MOVING
MOuntain VAlorisation through INterconnectedness and GREEN growth

D4.5: Vulnerability and Resilience Performance

Report on the perceived threats of 23 mountain value chains across Europe and their recognition of preconditions for building adaptive capacity to increase resilience

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Acronyms

ACP	Adaptive Capacity Preconditions
ENV	Environmental Threats (category)
EVCA	Extended Value Chain Analysis
HNV	High Nature Value Farming
INS-POL	Institutional and Political Threats (category)
IPCC	Intergovernmental Panel on Climate Change
MRL	Mountain Reference Landscape
MRR	Mountain Reference Regions
S-E	Social and Economic Threats (category)
SAPARD	Special Accession Programme for Agricultural and Rural Development
VC	Value Chain
VC-A	Value Chain Assemblage
WP	Work Package

Executive summary

This report is based on empirical research carried out as a part of the research task T4.5. The research utilises findings from the inventory of mountain value chains in Europe (T4.1) and the extended analysis of VC-A in reference regions (T4.2 -T4.5). Conceptualisation of the empirical study draws on the conceptual-analytical framework developed within the WP2 (Moretti et al. 2021).

The general objective of the study is to evaluate the vulnerability and resilience of the value chain assemblage to climate and other changes within the Mountain Reference Landscape (MRL) by assessing responses to drivers in the past and up to the present day.

The structure of the report follows a similar logic. After introducing the main objectives (Chapter 2), key concepts implemented in the study (Chapter 3) and methods (Chapter 4), a detailed view of existing threats and their impacts (Chapter 5) is provided. This is followed by the overviewed resources for developing adaptive strategies (Chapter 6) and the possibilities of the actors to utilise them. Information about the vulnerability of mountain regions and their value chains is thereafter summarised (Chapter 7). At the end of the report, the 'profiles' of 23 reference regions are presented with respect to their specific threats, impacts and preconditions for building adaptive strategies (Chapter 8). Final conclusions of the study are presented in the last chapter (Chapter 9).

The empirical study enabled the most important threats to mountain value chains to be identified from the perspective of stakeholders. These threats include environmental, socio-economic and political and institutional threats. All threats were evaluated and ranked by stakeholders with respect to their importance and existing adverse effects.

Participatory workshops with stakeholders in mountain regions enabled multiple preconditions to be identified for building an adaptive capacity for mitigating these adverse effects. All preconditions were classified according to their linkage to mountain value chains.

The report presents specific data about each of the MRL that include: a list of the most important threats, illustrative examples of the narrative of adverse effects and their impacts on value chains, preconditions for building the adaptive capacity and a short summary related to the overall vulnerability and resilience of the mountain reference region and the selected value chain.

1. Background of the study

This report is based on empirical research carried out as a part of the **research task T4.5**. The research utilises findings from the inventory of mountain value chains in Europe (T4.1) and the extended analysis of VC-A in reference regions (T4.2 -T4.5) (Blackstock et al., 2021). Conceptualisation of the empirical study draws on the analytic framework developed within the WP2 and specified in research guidelines that have been developed for the given research task.

The main purpose of the study is to **evaluate vulnerability of the mountain regions with respect to the global climate changes that are becoming sources of multiple threats**. The key idea is that **regions are vulnerable to changes that modify conditions for agricultural (and other economic) activities,** with potential adverse effects.

Our task is to identify these threats and to provide information about their forms and the intensity of their impacts. At the same time, we want to understand what resources are available in mountain regions that can be mobilised for building a capacity for adaptation to these changes.

This study on the vulnerability and resilience of the MRLs completes the empirical work conducted within the WP4. Findings from the study will be used in the final task 4.5 for understanding how to upgrade producers' roles in the VC-A.

It is important to note that findings from the vulnerability study – next to this report – are also presented in the form of a **digital story** created by each research team to include the main findings from the vulnerability measurement on the regional level.

2. Objectives

The general objective of the study is to **evaluate the vulnerability and resilience of the value chain assemblage to climate and other changes within the MRL** by assessing responses to drivers in the past and up to the present day. More specifically, a multicriteria approach to measuring different properties of mountain socio-ecological systems is implemented, in order to evaluate the vulnerability of the local value chain assemblage (based on its sensitivity to climatic and other changes and the local adaptive capacity); and whether the overall MRL is resilient to current exogenous pressures.

3. Conceptual notes

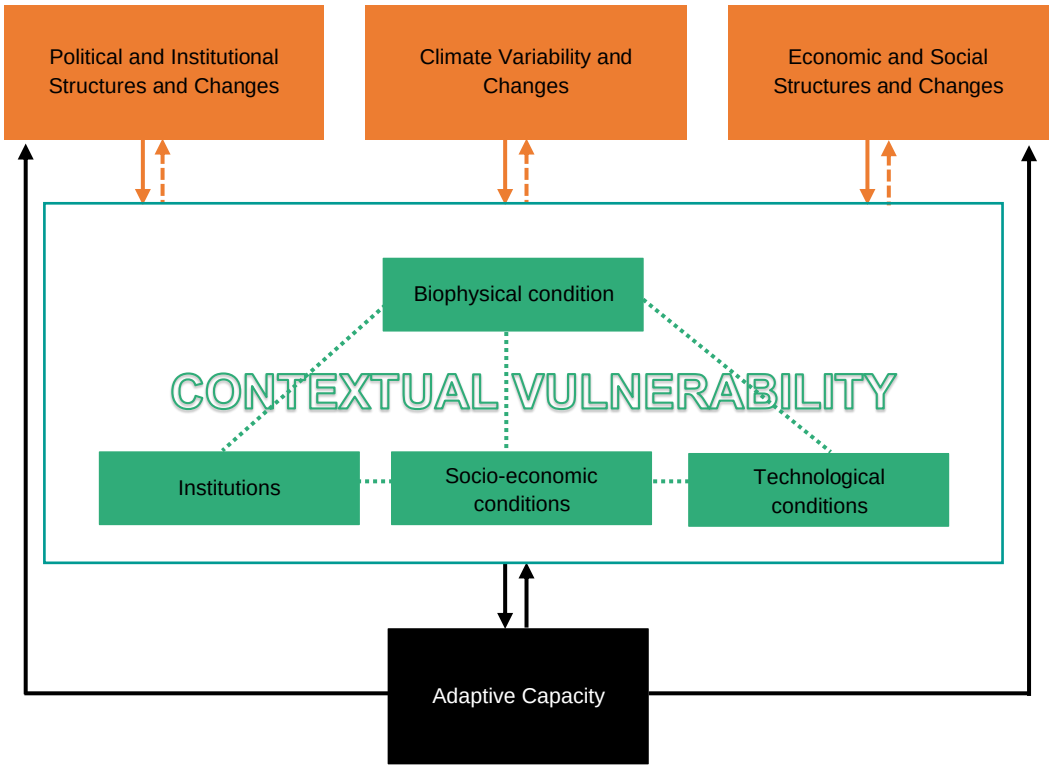
The conceptual and analytical framework is founded on key theoretical concepts introduced within WP2 (Moretti et al. 2021). It is important to note that the T4.5 is closely related to the evaluation of the MRL's vulnerability to climate changes conducted within the WP3 (Moreno

et al. 2021). However, some concepts have been redefined for the measurement of vulnerability in the socio-economic context.

Vulnerability to climate change, according to the Intergovernmental Panel on Climate Change (IPCC), is defined as 'the propensity or predisposition to be adversely affected' (Pörtner et al. 2022: 133). Vulnerability includes many other concepts and elements, including **sensitivity** or **susceptibility** to harm and a lack of capacity to cope and adapt (Pörtner 2022: 2927).

It is very common to see alternative applications of this concept in research. Two of the most prominent approaches are *outcome* and *contextual* vulnerability (Fellman 2012: 42-44). Outcome vulnerability (also known as end-point interpretation) is focused on the net impact of climate change on a specific exposure unit after feasible adaptations are taken into account. This approach is typically focused on biophysical changes in closed systems, with the additional information on the socio-economic capacity to adapt. Based on this definition, the outcome vulnerability is determined by the adaptive capacity of a system, in which biophysical components represent a central source that can modify the performance of the system. Outcome vulnerability studies typically search for technological solutions (such as new seeds, or innovative farming practices) to reduce the negative impacts of global climate changes. The main point of the assessment is to assess the future vulnerability of the system(s).

Figure 1: Definition of contextual vulnerability



Contextual vulnerability (also known as starting-point interpretation) considers vulnerability as the *present* inability of a system to cope with changing climatic conditions. Vulnerability is determined by changing biophysical climatic conditions, together with social, economic, political, institutional and technological structures and processes. Vulnerability is the characteristics of ecological and social systems that are mutually intertwined (Figure 1).

Research on contextual vulnerability places the main emphasis on current socio-economic drivers of vulnerability in relation to social, economic and institutional structures. The contextual interpretation of vulnerability directly assumes that these structures are key for understanding vulnerability, since 'vulnerability to climate change is not only a result of biophysical events alone but is also influenced by the contextual socioeconomic conditions in which climate change occurs' (Fellman 2012: 44).

Vulnerability can be reduced by modifying the contextual socio-economic conditions in which global climate change takes place, so that actors/communities can adapt to changes. Adaptive capacity of the region can be significantly improved by favourable contextual conditions that can help regional actors to mitigate negative effects.

