Mapping the Risks and Vulnerabilities in the EU Food Supply Chain

Daniele Bertolozzi Caredio and Simone Severini

Conducted by: Ecorys Brussels NV and Unitus

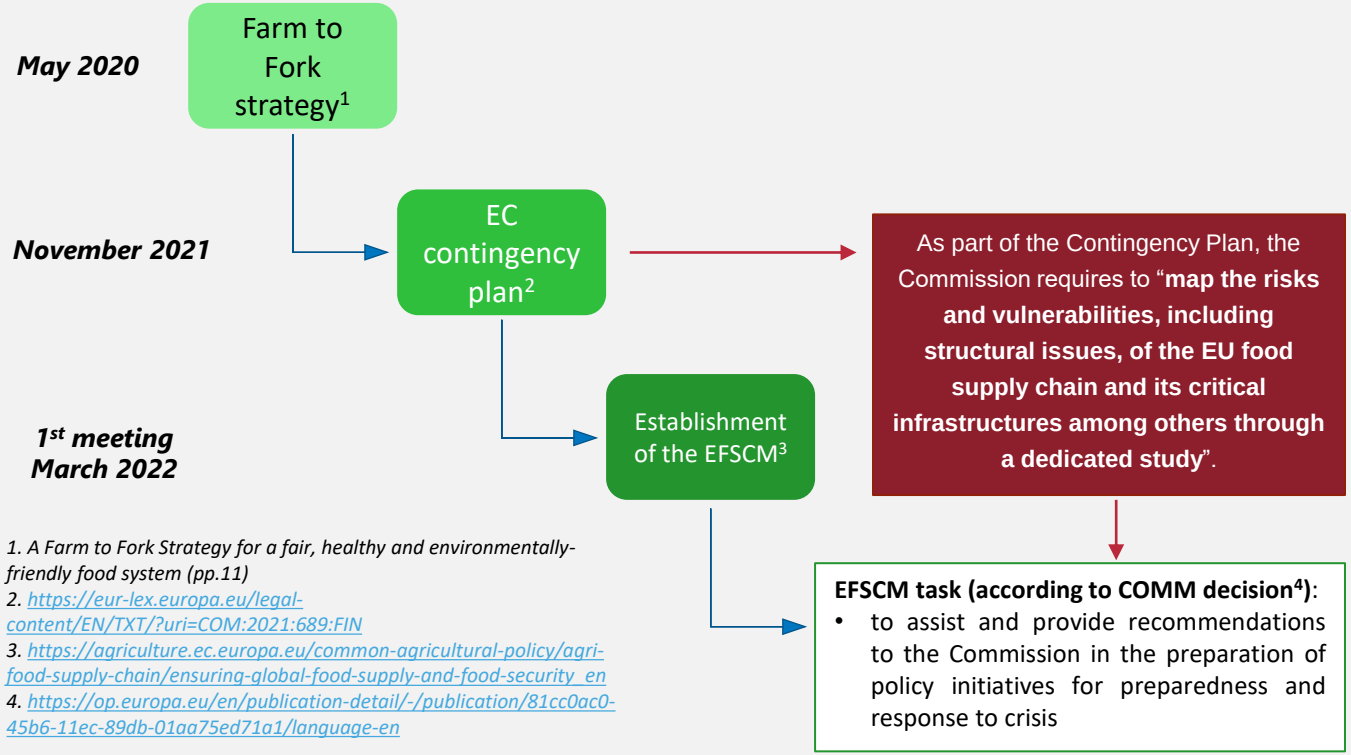
daniele.bertolozzi@ecorys.com; severini@unitus.it

AIEAA's Talk.
05/03/2024

Content of the presentation

- Context and rationale of the study
- Objective and scope of the study
- Data and methods
- Results:
  - Risks
  - Factors of vulnerability
- Conclusions

Context and objective of the study



1. A Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system (pp.11)
2. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:689:FIN
3. https://agriculture.ec.europa.eu/common-agricultural-policy/agri-food-supply-chain/ensuring-global-food-supply-and-food-security_en
4. https://op.europa.eu/en/publication-detail/-/publication/81cc0ac0-45b6-11ec-89db-01aa75ed71a1/language-en

Key definitions

RISK: A risk is an uncertain circumstance that can result in negative consequences (Hardaker et al., 2015; Chavas, 2004). It involves a potential impact and a specific likelihood of occurrence.

