational perspectives. At the same time, external European research centres and digital technology partners support system design, AI-enabled modelling, and technological Foresight.

The project is implemented over approximately 24 months through four phases. Phase 1 focuses on the mandate, alignment, and governance design, delivering an agreed vision, governance structure, and shared ethical and data principles. Phase 2 consolidates the 2035 vision and priority use cases through participatory workshops and case studies, producing a design brief for the MVP. Phase 3 co-designs the MVP and complete system architecture, including sandbox environments, interoperable simulations and early-warning dashboards. Phase 4 delivers a 2035 implementation roadmap that integrates technical development, institutional reforms, financing, training, and cross-agency exchange.

The Foresight plan will deliver a widely endorsed 2035 roadmap, MVP and system designs, and a stable governance model for long-term co-development. It will also strengthen cross-agency Foresight capacity, build shared understanding of the digital twin's added value, and lay the foundations for earlier warning, more coordinated crisis responses and anticipatory, evidence-based governance across the European Union.

6.2 Proposal 2: Foresight on 'Equitable, inclusive and just health systems in 2035'

This Foresight proposal aims to co-create a shared vision for equitable, inclusive and just health systems by 2035, grounded in broad stakeholder engagement and long-term institutional commitment. The overarching objective is not only to define desirable futures but to ensure that stakeholders across the health ecosystem feel genuine ownership of the process and its outcomes. By actively involving diverse voices, the project seeks to build legitimacy, trust and shared responsibility for shaping future health systems.

A critical first step is to clarify and operationalise the concepts of equity, inclusion and justice in healthcare. These principles are often invoked but interpreted differently across actors, sectors and cultural contexts. The Foresight process, therefore, focuses on unpacking these concepts, developing a shared understanding among EU agencies and stakeholders, and translating them into practical, measurable dimensions of health-system performance. From

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this common foundation, the project identifies concrete steps and enabling conditions required to move toward equitable, inclusive and just systems by 2035.

The project engages a broad and diverse stakeholder landscape, including patient organisations, health professionals, NGOs representing vulnerable groups, youth organisations, charities, philanthropic bodies, national health ministries, relevant European Commission DGs (SANTE, HOME, JUST, EMPL), and scientific experts from multiple disciplines, including social sciences and humanities. This diversity ensures that the Foresight reflects lived experiences, professional expertise and policy realities, rather than a narrow institutional perspective.

The Foresight process is designed as a five-year effort, with two years dedicated to vision building—identifying key drivers, tensions and desired outcomes—and three years focused on operationalisation. Methodologically, the project combines vision development, backcasting from 2035, iterative revision of the vision based on stakeholder feedback and external developments, and roadmapping to define implementation pathways. Both backcasting and forecasting are used to ensure coherence between long-term ambitions and near-term action. A framework for monitoring progress and measuring outcomes is integral to the proposal. Clear indicators will be developed to track advances toward equity, inclusion and justice over time. Success will be assessed primarily through the effective mobilisation of stakeholders, the breadth and diversity of participation, and the sustained engagement of EU agencies and partners throughout the process, ensuring continuity from vision to implementation.

6.3 Proposal 3: Foresight on 'One Health governance system & data integration'

This Foresight proposal focuses on establishing a robust governance system alongside effective data integration and storage mechanisms that enable EU agencies to act coherently across sectors. The project is explicitly aligned with the ongoing work of the Cross-Agency One Health Task Force (EMA, ECDC, EFSA, EEA and ECHA), reinforcing and extending current joint actions rather than duplicating them. The convergence of ideas from both task force members and external participants confirms the strategic direction of existing OH collaboration.

The project is structured in two interlinked parts. Part I concentrates on building the governance framework. It begins with five core agencies and progressively expands through stakeholder mapping to include other EU agencies and relevant actors. The primary objectives are to integrate OH principles into EU public strategies, strengthen internal and external communication and awareness, and create durable bridges between themes, actors, policies and data. This is conceived as a permanent collaborative task requiring long-term commitment and a shift in mindset toward shared ownership of data and synergies across agencies.

Key actors include the core group of five agencies, with interest from EUDA and Frontex, supported by nominated representatives and Foresight experts. Methods centre on participatory workshops, roadmap development and mandatory OH training, with agencies jointly developing and overseeing learning materials. A baseline survey of the population, building on existing surveys, provides an evidence base for monitoring progress.

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A flagship outcome of Part I is an international OH governance conference held after one year. The event serves as a baseline milestone, a platform for nominating responsible agency representatives, and a mechanism to broaden the network through an open call that includes researchers and companies. Following this launch phase, the initiative transitions into a permanent effort, requiring a formal European Commission mandate, regular audits, periodic survey updates, and a comprehensive evaluation after 10 years.

