

# Scanning the Food Safety Environment

***EFSA's Strategic Environmental Scan Report***  
*July 2019*



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## Introduction

This report describes the results of EFSA's external and internal environment scanning, which aimed at providing insights for the definition of its next strategy. The objective of this exercise was to identify the critical external challenges and opportunities that the organisation may face in its upcoming future and, analysing its internal strengths and weaknesses, to explore their potential relevance for EFSA and its ecosystem in the medium and longer term. The study is based on the preliminary drivers, scenarios, challenges and policy options identified in the Science for Policy Report (DG-JRC Report) commissioned by the Directorate General for Health and Food Safety (DG SANTE) of the European Commission, together with supplementary and extensive literature reviews, internal staff consultations as well as discussions with stakeholders and institutional partners.

The intent of this report is to present the key findings and outcomes of the analysis, i.e. the consolidated SWOT analysis which includes recommendations to inform EFSA for its future strategic direction of 2021-2027 and beyond.

The document is structured as followed:

### **Chapter 1: The Aim**

*This chapter **outlines the 'why'**; EFSA's environmental scan, being used as a key input, to inform EFSA's Strategic Planning. It also **briefly describes the 'how'**; the phases, activities, supporting methodologies and tools used.*

### **Chapter 2: The Scan**

*This chapter **presents the 'what'**; focusing on the consolidated SWOTs containing EFSA's internal strengths and weaknesses and the external opportunities and challenges, alongside exploratory recommendations for defining the new strategy.*

### **Chapter 3: The Next Steps**

***This chapter describes the overarching exploratory recommendations** and highlights the open questions that need addressing prior to commencing definition of the strategy.*

## **Chapter 1: The Aim**

### **Why is EFSA scanning its environment?**

EFSA is the European decentralised agency for risk assessment related to food and feed safety, animal health and welfare, nutrition, plant protection and plant health. It was set up in 2002 (by Regulation (EC) No 2002/178) and is funded by the European Union as an impartial source of scientific advice and communication on risks associated with the food chain. The advice that EFSA provides to risk managers underpins the laws and regulations of the EU, as well as evolving policy priorities and needs, to protect European consumers from food-related risks – from field and factory to fork, and to foster trust in the food chain.

EFSA's Strategy 2020 is coming to an end soon; it was structured upon five strategic objectives, which were underpinned by five values, to prepare EFSA for the future and address EFSA's operating context, i.e. the challenges and opportunities, strengths and weaknesses relevant at the time of its development between 2015-2016.



Before embarking on the design of a new strategy, scheduled for adoption by the end of 2020 and implementation as of 2021, it is imperative to take stock of changes in EFSA's context, whether from developments and trends from the wider external environment (socio-political, technological, environmental) or as a result of evolved strengths and weaknesses following the implementation of EFSA's Strategy 2020.

### ***How did EFSA conduct its environmental scan?***

The key steps EFSA took in performing this environmental scan were:

#### **1. Identifying external drivers and creating future scenarios**

a. Scanning the environment for holistic representation of future drivers.

**Answering:** *How is the world evolving?*

b. Creating plausible and contextualized scenarios of what the future holds.

**Answering:** *What could the food and nutrition landscapes look like?*

#### **2. Performing a SWOT analysis**

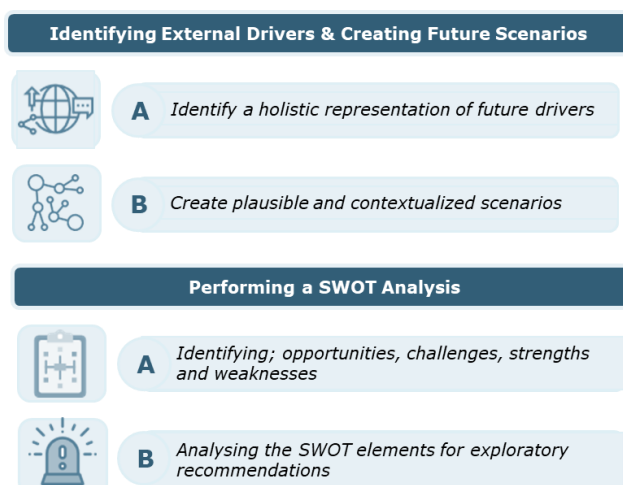
a. Identifying (external) opportunities and challenges and relevant (internal) strengths and weaknesses.

**Answering:** *What are the potential and the most important issues?*

b. Analysing the SWOT elements to identify exploratory recommendations for strategy definition.

**Answering:** *What could EFSA explore to address the changing context and better prepare for the future?*

**Figure 3:** Environmental Scanning Key Steps





The identification of **external drivers** was based on the Joint Research Centre's (DG-JRC)<sup>1</sup> [Science for Policy Report on 'Delivering on EU Food Safety and Nutrition in 2050 - Future challenges and policy preparedness'](#), four focused reports (listed below) and the contributions from participants at the EFSA 2018 Conference. Additional literature<sup>2</sup> was screened to ensure that any relevant elements were included throughout the process.

#### **The Four Focused Reports:**

1. The World Economic [Forum's Shaping the Future of Global Food Systems Report](#) - A Scenario Analysis by 2050;
2. The European Commission's [Future of Europe](#) – A 2025 White Paper;
3. The European Commission's Expert Food Group [Climate Smart and Sustainable Food](#) – A 2030 Agenda;
4. The UN's [Sustainable Development Goals](#) - 2030 Agenda.

Political, economic, social, technological, environmental and legal contexts (*PESTLE analysis*) and any relative potential short- and long-term shifts were considered as drivers and used to adapt the scenarios developed by DG-JRC to EFSA's context. **The scenarios** consist of plausible combinations of drivers, constituting a representation of "**what if**", not future predictions, offering an opportunity for EFSA to envision and plan, given different contexts and shifts. The four scenarios used were also based on the abovementioned DG-JRC report, having been slightly updated by adding further detail at the level of the description of the drivers and trend themes.

The scenarios were used to identify **Opportunities** and **Challenges** (the external environment that can adversely affect EFSA's performance or achievement of its objectives) and initial ideas for potential ways EFSA might address them.

Two workshops were organised with EFSA staff and external stakeholders to stimulate an interactive approach<sup>3</sup>. EFSA's **Strengths** and **Weaknesses** were first identified through desk research via an external mid-term evaluation of the delivery of EFSA 2020 strategy. EFSA "Roadmap" leaders with their teams carried out a self-assessment SWOT analysis against each of EFSA's Strategic Capabilities & Resources<sup>4</sup>, complementing the identification of ideas addressing external opportunities and challenges. A consolidated SWOT analysis structured against three strategic clusters was produced and validated during a final internal workshop, including a list of **exploratory recommendations** as input to the strategy definition process.

Therefore, EFSA's Strategic Environmental Scan, aimed to explore, consult, analyse and endorse drivers, future-scenarios, SWOT elements and relative exploratory recommendations. Chapter 3 below describes the final scanning outcome, i.e. the SWOT analysis with exploratory recommendations.

## **Chapter 2: The Scan**

### ***What do the consolidated SWOTs look like?***

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<sup>1</sup> A special thank you goes out to the JRC and particularly to Anne-Katrin Bock, for their valuable inputs and consultation throughout the initial phase of the scanning process.

<sup>2</sup> For a comprehensive understanding of the literature scanned, please refer to the Annex: Desk Analysis

<sup>3</sup> For a comprehensive understanding of the workshops, please refer to the Annex: Consultations

<sup>4</sup> For a comprehensive understanding please refer to the Annex: Strategic Definition Alignment



The **three strategic clusters**, created to finalise the consolidated SWOTs were: Food systems and risk assessment; Knowledge, data, people and funding; and Society and risk communication. Each cluster is presented alongside a descriptive summary of the SWOT content, the relative SWOT elements, and the assessment of their potential relevance for EFSA via exploratory recommendations.

Fundamentally, answering the following questions:

- **What is out there?**  
*Presenting the external opportunities and challenges.*
- **Where do we stand?**  
*Presenting the internal strengths and weaknesses.*
- **What could we do about it?**  
*Assessing the relevance of the above and presenting a list of exploratory recommendations.*

## 1. Food systems and risk assessment

**Sub-Clusters:** *Holistic and Fit-for-Purpose Risk Assessment, Risk-Risk and Risk-Benefit Analysis, New Data and Methods, Preparedness, Nutrition Advice*

The European food safety regulatory framework has delivered to EU consumers one of the safest food systems in the world. Demographic changes, malnutrition and the rise of non-communicable diseases, climate change and the depletion of natural resources (including biodiversity) call for new approaches for safe food. In such approaches, safety assessment goes beyond the traditional risk assessment model of single hazards analysis. At the same time, the United Nations have adopted a transformative agenda for 2030, including 17 different sustainable development goals (SDGs), and the EU has developed its own sustainability agenda (published in January 2019, while DG SANTE's own sustainability approach is currently in the making) to drive future policies. Food safety concerns are gaining increasing prominence as demonstrated by the establishment in 2018 of a World Food Safety Day.

### ***Emerging challenges and trends***

As the global population grows from 7 billion in 2010 to a projected 9.8 billion by 2050, overall food demand is on course to increase by more than 50%, and demand for animal-based foods by nearly 70%. Yet today, hundreds of millions of people remain hungry, agriculture already uses almost half of the world's arable land. Agriculture and related land-use change generate 25% of annual greenhouse gas emissions<sup>5</sup>. To achieve the SDG targets, it is necessary to significantly transform our production and consumption patterns, producing more with less and reducing waste. The transformation will require the development of alternative food and feed sources (e.g. insects and synthetic meat) and new production technologies (e.g. precision farming) that will need to be assessed for any possible human, animal, plant and environmental risks. New methods for risk assessment and the consideration of risks to the environment that may arise from the re-introduction of food waste into the food chain are also needed.

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<sup>5</sup> Synthesis report: *Creating a Sustainable Food Future*, World Resources Institute, December 2018



Development of scientific methodologies and tools offer new data sources for risk assessment and opportunities to further refine them while successfully applying the 3Rs principle (Replacement, Refinement, and Reduction) as alternatives to animal testing.

Worldwide obesity has nearly tripled since 1975. Malnutrition is currently the highest risk factor for public health in Europe. To achieve sustainable consumption and reduce malnutrition, a change in dietary patterns is necessary for the future.

And antimicrobial resistance in humans and animals continues to be one of the biggest threats to human health faced by the global community.

### ***What is out there?***

#### ***Challenges and Opportunities***

#### ***Holistic and Fit-for-Purpose Risk Assessment***

- Call for an integrated approach to contribute to the Sustainable Development Goals and Health priorities;
- Produce more with less and reduce waste;
- Re-introduction of food waste and environment hazards in the food chain;
- New alternative food and feed sources (e.g. insects and synthetic meat);
- New food and feed production technologies (e.g. precision farming);
- Increased exposure to chemicals at different stages of the food chain;
- Need to prioritise questions for risk assessment (workload and complexity) and perform hazard ranking.

#### ***Risk-Risk and Risk-Benefit Analysis***

- Need to integrate nutrition, health, environment and sustainability aspects in risk assessment;
- Expectation to integrate risk assessment and risk-benefit analysis.

#### ***New Data and Methods***

- Application of 3Rs principle in food and feed risk assessment;
- Systematic risk assessment for chemical mixtures;
- Integrating new types of data in chemical and biological hazard assessment;
- Taking account of human variability and personalisation needs;
- Increase in food allergies and other auto-immune diseases.

#### ***Preparedness***

- Increase in antimicrobial resistance in humans and animals;
- Increased complexity and impact of food and feed incidents resulting from contamination and/or fraud.

#### ***Nutrition Advice***

- Changing dietary and consumption patterns;
- Personalised nutrition trends.



## ***EFSA in 2019***

EFSA has, in less than 20 years, gained an international reputation as a leading authority in food and feed risk assessment (RA). Its staff and access to large networks of Member State experts are its main assets – it is therefore important to take full advantage of this interdisciplinary richness and increase engagement with the research community (public and private) to keep pace with technological developments.

