

Climate Risk and Vulnerability Assessment

A Tool for Adaptation Planning in Ukraine

Dt. Svitlana Krakovska, Key expert on applied climatology, Egis-Ukraina



The **purpose of this assessment** is

- to determine the current and projected **vulnerability** to climate change of four horticultural crops (apples, walnuts, strawberries, and raspberries);
- to identify and spatially assess **climate risks** associated with individual types of climate **hazards** at the **oblast level** in Ukraine;
- to provide a scientifically sound **analytical basis** for further analysis of the potential consequences of climate change for the **economic performance** of the respective agricultural production systems, as well as for the development of strategic decisions on the **adaptation** of horticultures to climate change.

*The results may also be used to incorporate climate risks into **regional development and recovery planning** and to inform **long-term decisions** concerning the development of the respective production systems.*



Climate data and regions for CRVA

<https://uhmi.org.ua/>
<https://interactive-atlas.ipcc.ch/>
<https://climate.copernicus.eu/fire-weather-index>
[EU JRC LISCOAST](#)

Climate variable	Numbers of CORDEX-Adjust outputs
	RCP 4.5 & RCP 8.5
Daily mean air temperature	34
Daily maximum air temperature	14
Daily minimum air temperature	14
Daily precipitation	34
Daily relative humidity	7
Daily snowfall	9
Daily snow surface area fraction	11
Daily maximum near-surface wind speed of gust	13
Σ	136



PROGRESS

Promoting Green Deal Readiness in the Eastern Partnership Countries

Methodological framework for CRVA

IPCC Sixth Assessment Report

Working Group 1: The Physical Science Basis

Table 12.2 | Relevance of key climatic impact-drivers (and their respective changes in intensity, frequency, duration, timing and spatial extent) for major categories of sectoral assets, as assessed with at least *medium confidence* in [Section 12.3](#) across many studies and applications.

a) AR5 IPCC Risk Framework



b) AR6 and future of the IPCC Risk Framework



Sector	Asset	Climatic Impact-driver																	
		Heat and Cold	Wet and Dry	Wind	Snow and Ice	Coastal	Open Ocean	Other	Heat and Cold	Wet and Dry	Wind	Snow and Ice	Coastal	Open Ocean	Other	Heat and Cold	Wet and Dry	Wind	Snow and Ice
		Mean air temperature	Extreme heat	Cold spell	Frost	Mean precipitation	River flood	Heavy precipitation and pluvial flood	Landslide	Agricultural and ecological drought	Hydrological drought	Fire weather	Mean wind speed	Severe wind storm	Tropical cyclone	Sand and dust storm	Snow, glacier and ice sheet	Permafrost	Lake, river and sea ice
Food, Fibre and Other Ecosystem Products (WGII Chapter 5)	Crop systems																		
	Livestock and pasture systems																		
	Forestry systems																		
	Fisheries and aquaculture systems																		
Cities, Settlements and Key Infrastructure (WGII Chapter 6)	Cities																		
	Land and water transportation																		
	Energy infrastructure																		
	Built environment																		
Health, Well-being and Communities (WGII Chapter 7)	Labour productivity																		
	Morbidity																		
	Mortality																		
	Recreation and tourism ^a																		
Poverty, Livelihoods and Sustainable Development (WGII Chapter 8)	Housing stock ^b																		
	Farmland ^b																		
	Livestock mortality ^b																		
	Indigenous traditions																		

^a The Recreation and tourism asset category includes outdoor exercise and the tourism industry (including ecosystem services) assessed in many WGII chapters.

^b This asset category is distinguished by the threat of a full loss of key investments and living environments rather than a recoverable damage or loss of productivity or profit.

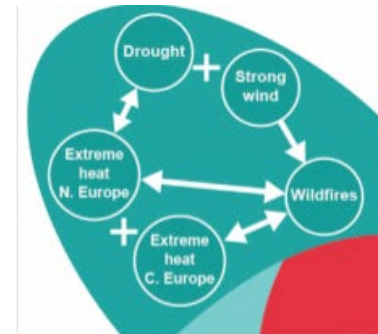
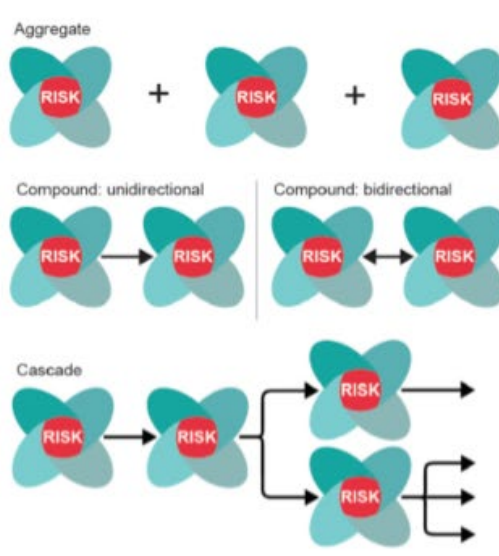


Compound and Systemic Climate Risks



Climate hazards, exposure and vulnerability jointly determine the level of climate risk.

Compound threats—such as a combination of drought, heat, and wind—lead to higher risks that are difficult to predict.



Simpson et al 2021 One Earth



Dr. Patrick M. Reed

CMCC lecture 03.03.2026

Systemic failures, extreme events and 'hyper-risks' emerge as a result of the highly complex and highly interconnected human-Earth systems

Dynamic relationships between agents, systems and sectors transmit risk for one to another

Drivers can amplify or buffer existing threats

Need for fundamental innovations in risk assessment

“Water and multisectoral resilience in a world of interconnected risks”



Climate hazards, exposure and vulnerability jointly determine the level of climate risk.

Compound threats—such as a combination of drought, heat, and wind—lead to higher risks that are difficult to predict.