The contextual approach points out that the social and ecological contexts in which global climate change occurs are equally important as the climate shock itself. Such an approach is highly relevant for an assessment of the socio-ecological systems, represented by the valuce chain assemblage (VC-A) extensively studied in the WP4.

The contextual interpretation of vulnerability clearly corresponds with the recent IPCC Report (Pörtner et al. 2022), which puts a new emphasis on bottom-up, social and contextual determinants of vulnerability. Vulnerability is dynamic and depends on context, therefore it differs within communities and across societies and changes through time. The Report also modifies the concept of **exposure** that is defined as

> 'the presence of people; livelihoods; species of ecosystems; environmental functions, services and resources; infrastructure; or economic, social or cultural assets in places and settings that can be adversely affected.' (Pörtner et al. 2022: 133).

Such a definition allows for the study of *places* and *setting* in different geographical contexts, which is highly relevant for the empirical research on mountain value chains (VC) within the WP4.

In our analysis of the vulnerability, we will observe and evaluate the impacts of climate changes within the MRL in which the VC-A is embedded. In order to capture the joint aspect of biophysical and societal aspects, we will refer to the *system* that, in the context of our analysis, includes VC-A and MRL.

Adaptive capacity is in theory determined by current vulnerability to climate stimuli. It includes two dimensions: (1) coping ability, i.e. adaptive capacity to shock, and (2) management capacity, i.e. adaptive capacity to change. Adaptive capacity is indicated by resources that are embedded in the region and can be mobilized by actors for mitigating negative effects of threats. Resources for building adaptive capacity are studied in different sectors, geographic locations, and scales (e.g., Siders, 2019).

Generally, it is possible to describe the main relations in the following way:

$$Vulnerability = (Exposure \times Sensitivity) - Adaptive\ Capacity$$

The concept of vulnerability is often studied together with the concept of **resilience.** However, different conceptual frameworks for vulnerability provide different answers about possible linkages between those concepts (see, for example, Cutter et al. 2008).

In accordance with Fellman (2012), the **concepts of resilience and vulnerability are connected through the concept of adaptive capacity**. Resilience enables systems to 'anticipate, absorb and accommodate or recover from the events of hazardous event or trend or disturbances' (Meybeck 2012: 20: Pörtner et al. 2022: 134). A system is more resilient if it is less vulnerable.

Driver of change specifies any natural or human-induced factor that directly or indirectly causes a change in a system. A direct driver of change unequivocally influences ecosystem processes and/or sociocultural and economic characteristics and can be identified and measured. An indirect driver of change operates by altering the level or rate of change of other, more direct drivers (MA 2005; Wester et al., 2019). Such changes can produce negative as well as positive impacts on the analysed systems. An up-to-date literature review reveals a variety of drivers of change causing an impact in the mountain areas (e.g. Muñoz-Ulecia et al. 2021; Bruley et al. 2021, Gupta et al. 2022; Wang et al. 2019; Hinojosa et al. 2019; Drăgan and Cocean 2018; Krtička et al. 2018; Delay et al. 2015; Bezák and Mitchley 2014; Munteanu et al. 2014; Cocca et al. 2012; García-Martínez et al. 2009; Pauchard et al. 2009; Gehrig-Fasel et al. 2007). In addition, it is expected that even the most recent circumstances, such as inflation, increasing energy prices and pandemics, have a substantial impact on the value chains in mountain areas. Our approach to assess vulnerability is primarily focused on *negative impacts* and the evaluation of *adverse effects* on socio-economic systems. In the study T4.5 (to avoid confusion with terminology used previously in the WP3 and WP6), we are using the term ***threats*** instead of *drivers of change*.

4. Methods

4.1. Preparation of the study

The study was planned and conducted in accordance with the project proposal. The WP4 leader (James Hutton Institute) was intensively consulted in the preparation of the study. At the same time, feedback was sought from the other research teams. Thus, **all research teams of the project consortium were involved in the preparation of the study**.

The final proposal for the implementation of the study was presented in October 2022. During November and December the research teams organised participatory workshops at MRLs. Following this, they submitted their results to the task leader (CZU). During January and

February 2022, the CZU team synthesized and prepared a dissemination of the results summarizing the findings from the 23 regions. A detailed timeline of the work is provided on the end of this report (Appendix 1).

4.2. Research design

Design of the study included **five steps** that were carried out by each research team based on standardized guidelines.

1. Overviewing threats in the reference regions
2. Identifying exposure and adverse effects
3. Verification of the impacts on VC-A
4. Exploring adaptive capacity
5. Reporting on results of the study to the CZU team

4.2.1. Step 1 – Overviewing threats to mountain regions and their VC's

Drivers of change, recognized as **threats** in our study, are natural or human-induced factors that directly or indirectly cause changes in the system. Analysed system under study is delineated by the Value Chain Assemblage embedded in the MRL.

The list of threats can be divided in three dimensions: Environmental; Social and Economic; Political and Institutional.

Research teams evaluated a relevance of each threat using a simple scale (ranging from 0-3). Results of the evaluation have been be recorded.

For further work, the list of threats was reduced. The following measurement included only the representatives with the score 3 (high relevance) and eventually threats with the score 2 (medium relevance). It was expected that each team will include at least one example (i.e. a threat) of each category, and the final number of threats after the reduction will be between three and six to ensure comparable data across the 23 MRLs.

Table 1: Overview of the threats to mountain regions

Environmental	Social and economic	Political and Institutional
Drought	Land use changes	Legislation changes
Air Temperature change	Mass tourism and associated infrastructure	Incentives and subsidies changes
Water Temperature Change	Demographic changes	Changes in the political system
Extreme weather events	Life-style changes (post-productivism)	
Flooding	Change in traditional practices	
Wildfires	Market changes – consumer demand changes	
Soil condition	Change in knowledge production and use	
Use of natural resources – renewable and non-renewable	Technological Innovation (digitization)	
Biodiversity Change	Society polarization (rich vs poor)	
Non-native invasive species	Inflation	
Air quality	Energy prices	
Water Quality	Pandemic situations	
Soil quality		

Reference: Authors' description based on literature review (see Section 3 for details)

Research teams evaluated a relevance of each threat using a simple scale (ranging from 0-3). Results of the evaluation have been be recorded.

For further work, the list of threats was reduced. The following measurement included only the representatives with the score 3 (high relevance) and eventually threats with the score 2 (medium relevance). It was expected that each team will include at least one example (i.e. a threat) of each category, and the final number of threats after the reduction will be between three and six to ensure comparable data across the RR.

4.2.2. Step 2 – Identifying exposure and adverse effects

This step identified the main elements of the VC-A and MRL that are **exposed and sensitive** to the effects of the threats (identified within Step 1).

Exposure is generally defined as the presence of tangible and intangible sources that can be *adversely affected*. The most important relations have been already captured in previous Task 4.4. In the context of this study, the resources are represented by constitutive elements of the VC-A and territorial capitals of the MRL. In compliance with the analytic framework of the

EVCA, the VC-A comprises *actors, linkages* and *processes* that can be impacted by major changes induced by the threats. Territorial capitals refer to *natural*, *economic, social* and *human capitals* embedded in the region and utilised by actors engaged in the VC-A.

It is important to note that the contextual vulnerability assumes that systems are affected by climatic factors as well as non-climatic factors (see Figure 1 above). In order to understand the interplay between both groups of factors, the research teams viewed the system (i.e. VC-A and MRL) holistically to understand how the impacts of climatic factors (observed across biophysical aspects of the system) are modified by the socio-economic context that can differentiate between the impacts of the original factors. Each research team provided a short description of the negative impacts within the so-called **narrative of adverse effects**.

Table 2 offers a list of potential contextual conditions that are relevant for the vulnerability assessment of the VC-A and MRL systems.

Table 2: Examples of contextual conditions modifying vulnerability of the system

Contexts	Structures and process modifying vulnerability
Institutions	Implementation of a specific policy (EU, State, Regional)
Biophysical conditions	Land Use
Socio-economic conditions	Farm-size structure Land tenure Access to productive resources Marginalisation of specific social groups Human capital Social capital
Technological conditions	Agricultural Machinery Digital technologies

Reference: Authors' description

4.2.3. Step 3 – Verification of the impacts on VC-A

The narrative of adverse effects primarily reflects the researchers' point of view. The first part of the workshop was therefore used for verifying the narrative through **facilitated discussion** with participating stakeholders.

After completion of the facilitated discussion, the stakeholders were asked to assess the *exposure* and *sensitivity* of the selected elements of the VC-A. Assessment was carried out with the use of the Vulnerability Questionnaire (Appendix 2, Appendix 3) prepared before the workshop. The measurement was based on the following questions:

- *Exposure*: To what extent are the following VC-A elements exposed to changes induced by a set of a selected threats? (Evaluate with the use of the scale 1-7).

- *Sensitivity:* How big are the impacts of such change on the VC-A element? (Evaluate with the use of the scale 1-7).

