AETHR
ASSOCIATES

CLIMATE CHANGE AND FRESH FOOD SECURITY

Assessing Risks and Building Resilience in the UK

A STRATEGIC REPORT BY AETHR ASSOCIATES
IN COLLABORATION WITH THE FRESH PRODUCE CONSORTIUM

FPC

Executive Summary

Protecting our food supply from the risks of climate change

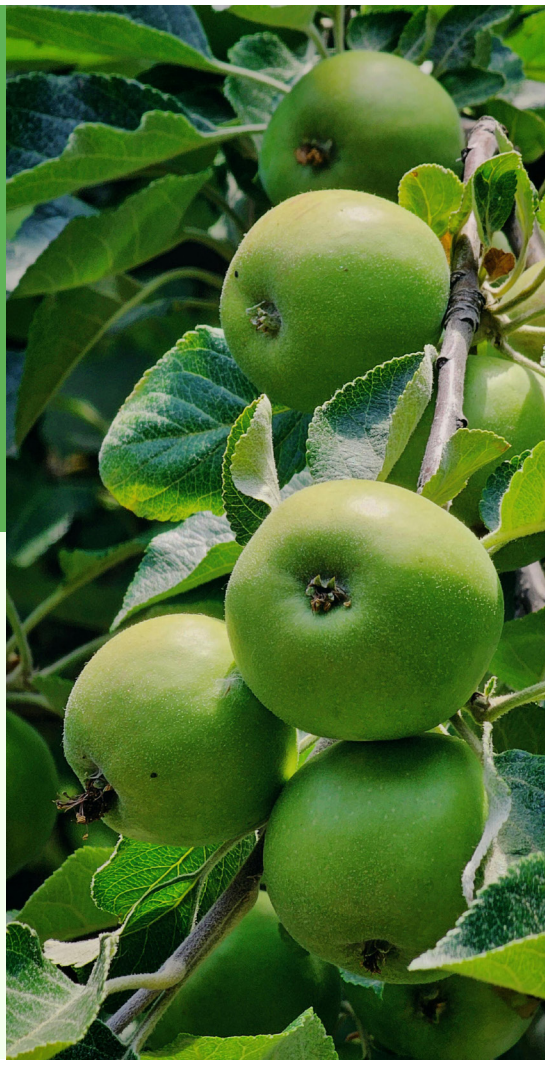
Climate change is no longer a distant threat. It's an immediate and escalating crisis.

As global temperatures rise, extreme weather events are becoming more frequent and severe, disrupting agricultural production and destabilising supply chains.

The threat to the UK's food security - with a heavy reliance on fresh produce imports - is particularly high. This concern is underscored by the DEFRA Food Security Report 2024, which highlights the growing vulnerabilities in our supply chains at home and abroad.

Did you know?

- Between 2014 and 2023, global warming accelerated to 0.26°C per decade[1]
- In 2023, the UK imported 47% of its vegetables and 84% of its fruit[2]
- Economic losses as a result of climate change are projected to reach $38 trillion annually by 2050[3]



Our analysis of climate change impacts under moderate projections (RCP 4.5)[4] highlights significant risks to water availability, agricultural productivity, and long-term food supply stability in the nations the UK depends on for fresh produce.

Nations like Spain, Morocco, South Africa, and Egypt are already facing increased desertification, water scarcity, and declining crop yields as a result of more volatile and extreme climate conditions.

[1]UKFSR 2024 [2]Defra Hort Stats 2024 [3]Germanwatch 2025 [4]Representative Concentration Pathway

Our analysis shows:

1 **64% of UK fruit and veg** imports in 2024 came from just 10 source countries

2 From 2019-2024 the **UK increased its spending on fruit and veg imports by 43% in countries** with high or very high water pressure risk (water stress/drought risk)

By 2050:

3 **The top 10 supply** countries will see average temperatures increase by an average of 16%

4 **41% of our current imported produce supply** will move from moderate flooding risk to high or very high risk of flooding

5 **72% of the produce** sourced from the top 10 countries (2024) will be facing extreme water stress.

→ What needs to happen

To safeguard food security, businesses and policymakers must integrate climate risk into their decision-making.

A structured climate risk evaluation and prioritisation process is essential to identify vulnerabilities, quantify exposure, and implement targeted mitigation strategies.

By embedding climate resilience into our food production, we can begin to tackle the UK's heightened food security risks, stabilise prices, and develop more robust, climate-adaptive supply chains.

The time to act is now →

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Understanding the challenges

1 The clear and present threat

The threat of climate change is here.

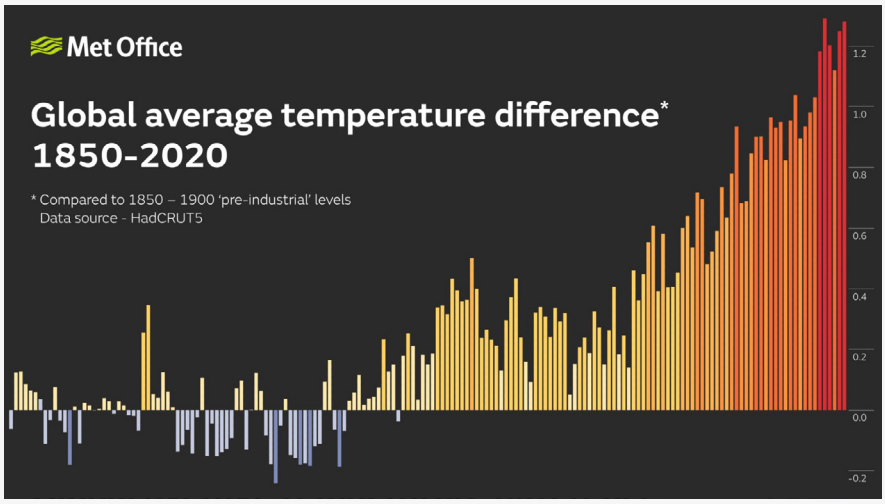
Primarily driven by human activities such as burning fossil fuels and deforestation, global temperatures are rising at an alarming rate. The result? More frequent and severe extreme weather events - like heat waves, droughts, and floods - which threaten both ecosystems and human livelihoods.

The urgency of the crisis:

- Between 2014 and 2023, global warming attributed to human influence has occurred at a rate of 0.26°C per decade - a clear acceleration compared to previous decades[1]
- 2015–2023 were the nine warmest individual years on record[1]
- 2023 was recorded as the hottest year in history, with both global air and sea surface temperatures reaching unprecedented levels[1]
- On 22nd July 2024, the Earth experienced its hottest day ever recorded[2]

International agreements are trying to curb emissions and encourage change, but progress remains slow (and subject to the whims of political leaders).

Without swift and decisive intervention, climate change will continue to destabilise economies, exacerbate food insecurity, and disrupt global supply chains.



Source: (Met Office,2024)

[1]UKFSR, 2024 [2]Germanwatch, 2025

The impact of a warmer world

Climate change is fundamentally disrupting the delicate balance of the Earth's climate system. Rising temperatures are altering weather patterns, intensifying extreme events such as droughts and floods, and shifting growing seasons – with far-reaching implications for ecosystems, agriculture, and food security. Two critical drivers of these changes are (1) the disruption of atmospheric circulation and (2) the increased capacity of the atmosphere to hold water vapour.