Part II addresses data integration and bridging between data storage systems. Here, agencies act as brokers and coordinators, mapping data streams across organisations, testing interoperability, usability and sharing arrangements, and integrating efforts with existing EU data networks, such as the Data Analysis and RealWorld Interrogation Network (DARWIN EU®) of EMA (EMA, 2026). Proofs of concept are needed to demonstrate value and cost–benefit. This part requires strong coordination, joint capacity building and targeted training. Across both parts, a shared communication and awareness strategy is essential to engage citizens and build legitimacy for data integration and governance.

6.4 Proposal 4: Foresight on 'Melting of the Arctic and its implications for One Health'

This Foresight proposal examines the OH implications of Arctic ice melting by 2035, using the Arctic as a strategic case study to explore the intersection of climate change, security, technology and societal well-being. The melting Arctic is framed not only as an environmental phenomenon but also as a catalyst for profound changes in energy systems, trade routes, military dynamics, technological competition, and public health. The proposal links OH to security—understood in military, energy and cognitive terms—and to broader societal impacts such as mental health, drug use and trust in institutions.

The thematic scope integrates several cross-cutting Foresight domains. These include strategic autonomy for critical raw materials, security of strategic infrastructure and key enabling technologies, future energy systems, and disruptive technological developments (e.g., quantum computing and the economy). Additional Foresight themes cover future transport routes, the effects of climate change on border and internal security, and the implications of emerging technologies such as quantum computing for the synthesis of new drugs. Together, these dimensions illustrate how Arctic change can trigger cascading risks across health, security and technological systems (for instance, making the Arctic more accessible for research on Cryogenic Technologies for Innovative Computing).

The objectives of the project are fourfold. First, it seeks to explore the consequences of a Europe increasingly focused on security under climate, social and geopolitical pressures, using Arctic ice melt as an integrative scenario. Second, it aims to strengthen communication routines and collaboration mechanisms at the interface of OH, security and technology, including support to the existing OH task force on concrete issues such as pesticide-contaminated cannabis and associated health risks. Third, the project will develop shared scenarios and rapid-assessment procedures to inform policy options and crisis response. Fourth, it aims to embed forward-looking practices more systematically into agency work, including the formulation of Horizon Europe research proposals and the normalisation of Foresight as a core project component rather than a standalone activity.

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Key actors include EU agencies and joint platforms such as EU-ANSA, external experts, the Arctic Council, national authorities, affected communities—particularly indigenous populations—and citizens contributing perspectives on future scenarios. Non-human actors and ecosystems are also explicitly considered through the collection of weak signals related to nature and animal health.

Methodologically, the proposal combines horizon scanning, weak-signal analysis, real-time Delphi processes, bibliometric and patent analysis, technology roadmapping and backcasting, complemented by participatory tools such as future wheels and inclusive stakeholder workshops. A central deliverable is the development of a technology Foresight tool "on demand", enabling EU agencies to conduct security-related Foresight based on emerging signals rapidly.

Expected outcomes include actionable insights for research and innovation programmes, improved preparedness and capacity-building, prioritisation matrices, and capability mapping across the EU system. Impact will be measured through uptake in work programmes and strategic documents, stakeholder participation, feedback rates and the generation of new policy proposals. Dissemination will leverage OH and security communities, public events, EU publication channels and international organisations to ensure broad visibility and policy relevance.

6.5 Conclusion: Insights on multi-agency Foresight proposals

The proposals developed across the portfolio demonstrate that the central challenge for multi-agency Foresight is less about methodological capability and more about **strategic orchestration under conditions of uncertainty and institutional diversity**. The agencies are already capable of running sophisticated exploratory exercises (horizon scanning, scenarios, stress testing), but the impact depends on how these activities are sequenced, connected, and sustained over time. Foresight, therefore, needs to be treated as a **strategic infrastructure** rather than a collection of projects: one that enables agencies to jointly interpret signals, align assumptions, and test options without requiring full convergence of mandates or priorities.

Finally, the proposals collectively underline that **governance, data integration and capability building are not auxiliary activities but enabling conditions** for any credible long-term Foresight effort. Whether addressing digital twins, equitable health systems, OH governance or Arctic-related risks, the portfolio consistently points to the need for shared rules, ethical frameworks, interoperable data pathways and sustained learning mechanisms. The final implication is therefore institutional rather than technical: Europe's ability to anticipate and shape complex futures will depend less on choosing the "right" scenarios or technologies, and more on sustaining a multi-agency Foresight portfolio that is adaptive, co-owned and embedded in everyday governance practice.

Strategic insights from Foresight proposals

For EU agencies:

1. **Mobilise diverse stakeholders as co-creators of visions and pathways.** Involving patient and consumer groups, youth organisations, vulnerable

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communities, scientific experts, national authorities, and other stakeholders as co-designers—rather than consultees—deepens ownership and enriches Foresight inputs. Co-creation of visions, backcasting steps, and roadmaps ensures strategies reflect real-world needs and remain robust across governance levels.

2. **Use engagement platforms to catalyse collective ownership, learning, and continuity.** International OH conferences, events, open calls, and regular audits expand the Foresight community, attract researchers and companies, and sustain momentum. Embedding communication and awareness-raising across governance and data-integration work supports citizen understanding and the transition from initial collaboration to a durable ecosystem.