4.2.4. Step 4 – Exploring adaptive capacity

The specific goal of this step was to identify the necessary **preconditions** for the development of the adaptation of the system of VC-A. It was important to evaluate these preconditions in relation to the possibilities of stakeholders to fulfil these preconditions with the use of endogenous resources (i.e. **ability to mobilise**), in order to reduce the vulnerability of the VC-A. Adaptive capacity preconditions were quantitatively assessed with the use of a standardized data-collection sheet (Appendix 4).

4.2.5. Step 5 – Reporting results of the study

Each team completed and submitted a relatively short **MRL Report**. A template for writing the report was provided by the task-leading team. The report captured the findings from the vulnerability measurement in the case study region. All MRL Reports were used as a baseline for **following synthesis** and for generating a final report.

4.3. Participatory workshops

Research team organized workshop in their RR. Overall, there was organized **23 participant workshops**. The workshops hosted **215 participants** knowledgeable about state of a selected VC in the MRL. Participants included farmers, processors, researchers, policy makers as well as consumers. The exact structure of the participants group is presented in the Table 3.

Table 3: Structure of stakeholders' groups participating in the workshops

Stakeholder group	Number of participants (%)
Farmers	65 (30%)
Processors	34 (16%)
Consumers	21 (10%)
Researchers	43 (20%)
Policy makers	36 (17%)
Other (unspecified)	16 (7%)

Reference : Authors' calculation

According to the standardized guidelines the workshops included **two sections** that took on average 2 hours and 25 minutes. The first section was focused on assessment of threats and adverse effects, and the second section on adaptation capacity preconditions.

4.4. Data analysis

Each research team prepared a short report describing the MRL under study and results of the participatory workshops. The reports also included primary data that was analyzed for the purpose of this synthesis report.

All quantitative data were checked and coded into a dataset that was processed with the use of the IBM SPSS Statistics (version 28.0). Quantitative analysis was mainly based on calculation of descriptive statistics.

Qualitative data from the participatory workshop (i.e. narratives of adverse effects provided by each research team) was coded according to themes that were represented in the narratives. Following analysis was focused on understanding similarities and differences between MRLs with respect to impacts of adverse effect. Findings from the qualitative analysis are presented in section 5.3 of this report.

5. Threats to mountain regions and their impacts

The basic concept of *drivers of change* was adapted for the purpose of the study. With regard to the interaction with stakeholders, we used the concept of *threats* instead of *drivers of change*. This concept better describes changes coming from the external environment with potentially negative impacts on MRL.

5.1. Threats (drivers of change)

The study worked with a total of 28 threats (see Table 1), which were listed in three groups: environmental, social and economic, political and institutional. All threats were assigned a score (0-3) according to their relevance for impacting VC-A in the given MRL.

The basic descriptive statistics for the 23 MRs show that all categories of threats are considered relevant. The differences in mean values are relatively small and the scores of threats have a high variability (Table 4).

In addition, threats that can be considered relatively widespread, but are no longer universal across our cases also featured prominently in the list of priority threats. These are threats that are relevant in about one-half of the regions. Examples are: extreme weather events, market changes, inflation, energy prices and legislative changes. Finally, threats that are urgent, but less geographically widespread, can be identified. Examples are: wildfires, technological changes, mass tourism, etc. These threats are more dependent on the specific conditions of the region and are therefore relatively less represented. A summary view of the priority threats and their distribution in the MRLs under consideration is shown in Table 6.

Table 4: Mean values and SD for category of threats across 23 VC-A cases

Threats category	Number of threats within category	Mean Value	SD
Environmental (ENV)	13	1.30	.47
Social and Economic (S-E)	12	1.55	.38
Political and institutional (INS-POL)	3	1.77	.56

Reference : Authors' calculation

A more precise view is provided by the description of the individual threats. The main threats to MRL include: drought, demographic changes, incentives' and subsidies' changes, energy prices and inflation. The average score for these threats ranged from 2.04-2.61 and was the highest across the entire set of threats studied, i.e. highly relevant, with medium to high impacts on VC-A.

The majority of the observed threats were rated as relevant, with low to medium impacts. This group includes most environmental threats, as well as social and economic threats. The average score ranged from 1.04 to 1.91.

Some of the threats under consideration scored relatively lower in the assessment. The average score ranged from 0.48-0.96. Among these threats are examples that may be highly relevant for some MRLs (such as wildfires in Portugal), while not at all relevant for other regions. This group also includes examples that are generally understood as potential threats in the context of global climate change, but, given their nature, are not as relevant to mountain regions and their VC-A (such as water quality). A summary view of the threats, grouped by relevance, is provided in Table 5.

During the workshops, the research teams verified the impact on VC-A of only the most urgent threats. For this purpose, they reduced the pre-defined list to 3-5 threats that they considered the most urgent in the context of a given MRL.

Thus, a total of 123 urgent threats were identified considering the contextual conditions of the MRL. The threats most frequently selected for the priority list were: drought, demographic changes, incentives' and subsidies' changes, energy prices and inflation. These threats were highlighted by the vast majority of the regions surveyed (drought in 18 MRLs out of 23, demographic changes in 16, incentives' and subsidies' changes in 14). These three threats are thus very common in our cases in terms of the extent to which they threaten land based VC-A in mountain regions.

Table 5: List of threats and relevance of their impacts on VC-A in MRL

Threat	Mean across 23 cases	Category	Relevance to the overall 23 cases
Drought	2.61	ENV	High - medium
Demographic changes	2.48	S-E	
Incentives' and subsidies' changes	2.43	INS-POL	
Energy prices	2.26	S-E	
Inflation	2.04	S-E	
Land use changes	1.91	S-E	Medium - small
Extreme weather events	1.87	ENV	
Air Temperature change	1.83	ENV	
Legislation changes	1.83	INS-POL	
Market changes – consumer demand	1.65	S-E	
Biodiversity Change	1.61	ENV	
Soil condition	1.52	ENV	
Non-native invasive species	1.43	ENV	
Change in traditional practices	1.43	S-E	
Use of natural resources	1.39	ENV	
Soil quality	1.35	ENV	
Life-style changes (post-productivism)	1.22	S-E	
Change in knowledge production and use	1.22	S-E	
Mass tourism and associated infrastructure	1.17	S-E	
Technological Innovation (digitisation)	1.17	S-E	
Pandemic situations	1.13	S-E	
Changes in the political system	1.04	INS-POL	
Wildfires	.96	ENV	Small – not relevant
Society polarisation (rich vs poor)	.91	S-E	
Flooding	.74	ENV	
Air quality	.57	ENV	
Water Quality	.52	ENV	
Water Temperature Change	.48	ENV	

Reference : Authors' calculation

In addition, threats that can be considered relatively widespread, but are no longer universal across our cases also featured prominently in the list of priority threats. These are threats that are relevant in about one-half of the regions. Examples are: extreme weather events, market changes, inflation, energy prices and legislative changes. Finally, threats that are urgent, but less geographically widespread, can be identified. Examples are: wildfires, technological changes, mass tourism, etc. These threats are more dependent on the specific conditions of the region and are therefore relatively less represented. A summary view of the priority threats and their distribution in the MRLs under consideration is shown in Table 6.

Table 6: Overview of the priority threats and their representation in MRL's

Priority threat	Category	Representation in MRL's (out of 23)
Drought	ENV	18
Demographic changes	S-E	16
Incentives' and subsidies' changes	INS-POL	14
Energy prices	S-E	9
Extreme weather events	ENV	9
Inflation	S-E	9
Legislation changes	INS-POL	6
Market changes – consumer demand changes	S-E	6
Land use changes	S-E	5
Change in traditional practices	S-E	4
Non-native invasive species	ENV	4
Air Temperature change	ENV	3
Biodiversity Change	ENV	3
Soil quality	ENV	3
Life-style changes (post-productivism)	S-E	2
Mass tourism and associated infrastructure	S-E	2
Pandemic situations	S-E	2
Soil condition	ENV	2
Use of natural resources	ENV	2
Change in knowledge production and use	S-E	1
Changes in the political system	INS-POL	1
Technological Innovation (digitisation)	S-E	1
Wildfires	ENV	1
Society polarization (rich vs poor)	S-E	0
Flooding	ENV	0
Air quality	ENV	0
Water Quality	ENV	0
Water Temperature Change	ENV	0

Reference : Authors' calculation

5.2. Susceptibility of the mountain VC-A

The stakeholders identified a **total of 278 unique VC-A elements** that are exposed to the most significant threats. Overall, 542 VC-A examples of VC-A elements were analysed, but some of them were mentioned repeatedly in different MRLs. These VC-A elements were **divided into five categories, according to the stages of mountain VC-A**:

- Production
- Processing
- Distribution and Marketing
- Consumption
- Multiple Stages/Entire VC-A

The last category (Multiple Stages/Entire VC-A) included elements to which it was not possible to assign a single VC stage (such as Production), or which referred to more general impacts affecting the entire VC-A as such.

The most susceptible stage of the mountain VC-A is the Production stage, to which almost 63 % of the threatened VC-A elements belong. It is obvious that stakeholders consider production as the most important stage within the whole mountain VC-A. Assumed threats of production processes often reach beyond this stage, and indirectly impact on other stages of VC-A, such as processing or marketing. **The stages of Processing, Distribution and Marketing,** and **Consumption** are equally evaluated as significantly **less susceptible**. For details see Table 7.

