

# A preparedness plan for Europe: Addressing food, energy and technological security

The current situation in Ukraine has led to severe supply chain disruptions, contributing to a sharp increase in food and commodity prices globally and the limitation of fossil fuel imports from Russia to the EU. A study recently prepared for STOA aims to identify drivers of and barriers to greater open strategic autonomy at EU level. It then recommends possible coordinated solutions, with a view to addressing supply chain resilience in four critical areas: food security, energy security, semiconductors and satellite communications.

## Introduction

The related study explores the ways to ensure food security for EU citizens and safeguard the agricultural sector. It also identifies possible ways to enhance the EU's energy security and ensure supply chain stability, as well as enablers and barriers to building resilience of the semiconductor supply chain in Europe. The study in the area of satellite communications focuses on the potential to leverage the Copernicus Programme – an important EU source of Earth observation data.

## Methodology and initial theses

A Delphi methodology was implemented to address the following questions: how to protect the European agricultural sector and prepare for food shortages; how to ensure energy security; how to ensure technological sovereignty of semiconductor production; and how to improve Copernicus's capabilities in the light of supply chain disruptions.

Sixteen theses were developed for these specific areas, as well as five additional cross-cutting theses demonstrating the relationship between the areas mentioned above. The questionnaires comprised Delphi theses, enablers, and barriers shaping the phenomena in the researched areas. The survey was addressed to experts representing one or more of the areas considered, primarily: scientists, academics, policy-makers, representatives of industry, government agencies, politicians, etc. The respondents were diverse in terms of gender, age, education, the sectors they represent and countries. The survey involved 153 experts in the first round and 117 experts in the second round.

## Main findings for the different areas of analysis

The conclusions of the study refer to the main findings and results obtained in the Delphi analysis in the four areas: food, energy, semiconductors and satellite communications. Detailed policy options to support resilience building in supply chains are presented in the full study report.

A number of specific measures are proposed for each policy option, and a cost/benefit analysis is made according to different aspects: social and environmental impacts, economic effects, and knowledge management and regulatory requirements.



## Food

Four theses were examined in this area. The highest significance index was noted for F\_T1 (Wheat production in EU countries will be independent of Ukraine and Russia), which may translate into a very high importance of decoupling wheat production in EU countries from Ukraine and Russia.

In the opinion of most (more than 70%) of the experts, the statements included in the theses will be implemented in the 2026-2030 period or in the 2031-2050 period.

The research carried out has led to the development of policy options that will promote open strategic autonomy at EU level and build resilience in food supply chains, where resilience is understood as the ability to secure food supply despite shocks and disruptions. The policy options in the area of food revolve around four main spheres, namely:

- 1 promoting local production and self-sufficiency of farms;
- 2 educating end users;
- 3 science, technology, engineering, mathematics (STEM) and research and development (R&D) orientation;
- 4 regulating to foster resilience in food supply chains.

## Energy

Five theses were examined in this area. The highest significance index was noted for E\_T3 (There will be closer integration of EU countries within European energy security), which points to high importance of energy cooperation within the EU, and the need for greater integration and coordination of activities.

The study also identifies 14 factors, highly rated by the experts, that may favour the resilience building of energy chains in the EU. The factor that received the highest importance scores was technological progress.

The research carried out has led to the development of policy options that will ensure the building of resilience in energy supply chains, where resilience is understood as the ability to secure energy supply despite shocks and disruptions. The policy options in the area of energy revolve around three main spheres, namely:

- 1 transformation towards energy communities/distributed energy/development of distributed energy;
- 2 greater energy integration of EU countries/deepening activities for the energy union;
- 3 reducing the energy needs of the EU/shortening and diversifying energy supply chains in the EU/greater flexibility of the energy system in the EU.

## Satellite communications

Three theses were examined in this area. In the experts' opinion, all three were characterised by a similar level of significance, with a slight advantage in favour of SC\_T1 (There will be rapid development of the market for free applications based on Copernicus data, which will increase the scale of stand-alone satellite data analytics by end-users). According to the experts, in the long term, satellite communication supply chains should become an ecosystem that includes all value-added activities, in the form of, for example, self-analysis and data visualisation through free and easy-to-use apps. Most experts (more than 80 %) believe this will be possible in the 2026-2030 period.

The study also identified 14 factors that, in the experts' opinion, may favour the resilience building of satellite communication supply chains in the EU. Generally, all the factors identified in the study may have a positive impact on building resilience of satellite communication supply chains in the EU. The factors with the highest uncertainty of development in the 2030 horizon include: the role of civil

society, the quality of legislation on cybersecurity, the use of digital data and aging society and the level of geopolitical stability.