3. **Align Foresight outputs with policy processes, research programmes, and organisational learning cycles.** Feeding insights into Framework Programmes, agency work plans, and preparedness strategies institutionalises Foresight as a systemic practice rather than a standalone activity. Clear dissemination pathways, capability maps, outcome indicators, and engagement with agency leadership support continuous learning, wider uptake, and measurable impact.

4. **Scientific Foresight must be translated into adaptive and operational policy pathways.** Sustained links between agencies and research and innovation communities enable emerging scientific insights to inform preparedness through co-developed guidance, co-learning for risk analysis, and maintenance of evidence coherence across diverse national environments, even under governance stress.

5. **Develop interoperable data-integration pathways through collaborative experimentation and proof-of-concept work.** Joint mapping of data streams, usability testing in cross-agency working groups, and links to existing EU data networks (e.g. DARWIN EU®) provide a practical foundation for integrated data governance. Prototypes and proofs of concept serve as concrete anchors for learning, cost–benefit reflection, and subsequent scaling.

For cross-agency collaboration:

1. **Co-develop a shared conceptual foundation to anchor long-term collaboration.** Multi-agency Foresight benefits from a jointly crafted understanding of what equitable, inclusive, and just health systems entail. Collaborative clarification of these concepts across agencies, DGs, professionals, and civil society creates a stable reference point for Foresight activities, enables alignment around long-term (e.g. 2035) outcomes, and reduces fragmentation across institutional perspectives.

2. **Sustained investment in cross-agency Foresight collaboration is required to maintain effectiveness over time.** Capacity building, joint training, staff exchange, and methodological harmonisation—supported by the EU-ANSA Futures Cluster as a convening hub—ensure continuity, deepen trust, and enable rapid collective response in a fast-evolving socio-geopolitical context, while keeping collaboration resilient as technologies and institutional requirements evolve.

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3. **Shared Foresight capacity becomes a strategic infrastructure asset for EU resilience and autonomy.** Embedding Foresight directly into operational systems—such as digital-twin-enabled environments—supports a shift from reactive risk management to anticipatory, scenario-driven governance. Investment in shared horizon scanning, stress-testing, and interpretation capacities improves preparedness and reduces dependence on external, often non-EU analytical ecosystems.

4. **Establish a forward-looking learning ecosystem that supports continuous reflection, adaptation, and progress tracking.** Monitoring frameworks with clear indicators, iterative vision revision, and structured mechanisms for ongoing stakeholder engagement—combining backcasting with forward-looking assessment—enable agencies to maintain strategic coherence, integrate new insights, and demonstrate sustained participation over multi-year collaboration cycles.

5. **Build an adaptive, jointly governed ecosystem for ethical, interoperable, and transparent modelling.** Aligning ethical AI principles, data governance standards, and transparent model assumptions across agencies through shared sandboxes, federated experimentation environments, and interoperable simulation architectures enables collective testing, comparison, and progressive shaping of a digital twin system that accommodates sector-specific needs while maintaining coherence.

6. **Co-create shared value and early demonstrators to anchor collaboration.** Multi-agency collaboration gains traction when the added value of joint analytical systems becomes visible early. Identifying everyday use cases and developing simple cross-agency demonstrators—such as shared horizon scanning or integrated risk dashboards—clarifies contributions to preparedness, early warning, and cross-border stress testing.

7. **Develop agile, co-owned Foresight infrastructures that integrate weak signals, technology insights, and stakeholder perspectives.** Shared Foresight tools, drawing on horizon scanning, weak-signal analysis, patent mapping, Delphi processes, and participatory workshops, provide agencies with on-demand capabilities to anticipate disruptive developments, including new synthetic drugs, transport transformations, and quantum-enabled threats. Inclusion of external experts, Arctic communities, and non-human environmental signals enriches the evidence base and strengthens trust.

8. **Embed forward-looking collaboration across security, climate, and OH interfaces.** Joint exploration of issues such as Arctic melting and its implications for energy security, military dynamics, mental health, drug risks, and institutional trust supports shared scenarios, rapid-assessment routines, and cross-sector task forces, creating a common operational language linking OH concerns to broader geopolitical and technological shifts.

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7 Toward multi-agency Foresight mechanism: Adaptive modular Foresight

7.1 Starting point: a heterogeneous but maturing Foresight landscape

The EU-ANSA Foresight mapping report (EU-ANSA, 2025) confirms that Foresight capacity across EU agencies has significantly matured over the period 2019–2024, with agencies now engaging in Foresight activities and many extending their time horizons to 10–20 years. At the same time, the mapping highlights persistent heterogeneity in mandates, resources, organisational models, methodological depth, and integration into core processes.