VULNERABILITY: vulnerability relates to the (in)capacity to respond to the negative impacts deriving from risks. A factor of vulnerability is a characteristic of the supply chain determining or increasing vulnerability to risks.

Objective and scope of the study

Objectives:

- To identify and characterise potential risks affecting EU food supply and security, and define a risk typology.
- To assess the vulnerability of the EU food supply chain in relation to the risks identified and define the factors determining such vulnerability.
- To identify the key risks threatening the most the EU food supply chain.

The scope of the study covers:

- All EU-27 (including outermost regions)
- The heterogeneity across sectors, stages of the supply chain, countries, and types of stakeholder

Stakeholders involved:

- Business stakeholders (single businesses and organisations)
- EU agencies and national competent authorities
- Research and academics
- International organisations and NGOs

Data and methods

Systematic literature review:
183 scientific and institutional papers

Semi-structured interviews:
152 stakeholders

Online survey:
278 participants

Risk and vulnerability analysis:

- Content analysis of interviews and literature
- Frequency analyses (relative importance, origin, time horizon)
- Likert scales (impact, likelihood, vulnerability, exposure)
- Econometrics
- Risk Index (Impact X Likelihood X Vulnerability)

Risk and vulnerability identification:

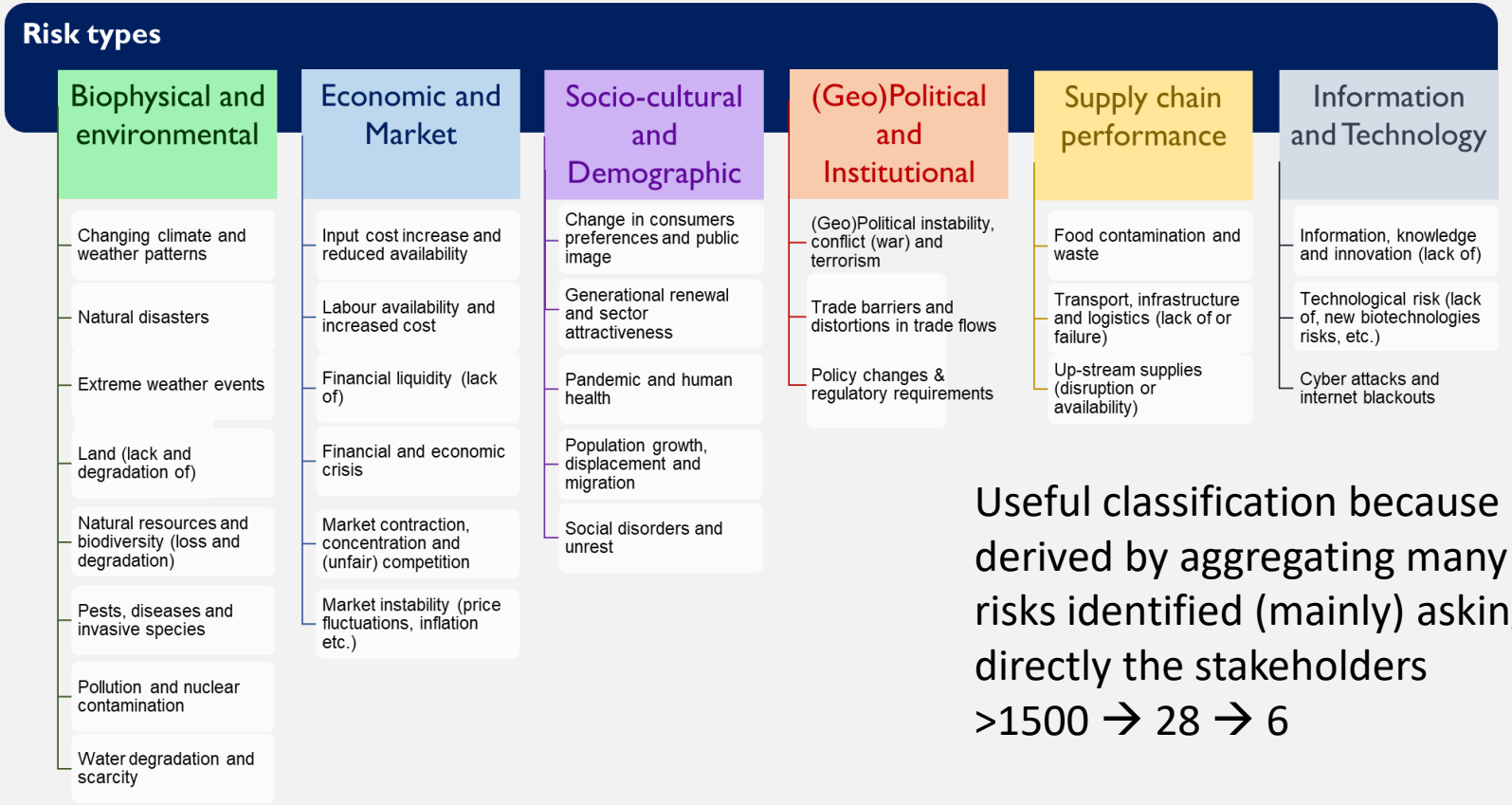
- Short list of 28 risk categories, further grouped into 6 risk types.
- Nine main factors of vulnerability