PROGRESS

Promoting Green Deal Readiness in the Eastern Partnership Countries



Climate hazards, exposure and vulnerability jointly determine the level of climate risk.

Compound threats—such as a combination of drought, heat, and wind—lead to higher risks that are difficult to predict.

A framework for complex climate change risk assessment



Dr. Patrick M. Reed
CMCC lecture 03.03.2026

Systemic failures, extreme events and 'hyper-risks' emerge as a result of the highly complex and highly interconnected human-Earth systems

Dynamic relationships between agents, systems and sectors transmit risk for one to another



Currently expanding...



Dr. Patrick M. Reed
CMCC lecture 03.03.2026

“Water and multisectoral resilience in a world of interconnected risks”

Previous work has focused more on impacts, by accounting for (some) drivers of hazard, vulnerability and exposure.

But what about human response?



Operationalizing of the framework for CRVA: vulnerability

AR6 (IPCC, 2023): **Vulnerability** « WGI,WGIII,WGII »

The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements, including **sensitivity** or susceptibility to harm and **lack of capacity to cope and adapt**.

AR6 (IPCC, 2023): **Sensitivity** « WGII »

The degree to which a system or species is affected, either adversely or beneficially, by **climate variability or change**. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range, or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise).

$$CVI = \sum (32 \text{ CIDs}) \text{ } D \times S \times E \times (1-A), \text{ where}$$

CVI – Climate Vulnerability Index;

D – degree of CID's change;

S – sensitivity of asset to CID change;

E – exposure of an asset (E = 1);

A – adaptive capacity (A = 0)

AR6 (IPCC, 2023): **Climatic impact-drivers (CIDs)** « WGI »

Physical *climate system* conditions (e.g., means, events, extremes) that affect an element of society or *ecosystems*. Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral or a mixture of each across interacting system elements and regions.

Operationalizing of the framework for CRVA: climate risks

AR6 (IPCC, 2023): **Hazard** « WGI, WGII »

The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other **health impacts**, as well as **damage and loss** to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources.

AR6 (IPCC, 2023): **Exposure** « WGI, WGIII, WGII »

The **presence** of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be **adversely affected**.

CRisk = $D_h \times S_a \times E \times (1-A)$, where

CRisk – Climate Risk from climatic hazard D_h ;

D_h = max (D in RCP4.5 & RCP8.5 for 10 CID types) x P_f ;

P_f – probability function of hazard in a grid;

S_a – aggregated sensitivity of asset to CID change in hazard type;

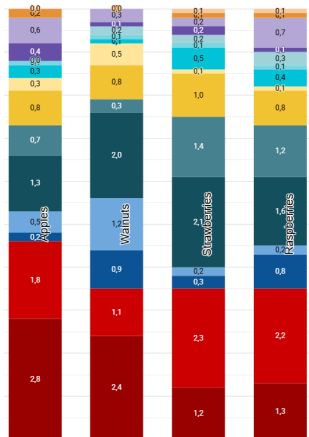
E – exposure of an asset ($E = 1$);

A – adaptive capacity ($A = 0$)

AR6 (IPCC, 2023): **Adaptive capacity** « WGII »

The ability of systems, institutions, humans and other organisms to adjust to **potential damage**, to take advantage of opportunities or to **respond to consequences** (MA, 2005).

Sensitivity of horticulture to CID changes

[illegible]

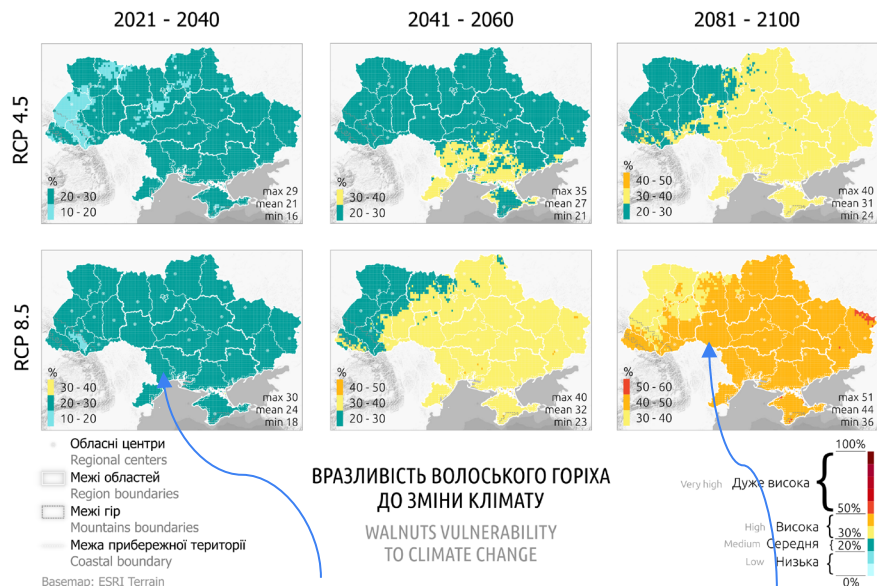
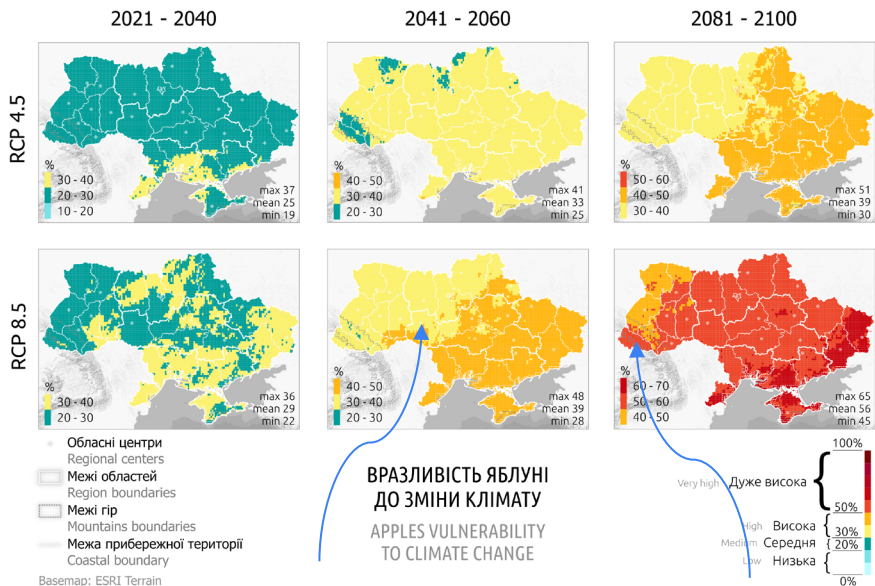
PROGRESS