The development and implementation of methodologies and tools for RA need to continue ensuring an end-to-end scientific process that is fit-for-purpose, considers all relevant data and addresses societal concerns.

Cooperation is often hindered by non-existent or cumbersome processes for joint drafting, adoption and publication of RA with other EU and Member State agencies as well as limited resources for partnering at EU and international level. This is coupled with a lack of harmonised terminology and concepts across different RA sectors, variable availability and accessibility of data for RA or even insufficient awareness of open access tools and platforms.

EFSA has a good track record on responsiveness to incidents but insufficient access to real-time data and lack of horizon scanning and early warning systems are weaknesses to be addressed.

## ***Where do we stand?***

### ***Strengths and Weaknesses***

#### ***Holistic and Fit-for-Purpose Risk Assessment***

- Internationally recognised quality of risk assessment performed by EFSA;
- EFSA staff possess in-depth scientific and regulatory expertise but have difficulty in keeping pace with technological developments;
- Scientific expertise and data available in existing panels and networks but insufficient focus on establishing interdisciplinary approaches;
- Lack of harmonised terminology and concepts across different RA sectors;
- Process for joint drafting, adoption and publication of RA with other EU and Member States agencies internal standards and implementation begun;
- Limited resources for collaboration with Member States and international collaboration in new RA approaches;
- Limited ways of addressing the challenge of a heterogeneous regulatory framework.

#### ***Risk-Risk and Risk-Benefit Analysis***

- Risk characterisation outcomes for regulated products are focused on approval criteria;
- Insufficient agility of RA (methodologies are further limited by regulatory requirements);

#### ***New Data and Methods***





- EFSA has developed most of the methodologies set-out in EFSA's 2020 Strategy – with differing levels of guidance development and implementation;
- New RA tools implemented: FAIM 2.0, FEIM and FACE;
- Insufficient resources for proactive self-tasking;
- Insufficient awareness among assessors of open access tools and platforms;
- EFSA carried out a pilot for the automation of applications via the MATRIX project. MATRIX would improve the availability of documentation relevant to EFSA scientific outputs. However, a gap analysis found that the overall implementation needs to be reviewed.
- Variable availability and accessibility of data for RA;
- Insufficient capabilities in biological, chemical and ecological predictive modelling, bioinformatics (WGS, Next Generation Sequencing), computational toxicology (QSAR and read across) and analysis of omics data;
- RA not considering the entire microbiota present.
- Limited use of evidence from epidemiological studies in chemical risk assessment;
- Insufficient clarity of scientific opinions and the scientific process behind ongoing challenges on timeliness (RA not 100% reproducible).

### ***Preparedness***

- Good responsiveness to incidents but insufficient access to real time data;
- Horizon scanning and early warning systems not available;
- Insufficient data and tools to support traceability investigations in case of food and feed incidents;
- Limited system-view on food systems.

### ***Nutrition Advice***

- Current limits of EFSA Regulatory framework in the field of nutrition advice.

### ***Emerging Futures***

The EFSA 2020 Strategy focus on widening EFSA's evidence base and preparing for future RA challenges has delivered important developments on how food and feed RA is delivered in the EU. The revisions to the General Food Law, and the requirement for proactive publication of data and full traceability of RAs will push EFSA to continue its transformation into an Open Science organisation.

Scientific developments and access to large sets of digital information offer EFSA the opportunity to assess food safety risks no longer as isolated events but as factors of complex systems that represent the world we live on. Food safety is a fundamental component of food security and health, but preservation of natural resources and sustainability of systems cannot be a trade-off, instead needs to be integrated in RA.

The transition towards a more holistic "one health/one environment" RA which integrates nutrition, health, environment and sustainability aspects is a challenge that needs careful consideration. However, EFSA's focus on fit-for-purpose RA must remain a priority, with an obligation to provide the best science available in the timeframe available to support the development and implementation of policies. This is naturally to be done in strong partnerships with the risk managers and assessors at the EU and Member State level as well as with international organisations.



Providing advice on alternatives, such as risk comparisons and risk-benefit analysis by developing joint assessments with EU and Member State organisations with relevant responsibilities, can contribute to better policy advice and ultimately more clarity for the wider public. It is important to identify who should be involved in providing the expertise to provide the advice on these options.

To implement new methodologies and access new data in food feed safety RA, EFSA must continue to invest in harvesting data and information to stay abreast of evolving scientific methodologies and research and develop adequate RA methodologies to assess new sources of potential food/feed risks such as new production technologies.

Investing in future preparedness by further developing methodologies to identify emerging risks at global level, and proposing prevention strategies that ensure the safety and sustainability of food systems is important; but also in conjunction, developing new/agile processes for urgent/rapid RAs that can support policy action when incidents occur. EFSA needs to ensure that scientific and technological developments contribute to the development of regulatory RA.

EFSA can contribute to dietary guidelines aimed at addressing diet-related chronic metabolic diseases and provide advice on how to drive behavioural changes in dietary habits moving from a "Farm to Fork" to a "One Health Approach". EFSA's role and responsibilities in this change need to be defined clearly, including how to integrate different target population groups in its dietary exposure assessments.

To face the future challenges and ensure its leading role in food and feed safety RA EFSA will need to consider:

- How to transition towards more holistic, "one health/one environment" RAs which integrate nutrition, health, environment and sustainability aspects?
- Who should be involved in providing the expertise to advise on options, risk comparisons and risk-benefit analysis through the joint assessments?
- How to ensure that scientific and technological developments contribute to the development of regulatory RA?
- What could be EFSA's role regarding nutrition advice?

### ***What could we do about it?***

#### ***Potential Recommendations***

#### ***Holistic and Fit-for-Purpose Risk Assessment***

- Develop approaches that facilitate holistic assessments, which integrate RAs across multiple stressors, geo-graphical/temporal scales and policies/legal frames;
- Develop/access interdisciplinary expertise to ensure non-fragmented RA for food-related topics in EU with the EC and Member States and international partners;
- Provide advice on current indicators being used to assess SDG progress with regards to food safety (SDG 3 Good health and well-being/SDG 12 Responsible production and consumption/SDG13-Climate action/SDG 14-15 life below water and on land) and support inclusion of food safety concerns into post-2030 international goals;



- Invest in future preparedness by further developing methodologies to identify emerging risks at global level and propose prevention strategies that ensure safety and sustainability of food systems;
- Ensure fit-for-purpose RA, making use of best science and addressing societal demands;
- Enhance workload prioritisation with DG SANTE and align understanding on framing of questions as well as expectations on scientific advice;
- Advocate the use of problem formulation to identify relevant and reliable information for RA.

### ***Risk-Risk and Risk-Benefit Analysis***

- Integrate risk-risk and risk-benefit analysis in the RA process by cooperating with EU and Member State organisations responsible for related and/or overlapping issues.

### ***New Data and Methods***

- Continue EFSA's transformation into an Open Science organisation; proactively publish non-confidential evidence and its appraisal used for scientific assessments in structured, searchable and downloadable formats, applied methods, models, assumptions and uncertainties;
- Make the evolution of scientific outputs traceable by linking it to scoping and planning documents, data collection and selection, method selection and opinion formulation;
- Implement the use of new methodologies and data in food/feed safety RA (biological, chemical and ecological predictive modelling, computational toxicology, and bioinformatics biomonitoring and omics data);
- Continue investing in harvesting data and information to stay abreast of evolving scientific methodologies and research in toxicology, epidemiology, exposure sciences and data sciences;
- Gain better insights from industry on new technologies and products;
- Develop adequate RA methodologies to assess new food/feed sources and production technologies.

### ***Preparedness***

- Develop new/agile processes for urgent/rapid RA, including automation for data analysis, lean standard report formats allowing automatic updating, and enhancing data availability across all EU Member States.

### ***Nutrition Advice***

- Contribute to develop dietary guidelines to address diet-related chronic metabolic diseases by considering specific foods and diets in addition to single nutrients and what changes are required to drive behavioural changes in dietary habits;
- Develop capacity (staff and knowledge) to address future requests on personal nutrition;
- Expand RA scope to include additional target groups, e.g. those with allergies and auto-immune diseases.



## 2. Knowledge, Data, People and Funding

**Sub-Clusters:** *Governance, Funding and Cooperation, People and Expertise; Data, Innovation and Technology*

Seventeen years following its establishment as a key actor in the European food safety regulatory framework, EFSA is embracing the updating of the General Food Law. This was brought about as a result of the evolving environment in which EFSA operates, the changing expectations of its customers and stakeholders, and the accumulation of lessons learnt through the delivery of its tasks. This review, based on a European Commission proposal, following a comprehensive fitness check and citizens' initiative requesting greater transparency, strengthens EFSA's role and its sustainability by bringing important changes to its *modus operandi* and governance, accompanied by a funding review.

### ***Emerging Challenges and Trends***

This reform comes amid numerous political developments at global and European levels, which are expected to have an influence on EFSA's role, in the medium and long term. Shifts in political priorities, such as to security, defence and migration, and other developments, such as Brexit, can have an important impact on EFSA, e.g. by influencing the availability of resources. But perhaps the most impactful will be the increasing focus of the EU Institutions to contribute to attainment of the UN sustainable development goals (SDGs), which requires greater collaboration within and between sectors. Such collaboration requires organisations and Member States to work together across traditional, institutional and professional boundaries, leveraging pooled resources and assets (competencies, knowledge, data, methods), with a clear focus on delivering cross-cutting outcomes. The lack of harmonisation in food safety standards at global level and the high costs related to the generation of new knowledge for the diverse areas of EFSA's remit, point to increasing opportunities provided by the Food 2030 research agenda. This underlines the need for strong partnerships with sister EU Agencies / Institutions and EU Member States, as well as further synergies with international actors. Policy developments are taking place even faster through changes linked to new technologies, scientific knowledge, expertise and the exponential growth in the availability of data and information. All of these are continuously disrupting EFSA's processes and ways of working. How can we keep up with innovation when public service organisations struggle to keep pace with the advancement of data and exposure sciences in a world spinning at internet speed?

Attracting the right expertise for EU RA is expected to become even more challenging in the face of increasing competitiveness from the private sector, the increased sharing of knowledge generated outside the EU, including in emerging economies, and the imbalances in the availability of scientific RA capacity within the EU and internationally. Also, the ever-increasing mobility of people and knowledge, facilitated by digital technologies, presents unique opportunities to exploit both scientific expertise and any available "cognitive surplus" from "non-formal experts", i.e. people's time, energy, creativity, and generosity that leads to productivity, creation, and sharing.

It is estimated that some 90% of the data in the world today has been created in the last two years and about 75% of this data is unstructured. At the same time, there is an increasing amount of data from different sources (surveillance and controls, biomonitoring) that remain under-exploited in view of the lack of connectivity.



Moreover, big data would be extremely valuable for EFSA if methods, competencies and tools were in place to harness and harvest this new data. While EFSA is already exploring approaches to manage and exploit big data sets, such as in whole genome sequencing, the scope and acceleration of the volume of data relevant to its RA remit has grown so large and complex that both new tools and new approaches are urgently needed to take advantage of them. Advances in computation capability and in biology and biotechnology (NGS<sup>6</sup>, CRISPR<sup>7</sup>), will shift 21<sup>st</sup>-century RA methods toward empirical whole plant or whole organism modelling to complement (or replace) traditional rational epistemological approaches to scientific RA. Cognitive analytics such as machine learning and natural language processing can discover patterns and relationships in information from millions of texts, books, online articles and other sources (e.g. social media), harvesting information that could take researchers (humans) decades to discover, retrieve and digest. These issues increase the relevance of managing transparency in the face of data ownership by Member States, confidentiality claims of applicants and overall conflicting provisions in existing legislation both at national and European level.

### ***What is out there?***

#### *Challenges and Opportunities*

#### ***Governance, Funding and Cooperation***

- Sustainable development goals and the need for holistic approaches;
- Opportunity for sharing and pooling services and resources by cluster of Agencies (One Health approach);
- EU political developments and priorities influencing EFSA; opportunity of 178/2002 revision for budget and tasks, uncertainty from Brexit and large policy priorities;
- Global food safety standards and related RA methods not harmonised;
- Food 2030 research agenda priorities in regulatory science and potential funding imbalances among the different areas of EFSA remit;
- Speed of change and continuous disruption vis-à-vis our processes: knowledge, information, people and technology.