The research led to the development of policy options meant to build resilience to infrastructural and geopolitical disruptions in satellite communications supply chains, and to mitigate and counter the effects of crises resulting from such disruptions. In the area of satellite communications, two policy options were developed that address the following issues:

- 1 supporting the decisions of the EU institutions managing the Copernicus programme;
- 2 supporting end-users (non-experts) and intermediate users (experts in Copernicus data analytics and Earth observation).

## Semiconductors

The global market, and any turbulence in semiconductor supply chains, have unquestionable impact on almost every area of human activity. The events of the past three years relating for instance to the COVID-19 pandemic, Russia's war on Ukraine, natural disasters, geopolitical conflicts have exacerbated the destabilisation and disruption of semiconductor supply chains. Almost all industries, such as the automotive, electronics, IT, medical, and military industries, and society as a whole, have felt the effects. The Delphi's survey of experts has pinpointed factors that will reduce the disruption of supply chains, on the one hand, and ensure the improvement of its resilience, on the other.

In the experts' opinion, the key issue is to ensure the security of supply of semiconductors to EU countries' strategic sectors. More than 57 % of the experts believe that the security of supply of semiconductors to strategic sectors (SE\_T2) will be ensured in the longer term – in the 2031-2050 period. The experts are more optimistic about the chance that the EU share of the global semiconductor market will increase from 10 to 20 % (SE\_T1) in the 2026-2030 period.

Regarding the verified theses, the experts deemed the most significant barrier constraining the theses' implementation to be a shortage of qualified workers and shortages of raw materials for semiconductor manufacturing. The realisation of the analysed theses, in the context of supply chain functions, will have the greatest impact on: a) minimising the cost of product and information flow while maintaining the level of service desired by the customer, and b) improving reliability, frequency and flexibility of supply.

Factors susceptible of favouring the resilience of semiconductor supply chains in Europe that received the highest importance scores included: funding of research, development and innovation, STEM talent investments and qualified employees in the semiconductor ecosystem. In contrast, the lowest impact on building resilience in semiconductor supply chains was characterised by such factors as: changes in environmental requirements that reduce manufacturing efficiency, fluctuating rates of demand for different types of semiconductors and conscious consumerism.

The research carried out has led to the development of policy options that will ensure the building of resilience in semiconductors supply chains. The policy options in the area of semiconductors revolve around four main spheres, namely:

- 1 global partnering supporting cutting-edge semiconductor fabrication plants (mega fabs);
- 2 support for local semiconductor ecosystems and the modern semiconductor sector;
- 3 STEM and R&D orientation;
- 4 increased protection for the EU market against security and safety threats.

## Interactions between areas

Five cross-cutting theses were formulated for this analysis to indicate the relationship between the research areas under consideration (food, energy, satellite communications and semiconductors).

The highest significance index was noted for CC\_T1 (The EU economy will become circular and the global value chain will be shifted closer to sites of consumption. As a result, EU supply chains (food, energy, satellite technologies, and semiconductors) will become shorter and lose their international importance). This may translate into a very high importance of the EU's move towards a circular economy and a shift of the global supply chain closer to sites of consumption. The orientation of countries' policies towards increasing self-sufficiency (energy, food, semiconductors) is the most significant factor favouring the implementation of this thesis. In contrast, the lowest values favouring implementation, according to the experts, is nearshoring – the practice of transferring a business operation to a nearby country, especially in preference to a more distant one.

In the experts' opinion, the strongest barrier to implementing this thesis is the lack of coherent policy in EU countries regarding energy. According to the experts, thesis CC\_T2 (Poverty in the EU will be a marginal phenomenon) is also significant. The significance index of this thesis is less than 2.4 % lower than that of thesis CC\_T1. The most significant factor favouring the implementation of this thesis is allocating certain funds in the budget of each EU country to finance services and research based on multidimensional data, including from the Copernicus programme. The strongest barrier to implementing this thesis is climate changes (e.g. hurricanes, droughts, floods). Over 80 % of the experts believe that the statements contained in most of the theses (with the exception of thesis CC\_T2: Poverty in the EU will be a marginal phenomenon) will be implemented in the 2026-2030 period or in the 2031-2050 period. According to more than 58 % of the experts, it is impossible for poverty in the EU to be a marginal phenomenon.

The implementation of most of these theses (with the exception of CC\_T2) has the highest impact on companies/industry and the lowest impact on non-governmental organisations (NGOs). In the case of CC\_T2, the experts assessed that it has the greatest impact on end-users, such as households, customers and consumers. In contrast, the lowest indicator values in this thesis were obtained for special interest groups, such as volunteer contributors and citizen scientists.

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