Disrupt atmospheric circulation

1

As polar ice continues to melt, this in turn causes:

- Jet stream changes as the temperature gradients between the poles and tropics weaken. A more erratic, meandering jet stream can lead to prolonged weather extremes.
- Hadley cell expansion as warming poles shift atmospheric circulation patterns (Hadley cells) which in turn changes global wind patterns, precipitation and climate zones. It can shift arid conditions poleward, negatively affecting regions such as the Mediterranean, the western United States, and parts of Australia.
- Ocean currents shift as the Atlantic Meridional Overturning Circulation (AMOC) is impacted by melting polar ice. This weakens global climate regulation and can affect rainfall patterns, with some areas becoming drier and others affected by more frequent and severe flooding.

Increase water vapour capacity

2

When global temperatures rise, the atmosphere's ability to retain moisture increases. According to the Clausius-Clapeyron relationship, for every 1°C increase in temperature, the air can hold 7% more moisture. This leads to more intense and unpredictable rainfall events, raising the risk of severe flooding.

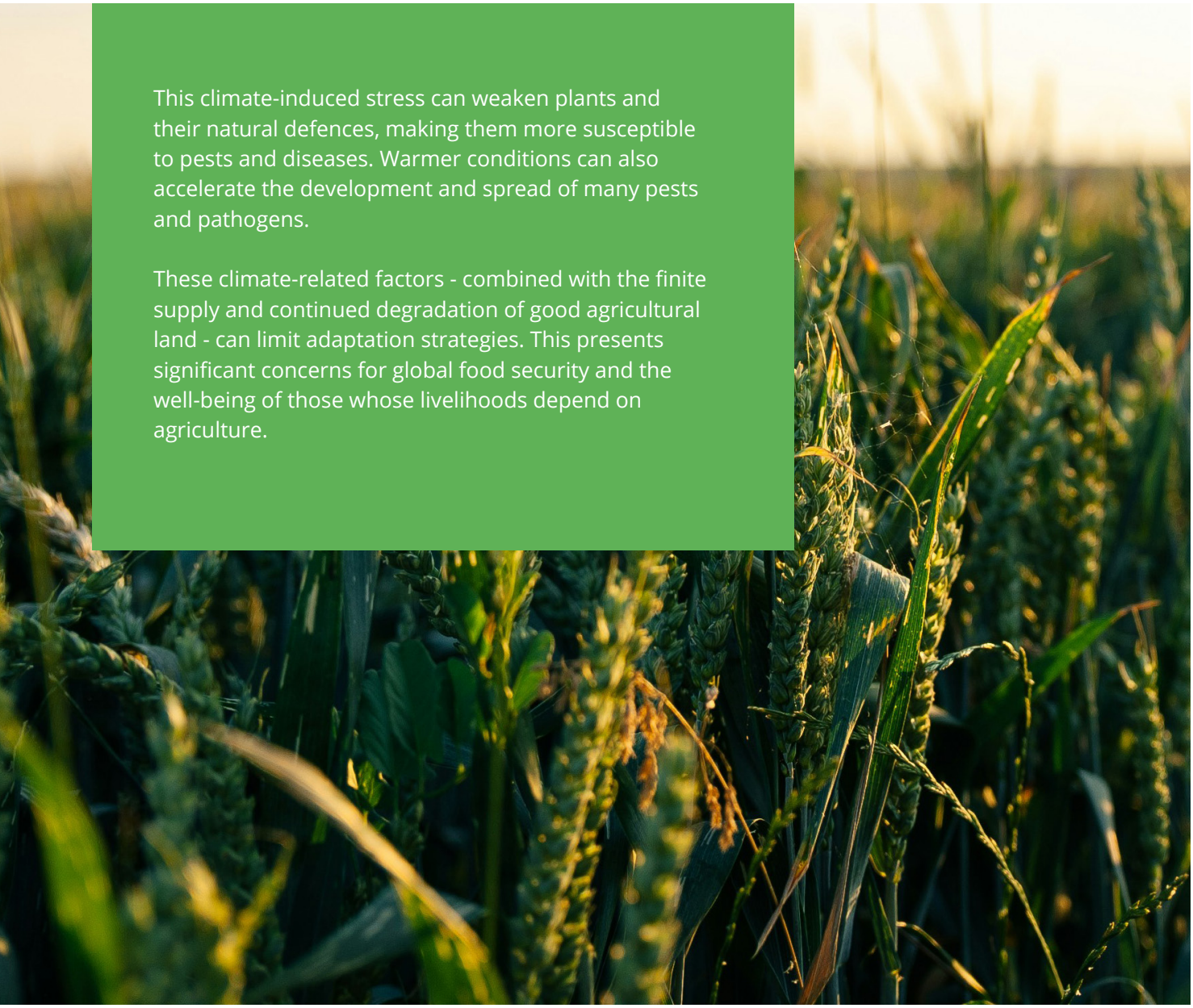
The reality of climate and crop production

Food production is particularly sensitive to the growing impacts of climate change. Higher temperatures and extreme weather events place considerable stress on crops.

- Higher temperatures interfere with essential plant functions like photosynthesis and pollination and increase their water demand
- Prolonged droughts deprive plants of vital moisture and nutrients
- Severe floods can damage root systems.

This climate-induced stress can weaken plants and their natural defences, making them more susceptible to pests and diseases. Warmer conditions can also accelerate the development and spread of many pests and pathogens.

These climate-related factors - combined with the finite supply and continued degradation of good agricultural land - can limit adaptation strategies. This presents significant concerns for global food security and the well-being of those whose livelihoods depend on agriculture.



How does climate change affect the UK's food security?

Over the last century, food production systems have intensified to meet consumer demand, driven by:

1

Year-round supply expectations as consumers expect a continuous availability of fresh produce, regardless of seasonality

2

Global supply network expansion which has increased reliance on international imports

As global crop production is impacted by a changing climate, there's a significant and growing threat to the security of the UK food system, with far-reaching implications for population nutrition and public health.

Within the past 50 years, the UK's reliance on imported food has risen sharply according to the UK Health Security Agency.

Why?

- More demand for exotic fruit and veg - UK diets have diversified substantially over the last 30 years, with a marked increase in the consumption of exotic produce like avocados, mangoes, and pineapples. These products are now widely available, thanks to expanding global trade, improved logistics, and evolving consumer preferences.[3]
- Ongoing import dependency - In 2023, the UK met only 16% of its fresh fruit supply and 53% of its fresh vegetable supply through domestic production[1]. Between 2019 and 2023, the value of fruit and vegetable imports from the UK's top 10 supplier nations increased by 20%, with notable growth from Southern Europe, Africa, and Latin America.[4]
- Public health and sustainability goals - The National Food Strategy suggests that to improve national health and meet net-zero commitments, the UK must increase fresh produce consumption by 30% by 2032.