Promoting Green Deal Readiness in the Eastern Partnership Countries

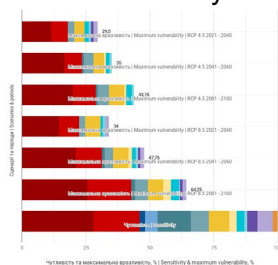
Climate vulnerability of horticulture trees

Apples

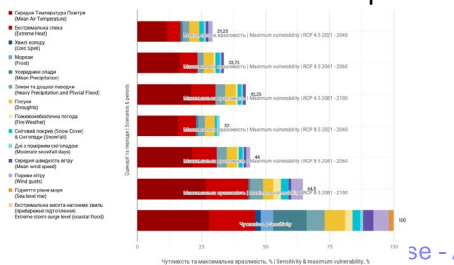
Walnuts



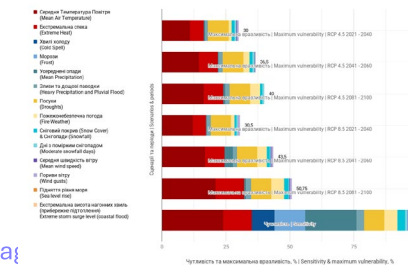
Яблуно - Вінницька обл. (Центр) | Apples - Vinnytska (Central)



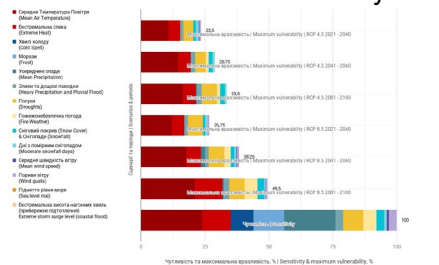
Яблуно - Закарпатська обл. (Захід) | Apples - Zakarpatska (West)



Волоський горіх - Одеська обл. (Південь) | Walnuts - Odeska (South)



Волоський горіх - Вінницька обл. (Центр) | Walnuts - Vinnytska (Central)