The mapping report shows that a lack of relevance or motivation does not constrain Foresight in EU agencies, but rather the structural conditions: uneven staffing, different degrees of institutionalisation, and limited capacity to sustain extensive, integrated Foresight exercises over time. It also shows that Foresight is organised in multiple ways: specialised units, transversal working groups, informal champions, or discretionary unit-level initiatives.

In this context, multi-agency Foresight cannot be built solely around single, comprehensive exercises. It requires a design logic that explicitly accommodates diversity while enabling cumulative value creation across the network.

7.2 Modularity as a response to heterogeneous Foresight practices

EU agencies increasingly operate in an environment characterised by systemic risk, cross-sectoral interdependencies and fast-moving political, technological and societal change. OH, climate–security nexuses, digitalisation, demographic transitions and geopolitical volatility generate uncertainty that cannot be addressed through pre-fixed analytical exercises. In this context, Foresight must function not only as an analytical activity but as an adaptive governance capability.

Building on the responsive and adaptive implementation of this project, multi-agency Foresight work could benefit from an adaptive modular Foresight approach that offers a way to reconcile two persistent tensions faced by EU agencies: the need for stability, comparability and accountability on the one hand, and the need for flexibility, responsiveness and contextual adaptation on the other. Rather than treating Foresight exercises as a stand-alone monolithic project with fixed scope and outputs, a modular approach decomposes Foresight into interoperable building blocks (modules) that can be recombined, scaled, paused or intensified depending on institutional needs and external developments. For instance, in implementing this project, several steps were taken to adapt the work based on decisions on scope, participation, project governance, methods used, and outputs needed. The proposal to apply the adaptive modular Foresight approach is also partly based on experience with Foresight portfolio management in a large contract research organisation (Könnölä et al. 2009).

Adaptive modular Foresight allows Foresight to be structured as interoperable modules that can be hosted, led and resourced differently across agencies. This modularity aligns with the mapping's finding that collaboration is already widespread but uneven. Modular Foresight lowers the transaction costs of collaboration by making participation selective, time-bounded and purpose-specific, rather than all-or-nothing. A coordinated portfolio of Foresight modules may constitute an approach adaptable to the needs of the agencies. While the modules may

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be administered as projects and budgeted under one or two leading agencies, in practice their value is perceived in relation to other complementary modules in the multi-agency Foresight portfolio.

Foresight module

In a multi-agency Foresight setting, a Foresight module is a bounded, purpose-specific, and interoperable unit of Foresight work that contributes to collective anticipatory capacity without requiring full integration of mandates, resources, or decision processes across participating agencies.

A module is designed to be self-contained yet connectable. It delivers a clearly defined function within a broader Foresight portfolio, **either exploratory modules** — such as joint horizon scanning or scenario exploration—creating safe spaces for divergence, uncertainty and methodological experimentation, **or convergent modules**—such as shared roadmaps, policy-relevant syntheses or inputs to Commission processes—that are activated only when there is sufficient maturity and mandate.

The following attributes define a Foresight module:

Clear purpose and function: Each module serves a specific Foresight function, such as horizon scanning, scenario exploration, governance design, backcasting, roadmapping, or methodological experimentation. It is explicit whether the module is exploratory, preparatory or decision-proximate.

Defined scope and time horizon: Modules are scoped around a thematic domain, policy question, or governance challenge, with an explicit time horizon (e.g. short-term preparedness, long-term strategic orientation to 2035–2040).

Flexible participation and leadership: Participation is voluntary and asymmetric. One or more agencies may lead a module, while others contribute data, expertise, validation, or stakeholder access. Not all EU-ANSA members are expected to participate in every module.

Methodological coherence: Each module uses a defined set of Foresight methods appropriate to its function (e.g. participatory workshops, Delphi, scenario building, modelling, futures dialogues).

Explicit outputs and interfaces: A module produces identifiable outputs (e.g. signals database, scenario set, policy options, roadmap, guidance note) and defines how these outputs can feed into other modules, agency processes, or Commission Foresight activities.

Temporal autonomy and reusability: Modules can be launched, paused, repeated, or updated independently. Their design, outputs and learning may be reused in future Foresight cycles, reducing transaction costs and strengthening institutional memory.

Governance lightness and mandate compatibility: Modules adapt to existing mandates, not conditioning engagement with binding commitments of all participating

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agencies at the outset. They are designed to support coordination and learning rather than decision-making authority.

7.3 Modularity as a coordination logic for multi-agency Foresight

In a multi-agency setting, modular Foresight should be understood less as a methodological choice and more as a coordination logic. This design has four critical advantages for multi-agency Foresight.