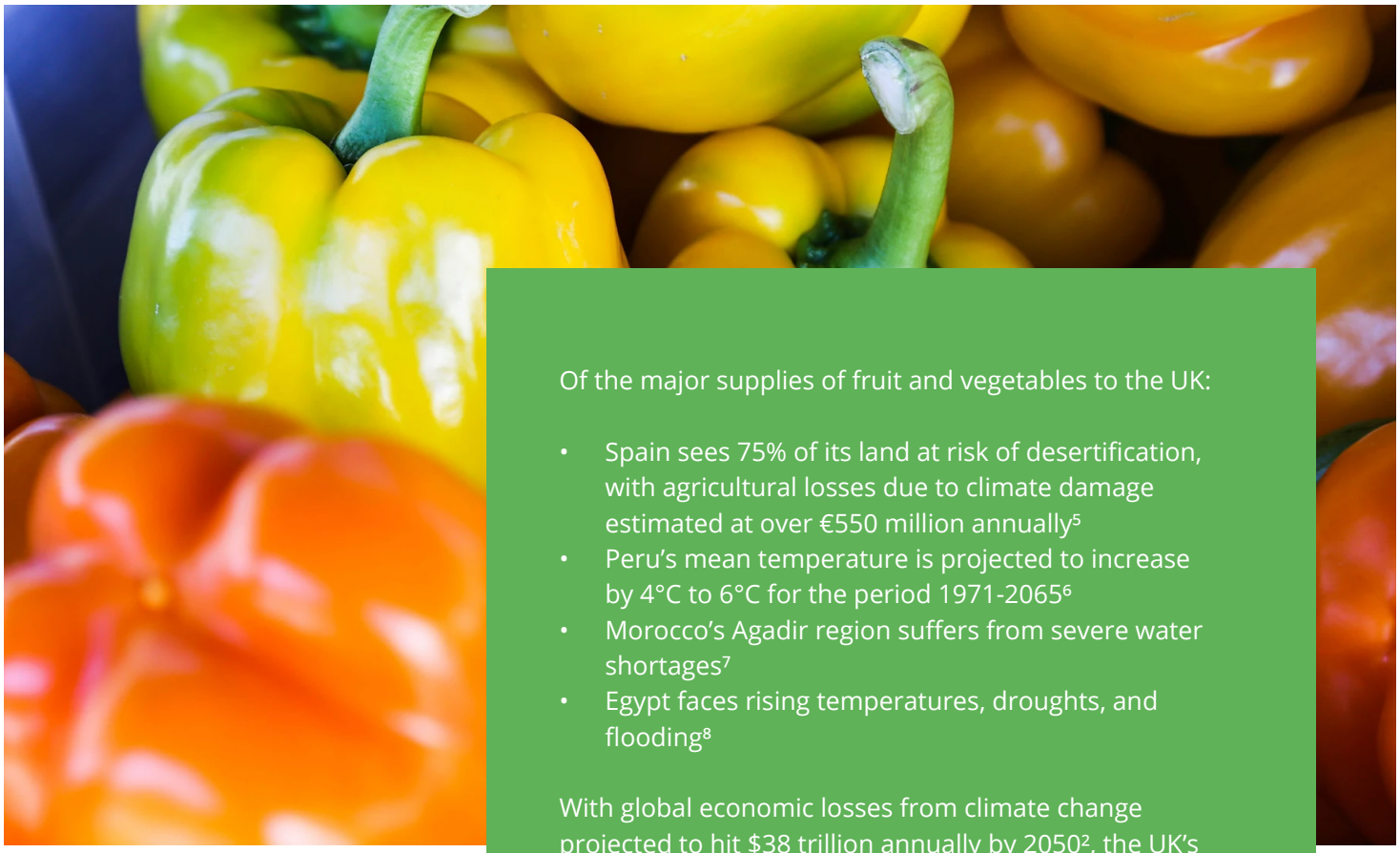
[3]ONS, 2025 [4]ITC Trademap Data

The source of our food supply matters

As climate change gradually undermines global food security we see firsthand how vulnerable agricultural production is to shifting rainfall patterns, rising temperatures, and extreme weather events.

How, and from where, we source our food then comes into sharp focus.

Imported fresh produce faces greater climate risk than UK-grown alternatives. While UK agriculture is vulnerable - high temperatures caused a drop in cereal yield from 25.5 million tonnes in 2019 to 19.0 million tonnes in 2020[1] - key import regions face even harsher impacts.



Of the major supplies of fruit and vegetables to the UK:

- Spain sees 75% of its land at risk of desertification, with agricultural losses due to climate damage estimated at over €550 million annually[5]
- Peru's mean temperature is projected to increase by 4°C to 6°C for the period 1971-2065[6]
- Morocco's Agadir region suffers from severe water shortages[7]
- Egypt faces rising temperatures, droughts, and flooding[8]

With global economic losses from climate change projected to hit $38 trillion annually by 2050[2], the UK's food imports are increasingly exposed to the impact of external climate shocks.

[5]agroberichtenbuitenland.nl [6]FAO 2018 [7]centre-for-sustainability.nl [8]Omran & Negm, 2020

The urgent need for a response

These compounding trends underscore the urgent need for adaptation and adoption of sustainable farming practices to ensure the resilience of both the UK's domestic and import industry amid an increasingly volatile climate landscape.

Momentum is lagging on two critical fronts across the industry:

1	**Firstly, To recognise the escalating threat to our supply of food**
2	**Secondly, to take swift and decisive action**

Identifying these risks is the essential first step. Without a clear understanding of where we're vulnerable, effective solutions are ignored.

But recognition alone isn't enough. We must move swiftly from awareness to action, developing innovative, resilient strategies that protect our food systems from climate impacts, supply chain disruptions, and rising costs.

A collaborative approach

Policymakers, industry leaders, and supply chain stakeholders must work collaboratively to:

- Identify and mitigate the risks presented by extreme weather events.
- Diversify supply sources to reduce dependency on high-risk regions.
- Implement sustainable agricultural practices that mitigate climate impact.
- Support overseas supply chains to invest in sustainable & resilient practices.

A coordinated and proactive approach is essential to safeguarding the UK's food security and public health in an era of increasing climate uncertainty.

Reporting future risk exposure?

The expectations on food businesses to measure and declare both their climate change risk exposure and their adaptive strategies that protect food supply chains and control rising costs has been rising gradually over the last few years.

Linking Climate Change to Economic Outcomes

The Task Force on Climate-related Financial Disclosures (TCFD) reporting framework, first established in June 2017, is playing a pivotal role in shaping government policy by encouraging a more systematic approach to identifying, assessing, and managing climate-related risks.

Companies are increasingly being required - either through regulation or investor pressure - to align their reporting with the TCFD framework. The framework is structured around four key pillars:

1. Governance
2. Strategy
3. Risk management
4. Metrics and Targets

This means organisations must not only identify and evaluate how climate change could affect their operations and financial performance (Financial materiality) but also disclose how their activities impact the climate and environment (environmental materiality). This concept, known as double materiality, reflects the growing expectation for companies to consider both inward and outward climate related impacts in their reporting.

In many jurisdictions, such as the UK, reporting aligned with the TCFD is now mandatory for large companies, reinforcing the idea that climate risk is a mainstream financial issue. This shift is driving improved data quality, greater accountability, and better-informed decision-making among investors and stakeholders.

Modelling Future Climate Scenarios - Representative Concentration Pathways (RCPs)

This modelling was created by the IPCC (Intergovernmental Panel on Climate Change) to standardise the complexity associated with projecting future greenhouse gas concentrations. Each RCP (e.g., 2.6, 4.5, 6.0, 8.5) represents varying levels of radiative forcing, influencing temperature, sea levels, and extreme weather.