#### ***People and Expertise***

- Potential loss of expertise in the EU and different levels of scientific RA capacity and expertise within the EU and internationally;
- Using technology to exploit the "cognitive surplus".

#### ***Data, Innovation and Technology***

- Data is increasingly available from different and new sources, use of big data and the potential of the "internet of things" (e.g. data from surveillance [official controls and nutri-vigilance], biomonitoring/biosensors, alternative data sources such as travel data);
- Potential of Artificial Intelligence and machine learning for RA;

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<sup>6</sup> Next-generation Sequencing

<sup>7</sup> Clustered Regularly Interspaced Short Palindromic Repeats



- Regulation of data confidentiality, protection, privacy and intellectual property rights.

### **EFSA in 2019**

The legislative framework has an impact on EFSA's capacity to adequately plan and allocate its resources. This is partly due to limited interactions between the EU institutions during the legislative process, as well as EFSA's total dependence financially on the EU budget. EFSA has taken important steps in recent years to counteract its limited resources and constrained ability to coordinate RA activities within the EU and internationally. It has forged shared strategies and shared services with its EU Sister Agencies, sought to build and share capacity with Member States and influence together the EU research agenda, and to ensure that resources are directed to the most added-value activities, based on mature performance-based frameworks. In doing so, it has developed new and impactful cooperation and outsourcing mechanisms (e.g. partnering and tasking grants), although there is still scope to better share work across the various Member States and EU partners according to their roles. EFSA's Strategy 2020 addresses the challenges of cooperation, collaboration and knowledge management through collaborative digital platforms that help to further standardise and automate routine tasks of the agency. These new digital collaboration platforms may increase efficiency and enhance cooperation, but do not exploit the new opportunities for maximising the access, use and sharing of available knowledge, expertise, information and data. Moreover, this poses the question on EFSA's role and preparedness in a wider ecosystem of distributed knowledge, both on the technological as well as the cultural dimension, such as with regards to being too "inward looking" in a world which is becoming more inter-dependent, and also being too "rigid" with regards to adopting new technologies and innovation.

Even though EFSA's current scientific production process ensures a sound level of multidisciplinary expertise, guaranteeing the involvement of Member State national authorities and experts in EFSA outputs, this system has important limitations impacting the organisation's sustainability. Key issues include the availability of and attractiveness to "independent" regulatory science expertise and capacity in the Member States, and the low level of attractiveness for young scientists – and thereby the "latest expert knowledge". EFSA has made important steps in analysing its expert base, developing an "attractiveness package" and a new talent sourcing strategy based on competences, while the measures included in the revision of the General Food Law addresses many facets of the challenges EFSA is facing.

The EFSA website, Journal, and Scientific Data Warehouse, are EFSA's main "shop window" for stakeholders of the information EFSA publishes. While important strides have been made in the further structuring and opening of EFSA's data enabling transparency and re-use, there have been considerable delays in the implementation of an e-submission approach to ensure the availability of structured data in the regulated products area; likewise, recent surveys indicate a limited awareness of EFSA's open data platforms by potential users. Further limitations in fully exploiting and re-using the available data is insufficient data "literacy" in key areas at EFSA (what is available, what is needed, how it is used) combined with an underpowered computational capacity. Today more than half of the data needed and used in RA is not collected in the traditional data collection modes. While EFSA has started





addressing this evolving challenge, much more needs to be done to address the speed with which raw data, big data, and multi-disciplinary data is needed in the RA processes. The EFSA 2020 strategy maintains a focus on innovation, collaboration, and on specific topics in big data, but this does not necessarily guarantee relevance for RA by 2027. Under all scenarios, EFSA's current data collection and dissemination approach, constrained by the regulation and by agreements or lack thereof between Member States, will eventually undermine the relevance of its scientific output. Hence, EFSA is already cooperating with EU Sister Agencies and Member States in the quest to explore possible uses of artificial intelligence and machine learning. As EFSA achieves its strategic milestones, however, it is discovering that methodological and organisational capabilities are as equally important as the scientific and technological tools available (or in development). Data connection and semantic interoperability, for example, will require a significantly more coordinated approach between European institutions for the harmonisation of data management and modelling methods. A potentially more directive and coordinated approach from the EC may also be needed so that large data, open data, and their relevant methods are stitched together in increasingly multi-disciplinary approaches between entities that have until now operated vertically.

### ***Where do we stand?***

#### ***Strengths and Weaknesses***

#### ***Governance, Funding and Cooperation***

- Limited scope to coordinate RA activities within the EU and internationally;
- Limited resources for R&D (knowledge generation) and innovation;
- First steps in strengthened partnership with EU Sister Agencies, DG-JRC and EUAN towards common strategies and shared services; success stories with ECDC and ECHA;
- Agreed approach with Member States and EU Sister Agencies on influencing Research Agenda;
- New cooperation/outourcing mechanisms strengthening capacity building and preparedness (partnering and tasking grants) in place;
- Participation and engagement of Art. 36 list organisations in EFSA grants and procurements, not fully optimised/under-utilised;
- Inward looking culture, "hugging" of data, people and formulas, not open enough to new technologies and innovation. Key values of independence and excellence "misused" creating barriers to agility and innovation;
- EFSA at a crossroads, dwelling within its "identity": its evolving role, production model, and ambitions as a "knowledge hub" for methods, data and food safety RA science;
- EU Agencies' weak influence on multiannual financial framework and budgetary negotiations;
- EFSA's full dependence on EU budget, no own funding;
- EFSA's strengthened performance-based management system, in close cooperation with SANTE, EU Agencies and Institutions, increasingly supporting resource planning, negotiation and prioritisation.

#### ***People and Expertise***



- Solid but limited basis of domain and RA/regulatory science expertise, with different gaps among Member States (e.g. pesticides area); limited intelligence on the needed interdisciplinary competences;
- Lack of EU-coordinated strategies and unclear approach on capacity-building at European level; New processes to source, plan and manage competences and talents under development;
- Low competition among experts compared to the private sector, limited access to international expertise due to independence constraints, limited access to "new/young" expertise due to turnover rate and contractual options, and under-developed mobility and exchange programmes.

### ***Data, Innovation and Technology***

- EFSA is progressing towards an EU food safety RA hub on data, methodologies, tools and knowledge (scientific Data Warehouse, Knowledge Junction, EFSA Journal), but with limited awareness outside EFSA;
- Insufficient data literacy in key areas, with weak computational capacity for full exploitation and re-use;
- First steps in interoperability but need for improved/wider data attractiveness, connectivity and access for data exchange/openness;
- EFSA in the lead in cooperation with EU Sister Agencies and Member States on the quest to exploring possible uses of artificial intelligence and machine learning.

### ***Emerging Futures***

Looking to the future, EFSA would most certainly benefit from stepping-up co-creation with the European Commission, EU Sister Agencies, Member States and key international actors; spanning common governance mechanisms and shared strategies, all the way to shared resources and services. This enhanced collaboration could include advocating for the use of new funding mechanisms, e.g. levies, fees and charges, even if the latter may require further changes to the General Food Law and widespread reforms. Moreover, building on the recent revision of the General Food Law, and taking advantage of new types of grants and optimised Art. 36 modalities, Member States could take on scientific tasks of an exploratory nature or routine tasks that have well-established methodologies and guidelines, including common RA priorities. Beyond the 178 review, EFSA could explore further process optimisation to address its current limitations and to support future legislative reviews, e.g. in the area of pesticides and the two-step review by Member States and EFSA. In this arena, strengthening the role and influence of regulatory science bodies along the various stages of the research cycle, together with Member States, EU Sister Agencies, DG-JRC, DG Research, and risk managers, could ensure a coordinated approach in R&D funding and optimise results and knowledge dissemination for regulated science purposes. This could be further accelerated via co-developing a (virtual) Research Platform supporting the wider research community and co-organising events to bring funders and scientific community together, fostering European Partnerships and consortium formation. Overall, it is worth exploring the extent to which EFSA can aim towards a role of a "knowledge hub", i.e. leading and directly investing in preparedness for data analytics, new/harmonised methods and capacity building vs.





that of a “knowledge broker”, thereby investing indirectly by building strong alliances on the above at the EU and global levels.

EFSA should exploit fully the new provisions of the revised General Food Law to increase the attractiveness for experts, e.g. by increasing the level of indemnities allocated to experts and/or to their employers and strengthen its sourcing model by increasing preparatory work done by Member States. EFSA could complement these by optimising the use of a wider international pool of expertise, e.g. by exploiting the available “cognitive surplus”, by tapping into non-formal experts (crowdsourcing) using global innovation platforms and implementing new methodological approaches for control of bias. Additional options could be explored in the longer term with DG SANTE, such as redefining the roles, responsibilities and competencies of staff, panel experts, Member States within the panel and pesticides systems. Beyond attractiveness, EFSA could further improve on the active scouting for additional and desirable competencies, anticipating emerging trends and risks that require different skills (developments in data require for example new roles such as data curators or bio-informaticians). To ensure the timely availability of critical competencies as they evolve the development and implementation of common/joint strategies with Member States, EU Sister Agencies and the European Commission, would be crucial. A joint investment in RA capacity building and knowledge acquisition and exchange via a digital interconnected virtual network of academic institutions and public sector bodies in the form of an “Academy”, could be one way forward.

The revision of the General Food Law has provided EFSA with a boost in its efforts to make available in a transparent way structured data in the regulated products area. Beyond this, EFSA could invest in strengthening data connectivity and interoperability, and by exploring in parallel centralised access management systems (i.e. “hub” concept) and real time distributed information systems (i.e. “broker” or “marketplace”). Addressing growing volumes of data via cognitive analytics and artificial intelligence will require significant efforts and funds, which underlines the importance of alliances with EU Sister Agencies, Member States, and international partners.

### ***What could we do about it?***

In summary, for EFSA to advance successfully in the management of knowledge and its constituents the new strategy should be clear on:

- How ambitiously should EFSA steer towards integrated strategies, work-programmes, joint-funding, shared services and research programmes for the one health approach? With whom (EU Agencies, Member States, International)?
- What potential “new/strengthened” roles of EFSA to explore in the knowledge management paradigm, “hub” (centralised, leading) vs broker/networker (decentralised, participating)? And in which areas: expertise and capacity building, data, methodologies?
- Should EFSA explore a dual operating model, with a focus on peer-review and knowledge production on the one hand, and knowledge management and exploitation on the other?
- Which priority towards exploring crowdsourcing and additional ways of avoiding bias to increase EFSA’s pool of expertise?



- Should EFSA investigate opportunities for new *modus operandii* (and related sourcing models) for the panel and pesticides models, via separation of preparatory work and peer review? i) Within the constraints of the revised General Food Law legislation and ii) Subject to future regulatory reviews?
- What priority should be given to exploring and investing on big data, cognitive analytics and artificial intelligence, given the uncertain and lengthy return on investment?
- Which type of partnerships/cooperation models to seek and with whom?
- Which capacity-building strategies? Within and outside Europe?

### ***Governance, Funding and Cooperation***

- Coordinated governance, strategies, work-programmes and provision of shared services with EC (SANTE, ENV, AGRI, RTD), ENVI Agencies and JRC and a strengthened harmonisation of RA methods internationally;
- Closer partnership with Member States and better coordination to address joint EU food safety priorities;
- Advocacy in close cooperation with SANTE (at European Commission and Parliament levels) i) about the sustainability and self-financing of the food safety model (e.g. levies, charge-back mechanisms) and ii) for adequate funding and enhanced workload prioritisation, underpinned by process efficiencies and mature performance-based frameworks;
- Strengthen the role and influence of regulatory science bodies along the various stages of the EU/Member States research cycle, together with EU Sister Agencies, DG-JRC, Member States and DG Research, ensuring a coordinated approach in R&D funding and results dissemination for regulated science purposes;
- Support the wider research community through a (virtual) Research Platform fostering European Partnerships and Consortium formation;
- Clarify EFSA's role, expectations, ambitions as a Knowledge Organisation/Hub (which products/services? what functions?) within the "One Health/One Environment" ecosystem, in the short (General Food Law revision) and longer terms; explore potential to evolve beyond "independent" to "inter-dependent" via participatory RA;
- Use new processes, organisational design and technology addressing the General Food Law revision to become a more agile organisation while ensuring continuity in quality of products and services; explore with the EC, Member States and EU Sister Agencies further process optimisation to address current limitations and to support legislative reviews, e.g. in the area of pesticides.