It is important to note that identification of the main threats and perception of the impacts is most likely influenced by structure of the participants of the workshops in which farmers and processors dominated. These actors represented 46% of all participants (see Table 3 for details).

Table 7: Distribution of VC-A elements among categories

VC-A element category	No. of cases	Relative frequencies (%)
Production	341	62.9
Processing	33	6.1
Distribution and marketing	51	9.4
Consumption	40	7.4
Multiple stages/Entire VC-A	77	14.2
Total	542	100.0

Reference: Authors' calculation

Table 8 shows in detail the threats to each stage of the mountain VC-A, according to the stakeholders' assessment (relative counts within the individual VC-A element categories). The **Production stage** is the most frequently affected by the following threats: drought, changes in incentives and subsidies, and demographic changes. It is obvious that the most frequent

threats in this case are distributed evenly among the environmental, socio-economic and institutional subcategories.

The same holds for the category of **Multiple Stages/Entire VC-A**, which is most often threatened by demographic changes, drought, legislative changes and changes in incentives and subsidies.

For the remaining stages (Processing, Distribution and Consumption), only some of the subcategories of threats are relevant. Specifically, in the case of the **Processing** stage, only socio-economic threats – demographic changes, inflation and consumer demand changes – are represented. The **Distribution and Marketing** stage is most often threatened by inflation, incentives' and subsidies' changes, energy prices and consumer demand changes. The **Consumption** stage is then most often threatened by consumer demand changes, drought and inflation.

It is important to note that the values represent the frequency of how many stakeholders mentioned the impact of each threat on the VC-A stages only. Thus the figures do not necessarily show intensity of threats.

The intensity of the threats is calculated based on the exposure and sensitivity score (for detailed definition see Section 4.2.3) and presented with the impact score in for the stage of mountain VC-A (Table 9 and Table 10).

Table 9 provides information about **exposure and sensitivity within the specific VC-A stage** to the most significant threats, based on the assessments of 215 stakeholders from 23 case study regions. It also shows the overall impact of these threats on each VC-A stage.

Table 8: Count of VC-A elements threatened by various threats across the VC stages

Threats	VC-A elements categories (% within VC-A elements category)				
	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	16.2	9.1	7.8	15.0	10.7
Air Temperature change	4.4	.0	.0	.0	1.3
Extreme weather events	7.4	6.1	5.9	7.5	4.0
Wildfires	.9	3.0	.0	.0	.0
Soil condition	2.4	.0	2.0	.0	2.7
Use of natural resources	1.8	3.0	2.0	2.5	.0
Biodiversity Change	2.9	3.0	2.0	2.5	1.3
Non-native invasive species	4.7	.0	.0	2.5	.0
Soil quality	1.8	.0	.0	.0	.0
Land use changes	5.9	3.0	5.9	7.5	6.7
Mass tourism and associated infrastructure	1.5	.0	3.9	2.5	5.3
Demographic changes	11.8	18.2	3.9	5.0	24.0
Life-style changes	1.2	.0	.0	2.5	.0
Change in traditional practices	4.4	.0	2.0	.0	8.0
Market changes – consumer demand changes	4.1	12.5	11.8	22.5	4.0
Change in knowledge production and use	.6	.0	.0	.0	.0
Technological Innovation (digitisation)	1.2	3.0	3.9	2.5	.0
Inflation	3.8	18.2	17.6	15.0	4.0
Energy prices	5.0	12.1	11.8	5.0	2.7
Pandemic situations	1.2	.0	.0	.0	4.0
Legislation changes	4.4	.0	3.9	5.0	10.7
Incentives' and subsidies' changes	12.6	6.1	13.7	2.5	10.7
Total	100.0	100.0	100.0	100.0	100.0

Reference: Authors' calculation

Table 9: Average exposure, sensitivity and impact according to VC-A element categories

VC-A element category	Exposure	Sensitivity	Impact (Exposure x Sensitivity)
Production	4.8	4.6	24.0
Processing	4.4	4.3	21.5
Distribution and marketing	3.7	3.8	16.3
Consumption	3.9	3.8	16.0
Multiple stages/Entire VC-A	5.1	4.8	25.7

Note: Scale for evaluating exposure and sensitivity ranged from 1 to 7.

Reference: Authors' calculation

The VC-A elements that are considered by stakeholders to be the most exposed and also to be the most sensitive to threats are those that affect **the Entire VC-A**. The **Production** and **Processing** stages are also considered relatively more exposed and sensitive to threats. Contrary to this, the **Distribution and** M**arketing** and **Consumption** stages are relatively less sensitive and exposed to threats. Again, this finding might have been affected by the composition of the workshop participants.

The greatest impact (Exposure x Sensitivity) of threats is seen in the VC-A elements that refer to Multiple Stages/Entire VC-A. A plausible explanation is that the threats are associated with general, large-scale issues related to overall functioning of the VC-A, and thus the impacts are subjectively viewed as the most intense.

The impact of threats is significantly smaller on the Distribution and Marketing/Consumption stages. In summary, the Production stage is the most susceptible among the individual VC stages, not only in terms of the frequency of threatened VC-A elements which belong to this stage, but also in terms of the strength of the impact of the threats.

Considering the intensity of threats and their impacts on specific stages, the **Production** stage is the most impacted by wildfires, soil quality and drought. The **Processing** stage is the most impacted by technological innovation, the use of natural resources and demographic changes. The **Distribution and Marketing** stage is the most impacted by consumer demand changes, changes in traditional practices and changes in knowledge production and use. The **Consumption** stage is the most impacted by non-native invasive species, lifestyle changes and inflation. The functioning and governance of the whole VC-A is the most impacted by biodiversity change, extreme weather events and drought. An overall view of the intensity of the impacts of threats on selected VC-A elements is provided in Table 10. Statistical figures for measured impacts are provided in the Appendix (Annex 5).

In general, the VC-A and also the production stage are the most strongly impacted by environmental threats. However, the intensity of the threats in the area of processing, distribution and marketing and consumption are mostly threatened by socio-economic factors. The impact of institutional threats on all stages of the VC-A are considered rather low.

Specific examples of the forms, and how selected threats impact on VC-A elements are provided in section 5.3, based on a qualitative analysis.

Comparing the figures presented in Table 8 and Table 10, it is obvious that **the most frequently occurring threats may not be those with the greatest impact on VC-A**. For example, the three threats with the greatest impact on VC-A are biodiversity change, wildfires and extreme weather events, but none of these threats are among the most frequently mentioned. Specifically, wildfires are mentioned only three times (e.g. case in Portugal), but their impact on production for these VC-As is very high. On the other hand, the threats most frequently mentioned (and threatening in most case studies) are drought, demographic change and incentives and subsidies. Specifically, incentives' and subsidies' changes are mentioned a total of 43 times in 14 case studies, but their impact on production for these VC-As is relatively lower.

Table 10: Average impact of threats on VC-A element categories

Threats	VC-A elements categories (% within VC-A elements category)				
	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	Very High	High	Low	Low	Very High
Air Temperature change	High	.	.	.	Very High
Extreme weather events	High	Low	Low	Low	Very High
Wildfires	Very High	.	.	.	.
Soil condition	High	.	Medium	.	Very High
Use of natural resources	Medium	Very High	Low	Low	.
Biodiversity Change	High	Low	Low	Low	Very High
Non-native invasive species	High	.	.	Very High	.
Soil quality	Very High	.	.	.	.
Land use changes	High	Very High	Low	Low	Very High
Mass tourism and associated infrastructure	High	.	Low	Low	High
Demographic changes	Very High	Very High	Medium	Medium	High
Life-style changes	High	.	.	Very High	.
Change in traditional practices	High	.	High	.	Very High
Market changes – consumer demand changes	Medium	High	High	Medium	Very High
Change in knowledge production and use	Medium	.	Medium	.	.
Technological Innovation (digitization)	Low	Very High	Medium	Low	.
Inflation	Medium	Medium	Medium	High	Very High
Energy prices	High	Medium	Medium	Medium	Medium
Pandemic situations	Low	.	.	.	Very High
Legislation changes	Medium	.	Low	Low	High
Incentives and subsidies changes	High	Medium	Medium	Low	Medium

Note: Dot symbol denotes that the impact of the threat on selected VC-A element category was not indicated.

Reference: Authors' calculation

5.3. Adverse effects through the eyes of local actors

In this chapter we provide detailed qualitative analysis and narratives of forms and impacts of ten most significant adverse effects on meat, tourism, food and alcoholic beverages value chains (for categorization see Table 11). This categorization is a simplified version of the categorization used previously in the Task 4.2 (Blackstock et al. 2021). Categorization of the VC-As used in this report was done solely for the purpose of the qualitative analysis.

Overall, it seems that the forms and impacts of adverse effects are not uniform across all types of value chains studied. In each region the intensity and scale of impacts of adverse effects on value chains differ. Important detail for understanding the following narratives is that while in some regions local actors described the negatives caused by adverse effects in terms of active damage, in many cases the negative impacts are referred to as a "risk", they "can" or "may" represent a major threat, but not presently, more of a threat in the near future if certain political, economic or environmental conditions are activated.