- **First, it lowers the threshold for participation**. Agencies can engage in modules that are directly relevant to their mandate or capacity, without being obliged to commit to an entire Foresight cycle. This is particularly important in EU contexts where agencies operate under different legal constraints or resource limitations.
- **Second, modularity enables asymmetric leadership and participation.** Certain agencies or clusters (for example, those already engaged in OH task forces or data networks) can lead specific modules. In contrast, others contribute expertise, validation or data at defined points. Leadership thus becomes distributed rather than centralised, reducing coordination fatigue while preserving coherence.
- **Third, modular Foresight supports temporal decoupling.** Some modules operate on long time horizons (strategic planning), while others are shorter, iterative or reactive (e.g. stress-testing against emerging crises). This allows Foresight to align with heterogeneous planning cycles across agencies and Directorates-General.
- **Fourth, modularity allows Foresight to remain adaptive under political uncertainty.** If external conditions change—shifts in political priorities, crises, or institutional reforms—individual modules can be adjusted, paused or replaced without collapsing the entire multi-agency Foresight effort.

7.4 EU-ANSA's role: from facilitator of exchange to curator of Foresight portfolios

Within the EU institutional landscape, EU-ANSA (Futures cluster) plays a distinct role as a coordination and sense-making platform rather than as a hierarchical decision-making body. Adaptive modular Foresight design aligns with this role by providing EU-ANSA with a governance-compatible mechanism to support multi-agency collaboration without encroaching on agency mandates or Directorate-General (DG) responsibilities.

EU-ANSA enables a **distributed Foresight infrastructure and architecture** in which agencies contribute according to their legal competences, operational capacities and strategic priorities. Modularity allows Foresight to function as a shared service and coordination infrastructure, supporting EU-level anticipatory governance while respecting institutional autonomy.

The mapping clearly positions the EU-ANSA Futures Cluster as a trusted space for exchange, mutual learning and coordination. However, it also highlights a recurring challenge: Foresight activities are often planned independently by agencies, making it difficult to align timing,

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topics, and outputs with EU-level priorities and the Commission's strategic Foresight processes.

Adaptive modular Foresight reframes EU-ANSA's role from facilitator of individual exercises to curator of a shared Foresight portfolio. This does not imply centralisation of Foresight, but structured coordination across modules. In practice, it ? means:

- **identifying cross-cutting themes** of shared interest early (e.g. OH, digitalisation, security, equity) as well as **synergies and gaps** between thematic Foresight activities
- **supporting the sequencing of modules in the portfolio** across agencies
- **facilitating multi-agency engagement** in Foresight modules in their planning, implementation and evaluation, as well as in methodological alignment and shared learning
- **maintaining visibility over ongoing and planned Foresight modules** to reduce duplication and increase complementarity, as well as for maintaining institutional memory across Foresight cycles.

Portfolio governance enables EU-ANSA to support continuity over time, even as individual modules start and end at different moments, involve different participants, or respond to emerging policy demands. This role is crucial given the diversity of agency planning cycles and the varying proximity of Foresight work to regulatory or operational decisions.

Adaptive modular Foresight turns collaboration itself into a capacity-building mechanism. By co-implementing modules, agencies learn methods by doing, rather than relying solely on training. Joint modules allow agencies with less experience to build competence incrementally, while contributing domain expertise.

Adaptive modular Foresight supports a shift from episodic collaboration to standing anticipatory capability at the EU-ANSA level. Reusable modules, shared data and scenario frameworks, and recurring joint activities (e.g. periodic horizon scanning pilots) create continuity even when individual agencies face staffing or budget fluctuations.

Adaptive modular Foresight design enables the progressive construction of a **shared, accumulative Foresight knowledge base**, particularly for horizon scanning, by decoupling signal collection from individual projects and anchoring it in reusable, interoperable modules. The joint scanning pilot in this project provides a promising example. When horizon scanning is implemented as a standing exploratory activity (rather than a time-bound activity tied to a single exercise), signals, trends, assumptions, and early interpretations can be continuously captured, tagged, and curated across agencies. The portfolio of horizon scanning modules implemented by the agencies contributes at varying intensities and rhythms, while ensuring that outputs follow common metadata, taxonomy and quality standards. Over time, this transforms horizon scanning from a series of disconnected scans into a **living, shared evidence layer** that can be reused, reinterpreted and stress-tested across multiple Foresight themes and policy cycles.

Crucially, modularity supports **learning and accumulation rather than reset cycles**. Because modules are designed to be iterative and updateable, new signals can be linked to earlier observations, scenario assumptions, and past decisions, creating traceability and

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institutional memory that individual agencies could not sustain on their own. This cumulative database strengthens collective sense-making, reduces duplication of scanning efforts, and improves the consistency of cross-agency Foresight inputs to scenarios, roadmaps and preparedness planning.

7.5 Conclusion: Strategic insights on adaptive modular Foresight

EU agencies are ready for deeper Foresight collaboration, but require designs that reflect heterogeneous capacities, constrained resources and diverse mandates. Adaptive modular Foresight offers EU-ANSA a governance-compatible way to scale the cooperation, align Foresight with EU priorities, and progressively build shared anticipatory capacity—without imposing uniformity or overburdening agencies. In doing so, Foresight becomes not only a method, but a shared institutional infrastructure for multi-agency preparedness and strategic coherence.