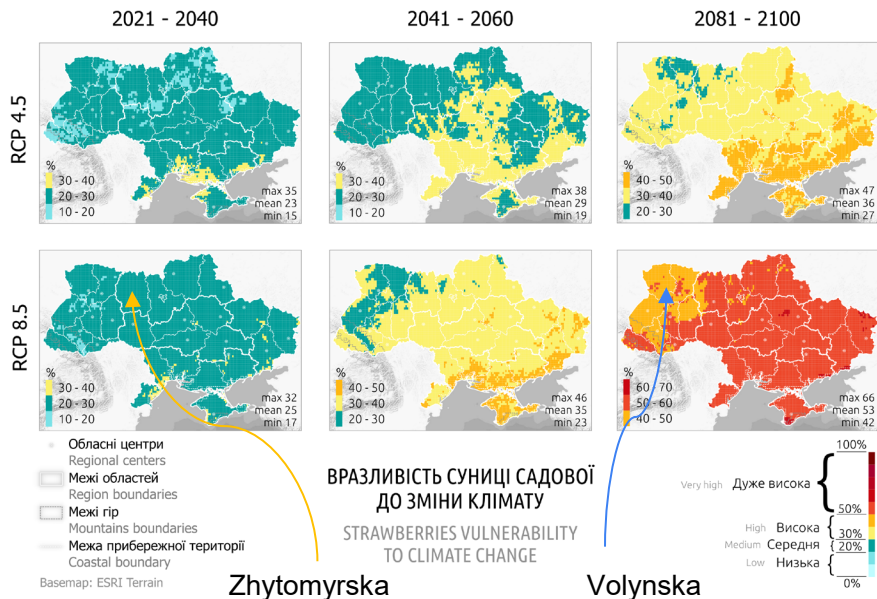
PROGRESS

Promoting Green Deal Readiness in the Eastern Partnership Countries

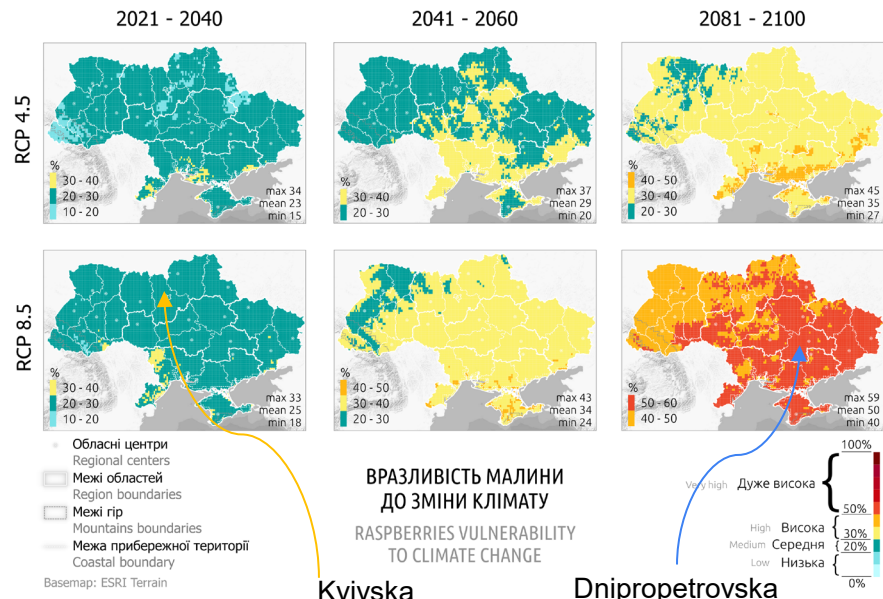
Climate vulnerability of berries

Strawberries

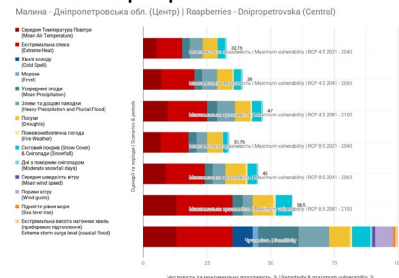
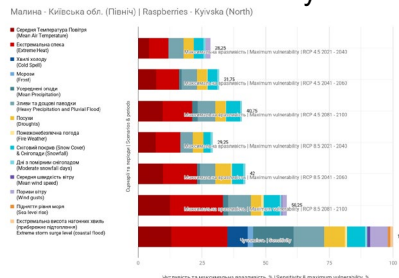
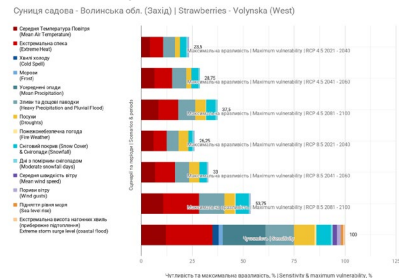
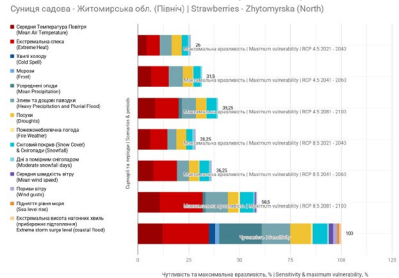
Raspberries



Volynska



Dnipropetrovska

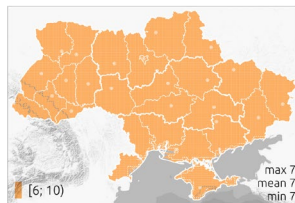


Examples of Mean and Maximum Risk Hotspots for Horticultures in Regions

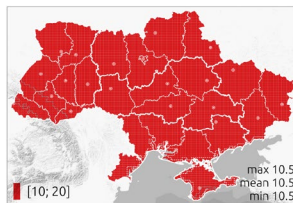
Mean and maximum risks for apples in Central oblasts from climatic hazards

RCP 4.5 & 8.5

2021 - 2040



2041 - 2060

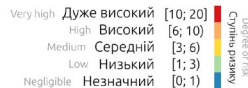


РИЗИК ПІДВИЩЕННЯ СЕРЕДНЬОЇ ТЕМПЕРАТУРИ ПОВІТРЯ
ДЛЯ ЯБЛУНІ

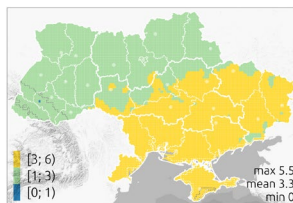
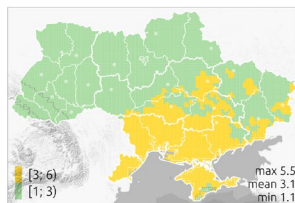
RISK OF MEAN AIR TEMPERATURE INCREASE
FOR APPLES

- Обласні центри
Regional centers
- Межі областей
Region boundaries
- Межі гір
Mountains boundaries
- Межа прибережної території
Coastal boundary

Basemap: ESRI Terrain



RCP 4.5 & 8.5

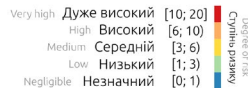


РИЗИК ЗБІЛЬШЕННЯ ПОСУХ ТА ПОЖЕЖОНЕБЕЗПЕЧНОЇ ПОГОДИ
ДЛЯ ЯБЛУНІ

RISK OF DROUGHTS & FIRE WEATHER INCREASE
FOR APPLES

- Обласні центри
Regional centers
- Межі областей
Region boundaries
- Межі гір
Mountains boundaries
- Межа прибережної території
Coastal boundary