Table 11: Categorization of VC-A with respect to focal product

Category	Focal product	Country - MRL
Meat	Lamb, Organic beef, Iberian ham	Austria – Austrian Alps Czech Republic – Šumava France – Drome Valley Serbia – Dinaric Mountains Spain – Sierra Morena
Tourism	Public goods from HNV farming Tourism	North Macedonia – Maleshevski mountain Romania – Southern Romanian Carpathians Hungary – Transdanubian Bulgaria – Western Stara Planina
Food	Chestnut flour, Carob flour, Cheese (sheep, cow), Bio honey, Organic olive oil, Mountain grain, Tomatoes, Cereals,	Italy – Central Appenines Portugal – Cordilheira Central Switzerland – Swiss Jura France – Corsica Greece – Rethymno, Crete Italy – North Appenines Spain – Betic system Switzerland – Swiss Alps Turkey – Beydaglari Slovakia – Slovak Carpathian mountains
Alcoholic beverage	Wine, Whisky	Italy – Eastern Alps Portugal – Macico Noroeste Spain – Spanysh Pyrenees United Kingdom (Scotland) – Upper Speyside

Reference: Authors' work

Moreover, in some cases, the industry is not dealing with the current consequences of climate change and some of the actors in VC currently do not consider a long-term strategy to reduce the impact of climate on the value chain, nor to adapt production to climatic conditions that would actually evolve negatively more rapidly than expected.

5.3.1. Drought

Drought is the most reflected threat in a majority of the cases, and it is a threat recognised across Europe. Although the forms of drought differ slightly in each region, the common denominator is the similar negative impact on all actors and processes within the value chain.

The main forms of drought that were observed in meat production are related to changes in precipitation, rainfall instead of snow, reduced rainfall and moisture in general during the vegetative period, and water scarcity. Adding to this, actors also listed long dry periods, unpredictable seasons, quickly changing climate, mild winters, and heatwaves. Drought affects regions relying on tourism as a source of income, specifically by increasing air temperatures in summer and winter. Access to water is also impacted, in some regions all year round. Regions which specialise in the production of food experience summer drought and uneven precipitation over the year, periods without precipitation, less water availability, a reduction and changes in the seasonal distribution of rainfall. Furthermore, persistent heatwaves were recognised to be related to patterns fostered by climate change. Regions focusing on the production of alcoholic beverages face increasing air temperature, severe heatwaves, and changes in the levels of precipitation impacting on the available quantity of surface and groundwater. Three main common characteristics for all types of production across regions are reduced available water, with uneven distribution of precipitation and rising heat.

Meat

The impacts of drought on the meat production VC are primarily in the water balance and availability of water, which impact a reduction in the quality and quantity of fodder. This leads to the necessity to purchase fodder, the purchase of additional land or a reduction in the number of animals. Pasture management becomes an important issue for pastoral livestock farming, namely the optimisation of forage areas. Actors in mountain regions with animal production describe a phenomenon in which the reduction in animals and reduction of pastures cause an imbalance in the countryside: increased overgrazing in some areas, while abandoned pastures are overgrowing other areas. This leads to a higher risk of wildfires, a reduction of biodiversity and, importantly, the deteriorating quality of the soil, making it prone to erosion. Farmers are witnessing a reduction in the species composition of grasslands, and a reduction of forage value in the grazed vegetation, which have a negative impact on livestock productivity and pose a threat to the financial viability of traditional farming systems. They thus often abandon traditional farming systems, possibly giving up farming altogether. Pastures are not the only source of feed; trees

are as important a source of feed in the case of acorn production for pigs, as in Jamón Ibérico production in Spanish Sierra Morena. Acorns are affected by a lack of water and rising heat, and the fewer or smaller the acorns produced, the fewer pigs can feed on them and, therefore, the fewer units can be sold under the PDO certification label. Lastly, drought also affects the rise of parasitism and non-native, invasive species.

Tourism

There is direct link between the forms of drought mentioned above and consequent changes in land management and changes in the attraction of the countryside for tourists. For example, drought alters the character of landscape and biodiversity by influencing species to move to higher altitudes, which can lead to 'altitude extinction', thus lowering the attractivity of given area. Wildfires deteriorate air quality, one of the essentials sought after by tourists. There is strong competition and rivalry between tourism and farming regarding water resources. For example, due to the high demand of accommodation units, pressure on the water infrastructure arises. On the other hand, the use of water sources, such as water reservoirs, were previously shared between tourists for recreation and farmers for irrigation. The lower levels of available water are no longer attractive for recreation and swimming. This is the case in the Eastern Alps, Italy, where lakes lose more than one-half of their volume due to irrigation, making them less attractive to potential visitors. Finally, many producers rely on tourists to purchase their products. The effects of drought are impacting on farmers' capacity to produce and offer added value quality products to tourists. In addition, the negative changes in some areas lead to visits by fewer tourists.

Food

Commonly, drought and heatwaves are challenging actors specialising in the processing and production of food, mainly by the lower quantity and quantity of grass and lower yields in general. Pastures are less productive, due to a lack of water, which necessitates flocks needing to go further into the mountains or additional fodder needing to be brought in. Poorer animal feed affects the quality and quantity of the final dairy products. Drought leads to the derogation of pastures and a decrement in the grass quantities that can be mowed for winter supplies. The threats are concentrated in the timeline, the overall impact of lower yields on VC is a lower income, which, in combination with increased costs and changes in agricultural product pattern, often lead to the actual or considered abandonment of agriculture, and, in some cases, even to migration from the region.

The drying of plants, soil and air leads to reduced production of nectar and honeydew, weakening the plant, including its roots and the ability to draw nutrients from the soil. This chain effect causes a predominance of drought-loving species, which are less favourable species composition for bee grazing. Drought also affects the health of bee colonies, where reduced pollen production leads to a reduced supplies. Areas of olive production in mountain areas, such as the Betic System in Spain, are facing a drastic reduction of the current olive crop, characterised by the small size of

olives, and poor quality of the fruit, as well as very negative socio-economic impacts, notably a loss of income and a drastic reduction in the labour market.

Cheesemakers are indirectly affected by the consequences of the loss of grass quality and thus by the decrease in milk quality, especially in the case of a decrease in protein content (especially kappa casein, which is the most important factor in cheese processing). This decrease in quality affects the cheese yield and the quality of the cheese. There are opportunities to purchase or divert milk to other products. The consequences are much less important for cheesemakers, ripeners and traders than for farmers.

Alcoholic beverages

Drought increases plant water stress and ripening of the grapes, especially in short-cycle vine varieties. Drought affects grape yield and decreasing production potential of the vineyards. Availability of surface water (and potentially spring water) necessary for year-round abstraction for process and cooling in whisky distilling is challenged as well. The main current risk is to cooling water volumes, but future availability of processing water could become a concern. Threats to the focal malt whisky VC from drought include potential for reduced outputs and therefore profits. Increasing water temperatures also impact on wild salmon and trout numbers, and any other food or drink processing that requires cooling waters. The threats of drought to alcoholic beverages production are in spring and river water for private water supplies, alcoholic beverages processing, cattle waterings, and destination image. Low flows can threaten private water supplies for domestic and commercial buildings. However, Scottish stakeholders do not believe that low flows or increased water temperatures would impact much on the destination image associated with food and drink tourism.

5.3.2. Demographic changes

The two most significant demographic changes that are taking place in meat production are the depopulation of rural areas due to a lack of opportunities for the younger generations, thus a lack of people in general, and the problem of succession of family farms. The forms that demographic changes have on food production are common with the meat production sector, namely difficulty in the installation of young producers, rapid decline of the mountainous populations, desertion of villages by the younger generations, plus ageing of the population on family farms. In some cases, the declining birth rate is also a threat, with migration to urban areas. The forms of demographic changes for tourism are again depopulation, departure of young people (in some regions, especially males) and the ageing of the remaining population. Outmigration of farmers is also listed among the threats. This has been attributed to a lack of employment opportunities and the low quality of life, youth leaving to other EU countries for jobs, with the local population getting smaller and older. It must be added that in Stará Planina in Bulgaria, demographic changes have been ongoing since the 1960´s. However, the trend of depopulation has recently increased. For

the production of alcoholic beverages, there is a scarcity of workforce, especially seasonal. Aging and depopulation of the young and educated residents are again challenges, due to the poor social infrastructure and a lack of essential services.

Meat

Among the most common impacts that demographic changes have on VC of meat production is a lack of qualified employees, and related changes in local knowledge of the management of often unique farming systems (such as the Spanish dehesa – silvopastoral systems). A lack of generational renewal in the sector makes access to traditional management knowledge difficult. This is compounded by the difficulties of access to land and farms, due to the high entry price, with belonging to a traditional livestock farming or family farming being one of the few ways of gaining access to it. The transmission of traditional knowledge is practically relegated to the family level and there are barriers to combining it with other types of knowledge to generate practices that seek the sustainability of the whole system. The loss of young people in the territory may lead to a lack of innovation and improvement of practices.