Limitations to account for

- Stakeholders' perceptions can be influenced by the context in which the interviews and the survey have been conducted (e.g. Covid-19, Ukraine conflict).
- The analysis was conducted with aggregated data, whereas stakeholders and regions are not equally represented; therefore, the results might not reflect the specificities of each sector or stage of the supply chain and should be carefully interpreted.

Results

Risk typology

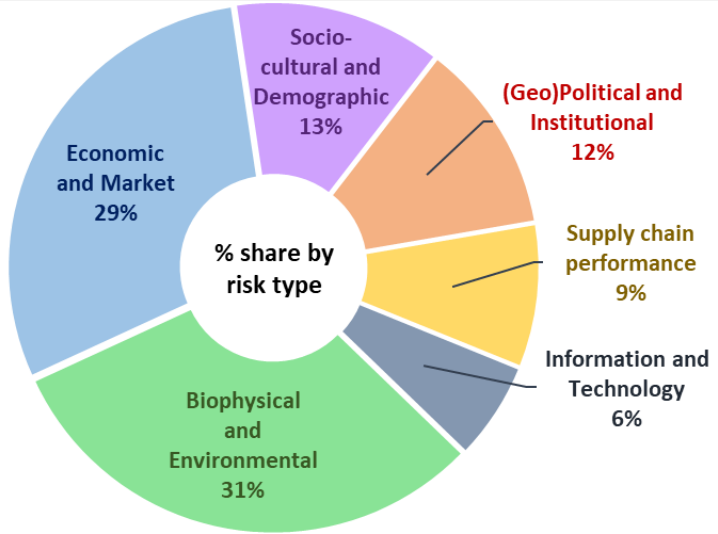


Useful classification because it is derived by aggregating many single risks identified (mainly) asking directly the stakeholders