- **RCP 2.6 – low-emissions keeps warming below 2°C.**
- **RCP 4.5 – moderate emissions lead to ~2.4–3°C warming.**
- **RCP 6.0 – higher emissions cause ~3–4°C warming.**
- **RCP 8.5 – worst-case warming of 4°C+**

The analysis in this report uses RCP 4.5, as it represents a stabilisation scenario where emissions peak around 2040 before declining. This balances humanity's speed of mitigation and adaptation, but is realistic that the target of limiting global temperatures to 1.5°C - the one integrated into the Paris agreement - will not be achieved

What do the risks to our food supply chain look like? →

Assessing the risks

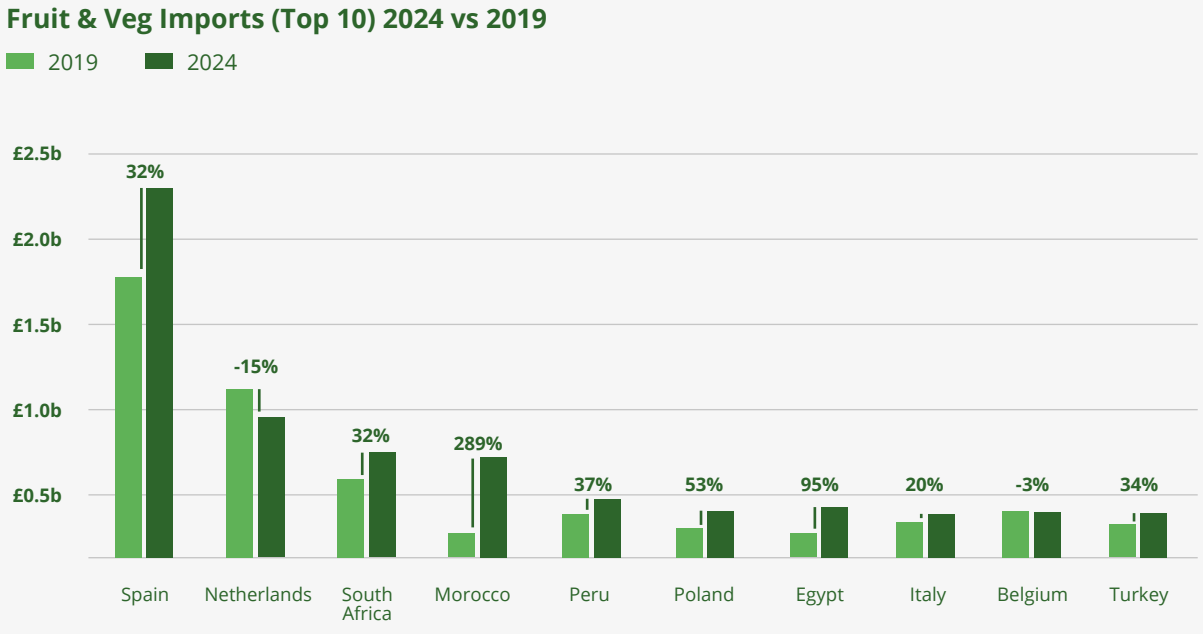
2

Market analysis for UK fresh produce food security

To recognise the escalating risks from climate change to UK food security, we've conducted an analysis focusing on fresh fruit and vegetables and the top 10 supplier countries by spend.

Why?

Because it represents such a high percentage (64%) of the fresh produce we import into the UK.



65%
of fruit and veg sourced from abroad
(84% fruit, 47% veg)

£9.8b
of imported produce in 2024

64%
of all fruit and veg imported comes from just 10 supply countries

Sources: ITC Trademap Data // Defra AUK

Future climate projections for the top 10 import countries

Based on RCP 4.5. Moderate emissions projections leading to 2.4-3oC warming.

We assessed how the risk exposure for each of the top 10 import countries for 2024 has changed in the short term and looked at how it's projected to change by 2050 under moderate climate projections.

Because the UK's fruit and veg imports are heavily focused on these top 10 countries, even the slightest change in climate conditions could bring significant challenges for producers that could disrupt this supply chain - as you'll see below.

Note: Countries are ranked in order of the amount the UK spends on imports, with Spain ranked first with the highest spend.

1 *Projected average temperature movement by country*

Average temperatures across key supply nations are expected to rise by an average 16%.

Spend Ranking	1	2	3	4	5	6	7	8	9	10
Countries	Spain	Netherlands	South Africa	Morocco	Peru	Poland	Eqypt	Italy	Belgium	Turkey
Avg Temp (Ref 1995-2014)	13.6	9.8	17.9	17.8	19.0	7.9	22.4	12.5	9.6	11.2
Avg Temp (future 2050)	15.6	11.5	19.8	20.1	20.8	10.2	24.6	14.6	11.3	13.5
Movement	15%	17%	11%	13%	9%	29%	10%	17%	18%	21%

Source: World Bank Climate Change Knowledge Portal

2 *The equivalent change in hot days per annum (more than 35 degree average)*

More than half of the top 10 countries are projected to experience a doubling of extreme heat days (24 hour average >35°).

Countries	Spain	Netherlands	South Africa	Morocco	Peru	Poland	Eqypt	Italy	Belgium	Turkey
Current Mean	9	0	14	38	1	0	99	1	0	8
Future Mean	20	0	28	56	11	2	132	4	0	18
%	122%		100%	48%	1000%		33%	300%		125%

Source: World Bank Climate Change Knowledge Portal

Key:

3 *Projected annual precipitation change by country*

While overall precipitation may remain steady for some countries, critical suppliers like Spain, Egypt, and Morocco face declines, contributing to an anticipated 25% increase in available water risk (water stress + drought risk).

Countries	Spain	Netherlands	South Africa	Morocco	Peru	Poland	Eqypt	Italy	Belgium	Turkey
Precipitation Current (mm)	674	828	540	306	2114	749	14	1011	886	716
Precipitation Future (mm)	620	835	525	260	2103	778	13	986	888	683
%	-8%	1%	-3%	-15%	-1%	4%	-8%	-2%	0%	-5%

Source: World Bank Climate Change Knowledge Portal

4 *Water Stress*

Baseline water stress measures the ratio of total water demand to available renewable surface and groundwater supplies. Water demand includes domestic, industrial, irrigation, and livestock uses. Available renewable water supplies include the impact of upstream consumptive water users and large dams on downstream water availability.

Risk is rated on a scale of 0 (lowest risk) to 10 (highest risk).

Countries	Spain	Netherlands	South Africa	Morocco	Peru	Poland	Eqypt	Italy	Belgium	Turkey
Current (1995-2014)	9.2	2.6	8.3	8.5	9.1	3.4	8.9	6.3	8.7	9.2
Future (2050)	9.8	2.8	8.8	9.1	9.1	3.5	8.1	6.5	8.8	8.8
Movement	7%	9%	6%	7%	0%	3%	-9%	2%	0%	-5%

Source: Aqueduct Water Risk Atlas

5 *Drought risk*

Climate change increases drought risk by intensifying heatwaves, altering rainfall patterns, reducing soil moisture, and accelerating evaporation. These factors worsen water shortages, making ecosystems, agriculture, and communities more vulnerable to prolonged dry conditions.

Countries	Spain	Netherlands	South Africa	Morocco	Peru	Poland	Eqypt	Italy	Belgium	Turkey
Current (2022)	6.8	5.5	6.9	6.6	6.3	6.9	7.6	6.9	6.0	7.2
Future (2050)	9.0	6.2	8.8	9.0	8.4	7.9	10.0	8.5	7.1	9.4
Movement	32%	13%	28%	36%	33%	14%	32%	23%	18%	31%

Source: INFORM

Key:

Highest Risk — Moderate Risk — Lowest Risk

6 *Riverine flood risk*

Climate change increases riverine flood risk by intensifying extreme rainfall, accelerating glacial melt, and altering seasonal flows. Higher temperatures cause heavier storms, overwhelming rivers, leading to more frequent, severe, and unpredictable flooding events.