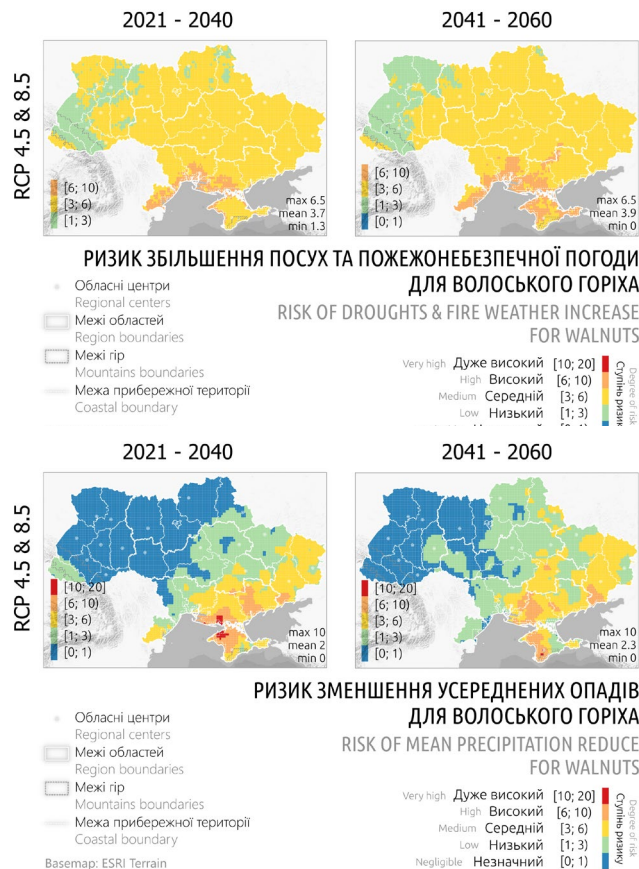
Basemap: ESRI Terrain



AVERAGED & MAXIMUM RISK ASSESSMENT FOR APPLES WITHIN REGIONS		Mid period	↗ Mean Air Temperature	↗ Extreme Heat	↗ Cold spell & frost	↘ Mean Precipitation	↗ Heavy Precipitation and Pluvial Flood	↗ Droughts & fire weather	↘ Snow cover & snowfall	↗ Moderate snowfall days > 10mm/day	↗ Wind speed & Gusts
Dnipropetrovska (Central)	2030		7,0	6,8	0,0	2,4	1,9	3,4	0,4	0,2	0,0
	2050		10,5	6,8	0,0	2,8	1,6	4,2	0,7	0,2	0,0
Cherkaska (Central)	2030		7,0	4,5	0,0	0,7	2,0	2,9	0,7	0,3	0,0
	2050		10,5	6,8	0,0	1,1	3,0	3,1	0,8	0,3	0,0
Kirovohradska (Central)	2030		7,0	6,0	0,0	1,0	2,4	3,5	0,5	0,2	0,0
	2050		10,5	6,8	0,0	1,2	3,2	4,0	0,8	0,3	0,0
Poltavska (Central)	2030		7,0	4,9	0,0	1,4	2,2	3,1	0,7	0,3	0,0
	2050		10,5	6,8	0,0	1,8	2,5	3,5	0,8	0,3	0,0
Vinnytska (Central)	2030		7,0	4,6	0,0	0,0	3,0	2,8	0,7	0,3	0,8
	2050		10,5	6,8	0,0	0,6	3,4	3,1	0,8	0,3	0,2

Dnipropetrovska (Central)	2030		7,0	4,5	0,0	1,6	3,5	2,8	0,9	0,5	0,0
	2050		10,5	6,8	0,0	3,3	3,5	2,8	1,1	0,5	0,0
Cherkaska (Central)	2030		7,0	4,5	0,0	1,3	3,5	2,8	1,1	0,5	1,3
	2050		10,5	6,8	0,0	1,6	3,5	4,1	1,1	0,4	0,0
Kirovohradska (Central)	2030		7,0	4,5	0,0	0,0	3,5	2,8	0,8	0,5	1,3
	2050		10,5	6,8	0,0	0,0	3,5	2,8	1,1	0,4	1,3
Poltavska (Central)	2030		7,0	4,5	0,0	1,6	3,5	2,8	0,8	0,5	0,0
	2050		10,5	6,8	0,0	3,3	3,5	2,8	0,8	0,5	0,0
Vinnytska (Central)	2030		6,0	4,1	0,0	10,0	1,5	6,5	0,6	0,4	0,5
	2050		9,0	4,1	0,0	10,0	1,5	6,5	0,8	0,4	0,8

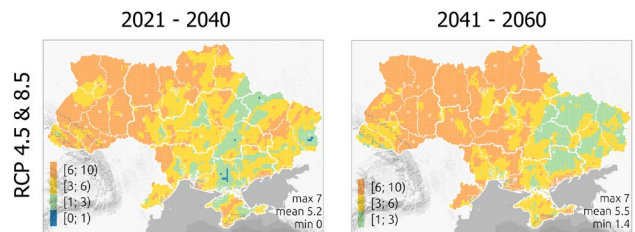
Mean and maximum risks for walnuts in Southern oblasts from climatic hazards



AVERAGED & MAXIMUM RISK ASSESSMENT FOR WALNUTS WITHIN REGIONS	Mid period	Mean Air Temperature	Extreme Heat	Cold spell & frost	Mean Precipitation	Heavy Precipitation and Pluvial Flood	Droughts & fire weather	Snowcover & snowfall	Moderate snowfall days > 10mm/day	Wind speed & Gusts
		↗	↗	↗	↘	↗	↗	↘	↗	↗
Odeska (South)	2030	6,0	4,0	0,0	2,2	1,1	5,3	0,4	0,2	0,4
	2050	9,0	4,1	0,0	2,1	1,3	5,4	0,5	0,3	0,3
Mykolaivska (South)	2030	6,0	4,1	0,0	3,5	0,9	5,2	0,4	0,2	0,0
	2050	9,0	4,1	0,0	3,7	1,3	5,5	0,6	0,3	0,1
Khersonska (South)	2030	6,0	4,0	0,0	5,9	0,6	5,4	0,4	0,2	0,0
	2050	9,0	4,1	0,0	5,7	1,0	5,8	0,4	0,2	0,0
Zaporizka (South)	2030	6,0	3,9	0,0	5,5	0,8	4,5	0,4	0,2	0,0
	2050	9,0	4,1	0,0	4,1	0,7	4,9	0,5	0,2	0,0
AR Krym (South)	2030	6,0	3,6	0,0	6,4	1,0	4,9	0,4	0,2	0,1
	2050	9,0	4,1	0,0	5,3	1,0	6,0	0,4	0,2	0,1