### ***People and Expertise***

- Develop and implement with Member States, EU Sister Agencies and EC distinct strategies for building and sharing the RA vs domain expert competences and capacity;
- Increase the pool of expertise contributing to EFSA's work and exploit "cognitive surplus";
- Optimise the use of a wider international pool of expertise by implementing methodologies for control of bias, use of pre-defined protocols, separating the RA and review functions.

### ***Data, Innovation and Technology***

- Further develop interoperability with all actors in EFSA's ecosystem (health, environment) ensuring relevant knowledge is captured, accessed and used when and as needed; explore a dual strategy via a centralised access management system vs real time/event driven distributed information systems;
- Co-explore and co-fund with EU Sister Agencies and Member States, and across different sectors, tools to tackle growing volumes of data and cognitive analytics.

## **3. Society and Risk Communication**

### ***Sub-Clusters: Communication, Engagement***

### ***Emerging Challenges and Trends***

Trends such as the rise of populism and national sentiment in the EU, coupled with the democratisation of information in a highly interconnected, global environment, are combining to affect the trust of citizens in institutions and the expectations that society places on regulatory science. Within the EU, food safety information needs vary significantly depending on socio-economic factors and geography. And food safety is just one piece of the puzzle – it influences consumer choices together with food quality, origin, taste, nutrient content, environmental impact, and price. As the revisions to the General Food Law indicate, more attention will be given to provide coherent, consistent and clear messages about food-related risks. This reinforces risk communication as a core part of the risk analysis paradigm, with its relevance arguably set to increase within today's information ecosystem.

At the same time, the call for transparency and openness places emphasis on the need for increased dialogue with society as part of risk analysis. Appropriate engagement strategies in RA and communication must take into account the positions of different stakeholders and ensure a balanced representation of all interested parties. There must be clarity and transparency on the process and the elements which stakeholders' contributions can inform in the risk analysis while safeguarding EFSA's scientific independence. Increasingly globalised markets speak to the importance of international cooperation in RA in the future and EFSA may also need to adjust the way it interacts with the private sector to keep up with the pace of change and innovation in food production.



## ***What is out there?***

### *Challenges and Opportunities*

#### ***Communication***

- Interconnected, global information ecosystem (high amount and speed of available information);
- Proliferation and dissemination of false information;
- EU citizens have diverse food safety information needs;
- Food safety information needs to be complemented with other drivers of consumer choices (nutrition, health considerations, environmental impact, prices etc.),
- Consumers potentially taking more food safety responsibility;
- Demand for timely service and cutting-edge technology use in regulatory science, creating an expectation gap;
- Potential of international cooperation in the area of risk communication and social science.

#### ***Engagement***

- Increasing expectations for transparency and engagement, coupled with General Food Law review provision for an Open EFSA;
- Dialogue with society needs to be part of the risk analysis process, while maintaining independence of science and RA and identifying/addressing potential bias.
- Rise of populism and nationalist sentiments and declining trust in institutions;
- Globalised markets and innovation prompting more interaction with private sector and emerging countries.

#### ***EFSA in 2019***

As noted in the external evaluation of EFSA's Strategy 2020, the Authority is recognised for the quality of its scientific outputs and communication materials. The improvement of the editorial quality of scientific outputs was facilitated, *inter alia*, by migrating the EFSA Journal to a dedicated professional platform (Wiley online library). EFSA has also reviewed its approach to external relations by consolidating all competencies in the areas of communications, customer, stakeholder and media relations. Through the Communication Experts Network (CEN) EFSA proactively seeks communication synergies with Member States' authorities to strengthen consistency of information on food and feed safety. This approach ensures that messages are not provided in isolation, but provide a broader context that is meaningful to consumers and that explain the scientific basis for risk management measures. However, working with a model that relies on multipliers for the dissemination of its messages, and producing material that is not specifically targeted to EFSA's various audiences, will present challenges if the broader aim is to ensure more coordination in risk communications in the future. The fact that the existing network of food safety risk communicators in Europe, semi-formal in nature, includes actors with different levels of experience, approaches, and roles and responsibilities adds further complexity in this respect. EFSA has already begun to address this challenge, integrating the discipline of social research into its communications to provide a better understanding of the information needs of those with whom it communicates. The recent publication



of the “Guidance on communication of uncertainty in scientific assessments” by EFSA was guided by a working group which included social scientists in an effort to improve risk communication by taking account of evidence on the way people can best understand messages on uncertainties.

Social research insights may also have a positive spill-over effect for science, for example in determining how and when EFSA should engage with society during the RA process. The current stakeholder engagement approach provides a flexible and inclusive platform. However, the assumption that a pool of stakeholders working at EU level is representative of society at large is to be reviewed. Alternative or strengthened mechanisms to engage with consumers, food and feed businesses, the academic community and other interested parties may be required and should address some of the current weaknesses – such as the fact that stakeholders are not part of mandate framing or that the awareness of private-sector driven innovations occurs solely at application stage.

### ***Where do we stand?***

#### ***Strengths and Weaknesses***

##### ***Communication***

- Recognised quality of scientific outputs and communication materials;
- Established network of risk communicators in Member States and cooperation with Pre-Accession countries (semi-formal nature);
- Lack of systematic approach to managing fake news;
- Serving multiple audiences, sometimes through a one-size-fits-all approach, with four-language policy, relying on multipliers for message dissemination;
- Progressive build-up of social science expertise;
- Differences in experience, approach, roles and responsibilities between different risk communication actors.

##### ***Engagement***

- Concerns regarding lack of transparency and independence of EFSA;
- Established stakeholder engagement approach (inclusive, targeted, and flexible);
- Pool of stakeholders not always representative;
- Framing of mandates excludes stakeholders;
- Limited engagement with EU public at large;
- Relative low awareness of the EU food safety system; EFSA not always recognised as first point of reference for food safety;
- Awareness of private-sector driven innovations occurs at application stage.

##### ***Emerging Futures***

EFSA will be consulted in the development of the General Plan for Risk Communication, required under the revised General Food Law, which provides a strong incentive to enact change in the way it engages with society and communicates about food-related risks. There are several options that may be considered for improvement. For example, a more systematic use of joint campaigns with risk



managers and other EU agencies may improve consistency or messages and coordination on certain high-profile topics. There may also be value in cooperating with risk managers to present a single, non-fragmented source at EU level of food-related information, combining food safety facts with information on other factors that determine consumer choice such as nutrition or health considerations.

Developing a “society watch” to better understand risk perceptions would likely help EFSA produce more effective communication materials for its target audiences. To implement a more tailored approach in an efficient manner, the needs of different audiences and the required communication need to be considered. Capacity-building activities could help harmonise methods and standards among practitioners involved in risk communications on food, addressing weaknesses in the current system, as well as providing tools for use within existing education programmes on how to critically assess scientific information.

EFSA should continue to develop methods to strengthen engagement with stakeholders (civil society, industry, academia) starting from the framing of the questions and continuing throughout the process in forms of consultations, hearings, etc. Enhanced engagement could also focus on broadening the outreach – for example with consumer organisations at a national level or the academic community, or with specific sectors of the food and feed industry to ensure that EFSA anticipates upcoming innovation in advance and is ready when the time comes with appropriate scientific methodologies.

In summary, for EFSA to successfully advance in the areas of risk communication and engagement, the new strategy should be clear on:

- How to integrate food safety data with information on other factors affecting consumer choices?
- What priority should be assigned to communicating with different target audiences?
- How best to engage with EU public at large?

### ***What could we do about it?***

#### ***Potential Recommendations***

##### ***Communication***

- Participate in developing the “General plan for risk communication” as per revised General Food Law and design joint campaigns with wider outreach (with EC, Member States, EU agencies);
- Strengthen the risk communication network in the EU through capacity building activities;
- Set up jointly with the EC, Member States and other EU Agencies a non-fragmented EU source of information for food-related topics including food safety, nutrition, health and environmental impacts, food quality, traceability and prices;
- Set up a society watch to monitor risk perceptions, in collaboration with social science expertise in EC, Member States, EU Agencies and international organisations. Advocate for social research within EU research agenda. Invest in foresight activities to understand the future science communication landscape;





- Use evidence from social science to improve RA communication, including development of different products adapted to targeted audiences on high-profile/sensitive topics (with EC, Member States and EU Agencies);
- Scrutinise existing communication channels and products and invest in use of the latest technologies. Explore options for multi-language approach with EU Sister Agencies;
- Develop existing capabilities to provide tools that can be used by educators to enable citizens to evaluate scientific information critically (with EC, Member States and EU Agencies).

### Engagement

- Develop methods to enhance engagement with stakeholders (civil society, industry, academia) starting from the framing of the question and continuing throughout the process in the form of consultations, hearings, etc.;
- Look to establish networks with consumer organisations at national level and widen the pool of stakeholders from academia;
- Review the approach for interaction with applicants and invest in engagement mechanisms where EFSA can gain better and more advanced awareness of private-sector driven innovations.

## Chapter 3: The Next Steps

This foresight analysis of EFSA's operating environment identified a number of drivers that simultaneously impact the food safety landscape from a variety of angles, e.g. environmental, technological, societal, political. Applying the SWOT approach across the different capabilities and resources of EFSA, resulted in the identification of several key insights on the organisation as a whole, which may be used in many ways for the streamlined preparation of the Strategy 2021-2027.

To facilitate this process, the options of "What could we do about it" presented in this chapter could drive the thinking as EFSA moves into the next step – the definition of strategic directions for its new strategy. In addition, some overarching questions have emerged to prompt discussions during this process.

These include:

- **In a new paradigm of RA which integrates nutrition, health, environment and sustainability aspects...**  
*To what extent should EFSA engage, build alliances, in the assessment of risks, benefits, impacts and options?*
- **To be more efficient and better prepared...**  
*To what extent should EFSA invest in:*
  - I. *New approaches and methodologies?*
  - II. *Big data analytics and artificial intelligence?*
  - III. *Crowdsourcing and widening its expertise base ?*
  - IV. *Capacity-building and knowledge sharing?*
- In the context of the revised General Food Law requirement to develop a General Plan on Risk Communication...



*To what extent should EFSA engage and communicate with different target audiences and exploit social science insights?*

This report will be presented to EFSA's Management Board in June 2019 to initiate the discussion on the findings and elicit views that can further help prepare a strategy that adequately prepare EFSA for and shape the food safety environment of the next decade.





## Annex

### Glossary

#### Drivers

Factors causing change, affecting or shaping the future. Usually, fully the macro-environmental factors found in a PESTLE analysis.

#### Foresight

A systematic, participatory and multi-disciplinary approach to explore mid- to long-term futures and drivers of change.

#### Environmental/Horizon Scanning

A systematic method for gathering new insights on issues which may impact the future. The scanning process explores novel and unexpected issues as well as persistent problems and trends, including matters at the margins of current thinking that challenge past assumptions. It is often based on desk research, which involves a wide variety of sources, such as the Internet, government ministries and agencies, non-governmental organisations, international organisations, research communities, and on-line and off-line databases and journals.

#### Horizon / Time Frame

The farthest point in the future that one will consider in a Futures Study. The time frame refers to the complete period (past-to-future) considered in a Futures Study.