River flooding, while highly localised, is expected to surge nationally in some regions like Egypt (+13%), though others like Morocco may see reductions (-23%)

Countries	Spain	Netherlands	South Africa	Morocco	Peru	Poland	Eqypt	Italy	Belgium	Turkey
Current (2022)	6.1	9.3	5.2	6.1	6.3	5.1	7.6	6.2	4.4	6.3
Future (2050)	6.0	9.3	5.3	4.5	5.8	5.5	8.6	6.7	4.5	5.5
Movement	-2%	0%	2%	-26%	-8%	8%	13%	8%	2%	-13%

Source: INFORM

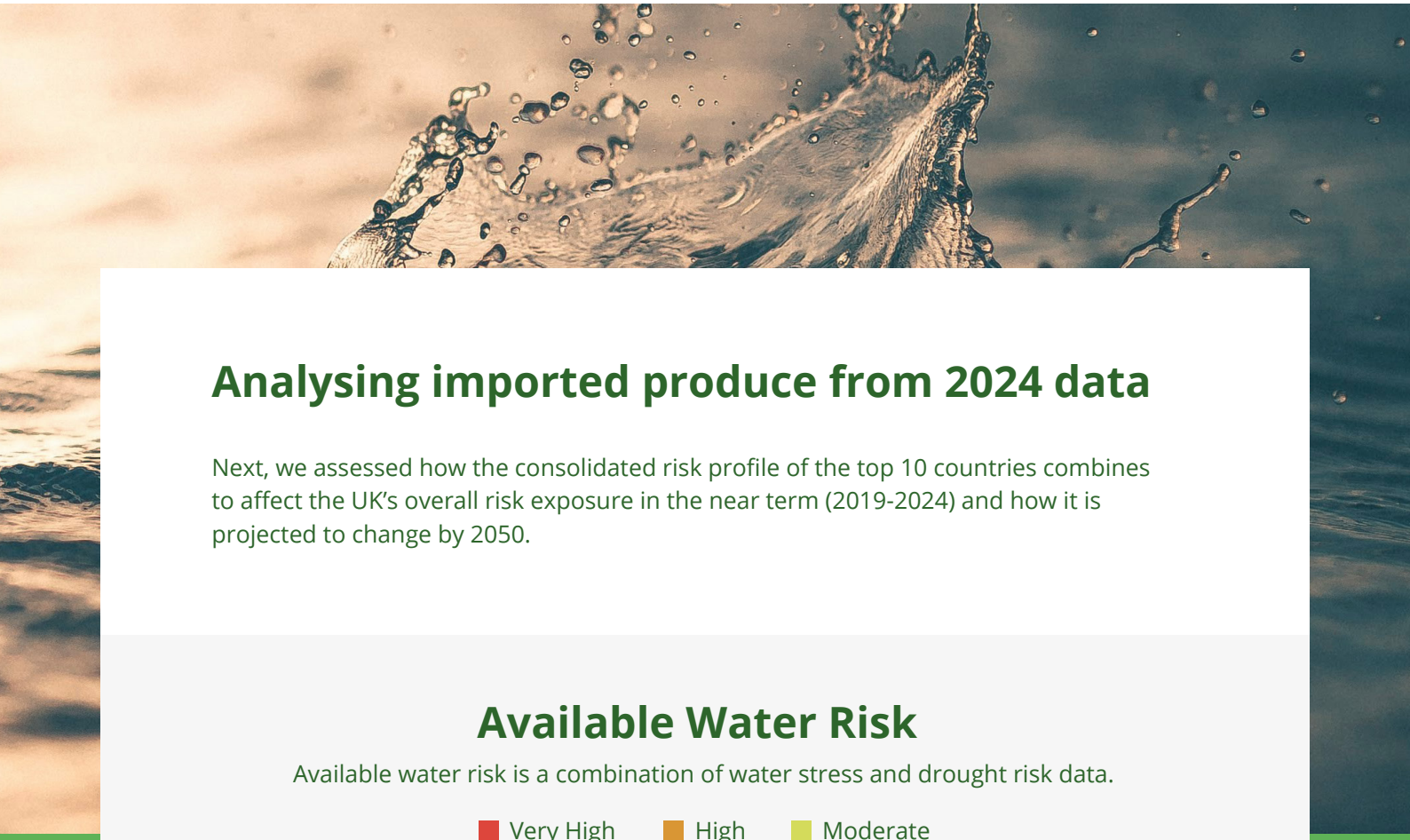
7 *Coastal flood risk*

Climate change raises coastal flood risk by causing sea level rise, more intense storms, and stronger waves. These changes lead to increased erosion, higher storm surges, and greater vulnerability for coastal communities.

Coastal flood risk is projected to rise by 21% on average, with 42% of key source countries moving from moderate to high flood risk

Countries	Spain	Netherlands	South Africa	Morocco	Peru	Poland	Eqypt	Italy	Belgium	Turkey
Current (2022)	5.2	9.7	1.1	5.0	1.9	5.6	7.0	6.3	6.7	4.9
Future (2050)	6.2	10.0	1.3	6.1	5.4	6.3	8.6	7.4	7.9	5.2
Movement	19%	3%	18%	22%	184%	13%	23%	17%	18%	6%

Source: INFORM

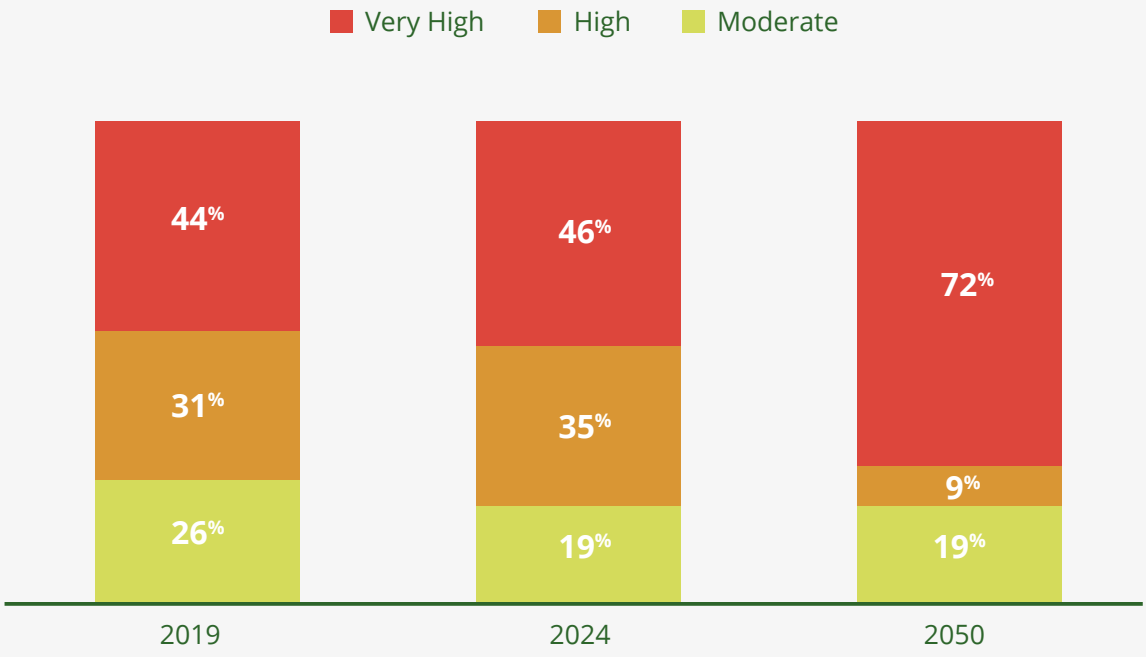


Analysing imported produce from 2024 data

Next, we assessed how the consolidated risk profile of the top 10 countries combines to affect the UK's overall risk exposure in the near term (2019-2024) and how it is projected to change by 2050.