Odeska (South)	2030	6,0	4,1	0,0	5,0	1,5	6,5	0,8	0,4	0,8
	2050	9,0	4,1	0,0	5,0	1,5	6,5	0,8	0,5	0,5
Mykolaivska (South)	2030	6,0	4,1	0,0	5,0	1,5	6,5	0,4	0,4	0,4
	2050	9,0	4,1	0,0	7,5	1,5	6,5	0,8	0,4	0,5
Khersonska (South)	2030	6,0	4,1	0,0	10,0	1,5	6,5	0,4	0,4	0,0
	2050	9,0	4,1	0,0	7,5	1,5	6,5	0,6	0,4	0,0
Zaporizka (South)	2030	6,0	4,1	0,0	7,5	1,5	5,2	0,4	0,4	0,0
	2050	9,0	4,1	0,0	7,5	1,5	6,5	0,8	0,4	0,0
AR Krym (South)	2030	6,0	4,1	0,0	10,0	1,5	6,5	0,6	0,4	0,5
	2050	9,0	4,1	0,0	10,0	1,5	6,5	0,8	0,4	0,8

Mean and maximum risks for strawberries in Northern oblasts from climatic hazards



РИЗИК ЗБІЛЬШЕННЯ ЗЛИВ ТА ДОЩОВИХ ПАВОДКІВ
ДЛЯ СУНИЦІ САДОВОЇ

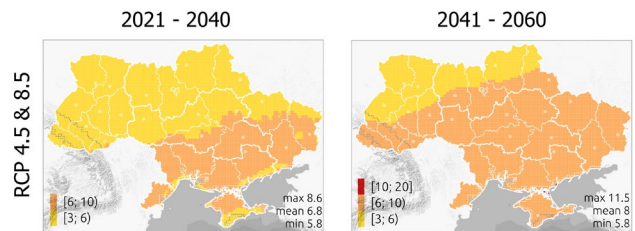
RISK OF HEAVY PRECIPITATION AND PLUVIAL FLOOD INCREASE
FOR STRAWBERRIES

- Обласні центри
Regional centers
- Межі областей
Region boundaries
- Межі ріп
Mountains boundaries
- Межа прибережної території
Coastal boundary

Basemap: ESRI Terrain

Very high Дуже високий [10; 20]
High Високий [6; 10]
Medium Середній [3; 6]
Low Низький [1; 3]
Negligible Незначний [0; 1]

Degree of risk
Супиння ризику



РИЗИК ПІДВИЩЕННЯ ЕКСТРЕМАЛЬНОЇ СПЕКИ
ДЛЯ СУНИЦІ САДОВОЇ

RISK OF EXTREME HEAT INCREASE
FOR STRAWBERRIES

- Обласні центри
Regional centers
- Межі областей
Region boundaries
- Межі ріп
Mountains boundaries
- Межа прибережної території
Coastal boundary

Basemap: ESRI Terrain

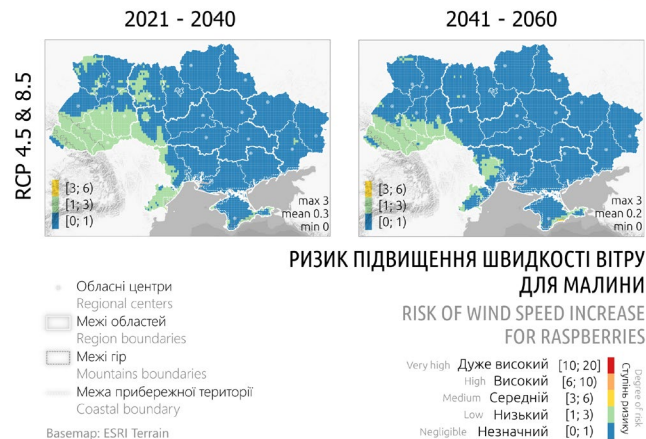
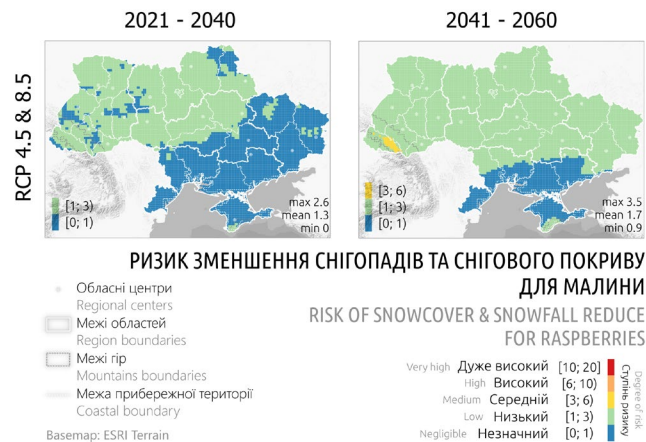
Very high Дуже високий [10; 20]
High Високий [6; 10]
Medium Середній [3; 6]
Low Низький [1; 3]
Negligible Незначний [0; 1]

Degree of risk
Супиння ризику

AVERAGED & MAXIMUM RISK ASSESSMENT FOR STRAWBERRIES WITHIN REGIONS		Mid period	Mean Air Temperature	Extreme Heat	Cold spell & frost	Mean Precipitation	Heavy Precipitation and Pluvial Flood	Droughts & fire weather	Snowcover & snowfall	Moderate snowfall days > 10mm/day	Wind speed & Gusts
Chernihivska (North)	2030		3,0	5,8	0,0	0,1	6,3	2,7	1,6	0,4	0,0
	2050		4,5	6,4	0,0	2,3	6,9	2,8	1,8	0,4	0,0
Kyivska (North)	2030		3,0	5,8	0,0	0,0	5,7	2,8	1,7	0,4	0,0
	2050		4,5	7,9	0,0	1,2	6,4	2,8	1,8	0,3	0,0
Zhytomyrska (North)	2030		3,0	5,8	0,0	0,0	6,9	2,6	1,6	0,3	0,3
	2050		4,5	6,8	0,0	0,0	7,0	2,6	1,8	0,3	0,0
Sumska (North)	2030		3,0	5,8	0,0	1,1	5,0	2,6	1,4	0,4	0,0
	2050		4,5	7,6	0,0	3,2	6,2	2,7	1,8	0,4	0,0