The analysis of the portfolio confirms that the primary challenge for multi-agency Foresight is no longer methodological experimentation, but the **strategic organisation and sustainability of anticipatory work across heterogeneous institutions**. An adaptive modular portfolio provides a structurally realistic way to scale collaboration: it allows agencies to engage selectively, preserves exploratory spaces for uncertainty and divergence, and creates clear interfaces where Foresight insights can be translated into shared orientations, roadmaps and implementation pathways without overstepping mandates.

At the same time, the portfolio logic underscores that **Foresight effectiveness hinges on governance and capacity, not only analysis**. Running modules in parallel within the EU-ANSA portfolio curation shortens learning cycles and strengthens operational relevance. The concluding implication is institutional: Europe's ability to navigate complex futures will depend less on any single Foresight exercise, and more on sustaining an adaptive, co-owned multi-agency Foresight portfolio as part of everyday governance practice.

Strategic insights on adaptive modular Foresight in and between EU agencies

1. **Institutionalise Foresight as a portfolio of interoperable modules.** The agencies differ widely in mandates, resources, Foresight maturity and organisational set-up, making single, comprehensive multi-agency Foresight exercises structurally unsustainable. An actionable step is therefore to formally adopt a portfolio logic, where EU-ANSA curates a rolling set of exploratory and convergent modules that agencies can join selectively. This allows cumulative value creation over time while reducing coordination fatigue, duplication and the risk of "all-or-nothing" participation.
2. **Separate exploratory and convergent Foresight functions.** Horizon scanning and scenario work should be protected as open, plural and iterative modules, while roadmapping, backcasting and prioritisation should be activated only when sufficient maturity and mandate clarity are in place.
3. **Use parallel module implementation to accelerate learning and reduce time-to-impact.** Run modules in parallel where feasible. This parallelism shortens feedback loops and makes Foresight more operationally credible.

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4. **Position EU-ANSA as a portfolio curator and capability broker.** Actively curate the Foresight portfolio: mapping ongoing and planned modules, identifying synergies and gaps, supporting sequencing across agencies, and maintaining institutional memory. This role strengthens coherence without centralising authority and aligns Foresight outputs more effectively with DG planning and Commission strategic Foresight processes.

5. **Treat collaboration itself as a structured capacity-building mechanism.** The EU-ANSA should design joint modules explicitly as learning-by-doing environments, where agencies with stronger capabilities lead modules and others build competence through participation. This turns the Foresight portfolio into a sustained capability-building infrastructure, increasing methodological depth, internal legitimacy and long-term resilience of multi-agency Foresight.

6. **Use modular design to institutionalise a shared Foresight knowledge base.** By implementing horizon scanning as a standing, reusable Foresight module—rather than as a project-specific activity—EU agencies can progressively build a shared, accumulative database of Foresight knowledge. Making this shared Foresight and especially horizon-scanning practice a curated portfolio asset under EU-ANSA governance reduces duplication, strengthens institutional memory, and provides a continuously updated anticipatory baseline that improves the coherence and impact of multi-agency Foresight.

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8 Final Conclusions and Recommendations

The convergence of health, environmental, social, security, and technological risks—intensified by climate change, geopolitical instability, digitalisation, and rising inequalities—cannot be effectively anticipated or managed through sectoral or agency-specific approaches alone. This Foresight process confirms that shared horizon scanning, scenario exploration, and strategic sense-making enable EU agencies to understand better systemic interactions, cascading risks, and long-term trade-offs that are otherwise invisible in mandate-bound analyses. In general, the project has served as a pilot for developing future multi-agency Foresight practices within the EU-ANSA framework.

A central insight across the scenario work, strategic areas, and Foresight concepts is that the main bottlenecks are institutional (e.g. fragmented data governance, mandate misalignment) rather than methodological. While agencies increasingly possess advanced tools, data streams, and modelling capabilities, their impact depends on trust, clear governance, data interoperability, and the ability to translate exploratory insights into coordinated action. The scenarios highlight, that futures characterised by fragmented governance, the privatisation of data, or declining trust consistently lead to weaker preparedness, greater inequalities, and reduced resilience—regardless of technological sophistication and integration. Conversely, futures with strong coordination, transparent governance, and inclusive engagement enable prevention-oriented, equitable and adaptive responses.

The report therefore points to a clear strategic direction: multi-agency Foresight must evolve from episodic exercises into a sustained, modular, multi-agency capability embedded in everyday governance. Adaptive modular Foresight provides a structurally realistic pathway to achieve this, allowing agencies to collaborate flexibly, accumulate shared knowledge over time, and align exploratory and convergent work without overstepping mandates. For the EU-ANSA Futures Cluster, the challenge ahead is to institutionalise Foresight as a shared infrastructure that continuously strengthens Europe's preparedness, resilience, and strategic coherence.