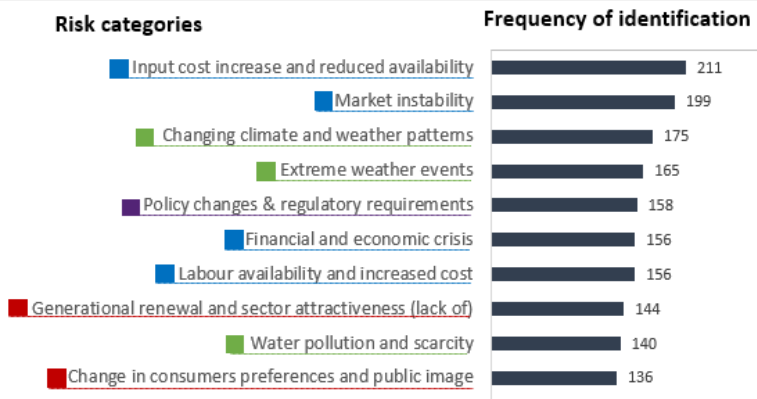
>1500 → 28 → 6

What are the risks that stakeholders identify most frequently?

Share of risk types mentioned by respondents (online survey).



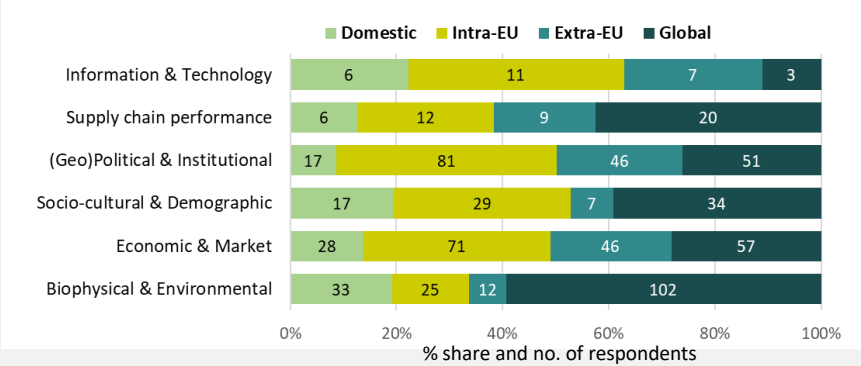
Ten most frequently identified risk categories (online survey).



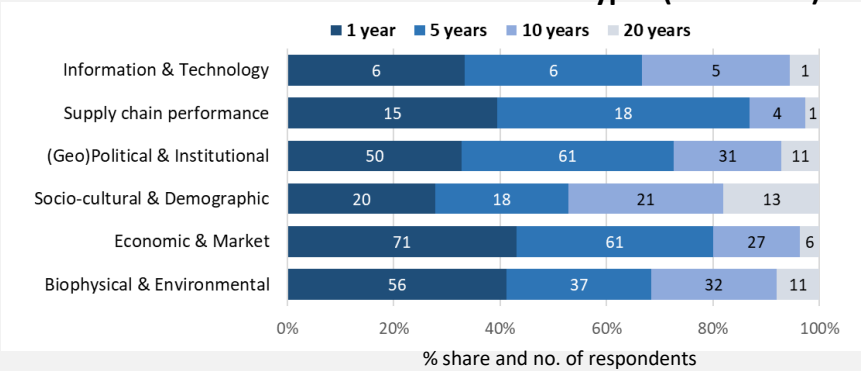
- Biophysical-Environmental and Economic-Market risk types are generally the most frequently identified.

What is the perceived origin and time horizon of the identified risks?

Origin of different risk types (interviews).



Time horizon of occurrence of different risk types (interviews).



A large share of the risks:

- originates from outside the domestic boundaries.

- Risks related to land degradation/lack of, financial liquidity, generational renewal, and market instability are perceived mainly of domestic and intra-EU origin.

- Risks related to changing climate, extreme weather events, pandemics and geopolitical instability are mainly perceived as extra-EU or global.

- is expected to occur within 5 years (or already threatening the FS!)

- Risks related to extreme weather, water scarcity, labour availability, cyber-attacks, and trade and input supplies disruptions are expected in the short term (1-5 years).