Chernihivska (North)	2030	3,0	5,8	0,0	2,6	7,0	2,8	2,1	0,5	0,0
	2050	4,5	8,6	0,0	5,3	7,0	2,8	2,6	0,5	0,0
Kyivska (North)	2030	3,0	5,8	0,0	2,1	7,0	2,8	2,6	0,5	0,5
	2050	4,5	8,6	0,0	2,6	7,0	4,1	2,6	0,4	0,0
Zhytomyrska (North)	2030	3,0	5,8	0,0	0,0	7,0	2,8	1,8	0,5	0,5
	2050	4,5	8,6	0,0	0,0	7,0	2,8	2,6	0,4	0,5
Sumska (North)	2030	3,0	5,8	0,0	2,6	7,0	2,8	1,8	0,5	0,0
	2050	4,5	8,6	0,0	5,3	7,0	2,8	1,8	0,5	0,0

Mean and maximum risks for raspberries in Western oblasts from climatic hazards



AVERAGED & MAXIMUM RISK ASSESSMENT FOR RASPBERRIES WITHIN REGIONS	Mid period	↗ Mean Air Temperature	↗ Extreme Heat	↗ Cold spell & frost	↘ Mean Precipitation	↗ Heavy Precipitation and Pluvial Flood	↗ Droughts & fire weather	↘ Snowcover & snowfall	↗ Moderate snowfall days > 10mm/day	↗ Wind speed & Gusts
Zakarpatska (West)	2030	3,3	5,5	0,0	1,9	5,1	2,1	1,4	0,3	0,8
	2050	4,9	8,3	0,0	0,0	3,2	2,1	2,1	0,3	0,9
Lvivska (West)	2030	3,3	5,5	0,0	0,0	5,3	1,5	1,4	0,4	0,3
	2050	4,9	5,5	0,0	0,0	5,7	1,2	1,8	0,3	0,2
Volynska (West)	2030	3,3	5,5	0,0	0,0	5,7	2,2	1,6	0,4	0,6
	2050	4,9	5,5	0,0	0,0	6,0	1,3	1,8	0,3	0,1
Ivano-Frankivska (West)	2030	3,3	5,5	0,0	0,0	5,9	1,6	1,3	0,4	1,0
	2050	4,9	7,5	0,0	0,0	5,3	1,4	1,8	0,4	1,0
Ternopiiska (West)	2030	3,3	5,5	0,0	0,0	5,9	2,1	1,5	0,3	0,9
	2050	4,9	7,0	0,0	0,0	6,0	1,9	1,8	0,3	0,5
Rivnenska (West)	2030	3,3	5,5	0,0	0,0	5,8	1,8	1,6	0,3	0,2
	2050	4,9	5,5	0,0	0,0	6,0	1,4	1,8	0,2	0,0
Chernivetska (West)	2030	3,3	5,6	0,0	0,0	5,9	2,1	1,7	0,3	1,3
	2050	4,9	8,3	0,0	0,2	6,0	2,2	1,8	0,3	1,3
Khmelnytska (West)	2030	3,3	5,5	0,0	0,0	5,9	2,1	1,5	0,3	0,8
	2050	4,9	7,3	0,0	1,1	5,9	2,2	1,8	0,3	0,4

Zakarpatska (West)	2030	3,3	5,5	0,0	2,0	6,0	2,3	2,6	0,5	1,0
	2050	4,9	8,3	0,0	0,0	6,0	2,3	3,5	0,4	1,0
Lvivska (West)	2030	3,3	5,5	0,0	1,6	6,0	2,3	1,8	0,5	1,0
	2050	4,9	8,3	0,0	0,0	6,0	2,3	2,6	0,5	1,0
Volynska (West)	2030	3,3	5,5	0,0	0,0	6,0	2,3	1,8	0,5	1,0
	2050	4,9	5,5	0,0	0,0	6,0	2,3	1,8	0,4	1,0
Ivano-Frankivska (West)	2030	3,3	5,5	0,0	0,0	6,0	2,3	1,8	0,5	2,0
	2050	4,9	8,3	0,0	0,0	6,0	2,3	1,8	0,4	1,0
Ternopiiska (West)	2030	3,3	5,5	0,0	0,0	6,0	2,3	1,8	0,5	2,0
	2050	4,9	8,3	0,0	0,0	6,0	2,3	2,1	0,4	2,0
Rivnenska (West)	2030	3,3	5,5	0,0	0,0	6,0	2,3	1,8	0,4	1,0
	2050	4,9	5,5	0,0	0,0	6,0	2,3	1,8	0,4	0,0
Chernivetska (West)	2030	3,3	8,3	0,0	0,0	6,0	2,3	1,8	0,5	2,0
	2050	4,9	8,3	0,0	2,0	6,0	3,4	1,8	0,4	2,0
Khmelnytska (West)	2030	3,3	5,5	0,0	0,0	6,0	2,3	1,8	0,4	1,0
	2050	4,9	8,3	0,0	2,0	6,0	2,3	1,8	0,4	1,0

Climate change risks for Ukrainian horticulture: key findings

- Rising climate vulnerability throughout the 21st century
- Extreme heat — the dominant climate pressure
- Heat + water stress — the main emerging combination
- South & East — climate-risk hotspots
- West & North — increasing heavy precipitation & excess moisture
- Strong regional and crop-specific differences

Key message:

Horticulture faces increasing heat and water stress, with contrasting moisture-related risks across regions.