Tourism

Among the impacts of demographic changes on VC is a deterioration of traditional livestock breeding and farming, which leads to the abandonment of HNV grasslands and/or overgrazing. This causes a loss of biodiversity and reafforestation. Due to the loss of qualified employees and the labour force shortage in general, the regions are slowing down, and tourism often stagnates or disappears. This has a negative impact on the loss of local culture and traditions, a disconnection between the education and training offered to youth studying tourism and the actual market realities, with the refusal of people to work while receiving social benefits. Labour contracts are often not adapted to the touristic sector seasonality. One of the recognised and reoccurring threats is also hiring the necessary employees from abroad (e.g. Nepal, Bangladesh). In the Swiss Alps, young people are seen as struggling with their expectations of work-life balance and not wanting manual jobs. However, some stakeholders recognised that changes and adjustments in their jobs and businesses were overdue. According to a few stakeholders in the Swiss Alps, tourism is ahead of other industries in this respect, for example, by offering a 4-day working week.

Food

The impact of demographic changes on the food production VC is wide. Firstly, there is a shortage of specialised and qualified workers, technicians, producers, processors and seasonal labour. This is transformational for the rural way of life and livestock production. The shortage of labour force is urgent, producers' children and next generations are seeking other options and a different lifestyle. In cereal production in the Swiss Alps, in some regions there are enough farmers on the production side. However, there is a lack of skilled employees and a working network along the

VC. Seasonality in labour demands and the need for seasonal work were cited as the biggest challenges. The work required in this VC and in VC-A was seen by outsiders as not valued enough, and as demanding. This was cited as the reason why it was so difficult to employ sufficient workers. The many different languages in the region could be an additional difficulty for newcomers.

In Cordilheira Central, Portugal, the greater availability of low altitude pastures and modernisation of shepherding is leading towards the abandonment of high-altitude pastures and a reduction in the herd numbers in the region. In the Dinaric Mountains, Serbia, on the other hand, very little innovation is being introduced, causing a lack of opportunities in the region. In combination with the prospects of higher salaries elsewhere and due to a lack of facilities and services that provide a certain quality of life, some young people do not want to take over the family business of sheep farming, since their life aspirations have changed. Agriculture is not their only choice. This leads to transformation in the rural way of life and livestock production. The shortage in the labour force is urgent, producers' children and next generations are seeking other options and a different life-style, resulting in great changes, both economically and socially.

Furthermore, inheritance difficulties and changes in lifestyle lead to a loss of traditional practices, a loss of cultural heritage and traditional (local) knowledge of the essential practices of traditional farming and the techniques related to the food transformation processes. In addition, a scientific technicality has been added and has become an issue, imposing the need for the understanding and mastery of additional technical itineraries in agroecology. Technology allows for the shortening of transformation times and aims at the reduction of the necessary workforce. It has been noted In Corsica, France, that it is very difficult to implement an efficient, adapted, and shared technology, which today does not allow advantage to be taken of the shared profitability. This leads to a decline in farming and agricultural activities in the MRL. Consequently, grove, pasture and meadow resources are abandoned, with activities being concentrated on a limited number of enterprises. This leads to the risk of deterioration in the local raw materials, a loss of traditional production practices, a reduction in the links between dairy production and the territory, and finally, advancement of the forest.

There is a relatively curious ongoing case related to the production of chestnut flour in the Northern Apennines, Italy. Visitors to the groves come from urban areas to collect fallen chestnuts, believing it is a public good and that they may take advantage of them by collecting them free of charge. This activity causes a loss to farmers and a decrease in chestnut flour production.

Alcoholic beverages

In the Spanish Pyrenees, the labour shortage affects agronomic operations and production costs in the wine value chain. The socio-economic sustainability of the region is challenged, together with rural vitality and the appeal for tourism. This is leading towards the replacement of small agricultural units by large companies making investments and buying land for extensive

agriculture. This not only reinforces the depopulation trend, but also ruins environmental equilibrium and biodiversity.

In the whisky production in the Upper Speyside, there has been population growth in the MRL, with depopulation in the southwest of the MRL, and population growth in the more accessible north-eastern parts. Within the MRL, there is an ageing population, with many younger people moving out of the area, due to the potential lack of long-term job opportunities or suitable housing. The impacts of Brexit may also have had a negative impact on the demographics of the MRL (i.e. fewer opportunities for EU members to remain working and living in the area). Salaries in the MRL tend to be higher than the national average, but there is still a gulf between salaries and the high cost of accommodation. Demographic changes pose a problem in the area, with the decreased availability of employees causing issues in both the whisky and tourism sectors. Lack of affordable housing contributes to the problem, with properties being used for short-term holiday rentals. However, the lack of local amenities – e.g. schools and medical care – can also deter young families from moving into the area. However, in contradiction to the initial narrative, participants highlighted that there are numerous long-term job opportunities – so it is potentially (or partially) a lack of awareness of career pathways that is the problem.

5.3.3. Incentives' and subsidies' changes

The most significant forms that incentives and subsidies across the European regions take in meat production are direct payments, public financial support, and financial resources for modernisation. Changes in the CAP (Common Agriculture Policy) funding is a threat recognised by a majority of the actors. The Spanish dehesa is not sufficiently considered by the European Commission in the CAP. For tourism, the forms most affecting conditions for survival are regular changes in EU regulations, the lack of clarity in support measures in CAP 2023-2027 and Special Accession Programme for Agricultural and Rural Development (SAPARD) funds and national legislation. Incentives for building new private accommodation and weak governance are issues in the Macedonian Maleshevski region. Actors engaged in food production are affected by poorly applied reforestation policies, inadequate forestry maps, EU subsidies within the new CAP that do not fully reflect the needs of farmers, the absence of support and neglect by agricultural directorates. A lack of training and education of farmers is mentioned as well. In the Northern Apennines, Italy, the lack of interest towards the chestnut and chestnut flour VC by local representatives and politicians, in favour of marble mines and seaside activities is an issue. Apart from the already mentioned forms of threats related to incentives' and subsidies' changes, we can also include bureaucracy, unpredictability, the slow and belated reaction of policymakers and, in the case of Serbia, the EU accession process.

Meat

The impact of VC on meat production is characterised by a decrease in investment and slow economic development, due to a decreased or fragile farm income. Thus, subsidies are essential for lowering the effects of exacerbation of the economic crisis and for the overall viability of farming. The Plan Pastoral Territorial (a regional programme) promotes the maintenance and development of pastoral practices. However, actors from the Austrian Alps also suggest that subsidies are mainly relevant for full-time farmers.

Tourism

Excessive bureaucratic and administrative in subsidy mechanisms represent burden which leads to an uncertain farming future, there is the recognised potential to reverse the loss of public goods. Policy measures need more tailoring to the needs of HNV farmers and greater attention is necessary for an integrated approach, such as profitability and the socio-economic viability of HNV farming. The new infrastructure for tourism has little or no respect for the natural habitat of the vegetation or wild animals, which are important for maintaining the balance in the mountains. This can cause permanent damage to the ecosystems. This is connected to misunderstanding of the legislation and sustainable tourism principles, as well as poor multilevel governance and the need for capacity building to support sustainable tourism properly and efficiently in the area. Poor governance and financial incentives in the Southern Romanian Carpathians were supporting improper and illegal building development in the mountain area, impacting negatively upon all the elements of our VC-A.

Food

Food producers have difficulties in adapting to the new mechanisms and change in the conditions of access to aid and subsidies. This is directly and indirectly the cause of a decline in agricultural production, a reduction in local raw materials and the profitable livelihoods of farmers, and finally, a decline in MRL, even exit from the sector. One of the issues is the mismanagement which fails to efficiently allocate incentives and subsidies across the VC. This discourages landowners, and encourages a change from sheep to cows, due to higher subsidies. The risk of a possible reduction or cancellation of subsidies causes instability and negatively affects future planning. Furthermore, the interests of producers are poorly represented at local and national levels, as there are no strong and functional producer groups in the Dinaric Mountains, Serbia. Disunited and independent producers are neglected (they are far from the decision-making centres). They also lose the chance to become more visible on the market as guardians of pasture-raised lamb from the ecologically clean expanses of Pešter. The lack of incentives and opportunities for financial support and investments accessible to farmers and producers has also been recognised among the issues. Changes in the (local) political system add to the complexity of applying for subsidies. The lack of local support could be an additional hindrance to the production, economic

stability and interest for the particular economic activity. An important observation is that each participant in the production chain deals with systemic and significant threats independently.

In Slovakia, beekeeping as a part of farmyards is disappearing, due to legislation that does not protect beekeepers' rights. Specifically, there is the threat of a ban on beekeeping in urban areas (by applying the mandatory consent of neighbours). Furthermore, environmental regulation is starting to put restrictions on beekeeping in new designated protected forest areas.

The greatest shortcoming of VC grain in the Swiss Alps, according to some stakeholders, is the small quantities, which result in a lack of standardisation and overall poorer quality. The quantity they can process in total has the biggest impact on the overall processing ability. This was a major threat for the Swiss Alps. Currently, the incentive for VC-A and production as a whole is perceived to be coupled with the inappropriate incentives – with the quality of the product being secondary. The production of hay-milk is, however, one of the main supporters of the typical landscape. It was not clear what exactly direct payments should support, but rather that all possibilities (per area or per ton) have negative effects. Stakeholders are disappointed by the many quality labels and the associated incentives and call for more education and know-how transfer to consumers. This perception as "just a hobby" came as quite a surprise. It is interesting to note that the VC gives this impression to some.

Animal husbandry makes the most sense from an economic and efficiency point of view and is therefore strongly supported politically. Ecological compensation areas are competition to production areas. Subsidies are per area instead of per livestock unit. This also means that farmers benefit again if they already own a lot of land.