#### PESTLE Analysis

The PESTLE analysis (political, economic, socio-cultural and technological, legal and environmental) describes a framework of macro-environmental factors used in the environmental scanning

#### Scenarios

A description of how the future may unfold according to an explicit, coherent and internally consistent set of assumptions about key relationships and driving forces. A scenario is a "story" illustrating visions of possible future or aspects of a possible future. Scenarios are not predictions about the future but rather similar to simulations of some possible futures. They are used both as an exploratory method or a tool for decision-making, mainly to highlight the discontinuities from the present and to reveal the choices available and their potential consequences.

#### Scenario Trends/Narrative Storyline

A coherent description of a scenario (or a family of scenarios), highlighting its main characteristics and dynamics, the relationships between key driving forces and their related outcomes. How the specific driver and related trend theme simulates itself within the specific context of the scenario.

#### Strategic Planning

Strategic planning is an organization's process of defining its strategy, or direction, and making decisions on allocating its resources to pursue this strategy. It may also extend to control mechanisms for guiding the implementation of the strategy.



## SWOT Analysis

The SWOT analysis (or SWOT matrix) is a strategic planning technique representing; Strengths: (internal) characteristics of the business that give it an advantage over others. Weaknesses: (internal) characteristics of the business that place the business or project at a disadvantage relative to others. Opportunities: (external) elements in the environment that the business or project could exploit to its advantage. Threats: (external) elements in the environment that could cause trouble for the business or project.

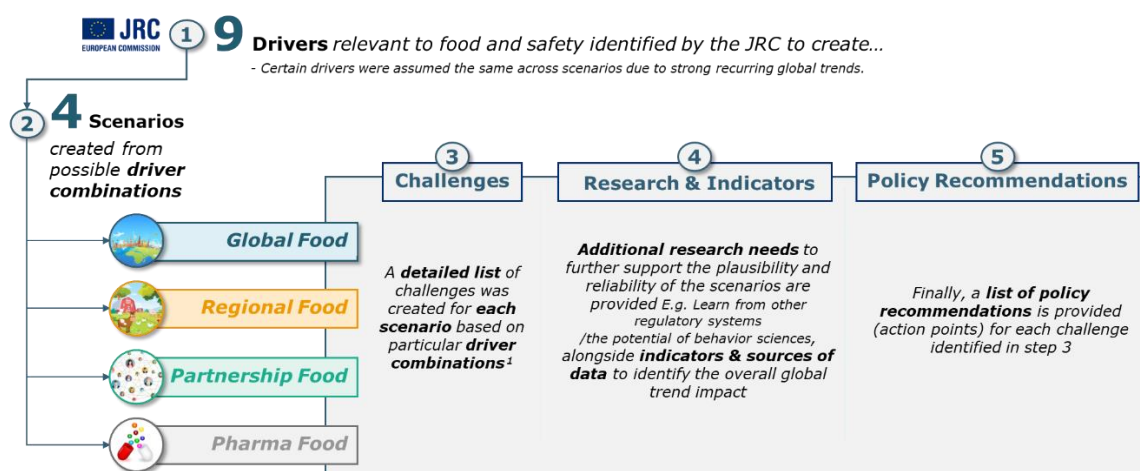
## Abbreviations

Abbreviation	Full Name
DG SANTE	Directorate-General for Health and Food Safety
EC	European Commission
EFSA	European Food Safety Authority
EU	European Union
DG-JRC	Directorate General Joint Research Centre
MS	Member States
PESTLE	Political, Economic, Social, Technological, Legal & Environmental
RA	Risk Assessment
SDG	Sustainable Development Goal
SWOT	Strengths, Weaknesses, Opportunities & Threats
3R	Replacement, Refinement, and Reduction

## Desk Analysis

In the link provided, you can find the original report, used as the starting point for the analysis, the Joint Research Centre's (DG-JRC) [Science for Policy Report on 'Delivering on EU Food Safety and Nutrition in 2050 - Future challenges and policy preparedness'](#):

The image below, depicts the original structure of the JRC Report;





## Bibliography

The above DG-JRC report content, was further elaborated and contextualized for EFSA using **supplementary Literature Reviews**, please find below the **comprehensive bibliography** for EFSA's Environmental Scan;

1. Bourgeois, R., Sette, C. (2017) The state of foresight in food and agriculture: Challenges for impact and participation. *Futures* 93: 115-131 doi.org/10.1016/j.futures.2017.05.004
2. Cuhls, K., Giessen, A., van der, Toivanen, H. (2015) Models of horizon-scanning: How to integrate horizon scanning into European research and innovation policies, available online at: [www.isi.fraunhofer.de/isi-wAssets/docs/v/de/publikationen/CU\\_ERL\\_PW\\_Models-of-Horizon-Scanning.pdf](http://www.isi.fraunhofer.de/isi-wAssets/docs/v/de/publikationen/CU_ERL_PW_Models-of-Horizon-Scanning.pdf);
3. De Ruijter, P. (2014) *Scenario Based Strategy: navigate the future* Gower Publishing Limited 1e edition, 2014. pp. 1- 188, EAN: 9781472437174
4. Dicks LV, Walsh JC & Sutherland WJ (2014) Organising evidence for environmental management decisions: a '4S'hierarchy. *Trends in Ecology & Evolution* 29, 11: 607-613 <https://doi.org/10.1016/j.tree.2014.09.004>
5. Directorate-General for Research and Innovation (European Commission), Ricci, Andrea; Andreescu, Liviu; Gheorghiu, Radu; Sessa, Carlo; Dragomir, Bianca; Cuhls, Kerstin; Rosa, Aaron; Giesecke, Susanne; Weber, Matthias; Schaper-Rinkel, Petra, Institutul de Prospectiva, Fraunhofer ISI, AIT Austrian Institute of Technology, 2018. *Transitions on the Horizon. Perspectives for the European Union's future research and innovation policies* <https://publications.europa.eu/en/publication-detail/-/publication/21d456ff-6eb5-11e8-9483-01aa75ed71a1/language-en>
6. Dreyer, I. & Stang, G. (2013). *Foresight in governments-practices and Trends Around the World*. European Union Institute for Security Studies. Available online at: [http://www.iss.europa.eu/fileadmin/euiss/documents/Books/Yearbook/2.1\\_Foresight\\_in\\_governments.pdf](http://www.iss.europa.eu/fileadmin/euiss/documents/Books/Yearbook/2.1_Foresight_in_governments.pdf)
7. Durance, P. & Godet, M. (2010). *Scenario Building: Uses and Abuses*. *Technological Forecasting and Social Change*, 77(9), 1488-1492.
8. EC (European Commission) (2015) DG Research and Innovation in close cooperation with the Standing Committee on Agricultural Research (SCAR), *Sustainable Agriculture, Forestry and Fisheries in the Bioeconomy - A Challenge for Europe 4th SCAR Foresight Exercise*, eds. Barna Kovacs, available online at: [https://www.researchgate.net/publication/283624704\\_4th\\_SCAR\\_report](https://www.researchgate.net/publication/283624704_4th_SCAR_report)
9. EC FOOD2030 (European Commission, Directorate-General for Research and Innovation), 2018, *FOOD2030 - Recipe for change* <https://publications.europa.eu/en/publication-detail/-/publication/d0c725de-6f7c-11e8-9483-01aa75ed71a1/language-en>;
10. EC, 2019. *Europe in May 2019 Preparing for a more united, stronger and more democratic Union in an increasingly uncertain world* EN The European Commission's contribution to the informal EU27 leaders' meeting in Sibiu (Romania) on 9 May 2019 [https://ec.europa.eu/commission/sites/beta-political/files/euco\\_sibiu\\_communication\\_en.pdf](https://ec.europa.eu/commission/sites/beta-political/files/euco_sibiu_communication_en.pdf)
11. EC, 2019. *Reflection Paper Towards a sustainable Europe by 2030* [https://ec.europa.eu/commission/sites/beta-political/files/rp\\_sustainable\\_europe\\_30-01\\_en\\_web.pdf](https://ec.europa.eu/commission/sites/beta-political/files/rp_sustainable_europe_30-01_en_web.pdf)
12. EFSA (2014a). *Drivers of emerging risks and their interactions in the domain of biological risks to animal, plant and public health: a pilot study*. EFSA supporting publication 2014: EN-588, 44 pp.
13. EFSA strategy 2020
14. European Commission, Joint Research Centre (2014). *Tomorrow's Health Society – Research Priorities for Foods and Diets*. JRC Foresight Study
15. European Commission, Joint Research Centre (2016). *Delivering on EU Food Safety and Nutrition in 2050 - Future challenges and policy preparedness*. DG-JRC Science for Policy Report
16. European public health alliance, Friends of the Earth Europe, IFOAM EU Group, Slow Food. 2019. *Transitioning Towards Sustainable Food Systems in Europe* <https://www.slowfood.com/slowlife/wp-content/uploads/Transitioning-towards-Sustainable-Food-Systems.pdf>
17. FAO (Food and Agriculture Organization of the United Nations), 2018, *The future of food and agriculture: Alternative pathways to 2050* (<http://www.fao.org/publications/fofa>);
18. FSA (Food Standards Agency) (2008) *Analysis of risks across the food chain*, available online at: <https://www.food.gov.uk/sites/default/files/analysisrisksacrossfoodchain.pdf>
19. Galli F., Favilli E., D'Amico S., Brunori G. *A transition towards sustainable food systems in Europe. Food policy blue print scoping study*. Laboratorio di Studi Rurali Sismondi, Pisa, Italy, 2018. ISBN: 9788890896040. [https://www.researchgate.net/publication/325248769\\_A\\_transition\\_towards\\_sustainable\\_food\\_systems\\_in\\_Europe\\_Food\\_policy\\_blue\\_print\\_scoping\\_study](https://www.researchgate.net/publication/325248769_A_transition_towards_sustainable_food_systems_in_Europe_Food_policy_blue_print_scoping_study)
20. Garnett, K., Delgado, J., Lickorish, F., Shaw, H., Rathe, A., Chatterton, J., Prpich, G., and Pollard, S.J.T (2014). *Plausible Future Scenarios for the UK Food and Feed System – 2015 & 2030*. Report for the