Available Water Risk

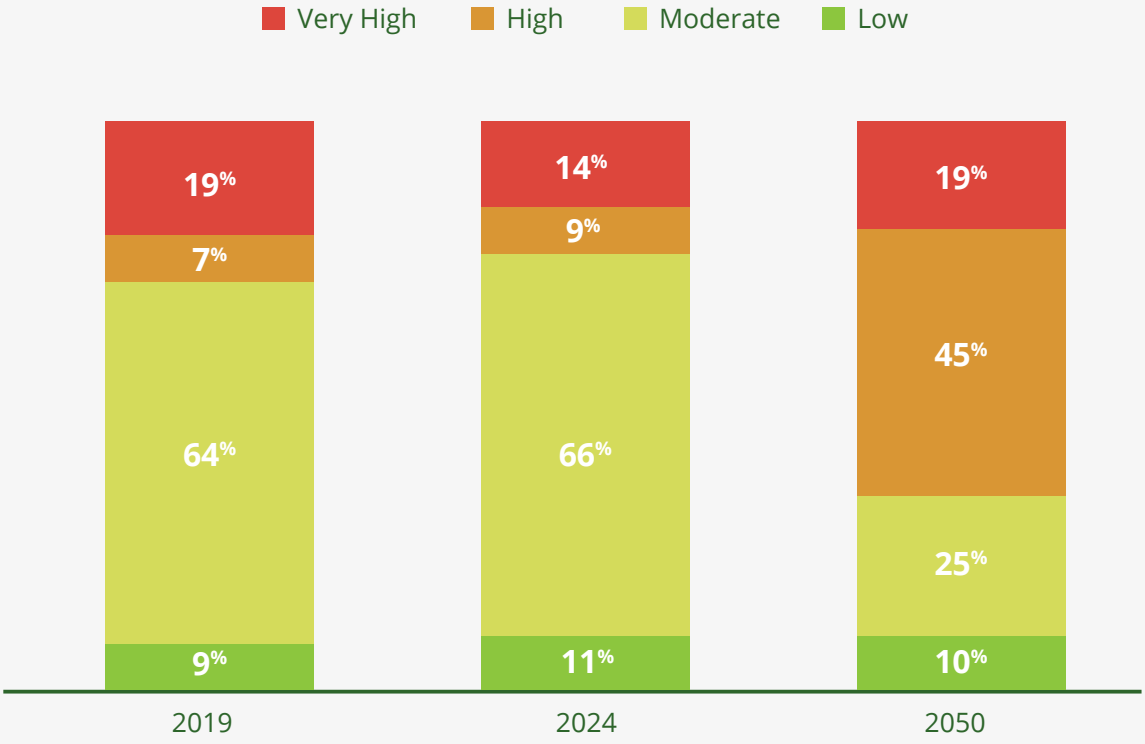
Available water risk is a combination of water stress and drought risk data.



Our analysis showed that water risk exposure has risen steadily on a short term basis (2019 - 2024) and it's projected that the 2024 spend share in the very high risk category will increase by 56% to nearly 3 quarters of top 10 spend by 2050. Of the 46% in the very high risk category in 2024, we are expecting circumstances will become even more challenging.

Flood Risk

Flood risk is a combination of riverine flood risk and coastal flood risk measures.



Although we're currently seeing a reduction in the share sourced from high/very high source countries, it's projected to swing drastically towards a higher risk scenario with a move from 9% to 45% in 2050.

National versus regional impacts

National-level climate projections offer broad, country-wide predictions based on large-scale climate models and overall averages. It's important to note these averages can mask significant variations at the local level, where certain areas may experience greater exposure to risks like water shortages or flooding.

You should always conduct a more detailed, local-level risk evaluation for specific farm locations to accurately assess the potential impacts and adapt accordingly.

Mapping risk across the fresh supply chain

Because the UK's fruit and veg imports are heavily focused on these top 10 countries, moderate climate projections for 2050 reveal significant challenges that could easily disrupt this supply chain.

Recent trends show we're potentially exacerbating the problem by sourcing more produce from areas at greater risk now and in the future. Between 2019 and 2024, the UK increased spending by 25% in countries classified as high or very high available water risk.

Projecting ahead to 2050, 25% of imports from key source countries are expected to shift from a high to a very high water risk status, meaning the UK could be sourcing a very high percentage (70% of top 10, 2024) of its fruit and vegetables from countries facing extreme water stress and drought risk.

These projections underscore an urgent need for proactive measures - from diversifying supply chains to fostering climate-resilient agricultural practices - to safeguard the UK's fruit and vegetable supply against mounting climate and water-related risks.

With key risks identified, now is the time to take decision action →

3

3. Building business resilience

Mitigating the risk of climate change

Our market analysis clearly shows how climate risk presents a significant challenge to our food security over the next 25 years.

UK importers need to start acting to evaluate where their exposure lies at a local level and how they can work with growers and suppliers to create mitigation plans.

Incorporating climate projection data into these evaluations is essential for assessing the specific risks that businesses and their supply chains are exposed to. National and regional climate projections provide valuable insights into how temperature, rainfall patterns, and extreme weather events may evolve in the future.

Combine this data with local risk assessments, and you will better understand the exposure to risks like droughts, floods, or heatwaves, which can directly affect crop yield and quality.

Mitigation planning involves developing strategies to reduce these risks, either by existing farm location development or diversification to areas less affected by the risks of climate change.

By proactively addressing potential vulnerabilities, you can:

1. Strengthen resilience
2. Safeguard production consistency and quality
3. Make better decisions across complex supply chains
4. Encourage the entire value chain to adapt and respond quickly to climate variability
5. Secure a stable food supply

But to do this, you need to focus on the most urgent issues.

Our climate risk evaluation and prioritisation process is designed to provide a clear and structured approach to assessing risks and determining the best course of action. By guiding decision-makers through evaluation, it helps make sure resources are directed where they are needed most for an effective and timely response to climate-related threats.