Alcoholic beverages

Actors operating in the alcoholic beverages area suggest that subsidies do not sufficiently address the small and newer family farms. Instead, they mostly favour large companies' investments, contributing to the negative demographic trend.

5.3.4. Extreme weather events

The forms of extreme weather events that meat producers and the producers of alcoholic beverages are experiencing are heavy rain, severe thunderstorms, hail, late frosts, increasing temperatures, heatwaves and subsequent drought. Air temperatures are rising, with an increasing number of hot days. Food producers are also facing late frost, hail, intense rain and the increase in temperature. Apart from these, changes in the intensity, frequency, and timing of heatwaves are significant new elements. Actors in the Betic System, Spain stated that the hot season is now 40 days longer than in the 1980s. In autumn, they experience "tropical nights", an increase in temperatures, continuous heat, with heat outside the usual period being the new normal. On the other hand, Turkey Beydagları is an example where flooding occurs. Examples of the forms of extreme weather events impacting on tourism were not collected.

Meat

As a result of extreme weather events, meat producers and animals are challenged by the water balance, degradation of soil and loss of humus. A combination of these factors affects fodder availability, higher production costs and a consequent reduction in animals. Rising heat also favours the pressure of pests on plants and animals.

Food

Soil erosion, deterioration of chestnut grove structures (stalls, plateaus), diseases (non-native invasive) decreasing yield – low chestnut quality and quantity; low income; exploitation costs; production costs. The pasture soil quality, soil conditions, reduced humus content and increased erosion, destruction of flowers, heatwaves, especially in combination with drought, weaken plants, reduce nectar production, and harm honeydew producers (insects). This prevents the proper development of flowering, and the pollen may even lose its germination capacity. There is a reduction in the number of flowers per inflorescence and a significant increase in ovarian abortion. Fruit will not grow properly, and an excessive temperature may slow down the photosynthetic capacity of trees, harm the harvesting process, transport of fruit, and oil production. Temperatures have a direct effect on pests and diseases. High temperatures tend to reduce the impact of pests, and have not prevented an acute attack of the olive fruit fly, whose predators also die as a result of the high temperatures, so the impact is more significant. The effect on the harvest is more noticeable, as there are fewer olives. On the other hand, the flights of light aircraft have not helped, because they fly too high and the product used for spraying (Spinosad) is less effective and compatible with organic production. Cereal production – crop damage = lower yield. There is greater difficulty in planning for the year (no experience), a risk of complete loss. Much of the pressure to deal with these events is put on producers alone. Animal production – less grass (fodder). Processing – grain moisture is more variable, grain is more difficult to store. Grain quantities to compensate (to increase or "save" overall quality) are unavailable. In the Swiss Alps, this threat was rated by stakeholders as less important than we had expected. This is probably due to the fact that the previously collected data – which led us to rate this threat as important – were mainly collected from the producers' perspective. The other stakeholders further down the VC are not as aware of this threat, or do not rate it as highly. All stakeholders (including producers) indicated that this threat leaves no real choice. So the only question is how to proceed/ deal with it now. They also indicated that these events are not yet as extreme or threatening as they were in the lowlands. And one even said that climate change can be an opportunity for this mountain region (to produce more/different crops). Yield and quality losses, reduced income, increased costs lead to decreased quality and quantity of the crop. In Greece, Carob trees are a drought-resistant and hardy species. The dry spells in Corsica can result in a better yield and the harvest of smaller, but sweeter fruits.

Alcoholic beverages

In general, the forms of extreme weather events impacting alcoholic beverage producers are related to soil erosion, loss of soil organic matter, loss of soil organic carbon and consequent changes in soil structure – specifically, water-holding capacity, soil chemical fertility and the availability of nutrients for plants. Water availability and water management are issues. Poor vegetative growth of grapes, their yield and quality are direct results of the above-mentioned. As a consequence of extreme weather events, actors also included a high degree of risks for viticultural growth and healthy yield and higher risks of massive landslides and vineyard destruction. The level of damage can reach up to 100 % of the annual production.

Higher mountain zones are relatively safe, but the trend of recent decades shows that, in future, damage from late frosts will be inevitable even in higher zones. Some farmers are less preoccupied with the extreme weather events, because they are covered by insurance and, in that case, are less worried about potential production loss. The individual case of Maciço noroeste in Portugal suggests that water availability is not so much related to drought, but the problem is that water from the Douro River is, and will be, mainly used for purposes other than vineyard irrigation, and is thus not channelled to vineyards.

5.3.5. Inflation

The common negative forms of inflation for meat production, food, tourism and alcoholic beverage producers are the increase in energy prices, higher inputs in general and rising farm costs.

Meat

The direct impact of forms inflation on VC is in the higher costs of production, processing, more expensive feed, energy and fuel. Dependence on external inputs means that prices are subject to factors that are beyond the control of the governance of the value chain itself. The profit margin at the time of sale is diminished, negatively affecting the economic sustainability of the value chain. The Ukraine War is mentioned as a factor affecting the feed prices, but also as a way for big companies to speculate with them, thus threatening the economic sustainability of small farms.

Tourism

The tourism VC is impacted by price increases in energy, production, packaging, transport, rising farm costs, land and consequent farming abandonment. There were obstacles to business providers to recover their losses incurred during the COVID-19 pandemic.

Food

The continuous increase in input prices for food producers impacts grazing losses, the necessity to obtain extra feed, thus increasing the costs of production transformation, storage, processing distribution and consumption. This is then reflected in higher product prices, production costs and pressure on sustainability of the value chain in precarious economic positioning. This has further implications for ecological transition policies on land use (energy vs. production).

The opportunistic behaviour of large-scale retailers is also among the impacts of inflation on VC. In setting prices, they do not take price hikes into account and do not allow producers to obtain a fair margin. This in turn accelerates direct reconnection processes between farms engaged in forage production and livestock farms. There is a lack of vision from the institutions and other local actors in Alto Molise, about the added value that the history of the area could have on products.

Overall, higher commodity prices and reduction in the availability of local raw materials, in combination with market placement practices of local products less attentive to the enhancement of quality, cause economic losses and eventually exit from the sector of marginal farms and dairies.

Alcoholic beverages

Inflation results in higher costs for agricultural fertilisers and pesticides, cellar tools, bottles and delivery costs, packaging, transportation, production, and distribution costs. This results in a shrinking economic margin for farmers and wine producers, who are thus facing uncertainty. Economic sustainability, development and tourism are threatened.

Stakeholders in whisky production and the whisky VC are affected by inflation in different ways. In the Speyside, whisky production and processing incur rising prices for inputs to the system. Rising energy prices are a major constituent of these inflationary pressures. Rising prices of goods and services will probably mean rising prices passed on to consumers, or alternatively, result in job losses and/or reduced profits within the VC-A businesses. It may also result in fewer tourists visiting the MRL (i.e. less disposable income means that holidays are curtailed). It may also impact consumption, as the cost of living squeezes those who would otherwise become tourists or whisky consumers. Issues around wages, jobs and competition for staff (current socio-cultural outcomes) will be negatively affected through the cost-of-living crisis. In extreme situations, businesses may need to reduce their production or even to cease production altogether. When businesses are having to manage rising input costs, they may lack the ability to invest in technologies to adapt to change. Furthermore, there may not be a large impact on investment in whisky processing, because of current inflation due to the long-term business model, where investments today are made on the basis of consumer preferences in 10-15 years' time, and most distilleries are owned by large companies. However, smaller food and beverage tourism businesses may suffer more acutely, as they do not have these long-term horizons. This threat may interact with the demographic threat, with anecdotal examples of hospitality

businesses wanting to increase wages to attract staff, but being unable to do so with the pressure inflation is already putting on their businesses. It is hoped that the international status of Speyside Whisky and the current Sterling exchange rates will help to offset reduced domestic tourism as more tourists visit from abroad. Overall, there is a threat to visitors to Speyside food and drink trails and investment in processing and visitor infrastructure as the final two elements for scoring.

In Trento in the Eastern Alps, the issue of rising prices of energy and, consequently, of essential input products for the value chain was not of primary importance to MAP members. Due to consumers' global demands for wine, wine producers in this area are open to the idea of supplier change in case of necessity. Many of them are already prepared to contrast the issue with different energy-efficient innovations in wineries.

5.3.6. Market changes (consumer demand changes)

Due to inflation and increased costs, the purchasing power of consumers has been reduced. Consequently, sales of added value meat and meat products have decreased, while the sale of cheap meat and meat products has increased. This phenomenon leads to abandonment of pastures, a decline in tourism, and finally, the end of farms. For example, in Drome Valley, France, the meat industry covers 50 % of demand by imports from abroad. In food production, in Rethymno, Crete, Carob pod prices are subjected to international market fluctuations and the import of Carob is increasing. There are lifestyle changes and a growth in the sensitivity of broad consumer groups. In Slovakia, there is limited knowledge about the origin of bee products and their positive health effects.

The forms of impacts of market changes and consumer demands for alcoholic beverages and tourism were not mentioned by the actors.

Meat

Prices of meat on the internal market have been affected due to inflation; imported meat is sold at lower prices. This leads to lower price competition with the territorial sector, a reduction of visibility of local farms and their products on the markets, resulting in the economic viability of national farms and the centralisation of the organisation of production and distribution.