To conclude the report, the following 12 cross-cutting recommendations are considered:

1. Adopt a portfolio approach to Foresight

EU-ANSA should formally manage multi-agency Foresight as a portfolio of coordinated, interoperable activities, rather than as a sequence of stand-alone, full-fledged projects. The report shows that agencies differ significantly in mandates, resources, and planning cycles, making comprehensive, one-off Foresight exercises difficult to sustain. A portfolio approach enables continuity over time, allows selective participation, and supports cumulative learning, while remaining compatible with institutional constraints. It also makes it easier to align Foresight investments with strategic priorities and emerging risks.

2. Build joint Foresight infrastructure: Institutionalise a shared horizon-scanning module

Sharing resources, capacities and capabilities is crucial for building a joint Foresight infrastructure among the agencies, which provides the basis for modular Foresight work. To start with, joint horizon scanning should be established as a standing, shared Foresight module under EU-ANSA coordination. The rationale is twofold: first, horizon scanning is

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resource-intensive and currently duplicated across agencies; second, its value increases significantly when signals are accumulated, revisited, and reinterpreted over time. A shared module with common taxonomies, metadata standards, and quality criteria would enable agencies to contribute according to capacity while progressively building a living, shared knowledge base that feeds scenario work, preparedness, and strategic planning. The pilot multi-agency horizon scanning conducted in this project provides some lessons learned in this regard.

3. Explicitly separate exploratory and convergent Foresight functions

Foresight loses effectiveness when exploratory and decision-oriented objectives are mixed prematurely. EU-ANSA should therefore explicitly distinguish between exploratory modules (e.g., scanning, scenario exploration) and convergent modules (e.g., road- mapping, prioritisation). This separation protects analytical openness and diversity of perspectives while ensuring that convergence occurs only when there is sufficient maturity, mandate clarity, and policy demand. Clear handover points between these functions improve both analytical quality and policy relevance.

4. Run Foresight modules in parallel where feasible

To reduce delays and increase operational relevance, EU-ANSA should encourage parallel implementation of Foresight modules rather than strictly sequential processes. The report shows that governance design, data integration, and capacity building can productively evolve alongside exploratory work. Parallelism shortens feedback loops, enables early testing of assumptions, and prevents momentum loss between analysis and action. This approach is particularly important for fast-moving risks such as emerging pathogens, climate impacts, or security-related threats.

5. Strengthen EU-ANSA's role as Foresight portfolio curator

EU-ANSA should evolve from a facilitator of exchange into an active curator of the multi-agency Foresight portfolio. This role includes mapping ongoing and planned Foresight activities, identifying synergies and gaps, supporting sequencing across agencies, and preserving institutional memory. The rationale is that Foresight activities are currently fragmented and unevenly timed, reducing their collective impact. Portfolio curation improves coherence without centralising authority or infringing mandates.

6. Embed governance and ethics in the core of Foresight

Governance, data stewardship, inclusiveness and ethical considerations should be treated as integral parts of Foresight, not as secondary checks. The scenarios clearly show that futures with weak governance, opaque data practices or low trust consistently lead to poorer outcomes, regardless of technological capacity. Embedding these aspects from the outset strengthens legitimacy, supports responsible innovation, and ensures that Foresight outputs are implementable within legal and societal constraints.

7. Use Foresight collaboration as a capacity-building mechanism

Rather than relying primarily on training, EU-ANSA should use joint Foresight modules as learning-by-doing environments. Agencies with stronger experience in specific methods (e.g. scenario building, horizon scanning, modelling) can lead modules, while others build

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competence through participation. This approach directly addresses the capacity asymmetries identified in the report and strengthens Foresight literacy, confidence, and internal legitimacy across the network.

8. Align Foresight cycles with Commission and agency planning rhythms

For Foresight to inform action, its timing must align with Commission programming, agency strategies, and regulatory cycles. The EU agencies should therefore synchronise key Foresight outputs—such as scenario implications or roadmaps—with relevant decision windows. This increases uptake, avoids Foresight being perceived as "interesting but untimely," and reinforces its value as a strategic input rather than a retrospective reflection.

9. Integrate social determinants, inclusiveness and equity systematically into Foresight

The report highlights the synergistic interactions between OH and social determinants, such as inequalities, social vulnerability, and mental health, as well as drivers and amplifiers of disease burdens. EU-ANSA should ensure that social determinants, distributional impacts, inclusiveness and equity considerations are systematically integrated into all Foresight modules, especially by ensuring sufficient diversity of participants representing such views. The search for synergies strengthens anticipatory governance by revealing who benefits, who bears risks, and where preventive action is most needed, thereby supporting inclusive and just policy responses. In this context, the agencies should also be cautious about potential health securitisation.

10. Engage experts in EU agencies and establish feedback loops from the work of agencies' policy implementation to Foresight

The EU Agencies should further institutionalise Foresight by engaging their experts in learning loops that feed from policy implementation back into horizon scanning, scenarios, and strategic priorities. This transforms Foresight from a one-directional input into a continuous adaptive process. The rationale is that real-world experience provides critical evidence on assumptions, blind spots, and system behaviour, which must inform subsequent Foresight cycles to remain credible and relevant.