- Risks related to pandemic and human health, generational renewal, changing consumer preferences, and technological risks are expected in the medium and long term (5-20 years or more).

How to assess the most threatening risks?

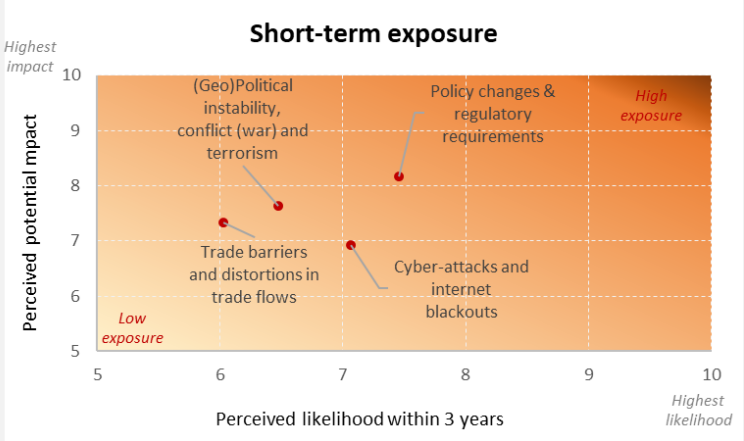
It depends on Risk Exposure and Vulnerability of the system facing a risk

Risk Exposure of a risk:

- Likelihood of Occurrence: how likely is the risk? (probability) (Likert 0-10 with 10 being the most likely)
- Potential Impact (if the risky event occurs) (Likert 0-10 with 10 being the highest impact)

Risk Exposure index (0-100) = Potential Impact (0-10) X Likelihood of Occurrence (0-10)

The higher the exposure to a risk, the higher the hazardousness of that risk.



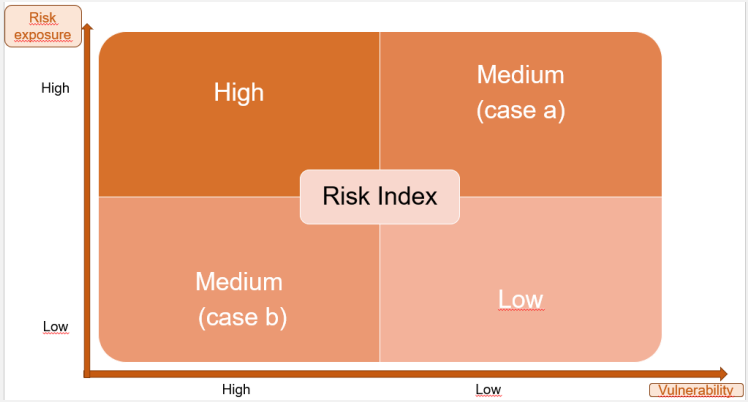
Vulnerability (Risk and Sector – specific):

Capacity of the food supply chain to deal with the considered risk

- Degree of vulnerability to a specific risk: Likert 0 - 10 (with 10 being the maximum degree of vulnerability).

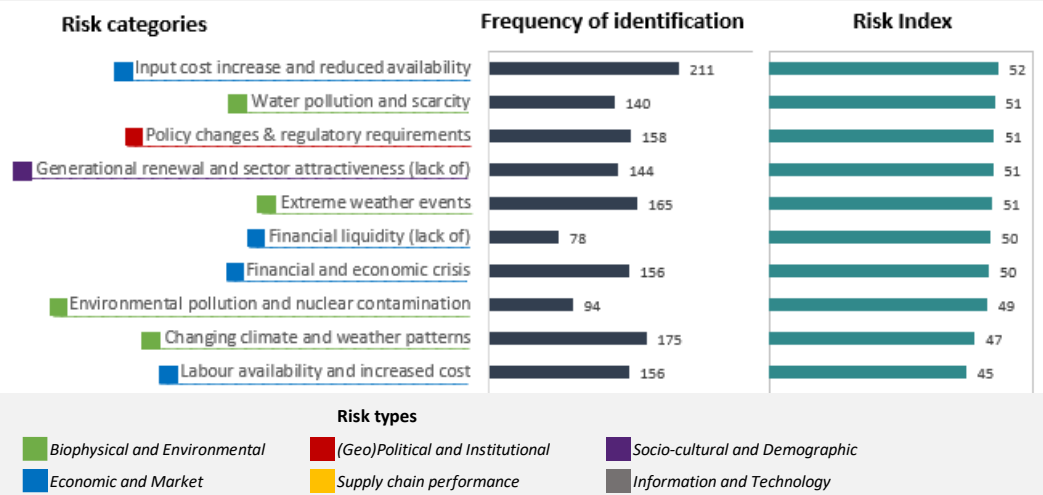
Risk Index (0-1000) = Risk Exposure (0-100) X Vulnerability (0-10)