Here's how we do it... →

STEP 1

Establishing vulnerability

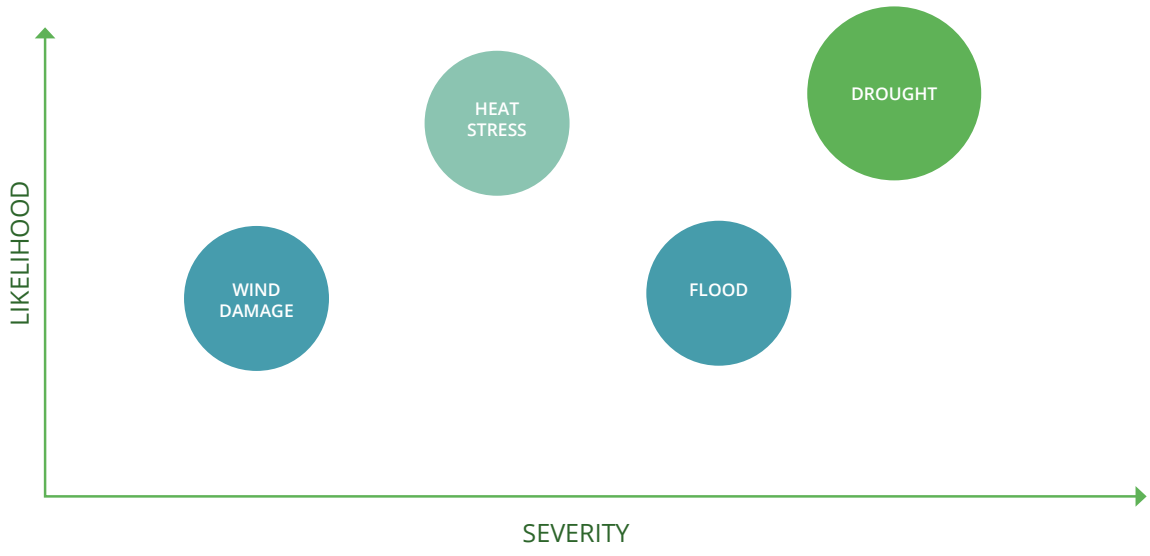
An organisation's exposure to climate risks, like extreme weather or policy changes, directly translates to its vulnerability. The greater the exposure, the higher the susceptibility.

Vulnerability = **likelihood of an extreme event x severity of the event**

By combining the likelihood of an event with the relative magnitude you can establish how exposed a specific location is and compare it to other locations or fruit and veg production models.

Predictive climate models also show that both likelihood and severity will increase against previous extremes.

Vulnerability Measurement



STEP 2

Establishing climate risk exposure

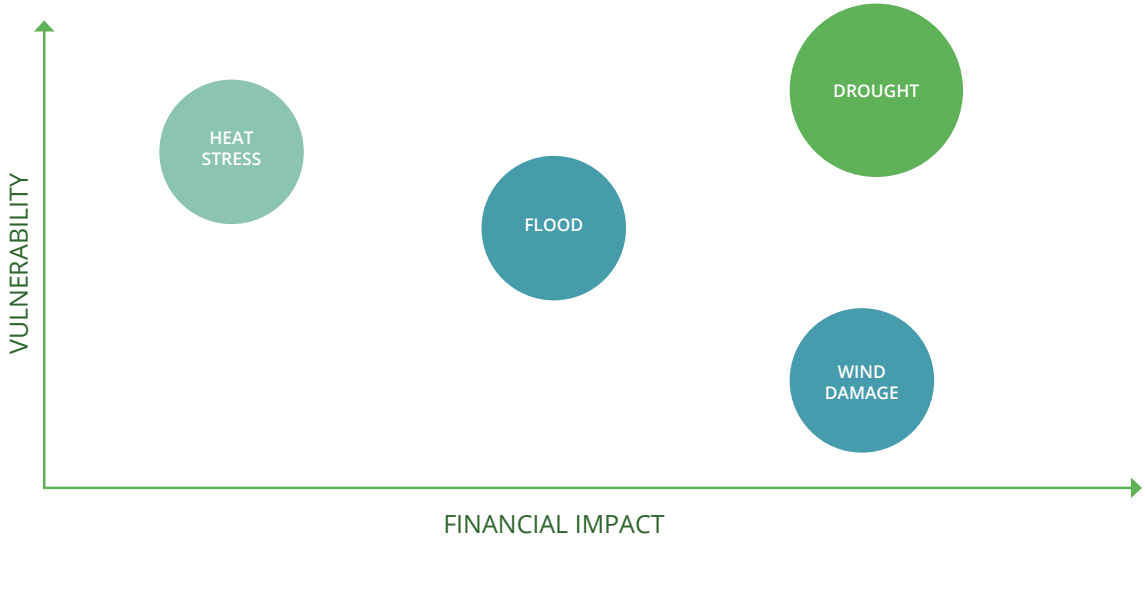
Climate risk can be determined by analysing the relationship between vulnerability and the financial impact of extreme weather events.

Climate Risk = **vulnerability of your organisation x financial impact**

To quantify financial impact, estimate the cost or loss of supply associated with specific climate events - like floods, high winds, or droughts - by evaluating potential damage, including crop loss, yield reduction, and infrastructure damage.

These impacts can be ranked as a percentage of total revenue, supplier spend or profit, providing a clear measure of financial exposure.

Risk Evaluation



STEP 3

Mitigation

By correlating vulnerability with financial impact, you can prioritise risks across multiple business units or global suppliers and enable targeted mitigation strategies, which in turn will give you greater resilience against climate-related disruptions.

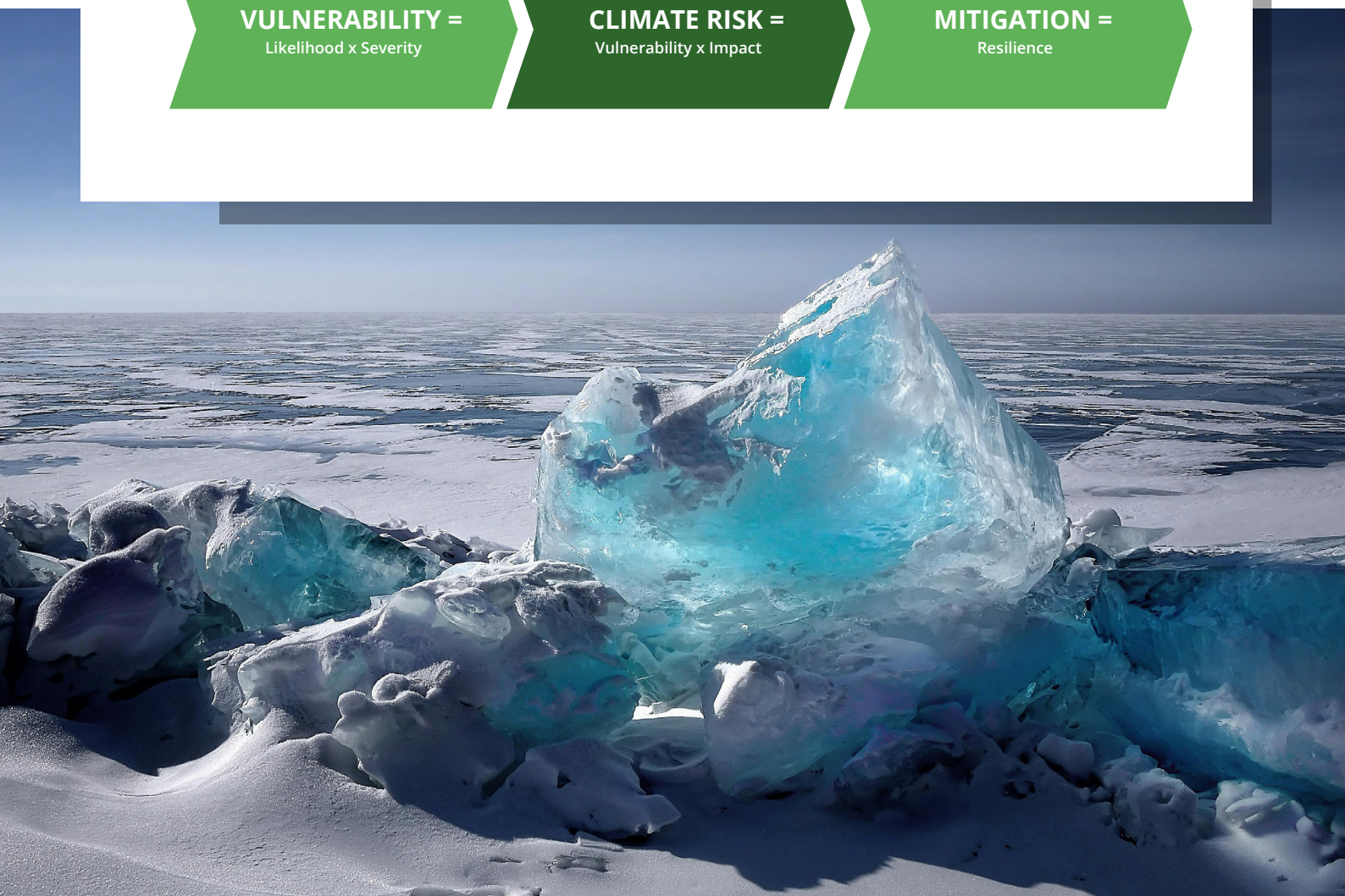
When you know what risks your business faces, you can create and deliver the appropriate mitigation strategies that build resilience against the threat of climate change.