What this means for the four horticultural value chains

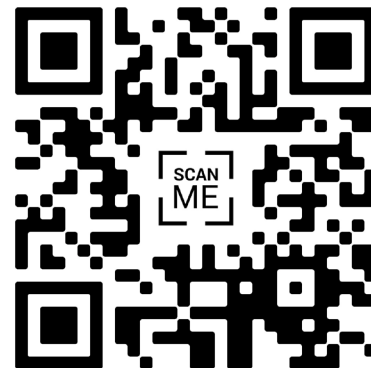
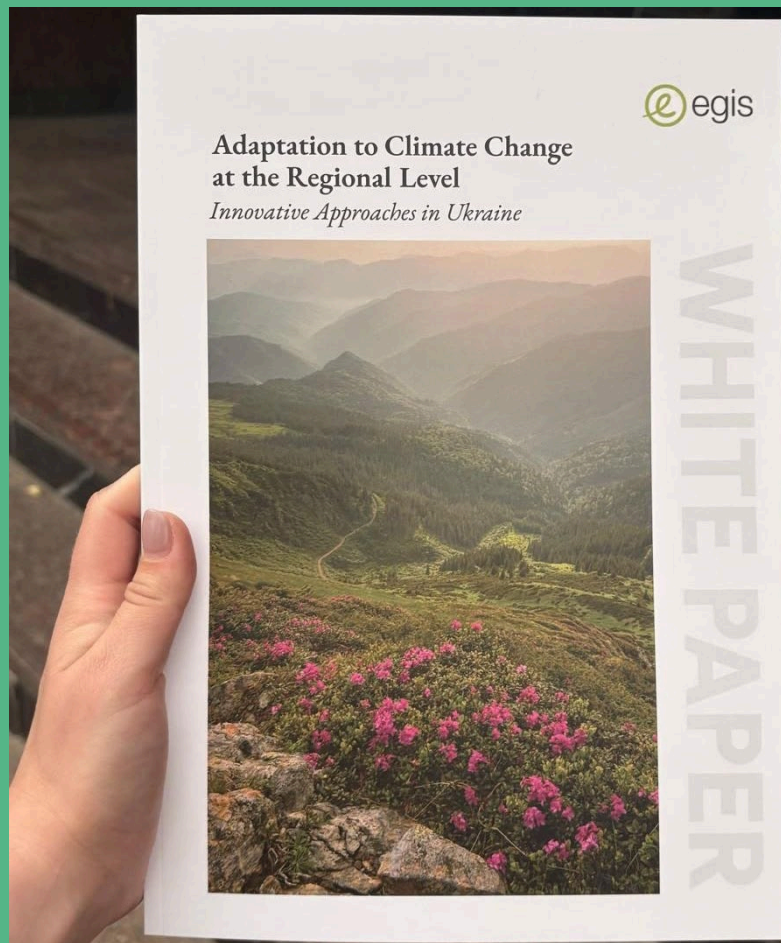
	<u>Main climate risks</u>	<u>Main adaptation priority</u>
Apples	Increasing temperature and extreme heat; drought and moisture deficits; heavy precipitation in western regions	Water security, heat/frost protection, cultivar and rootstock selection, orchard management
Walnuts	Heat + persistent moisture deficits; drought and fire weather, especially in south/east; increasing precipitation variability	Water availability/irrigation, climate-informed spatial planning, cultivar/rootstock selection, heat and drought management
Strawberries	Extreme heat is dominant; water stress in south/east; heavy precipitation and pluvial flooding in west/north	Irrigation and soil-moisture management, heat protection, drainage, plantation renewal and spatial planning
Raspberries	Extreme heat and drought in south/east; moisture deficits; heavy precipitation in wetter regions	Water management, climate-informed plantation planning, heat protection, monitoring and adaptation of production technologies

Cross-cutting implications

- **Climate-informed spatial planning should guide horticultural development and recovery after full-scale RF invasion.**
- **Water management is a common priority**, but responses differ by region:
 - irrigation & water security in the **south/east**;
 - drainage & excess-moisture management in the **west/north**.
- **Adaptation must be crop-specific:**
 - long-term decisions for perennial **orchards**; greater flexibility for **berry crops**.
- **Climate-informed phytosanitary monitoring** should link pest and disease surveillance with temperature, precipitation and phenology.
- **Next step:** economic assessment of yield, production costs, water requirements, infrastructure and investment needs.

PROGRESS

Promoting Green Deal Readiness in
the Eastern Partnership Countries



UKRAINIAN

PROGRESS

Promoting Green Deal Readiness in
the Eastern Partnership Countries



STAND WITH UKRAINE

On behalf of:



Federal Ministry
for the Environment, Climate Action,
Nature Conservation and Nuclear Safety



of the Federal Republic of Germany

The project „**Promoting Green Deal Readiness in the Eastern Partnership Countries**” (PROGRESS) is funded by the International Climate Initiative (IKI) of the German Federal Government and is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, as the lead agency, in partnership with the Organisation for Economic Co-operation and Development (OECD), the Regional Environmental Centre for the Caucasus (RECC), the European Business Association (EBA) Moldova and the Institute for Economics and Forecasting of the National Academy of Sciences of Ukraine (IEF).



PROGRESS

Promoting Green Deal Readiness in the
Eastern Partnership Countries

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

Martina Kolb / Martina.kolb@giz.de

Regional Environmental Centre for the Caucasus (RECC)

Sophiko Akhobadze / sophiko.akhobadze@rec-caucasus.org

**Institute for Economics and Forecasting of the National Academy of Sciences of
Ukraine (IEF)**

Oleksandr Diachuk / diachuk@ief.org.ua

Contact

Organisation for Economic Co-operation and Development (OECD)

Krzysztof Michalak / krzysztof.michalak@oecd.org

European Business Association (EBA) Moldova

Mariana Rufa / mariana.rufa@eba.md