- This index is normalised to assume values between 0 and 100 (with 100 being the highest risk).



What are the risks that are perceived to be the most threatening?

The ten main risk categories according to the Risk Index (0-100) (online survey)



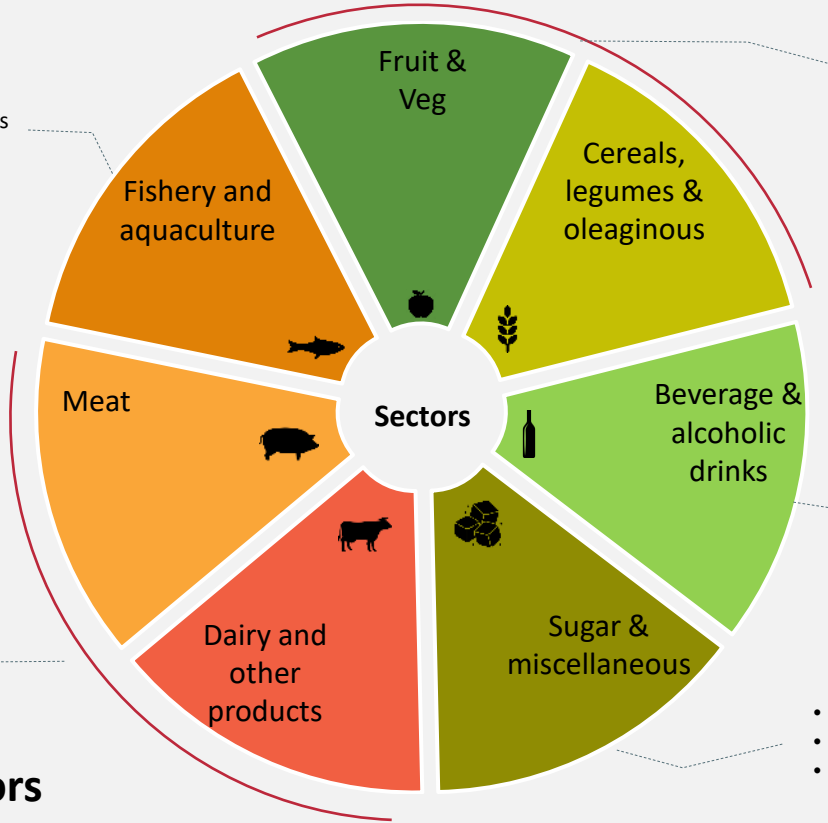
- The main risks are mainly Economic-Market and Biophysical-Environmental types.
- Generational renewal is perceived as a relevant threat overall.
- All other risk types are perceived as less threatening overall.

Which risks are perceived as most threatening across EU countries and regions?

Risks differ across Member States.

- Southern Europe (e.g. Malta, Italy, Spain) appears more affected by Biophysical and Environmental risks (especially climate risks).
- Eastern Europe and island Member States (e.g. Cyprus, Malta, Ireland, Hungary, Poland) seem more affected by Supply chain performance risks.
- Member States in South and East EU (e.g. Hungary, Czechia, Cyprus, Malta, Romania) are more affected by Socio-cultural and Demographic risks.
- Outermost regions are more exposed to all risk types, whereby certain risks that are less relevant on the European mainland (e.g. Socio-cultural and demographic, and Supply chain performance risks) become key risks in outermost regions.