- | Food   | Standards | Agency | (FSA). |
|--|-----------|--------|--------|
| https://www.food.gov.uk/strategievidenceprogramme/x02projlist/fs246007.  |           |        |        |
| 21. GO Science (UK Government Office for Science), 2011, The Future of Food and Farming (https://www.gov.uk/government/publications/future-of-food-and-farming)  |           |        |        |
| 22. Henriques, C., Garnett, K., Weatherhead, E. K., et al. (2015). The Future Water Environment — using Scenarios to Explore the Significant Water Management Challenges in England and Wales to 2050. Science of the Total Environment, 512, 381-396.   |           |        |        |
| 23. Ingram JS, Wright HL, Foster L, Aldred T, Barling D, Benton TG, Berryman PM, Bestwick CS, Bows-Larkin A, Brocklehurst TF, Buttriss J et al. (2013) Priority research questions for the UK food system. Food Security 5, 5: 617-636 https://link.springer.com/article/10.1007/s12571-013-0294-4   |           |        |        |
| 24. Lakner, Z. & Baker, G. A. (2014). Struggling with Uncertainty: The State of Global Agri-Food Sector in 2030. International Food and Agribusiness Management Review, 17(4), 141-176.  |           |        |        |
| 25. Mintel 2019. Global food drink trends 2019 https://www.mintel.com/global-food-and-drink-trends/  |           |        |        |
| 26. National Academies of Sciences, E. and Medicine (2019). Science Breakthroughs to Advance Food and Agricultural Research by 2030. Washington, DC, The National Academies Press. https://www.nap.edu/catalog/25059/science-breakthroughs-to-advance-food-and-agricultural-research-by-2030   |           |        |        |
| 27. OECD (2017) The Next Production Revolution: Implications for Governments and Business, OECD Publishing, Paris, available online at: http://dx.doi.org/10.1787/9789264271036-en   |           |        |        |
| 28. O'Keefe L., McLachlan, C., Gough, C., et al. (2016). Consumer Responses to a Future UK Food System. British Food Journal, 118(2), 412-428.   |           |        |        |
| 29. Parson, E. A. (2008). Useful Global-Change Scenarios: Current Issues and Challenges. Environmental Research Letters, 3(4), 045016.   |           |        |        |
| 30. Poppy, G. (2017) Chief Scientific Adviser's Science Report. Issue six: Data Science. Available at: Food Standard Agency CSA Science Report 13 pp. /food.gov.uk   |           |        |        |
| 31. Pretty J, Sutherland WJ, Ashby J, Auburn J, Baulcombe D, Bell M, Bentley J, Bickersteth S, Brown K, Burke J, Campbell H et al. (2010) The top 100 questions of importance to the future of global agriculture. International Journal of Agricultural Sustainability 8, 4: 219-236 https://www.tandfonline.com/doi/abs/10.3763/ijas.2010.0534 |           |        |        |
| 32. Regulation (EC) No 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. Official Journal of the European Communities, L31/1   |           |        |        |
| 33. Roy HE, Peyton J, Aldridge DC, Bantock T, Blackburn TM, Britton R, Clark P, Cook E, Dehnen-Schmutz K, Dines T, Dobson M et al. (2014) Horizon scanning for invasive alien species with the potential to threaten biodiversity in Great Britain. Global Change Biology 20, 12: 3859-3871 https://doi.org/10.1111/gcb.12603                    |           |        |        |
| 34. Scientific Advisory Mechanism, 2019. A scoping review of major works relevant to scientific advice towards an EU sustainable food system. Final draft. https://www.ria.ie/sites/default/files/5.sam_eu_sustainable_food_system_scoping_review_final_draft.pdf  |           |        |        |
| 35. Sutherland WJ, Fleishman E, Mascia MB, Pretty J & Rudd MA (2011) Methods for collaboratively identifying research priorities and emerging issues in science and policy. Methods in Ecology and Evolution 2, 3: 238-247 https://onlinelibrary.wiley.com/doi/abs/10.1111/j.2041-210X.2010.00083.x  |           |        |        |
| 36. Swart, R. J., Raskin, P. & Robinson, J. (2004). The Problem of the Future: Sustainability Science and Scenario Analysis. Global Environmental Change, 14(2), 137-146.  |           |        |        |
| 37. Van Duijne, F. et al. Precaution for food and consumer product safety: a glimpse into the future, Food and Consumer Product Safety Authority (VWA), Office for Risk Assessment and Research, The Hague, March 2010. Available as pdf on www.nvwa.nl  |           |        |        |
| 38. Vervoort, J. M., Thornton, P. K., Kristjansson, P., et al. (2014). Challenges to Scenario-Guided Adaptive Action on Food Security under Climate Change. Global Environmental Change, 28, 383-394.  |           |        |        |
| 39. World Economic Forum, 2017. Shaping the Future of Global Food Systems: A Scenarios Analysis http://www3.weforum.org/docs/IP/2016/NVA/WEF_FSA_FutureofGlobalFoodSystems.pdf   |           |        |        |

#### Web Sites:

40. https://www.unilever.com/sustainable-living/our-approach-to-reporting/defining-our-material-issues/
41. https://www.weforum.org/whitepapers/shaping-the-future-of-global-food-systems-a-scenarios-analysis
42. http://www.stt.nl);
43. STT 81 – The future of technology in agriculture;
44. STT 80 – Horizonscan 2050 Netherlands Study Centre for Technology Trends (2014), Jacintha Scheerder, STT Horizon Scan 2050, The Hague.

#### EFSA Internal Documentation:

45. Concept paper on the future of data in EFSA Final
46. Scientific activities evolution of current delivery model\_MTM\_08-03-2018



47. EFSA Future of Chemical Risk Assessment\_2019
48. Sustainability agenda \_ MASTER FILE - DG SANTE-Inter Agency meeting\_08-03-2019\_EFSA briefing
49. Reflection Paper Towards a sustainable Europe by 2030\_EFSA briefing
50. 2018 External Evaluation & MB Recommendations
51. EFSA 2018 Scientific conference recommendations
52. EFSA 2018 Scientific conference\_article\_Riolo\_Christoph\_2018
53. 20190423 INTERNATIONAL FORUM ON FOOD SAFETY AND TRADE ON 23 APRIL 2019 PM\_EFSA briefing
54. Additional references SAM scoping studies
55. EASAC (European Academies Science Advisory Council), 2017, Opportunities and challenges for research on food and nutrition security and agriculture in Europe
56. (<https://easac.eu/publications/details/opportunities-and-challenges-for-research-on-food-and-nutrition-security-and-agriculture-in-europe/>);
57. EEA (European Environment Agency), 2017, Food in a green light: A systems approach to sustainable food (<https://www.eea.europa.eu/publications/food-in-a-green-light>);
58. Fresco & Poppe (Wageningen University & Research), 2016, Towards a Common Agricultural and Food Policy (<http://edepot.wur.nl/390280>);
59. IIASA (International Institute for Applied Systems Analysis), 2018, The World in 2050
60. Transformations to Achieve the Sustainable Development Goals (<http://pure.iiasa.ac.at/15347>);
61. IPES-Food (International Panel of Experts on Sustainable Food Systems), 2019, Towards A Common Food Policy for the EU ([http://www.ipes-food.org/\\_img/upload/files/CFP\\_FullReport.pdf](http://www.ipes-food.org/_img/upload/files/CFP_FullReport.pdf));
62. STOA (Science and Technology Options Assessment), 2013, Technology options for feeding 10 billion people - Sustainable food and agriculture in the EU [http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513539/IPOL-JOIN\\_ET\(2013\)513539\\_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/etudes/join/2013/513539/IPOL-JOIN_ET(2013)513539_EN.pdf));
63. WRI (World Resources Institute, in partnership with the World Bank, UN Environment, UN Development Programme, CIRAD & INRA), 2018, World Resources Report, synthesis report: Creating a Sustainable Food Future: A Menu of Solutions to Feed Nearly 10 Billion People by 2050
64. (<https://www.wri.org/publication/creating-sustainable-food-future>);
65. WRR (The Netherlands Scientific Council for Government Policy), 2015, Towards a Food Policy
66. (<https://english.wrr.nl/publications/reports/2016/12/13/towards-a-food-policy>);
67. Opinion of the EESC (European Economic and Social Committee), 2017, Civil society contribution to the development of a comprehensive food policy in the EU
68. (<https://www.eesc.europa.eu/en/our-work/opinions-information-reports/opinions/civil-societys-contribution-development-comprehensive-food-policy-eu>).

#### **Selection of Supplementary works:**

69. Agrimonde (CIRAD & INRA), 2009, Scenarios and Challenges for Feeding the World in 2050
70. ([https://www.cirad.fr/en/content/download/3796/35063/version/7/file/1209Agrimonde\\_SummaryReport.pdf](https://www.cirad.fr/en/content/download/3796/35063/version/7/file/1209Agrimonde_SummaryReport.pdf));
71. Drawdown (Hawken et al.), 2017, The Most Comprehensive Plan Ever Proposed to Reverse Global Warming (<https://www.drawdown.org/the-book>), complemented with a Project Drawdown presentation and website consultation in 2019;
72. FAO & WHO (Food and Agriculture Organization of the United Nations & World Health Organization), 2014, Second International Conference on Nutrition (Rome, 19-21 November 2014) - Conference Outcome Document: Framework for Action (<http://www.fao.org/3/a-ml542e.pdf>);
73. GLOPAN (Global Panel on Agriculture and Food Systems for Nutrition), 2016, Food systems and diets: Facing the challenges of the 21st century
74. (<http://glopan.org/sites/default/files/ForesightReport.pdf>);
75. HLPE (High Level Panel of Experts on Food Security and Nutrition), 2017, Nutrition and food systems
76. ([http://www.fao.org/fileadmin/user\\_upload/hlpe/hlpe\\_documents/HLPE\\_Reports/HLPE-Report-12\\_EN.pdf](http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE_Reports/HLPE-Report-12_EN.pdf));
77. IPCC (Intergovernmental Panel on Climate Change), 2014, Food security and food production systems. Chapter 7 in the Fifth Assessment Report of the IPCC
78. ([https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap7\\_FINAL.pdf](https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap7_FINAL.pdf));
79. 19. Parsons & Hawkes (European Observatory on Health Systems and Policies), 2018, Connecting food systems for co-benefits: how can food systems combine diet-related health with environmental and economic policy goals? - Policy Brief 31 (<http://www.euro.who.int/en/about-us/partners/observatory/publications/policy-briefs-and-summaries/connecting-food-systems-for-co-benefits-how-can-food-systems-combine-diet-related-health-with-environmental-and-economic-policy-goals>);
80. Wageningen Economic Research, 2018, The food systems approach: sustainable solutions for a sufficient supply of healthy food (<http://library.wur.nl/WebQuery/wurpubs/fulltext/451505>).

#### **Selection of Notable Scientific Articles:**





81. EAT-Lancet Commission (Willett et al. in The Lancet), 2019, Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems ([https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4));
82. Krishna Bahadur et al. (in PLOS ONE), 2018, When too much isn't enough: Does current food production meet global nutritional needs? (<https://doi.org/10.1371/journal.pone.0205683>);
83. Lancet Global Syndemic Commission (Swinburn et al. in The Lancet), 2019, The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report ([https://doi.org/10.1016/S0140-6736\(18\)32822-8](https://doi.org/10.1016/S0140-6736(18)32822-8));
84. Springmann et al. (in Nature), 2018, Options for keeping the food system within environmental limit (<https://doi.org/10.1038/s41586-018-0594-0>).

## Consultations, Stakeholders & Acknowledgments

As mentioned above, EFSA's Environmental Scan was interactive and collaborative in its approach. Please find below the comprehensive information on the consultations held *i.e. workshops*, stakeholder groups and an extensive list of acknowledgements;

### Workshop 1

On the 3rd of December 2018, EFSA held a first one-day workshop to collect input for the **identification** of and **characterization** of **challenges and opportunities**, through the descriptive-aid of scenarios. 40 internal and external stakeholders attended the workshop held on EFSA's premises in Parma, Italy.

### Workshop 2

A second workshop was held on the 12th of March 2019, **aimed at further assessing the relevance** of the **opportunities and challenges** identified in the first workshop, and **providing a first set of exploratory recommendations**. 52 internal and external stakeholders attended the workshop held on EFSA's premises in Parma, Italy.

### Workshop 3

On the 22nd of May 2019, a final internal workshop was held **aimed at fine-tuning and validating the consolidated SWOT analysis**. 35 internal stakeholders attended the workshop held on EFSA's premises in Parma, Italy.

## Stakeholders

The choice of stakeholders involved aimed to be all-encompassing in nature; attempting to incorporate both internal and external stakeholders from various competency backgrounds, affiliations and levels of seniority. Consultation throughout the phases was broken down into the following activity-based groups;

1. **EFSA Senior Management**, providing overall steering and review at key stages of the process.
2. **The Core Team**, comprised of internal EFSA Staff and the support of external PwC Consultants. They were responsible for the overall desk research, preparation and overall facilitation of the various activities mentioned above.
3. **Support Team**, were created with internal EFSA staff, chosen for their different expertise in the various domains of EFSA's work. These meetings were used to test workshop approaches, fine-tune content and validate outputs.
4. **Roadmap Owners (and their relative teams)**, were appointed through the adoption of the Strategic Definition Concept Note approved by Management. This formalized characterization of internal EFSA staff to dedicated strategic roadmaps was the first alignment step taken within the Environmental Scan process.
5. **Workshop/Conference Participants**, were a mix of both internal (see above groups) and external stakeholders embodying all relevant EFSA stakeholders (*DG Sante, DG-JRC, Sister Agencies, EFSA Member States Advisory Forum, EFSA Stakeholder Forum, etc.*)



## Acknowledgements

EFSA's Strategic Environmental Scan would not have been possible if it were not for the extensive contributions from both its internal and external stakeholders. Below you can find the full list of contributors throughout this process, and their relative affiliation.