Managing Climate Risk

VULNERABILITY =
Likelihood x Severity

CLIMATE RISK =
Vulnerability x Impact

MITIGATION =
Resilience



4

Next steps

Act and adapt to secure the food chain

There should be little doubt of the growing and immediate risks that climate change poses to UK food security, especially fresh produce imports.

Rising global temperatures, shifting precipitation patterns, and an increase in extreme weather events - such as droughts and floods - are already destabilising key agricultural regions.

As the UK continues to rely heavily on climate-vulnerable suppliers, these risks threaten long-term food availability, economic stability, and public health.

→ What can we do?

To build a resilient, climate-ready food system, we must wholeheartedly embrace the age of adaptation.

This means identifying vulnerabilities across domestic and imported supply chains and investing in innovative, science-backed solutions to strengthen resilience and protect production.

From improving water management in key regions to advancing sustainable farming practices, we need targeted investment and coordinated action across government, industry, and research sectors.

The time to act is now.

Our analysis shows the need for urgent, coordinated action.
Building business resilience requires a structured approach to evaluation, prioritisation, and mitigation.

- **Assess your vulnerability**
- **Quantity your financial exposure**
- **Implement targeted mitigation strategies**

By integrating climate risk assessments into decision-making, diversifying sourcing strategies, and accelerating investment in sustainable agricultural practices, the UK can enhance the resilience of its food system.

Controlled environment farming, regenerative agriculture, and improved water management will be essential tools in adapting to a changing climate.

→ **But inaction will come at a high cost**

The risk of delay

Without a clear, collective strategy and adequate financial backing, we risk falling further behind and exposing our food security to increasingly severe climate impacts, supply chain disruptions, and economic losses.

This will inevitably drive up food prices and limit availability, putting further strain on consumers.

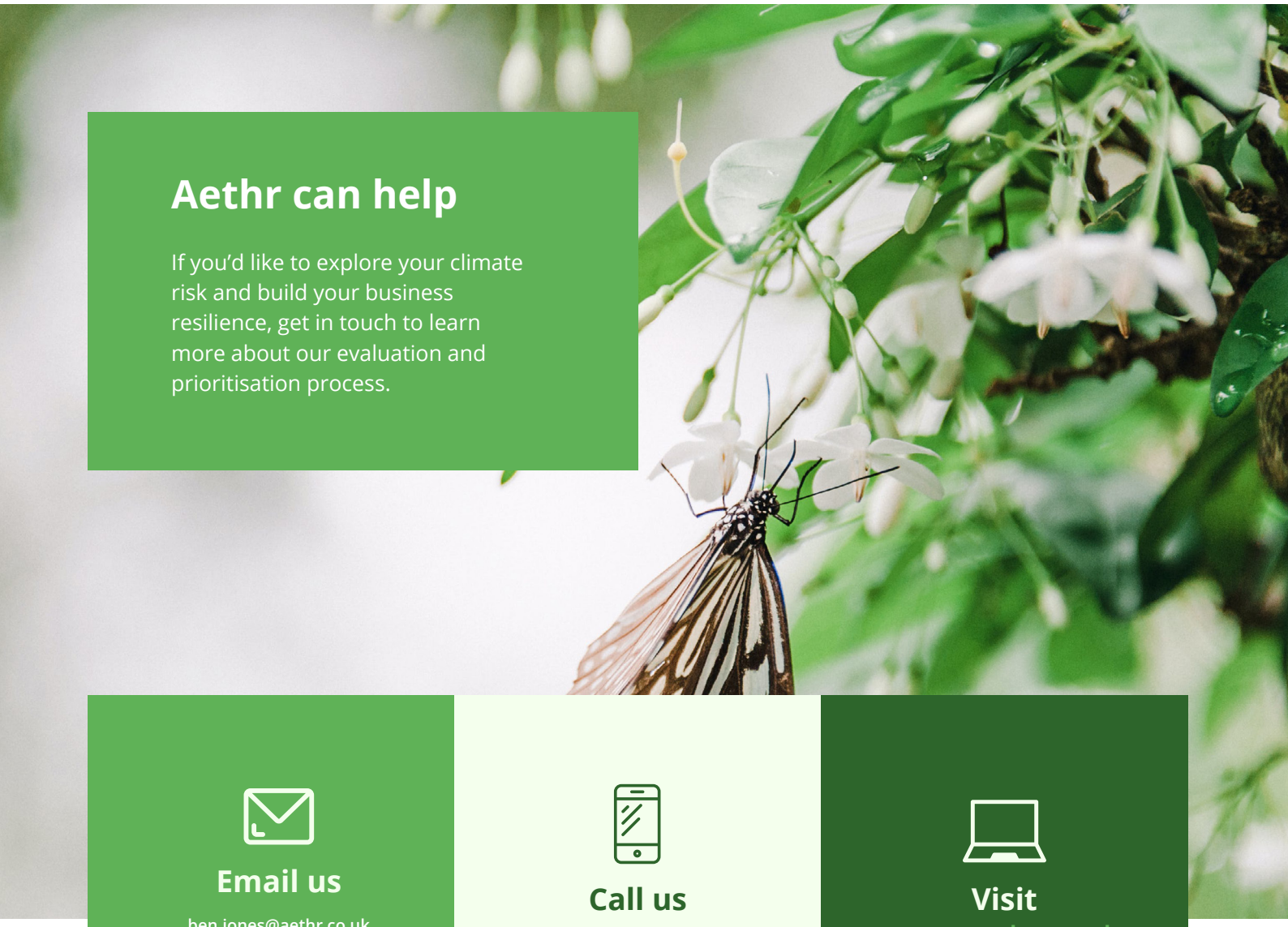
Failure to act =

- Supply disruptions
- Economic loss
- Rising food costs
- Increased vulnerability for consumers

About the Authors

Aethr Associates is a UK-based sustainability consultancy dedicated to helping organisations navigate the transition to a low-carbon future. With expertise in sustainability strategy, decarbonisation, and climate risk, Aethr translate their deep understanding of the food supply chain to deliver practical, data-driven solutions that drive real impact.

The Fresh Produce Consortium UK is the trade association representing the fresh produce, cut flowers, and plant sectors. It supports members through advocacy, industry insight, training, and promoting best practices to ensure safe, sustainable, and efficient fresh supply chains.



Aethr can help

If you'd like to explore your climate risk and build your business resilience, get in touch to learn more about our evaluation and prioritisation process.

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