Which risks are perceived as most threatening across different sectors?



- Innovation gaps
- Climate change and extreme weather events
- Financial liquidity constraints
- Rising input costs

- Adverse effects of extreme weather events
- Water scarcity
- Global market disruptions
- Geopolitical instabilities

- Evolving consumer preferences risks
- Evolving policy and regulation

- Animal diseases
- Inherent food contamination climate-induced impacts on animal health and productivity
- Shifting consumption trends

- Escalating costs and unavailability of crucial ingredients
- Intensified market competition
- Food contamination risks within the supply chain

Risks differ across sectors

Which risks are perceived as most threatening across different stages of the supply chain?

- Market instability
- Financial liquidity (lack of)
- Changing policy
- Food contamination

- Environmental pollution
- Input costs and availability
- Cyber-attacks
- Changing consumer preferences
- Broadly exposed to Supply chain performance risks

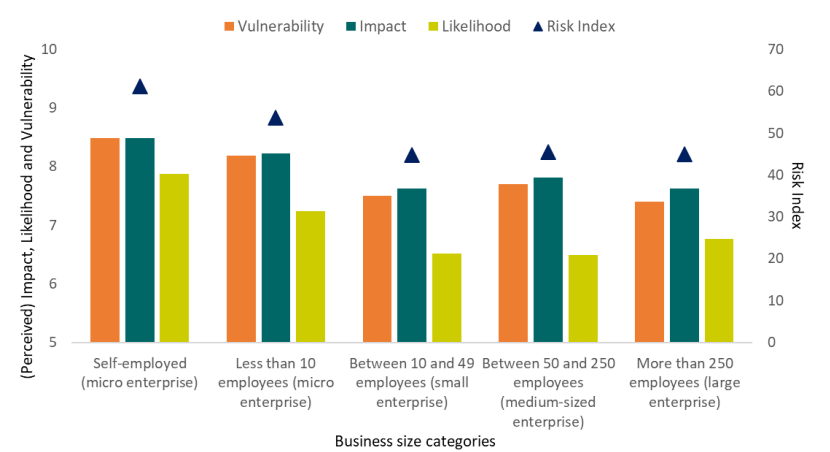
- Broadly exposed to Biophysical and Environmental risks (Changing climate, Extreme Weather events, Water scarcity, and Pests and diseases)
- Lack of Financial liquidity
- Generational renewal

- Policy and regulatory changes
- Environmental pollution
- Up-stream input supply
- Input costs and availability

Risks differ across stages but some risks affect more stage at the same time (interconnection)

How does risk perception differ across different types of respondents?