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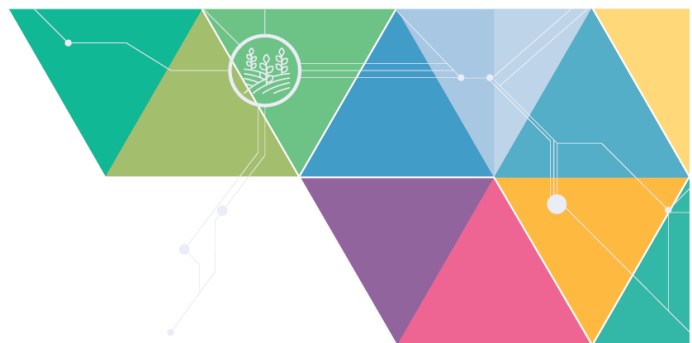
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## Drivers and Scenarios

The approach to Scenario Planning, described in Chapter 1, was facilitated through the use of **trend themes per driver**. The table below shows how each driver was further clustered to facilitate a holistic storyline across the four scenarios. The upcoming pages also provide the **detailed scenarios table, illustrative storylines and graphics per scenario**. The Graphics per scenario, were created by [Drawnalism](#) to support the illustrative storylines presented at the workshop.









**Table 1:** Drivers and Associated Trend Themes

Final Drivers	Trend Themes
<b>1. Global Trade</b>	<i>Barriers</i>
	<i>Safety Standards &amp; Legislation</i>
<b>2. EU Economic Growth</b>	<i>GDP</i>
	<i>Production Models</i>
<b>3. Agro-Food Chain Structure</b>	<i>Structure of Food Chain</i>
	<i>Product Characteristics</i>
<b>4. Technology Uptake</b>	
<b>5. EU Social-Political Environment</b>	<i>Strength of Trust/in EU Institutions</i>
	<i>EU Legislation / Enforcement Power</i>
	<i>EU Decision-Making Process</i>
	<i>Social Dynamics</i>
<b>6. Food &amp; Nutrition Values</b>	<i>Food Values</i>
	<i>Purchasing Drivers</i>
	<i>Dietary Trends</i>
<b>7. Climate Change</b>	
<b>8. Natural Resources</b>	<i>Resource Depletion</i>
	<i>Urgency/Actors of Intervention</i>
<b>9. Population</b>	<i>World Population Growth</i>
	<i>EU Aging Population</i>



**Table 2:** Detailed Scenarios Table

					
Drivers	Trend Themes	Global Food Scenario Trends	Regional Food Scenario Trends	Partnership Food Scenario Trends	Pharma Food Scenario Trends
Global Trade	<b>Barriers</b>	Fully liberalized	Disruption & Fragmentation	Trade zone between EU, US and Canada	Fully liberalized
	<b>Safety Standards &amp; Legislation</b>	Governments and businesses invest in foreign land and resources	Intra-EU bilateral agreements to satisfy needs	Convergence in food policy and legislation	Governments embrace international trade with provisions for responsible practices
EU Economic Growth	<b>GDP</b>	Moderate GDP growth	GDP replaced as performance indicator	Slow GDP growth	Strong GDP growth
	<b>Production Models</b>	Decoupling economic growth from environmental degradation	Circular, largely self-sufficient economy, with recognized vulnerabilities	Growing divergence and limited cooperation are major sources of vulnerability. Focus on efficiency and resilience	EU companies are the global market leaders for functional foods and "phoods"
EU Social-Political Environment	<b>Strength of Trust/in EU Institutions</b>	The unity of the EU is preserved but may still be tested in the event of major disputes	Common standards are set to a minimum but enforcement is strengthened in areas regulated at EU level	Increasing distrust in globalization leads to nationalist sentiment and isolationist policies	Improved trust, interdependency and trade among governments, as well as great coordination on fiscal, social and taxation matters
	<b>EU Legislation / Enforcement Power</b>	EU legislation checked regularly to see whether it is fit for purpose and outdated legislation is withdrawn.	Development of new rules and enforcement tools to deepen the single market in key new areas	Strong focus on reducing regulation at EU level	Harmonization of standards and stronger enforcement.
	<b>EU Decision-Making Process</b>	Remains complex to grasp and mostly based on a shared sense of purpose.	EU acts quicker and more decisively where it has a greater role	Process may be easier to understand but capacity to act collectively is limited.	Faster; however, questions of accountability arise
	<b>Social Dynamics</b>	Social cohesion within EU is low	High social cohesion	Social cohesion limited to local communities	High social cohesion and inter-generational solidarity
Agro-Food Chain Structure	<b>Structure of Food Chain</b>	Concentration at all stages of the food chain and considerable decrease of SMEs, small scale farmers, groceries	Low industry concentration and SMEs thrive across the shorter, more local food chains	Continuing concentration in the agro-food sector compared to today	Traditional agro-food industry is facing stiff competition from high-tech nascent "phood" sector
	<b>Product Characteristics</b>	Affordable, standardized, mass-produced processed foods	Lower variety of foods both processed and fresh available due to reliance on short food chains	Low cost, mass produced processed foods ensure sufficient intake of macro- and micro-nutrients	"Phood" manufacturing industry has a strong market position and political influence



Drivers	Trend Themes	Global Food Scenario Trends	Regional Food Scenario Trends	Partnership Food Scenario Trends	Pharma Food Scenario Trends
<b>Technology Uptake</b>		High technology uptake and acceptance by consumers	Selected uptake of technological advancements. Thorough environmental and health risk assessment	High technology uptake and acceptance by consumers. Less stringent approval procedure and governmental control	High uptake and consumer acceptance of new technologies. EU is strong in technology development
<b>Food &amp; Nutritional Values</b>	<b>Food Values</b>	Society does not value food quality and is not responsive to food-related health and environmental issues	Society values food and its integral role in nutrition, health, environment, culture and social cohesion	Society does not value food highly	Society values food highly as a means to support health
	<b>Purchasing Drivers</b>	Driven by price, taste and convenience	Primarily driven by health, environmental sustainability, local production, fair trade/ethical, animal welfare	Driven by price, taste and convenience	Social media and new education and marketing campaigns influence consumer demand
	<b>Dietary Trends</b>	Spread of Western-style diets, which are high in sugar, salt, fat and animal-based protein	Diets mainly comprised of food products produced locally/seasonally, lower consumption of animal proteins including red meat and dairy products	A common food culture develops with diets rich in calories, saturated fatty acids, salt and sugar	Personalized diets are a reality and functional/enhanced/nutraceutical foods are mainstream
<b>Climate Change</b>		2°C threshold of temperature increase will be reached by 2050			
<b>Natural Resources</b>	<b>Resource Depletion</b>	Progressive natural resource depletion towards 2050			
	<b>Urgency/Actors of Intervention</b>	Defer environmental protection in the hope of future "fixes"	Governments increase the use of environment incentives	Public and private sectors prioritize immediate concerns over environmental sustainability	Broad-scale adoption of good agricultural practices (GAP)
<b>Population</b>	<b>World Population Growth</b>	World population will increase to about 9 billion by 2050			
	<b>EU Aging Population</b>	EU population average age will continue to increase			



Below you can find both the illustrative storyline and graphic representation for each of the 4 scenarios:

### Global Food Scenario

*"Global Food projects the world of today, if the trends that have been observed to date continue with the same pace. The food safety standards that Europe has today have been preserved and the food safety system is still functioning, however food choices are driven by cost. Strong focus on education and literacy is needed, however political agenda's aren't prioritizing this societal need."*



Global food is a scenario that Europeans should be able to relate to in many ways. It projects the world of today if the trends that have been observed to date continue with the same pace. So it's an amplification of issues Europe encounters already today. In 2050, 80 percent of people live in urban environments. The urbanisation is partly an effect of climate change, which disrupted local economies and forced people to move from rural to urban areas. It is also driven by investments and developments all happening around city areas. It's a world of fully liberalised global trade where the industry has gradually concentrated into few corporations, which do not consider environmental degradation. This does not mean industry does not adopt new technologies in the agro-food chain. Quite the opposite, the uptake is high. But development is not focused on sustainability. Instead, it is aimed at increasing productivity and reducing costs. Many of those corporations are outside the EU. Food production within Europe is reduced, owing to some extent to climate change and the loss of viability to produce certain crops. In southern Europe, a trend of strong heat waves impacted production. In northern Europe, the agricultural areas face floods and precipitations. And then there is the spread of affordable western-style diets, high in sugar and protein. The EU relies heavily on imports, with BRICS and the US leading global food production. Companies invest a lot in preservation to extend the shelf life of foods. Mass-production has resulted in a decrease of SMEs and farmers producing food.

What the EU can produce in 2050 varies across geographic areas, but because of decreased farming, it imports large quantities of fruits, vegetables and seafood. It remains a market leader in the sector of small regional food chains, for example,



Parma region, but products from these areas have high costs and are real gourmet delicacies targeted at high-end consumers. The economic growth in the EU is moderate, with increasing inequalities in citizens' socio-economic status, which may undermine social solidarity. The EU still exists as an institution but is often questioned. This happens through channels that allow for voluntary information and bear the risk of misinformation. You can see a newspaper from the future in the illustration. Because of the proliferation of such articles – and because of decisions that led to the standing of the EU as described – politicians and governing bodies are not trusted very much.

The food safety standards that Europe has today have been preserved and the food safety system is still functioning. Regulatory scientists still enjoy a certain level of trust, higher than that of other institutions. The problem is that with decreasing production and increasing imports, the EU sources rely heavily on ingredients from all over the world. This increases the risk that food products entering the market do not conform to EU standards. Basically, the farm to fork process is very long and complex and starts somewhere far away from where food safety standards are different. And it is difficult to control these standards as Europeans demand food that is not produced in the EU. This could have been dealt with partially if food standards had been harmonised. However, this did not happen. And where is the EU citizen in this scenario? She or he teleworks a lot! The levels of physical activity decreased. Energy levels are often boosted with a large chocolate cappuccino. You can even get it delivered home through an app. Prevailing lifestyles are not too healthy. The issue is that the main driver of food choices is their cost. With low prices for ready-to-eat foods, food quality is not a priority and people are generally not responsive to food-related health and environmental issues. Coupled with the fact that public health budgets are not enormous, disparities in access to healthcare and social inequalities result in different health trends among the Member States. Those who still have a healthy lifestyle and eat fresh quality food can do so only at a high price – or they are lucky to live in a small preserved area of the European continent where fresh food is still produced locally. It's a world in which we can still make a positive contribution in the EU, but we have lost many opportunities in terms of sustainability, environmental preservation and social equality. Awareness of and education on health, food and environmental aspects are needed to spark a change. But the question is if there is political will to do so.



## Regional Food Scenario

*"Regional Food is considered by many a utopic scenario, a world where other values are more important than money, where social cohesion and welfare are the most important goals. The EU food chains overall have become more fragmented and on a local scale. Healthier eating habits, coupled with preventive health policies and nutritional education are at the forefront of society, however older generations still bear the marks of unhealthy dietary habits."*



Regional food is considered by many a utopic scenario, a world where other values are more important than money, where social cohesion and welfare are the most important goals. However, not all aspects in this scenario are that optimistic. So, how did we reach this stage? Discussions on climate change mitigation and resource depletion did not lead to the necessary changes to stop these trends. In spite of some adjustment, the emerging economies continued to grow rapidly, largely based on the use of fossil fuels. The growing world middle class shifted, as forecasted, towards a more westernised diet, rich in animal proteins, vegetable oils and processed foods, thus contributing to the increasing pressure on natural resources. As a reaction, citizen groups in the EU started advocating for a change of policy and more responsibility of the individual. Global trade and the use of technologies, such as genetic engineering, that is not accepted by everybody are additional concerns for EU citizens. Trust in the political system and the EU has decreased. Towards 2035, access to natural resources became an issue, and incidents of trade disruptions, in particular for food, increased in number, due to export bans following harvest failures, food price volatility, and scares and scandals related to food quality and safety. Climate change has increased average temperatures beyond the 2 degrees Celsius threshold, and the EU experiences more frequent heat waves and a decrease in rain falls. As a result, agricultural production becomes more and more dependent on irrigation as well as temperature and drought resistant crop varieties, while susceptibility to (new) pests is increasingly becoming an issue. Temperature increase, though, has allowed expansion of agriculture further north.