11. Integrate AI as an assistive layer within modular Foresight, not as a substitute for human sense-making

EU-ANSA should promote the use of AI as an assistive capability embedded within Foresight modules (for example, in horizon scanning, scenario generation, consistency checks, and pattern detection) while explicitly retaining human judgement, deliberation and accountability at decision points. The rationale is that AI significantly enhances speed, scale and analytical breadth, but does not resolve normative trade-offs, ethical considerations or contextual interpretation. Embedding AI within modular workflows allows agencies to experiment, compare results, and gradually build trust in AI-supported Foresight, without creating over-reliance or opaque decision processes.

12. Establish shared AI governance standards for multi-agency Foresight applications

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To ensure legitimacy and interoperability, EU-ANSA should coordinate the development of shared governance standards for AI use in general, as well as for Foresight, including transparency of models, documentation of assumptions, data provenance, bias management, and explainability requirements. The rationale is that agencies currently experiment with AI under different constraints and risk tolerances, which limits comparability and trust in joint outputs. Common standards enable responsible innovation, facilitate cross-agency collaboration, and ensure that AI-supported Foresight strengthens—rather than undermines—public trust, ethical integrity and institutional accountability. Here, it is important to understand differences in AI capacities among the agencies and establish minimum shared AI capabilities.

A. Suggested next steps for the EU-ANSA Futures Cluster

1. **Map agencies' Foresight capabilities to move toward an "adaptive modular Foresight" approach**

Continue mapping agencies' Foresight capabilities (methods, tools, time horizons, staffing, outputs) so that future joint work can be organised as modular building blocks—where different agencies can lead or contribute depending on mandate and capacity. The mapping is also an opportunity to invite new members to Futures Cluster and explore the agency contacts and Foresight-related practices with Member States and other stakeholders. Explore options for including Member State representatives or national nodes where appropriate (e.g., learning from EEA how they work with their National Focal Points (NFPs) and the European Environment Information and Observation Network (Eionet).

2. **Define steps to move toward joint horizon scanning**

Focus the planned June horizon scanning meeting of the Futures cluster on comparing methods (sources, taxonomies, validation rules, and quality criteria) and on agreeing on what can realistically be shared across agencies at this point. This lays the ground for building an agile joint infrastructure that can support adaptive modular Foresight work. Seek to treat horizon scanning as a continuing activity that builds an accumulated evidence base over time (signals revisited and re-interpreted), not as a one-off deliverable.

3. **Consolidate police messages from the agencies**

Explore opportunities to bundle key Foresight insights from agencies into a small number of consistent policy messages that are easy to use in Commission-level processes, rather than many separate agency inputs. This can be done both for specific requests, for instance, related to the Strategic Foresight report, but also by proactively exploring common areas for shared communication points.

B. Suggested next steps for individual agencies

1. **Share the report internally and run a sense-making session**

Circulate the report within the organisation and consider a short workshop to interpret implications for the organisation so the results do not stay "on the shelf". Considering inviting also EFSA colleagues; they have offered to share their project synthesis and experience with other agencies upon request.

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2. **Prepare a Foresight note for the Futures Cluster**

To explore further avenues for collaboration among agencies, each agency can prepare a brief note on its Foresight work. The following may support structuring the contributions:

- **Foresight capacities and capabilities:**
    - Methods and tools, either exploratory (e.g. horizon scanning and scenarios) or normative, close the decision-making (e.g. roadmapping and priority-setting)
    - Time horizons used
    - Estimated staffing in FTEs
    - Projects and outputs (publications, databases, etc. in last 3 years) and their use in policy support and gained impact
    - Collaboration networks and practices with Member States and other stakeholders
    - Any possible gaps in Foresight capacities and capabilities
- **Expectations on joint Foresight work:**
    - 2-3 topics that the agency would be interested in exploring through joint Foresight work with other agencies (cross-cutting, uncertain, and not owned by a single mandate).
    - If the agency is not yet participating in the Futures Cluster, consider it and provide any reflections on the situation, as well as any issues to be addressed with the Futures Cluster.

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Abbreviations

AI	Artificial Intelligence
AMR	Antimicrobial Resistance
BRICS	Brazil, Russia, India, China, South Africa (founding members)
CAP	Common Agricultural Policy
DARWIN EU	The Data Analysis and Real World Interrogation Network
DG	Directorate-General
ECDC	European Centre for Disease Prevention and Control
ECHA	European Chemicals Agency
EEA	European Environment Agency
EFSA	European Food Safety Authority
EMA	European Medicines Agency
EU-ANSA	EU Agencies Network on Scientific Advice
FOD	Foresight on Demand
FTE	Full-Time Equivalent
JRC	Joint Research Centre
LLM	Large Language Model
MVP	Minimum Viable Product

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NCD	Non-Communicable Disease
OH	One Health
PESTEL	Political, Economic, Social, Technological, Environmental, Legal
R&I	Research and Innovation
RTD	Research and Technological Development

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