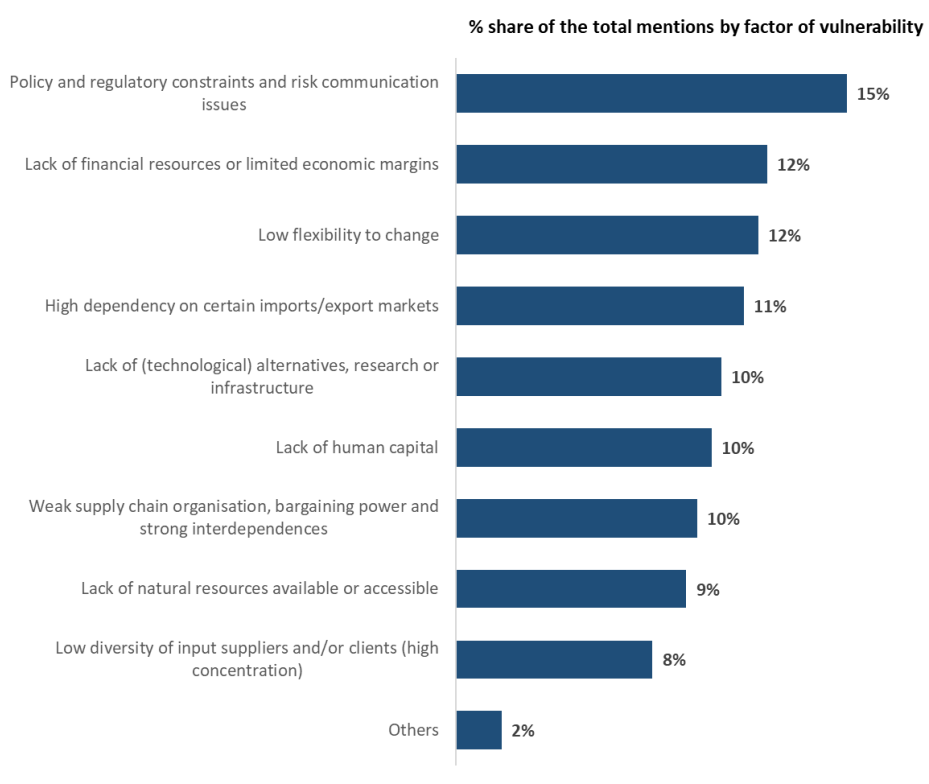
Risk perception by business size (online survey)



Risk perception (impact, likelihood, vulnerability) is higher in **small firms**

What are the main factors that are perceived to determine vulnerability?

Frequency of identification of factors of vulnerability (online survey).



- It is possible to identify different possible ways to reduce vulnerability
- Factors of vulnerability are relevant to specific risk types (not shown here for sake of brevity)

Conclusions

Conclusions (1/2)

The study confirms that **the EU food supply chain is indeed threatened by a large array of risks**. *It is noteworthy to further investigate the topic.*

A large share of the risks:

- belongs to the categories “Biophysical and environmental” and “Economic and market” (60%). *Need to focus on these?*
- originates from outside the domestic boundaries. *Need for international cooperation.*
- is expected to occur within 5 years (or are already threatening the FS). Examples are: Input cost increase, Market instability, Changing climate and Extreme weather events. *Need for a timely action.*

Novel risks emerge from the analysis (e.g., related to cyber-security, new technologies, pests and diseases). *Need for novel analyses/instruments*

Conclusions (2/2)

What are the most threatening risks? Overall picture is provided but large differences among:

- Member States (e.g., Southern Europe = Biophysical and Environmental risks (especially climate risks); Eastern Europe = Supply chain performance risks; East EU = Socio-cultural and Demographic risks)
- Sectors (e.g., F&V and field crops = water scarcity, extreme weather events, geopolitical instability; Livestock = shift in consumption; Beverage = policy and regulatory)
- Stage of the supply chain (e.g., wholesalers and retailers = env. Pollution, cyber-attacks; processors = policy and regulatory changes, up-stream input supply; producers = B&Env risks, financial and generational renewal)). Multiple stage are affected.
- Size of the firms involved (small firms report a higher risk index).

Complex/puzzling issue

Vulnerability is sometime high. *There is some room for reducing vulnerability* (e.g., by carefully manage policy and regulatory constraints, increasing availability of financial resources, diversifying import/export markets)

It seems a complex but also interesting and relevant topic for further investigation

→ policy implications/recommendations.

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For further details:

Bertolozzi-Caredio, D., Severini, S., Pierre, G., Zinnanti, C., Rustom, R., Santoni, E. and Bubbico, A., *Risks and vulnerabilities in the EU food supply chain*, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/171825, JRC135290.

JRC EXTERNAL STUDY REPORT

Risks and vulnerabilities in the EU food supply chain

Mapping and analysis based on a stakeholder survey

Bertolozzi-Caredio, D., Severini, S., Pierre, G., Zinnanti, C., Rustom, R., Santoni, E., Bubbico, A.