Most countries and macro-regions abandoned bilateral and global trade agreements 10 years ago; trade happens mainly within the EU, also in the sector of agricultural products and foodstuffs. Some critical raw materials still need to be imported, and specific policies and agreements are in place at EU level. Exports from the EU to the rest of the world are negligible. Prices for goods, in particular food, have gone up; food now represents an important share of the household budget. In line with the societal goal of sustainability, growth of GDP is no longer considered to be the only measure of success, and other elements such as environmental quality and quality



of life are considered more important. Increasing distrust in globalisation leads to nationalist sentiment and isolationist policies. Decision-making processes may be easier to understand, but capacities to act collectively are limited. The rise of disinformation and loss of scientific and technological know-how result in an erosion of trust in experts and institutions. Social cohesion is limited to local communities. Increasingly unfavourable conditions for food production led the EU and its citizens to turn their back on global trade and restructure the economy towards sustainability and food self-sufficiency. Citizens have a more active role in food production, consumers become “prosumers” and many of them use their gardens and rooftops to grow food, including animals. Reduction and re-use of food waste, as well as bio refineries, are common elements, and technologies such as biotechnology are used to create crops. Diets are largely plant-based.

The EU primary food production sector is a mix of large, rural entities, smaller peri-urban and urban farming facilities, complemented by advanced homesteading. Sophisticated technologies are used, including automation and precision farming. Food chains overall have become more fragmented and on a local scale. Intensive livestock production has continued its decrease, in particular cattle and pigs. For livestock species, it has been more difficult to increase disease resistance, since climate change has facilitated the spread of several, in the EU formerly unknown pests. Insects are now being produced for food and feed, as are new aquaculture species. Digital platforms support crowd-funding, and local initiatives for do-it-yourself biotech resulted in additional plant varieties with better agricultural characteristics and new tastes to broaden food variety. New varieties are tested to enlarge the currently limited diversity, and to find varieties that are better adapted to water scarcity and increased temperatures and that can help to ensure supply over a larger part of the year. Still, the variety of horticultural products, in particular, has decreased compared to today. Retail has been largely moved to online shopping; also local and individual producers who seek to sell directly to consumers offer their products online. Packaging and storage conditions have been improved to reduce waste. To save resources, food waste at any stage of the food chain has been greatly reduced compared to 2015. Unavoidable waste at the household level is collected and fed back into the system, be it as energy gained through fermentation, as feed, or as fertiliser after composting. Larger entities have decentralised systems in place to use their waste for biogas production and fertilisation of their (rooftop) fields. Healthier eating habits, coupled with a health policy geared towards prevention and nutritional education in schools, have led to a decreased incidence of diet-based non-communicable diseases and obesity in children and adults. However, the older adult generations still bear the marks of unhealthy dietary habits, with higher prevalence of cardiovascular diseases and Type-2 diabetes.



## Partnership Food Scenario

*"Partnership Food sees nationalist sentiment and isolationist policies rampaging Europe, with social cohesion being limited to the local communities. Since technology innovation and R&D investments are at an all-time low in the EU, European societies have found themselves taking a step backwards. European consumers continue to drift away from traditional European dietary habits and food culture. Fast and cheap processed foods are the choice of the day!"*



The partnership food scenario brings with it increasing distrust in globalisation. Nationalist sentiment and isolationist policies are rampaging Europe, with social cohesion being limited to the local communities. A new trade zone is in place between the EU, the United States and Canada, where there are, for the first time, convergences in food policy and legislation – mostly due to the reduction of regulations at EU level. Furthermore, the EU quality food labels are not enforced any longer and thus have lost relevance; US producers can freely manufacture and sell – both internally as well as in Europe – foods that were once protected by EU quality labels and tied to specific geographical regions, ingredients or processes. The original, formerly protected European products are still available in the EU and international markets, but only as premium niche foods. For the first time, society is informed about and understands the political contexts and processes, but the lack of a sense of community makes this point useless. Acting as one society has now become a thing of the past, and due to increasing distrust, the situation only seems to be getting worse. Growing divergences and limited cooperation are becoming major sources of vulnerability for economic growth and sustainability in the EU, as indicated by slow GDP growth.

Low-cost, mass produced and processed foods are the focus of the agro-food sector, which is also facing increased concentration as compared to 10 years ago. European consumers continue to drift away from traditional European dietary habits and food culture. Fast and cheap processed foods are the choice of the day!

Food manufacturing industries are also geared towards efficiency, mass-producing affordable processed foods. Most large food manufacturing industries operating in Europe are based in the US or are owned by US companies, the exception being SMEs, which have a rather small share of the food market, however. Similarly, research in and development of novel food technologies and products mostly takes place in the US and Canada, and as a consequence, there is a decreasing demand in this sector for experts, such as qualified food scientists and nutritionists, in the EU.



There is significant technology involvement at the manufacturing stage, aimed at enhancing shelf life, taste and appearance, nutrient content, packaging techniques etc. Nonetheless, food and drink marketing promotes overconsumption of calories and large-portion sizes, and there is no longer a drive to reformulate foods and reduce saturated fatty acids, salt and sugar in processed foods; on the contrary, fat, salt and sugar content, with the help of flavour and aroma enhancers, helps make the taste of mass produced food more acceptable. This focus on the efficiency and resilience of food production has led the public and private sectors to prioritise their immediate concerns over environmental sustainability. This development is due to both the slow GDP growth and a lack of collective power of persuasion. Food safety and nutritional literacy is deteriorating fast, impacting on the capacity to adhere to basic hygienic principles in food preparation. Policy measures to address this include mandatory food safety and nutrition courses for school children and continuous education via life-long learning, ICT-based programmes for adults both at university and the workplace. Strengthening exchange between consumer organisations has also been proposed as a means of sharing information and best practices; however, this step has not been taken any further. Fake news articles begin more and more frequently to circulate via (online) media channels. Society finds it hard to distinguish truth from fiction, and trust in institutions is decreasing rapidly.

This is probably the only scenario that depicts a loss of scientific and technological know-how, which is both a cause and consequence of an erosion of trust in experts and institutions. Consumers embrace technological advances, which are mostly developed in the US and Canada, however. Since technology innovation and R&D investments are at an all-time low in the EU, European societies have found themselves taking a step backwards. This has serious repercussions for the food system, where there is an increased vulnerability to food fraud and inappropriate use of new technologies, leading to both new and old food safety hazards. This again, has a further negative impact on the declining EU economy, due to the central role of the food sector. As shown by the trashcan in the background of the illustration, science, technology and innovation are out the door! This US-Canada-EU partnership, with a common and advanced market comprising little less than 1 billion consumers, is a situation for all three partners on the international scene and provides access to a large market and more weight in international negotiations. This EU-CA-US partnership is a strong/dominant player on the international stage.



## Pharma Food Scenario

*"Pharma Food is a scenario in which the EU is doing well on many fronts: a strong EU economy with changed food values, geared towards health and disease prevention but also sustainability. In a context where fresh produce is not abundant due to climate change, people turn to functional, processed foods, often personalised to optimise their health status."*



Pharma food is a scenario in which the EU is doing well on many fronts: a strong EU economy with changed food values, geared towards health and disease prevention but also sustainability. In a context where fresh produce is not abundant due to climate change, people turn to functional, processed foods, often personalised to optimise their health status. This is incentivised by the state and coupled by peer pressure and support from social networks. As a result, prices for goods and services have increased, and while general pharma products are affordable for all, food can represent an important share of the budget in households that wish to strictly follow optimised, personalised nutrition regimens. Personalised meals are popular in Europe and, as a result, the EU has a strong share in this market. Diets are personalised based on individual needs, which can range from more generalised schemes providing the "right" mix of nutrients at all stages of life to more specific diets for individuals with particular needs (from allergies and intolerances to other nutrient needs associated with genotypes). Food waste has been significantly reduced, as compared to 2015, the main reasons for this being increased efficiency in food manufacture, on-demand food production technology, longer shelf life through intelligent monitoring and packaging techniques, and reduced consumption of fresh and whole foods.

On a global level, trade is fully liberalised and governments embrace international trade with provisions for responsible practices. While the volumes of imports and exports for primary produce aimed at direct human consumption have decreased, trade in the manufacturing sector and for processed health-promoting foods has increased. The EU is the global market leader in this sector, followed by Japan, US, India, Brazil and China. Furthermore, the strong economies and purchasing power of the former BRIC countries provide new markets for EU food manufacturers as well as the opportunity to develop customised functional foods and "phoods" based on the food traditions in the targeted markets. The constant start-up trend, continuously



adds to this topic of innovation within this new digitalized world. These new products are being adopted post-market entry by big multinationals and pushed worldwide. On the other hand, the EU has increased its imports of processed food ingredients, including pastes and powders necessary for “phood” production. The agro-food industry is highly concentrated and strong food/pharma multi-nationals control most of the food chain as the investments needed for research, big data handling/analysis, and placing such foods on the market are far too high for small medium enterprises (SMEs). Throughout the world, pharmaceutical and food/drink industries converge to exploit this market, and so do high-tech information and communication technology (ICT), robotics and bio-monitoring industries. Decades of careful attention to food safety as well as inspiration from the tight pharmaceutical quality and safety controls result in a highly controlled, transparent and traceable food chain, and this ensures trust and technology acceptance on the part of consumers. Food standards are globalised in this world – they are mostly imposed by the food producers themselves, given their control of the market and strong lobbies, with convergent legislation and approval procedures. The standards are nevertheless high and respectful of quality and safety throughout the chain. In Europe, they are also the natural response to firm public health policies and high corporate social responsibility. They are essential to maintaining high consumer trust in companies, experts and institutions, along with consumers’ acceptance of new products and technologies. This contributes to high social cohesion and inter-generational solidarity.

Indeed, with the change of attitude towards food, European consumers have developed a positive outlook towards the use of technology, with a rapid uptake across the food chain by all actors. On the down side, traditional agro-food industries are facing stiff competition from the nascent high-tech “phood” sector. Regarding food production, technological development focuses on the production of a large variety of customary functional foodstuffs, ranging from classical health-claim foods aiming at improving body functions, maintaining health or preventing disease to advanced, therapeutic “phoods” for which prescription may be needed. Primary production, characterised by the broad-scale adoption of good agricultural practices, has been able to adapt to climate change with the help of new crop and livestock varieties (enhanced and specialty) as well as precision farming technologies that facilitate an efficient use of water, pesticides and fertiliser. Livestock breeds have been geared towards the production of leaner meat, but in-vitro meat production allows an even more nutritionally targeted meat production. As a result, livestock production has been reduced considerably. Derivation of fats or proteins from algae has developed into another promising production line. The availability of personalised meals has been significantly simplified by the use of advanced technologies such as 3D printing (industrially or at home). Insect or legume based “meat” is a commonly printed protein source. Micro- and macronutrients as well as bioactive compounds are also available as easy-to-mix and dissolve formulas, which allow for the convenient preparation of nutrient rich meals targeted to individual needs. The food chain also relies on other technologies that Europe has historically been more resistant to accept, such as GMOs, synthetic biology or nanotechnologies.

The high use of functional components and pharmaceutical substances in foods has also resulted in a need to improve or maintain food taste and texture, resulting in more demand for the food additive industry providing stabilisers, preservative and colouring agents, emulsifiers, sweeteners, gelling agents etc. To achieve personalised diets, individual data on health parameters as well as genetic and other



biological-relevant data is collected, monitored, and translated into nutritional advice enabled by reliable biomarkers and biosensors. The retail sector is characterised by hyper-retail structures, physical or virtual (online), which allow for the full array of different food products to be brought to the consumer. The food service sector is quite broad and ranges from street vendors, vending machines or small restaurants to brand restaurant and cafeteria chains. This innovative and blooming food and health industry employs a high share of the working force. Despite high automation in many sectors, there are new service and support-related jobs in a variety of sectors: research, education, qualified food inspectors, product development, quality management, logistics and tracking systems, e- and m-Health data management and interpretation, personalised nutrition consultants and health coaches.

EFSA thanks you and hopes to work with you in its next phase of Strategic Definition!

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