Food

There are barriers to establishing PDO status for local Cretan carob products, leading to a diminution of local cultural capital. This situation gives way to unfair practices and a deterioration in the reputation of the area's products, while products of inferior quality enter the market. In Alto Molise in the Central Apennines, the link between products and territory, and relations between

suppliers and processors tends to get lost. This leads to the abandonment of pastures and meadows, and tourist attractivity of the region being damaged. Changes in purchasing power and knowledge about the benefits of local honey in Slovakia may reduce the demand for natural honey and can consequently threaten traditional beekeeping with added value in Slovakia.

5.3.7. Land use changes

Land use changes contribute to limited secure grazing areas, while the impacts on tourism are in the increase in real estate prices, mass tourism, urbanisation pressures, impoverishment, and changes in consumption patterns. Forms of the impact for food and alcoholic beverages were not listed.

Meat

Impacts of land use changes on meat production VC are in the overexploitation of the nearest grazing areas and closure of certain environments. This poses an increased risk of forest fires and avalanches.

Tourism

In Hungary, land use changes prevent development, expansion, arrival of new value-added people and effectively promote out-migration. These changes in the long term may change the landscape, economic and social environment, and even make it impossible to generate activities, knowledge production, knowledge transfer and social learning. However, It is not such a strong trend yet, and probably will not even be so in the near future.

Food

In Food VC, land use changes trigger the abandonment of pastures and meadows, the process of succession, and a gradual reduction in the diversity of bee grazing. Management changes occur, especially in meadows, where mulching replaces mowing, thus changing biodiversity. Mulching mechanically destroys plants from the roots and prevents the growth of new plants. In addition, mulching can also harm bees that are currently grazing. The consumer has a less attractive landscape at his disposal, which can lead to lower attendance and fewer sales of local honey. In the Swiss Alps' cereal production, competition with animal production is the issue. Land abandonment can become permanent, and pastures eventually turn into forest. Land use change in terms of building new infrastructure was the most frequently mentioned problem. This applies to industrial, commercial, and processing buildings, as well as, for example, finding nearby housing for workers. There is a lot of competition with the tourism sector using land for

infrastructures such as hotels – often these tourism uses are seen as more lucrative by the official municipality and are therefore preferred or given more support.

Conflict is significant between the ideas and expectations of lowland visitors and actual mountain residents about how the landscape should look (e.g. old 'romantic' ruins/old sheds appeal to lowlanders, but mountain residents may prefer a modern, larger and more 'out-of-place' looking infrastructure). The mountain stakeholders complained about the "Disneyworld fixation" of their homes. Development in tourism thus fosters land use changes, which are in turn affecting production opportunities and small farms. Another problem in the Swiss Alps is that there are not many zones for industrial and commercial activities, and there is a lot of competition with tourism zones. Furthermore, sometimes the "second homes" of lowlanders are also a problem in zoning, as they are not used all year round. This has also become an increasing problem since the COVID pandemic, when many people from the lowlands came to the MRL to "work from home". Development of premium housing puts additional pressure on the local market. This was felt to be an important threat by the stakeholders. Finally, the needs of people, industry, etc. are very dynamic and constantly changing, but the laws governing the necessary zoning changes are very slow and cannot keep up with these changes. The Swiss Spatial Planning Act has to be implemented by each canton and then by each municipality, so there are also many differences in what stakeholders actually can and cannot do, depending on which municipal administration they fall under.

5.3.8. Wildfires

Wildfires represent a common threat in four countries across Europe. The primary negative effect is on livestock farming, but also on the safety of local inhabitants and MRL tourist attractivity.

In Serra da Estrela, Portugal, wildfires were listed as currently the most prevalent threats to SE. Fires destroy pastures, contribute to soil erosion, and affect the forest areas, changing the landscape pattern. Moreover, milk production is at risk, as is the attractivity of the location for tourists. Wildfires are connected with drought and air temperature increase, but also with land use changes leading to shrub encroachment in altitude pastures. With the abandonment of pastures, the areas of scrubland pose an increased risk of forest fires. Besides the social and environmental risks, fires burn and destroy pastures. This directly affects the availability of pastures and therefore milk production. Fires also have long-term impacts, as they leave the soil more susceptible to erosion. One of the explanations of the impact of wildfires is because the production of the Serra da Estrela PDO cheese is the most important territorial asset. Thus the cultural, environmental, economic elements are threatened. In North Macedonia, wildfires are more frequent as a result of very hot summer weather and the human factor; drought was listed as the number one threat. Wildfires in 2021 devastated a huge area planted with pine trees. This damages MRL attractivity, which is linked to clean air resulting from huge areas covered with forest. The fodder pasture is decreasing as well, due to high temperatures. This is causing migration of farmers towards the lower parts of the mountain, even more to the cities. The

occurrence of forest fires in Hungary due to excessive heat and a lack of water has resulted in unlivable conditions in certain areas. In France, the limited secure grazing areas due to the fear of predation pose a risk of overexploitation of the nearby grazing areas, the closure of certain environments, and thus the increased risk of forest fires and avalanches.

5.3.9. Non-native, invasive species and predation

Non-native, invasive species, pests and diseases and predation have been identified as an adverse effect in regions across Europe. The majority of cases are linked to plants, specifically trees. The most affected are producers who rely on plants, more specifically trees, in mountain areas. Livestock has rarely been mentioned. Not all are non-native invasive species; there is the problem of overpopulation of native species.

Predation by wolves mainly, and partially by bears, is a concern in two countries – France, and Switzerland. Although the problem of predation was not listed among adverse effects in other countries, this does not mean that it does not exist, but just that it does not pose a problem, especially not to farmers who rely on plant production. It could be expected that, with greater wildlife protection and natural conservation and protection, the territory of predators such as wolves will expand and their numbers will increase.

Meat

The main forms that invasive species take in meat production is the “seca” disease in Sierra Morena Spain. Pests are affecting many dehesas, weakening or killing Holm Oaks that take between 20 and 40 years to reach the age at which they are productive. This is then affecting the feed available to pigs, the production of ham and the income of farmers. In France, the increase in the number of wolves in the region is considered as among the most significant threats. Consequently, the increase in predation on flocks has an indirect impact on the pastoral resources and the production of winter stocks. Keeping the herds outside for a large part of the year and making the most of the mountain pastoral resources is one of the essential qualitative contributions to pastoral production. The threat of the presence of wolves and the numerous episodes of predation recorded in the year 2022 worry breeders. They are therefore less confident about taking their animals to certain pastoral areas far from the farm or the shepherd's hut. Even with guard dogs, complete protection is not guaranteed. Moreover, guard dogs represent a huge responsibility for farmers to manage, with social and economic impacts on their lives and businesses. The fear of attacks by breeders subjects them to conditions of stress and dissatisfaction with their work, a complex situation that leads some of them to leaving the profession. Furthermore, the reaction of the inhabitants, which is very dichotomous with regard to the issue (for or against the wolf), creates friction and misunderstanding between the inhabitants of the territory and the breeders, another destabilising element for breeders who may feel targeted by other actors in the territory.

Tourism

For the Macedonian Maleshevski region, pests on pine trees lower the attraction of the MLR. Local government has not yet allocated funding for the aerial treatment of pine trees with pesticides.

Food

In Northern Italy, conflict between grove owners, forest authorities, and environmentalists occurs, due to the devastating activities on Chestnuts by wild boar. Overpopulated mites are weakening the health of bee colonies in Slovakia; bees are subsequently susceptible to diseases. Turkey experiences yield and quality losses, in combination with increased costs to farmers who experience reduced income. In the context of biodiversity change, the discussion about the return of the wolf triggered a debate about the future of cereal and livestock pasture management in Switzerland. The presence of the wolf can be beneficial to crop production, as there is no direct threat and no protective measures against the wolf are required. However, as livestock are much more established, they could displace cereal production, as farmers have to use these areas for feeding the cows (and sheep) as a priority. Furthermore, livestock production could be abandoned in favour of cereal production, because of the danger to the animals. The re-introduction of predatory wild animals, such as bear or wolf, poses a danger to herds, and herd management gets more expensive. If animals can not be sent to the Alps during the summer anymore due to the wolf risk (e.g. some areas are too dangerous), they will have to be kept on lower areas closer to the farm, the area that was used for cereal has to be used to produce feed, which can become a serious threat to grain cultivation. In addition, predatory animals pose a threat to hikers and tourism in certain areas.

Alcoholic beverages

In Trento, Italy, in the Eastern Alps, the increasing incidence of Flavescence dorée along with increasing Drozofila Suzukii attacks affect grape yield and quality, and increase the costs of grape production (additional labour costs). However, some stakeholders are not considering an activation of the pathogens as a real threat to the VC because, from their experience, it is simply a question of a cyclical problem, which has efficiently been resolved over the years thanks to scientific research.

6. Measuring Adaptation Capacity

6.1. Resources for building adaptation capacity

Measurement of vulnerability has been coupled with a study of the necessary **adaptive capacity preconditions** (ACP) for developing adaptation of the VC-A system, in the context of MRL facing the selected threats. It is essential to evaluate these preconditions in relation to stakeholders' ability to build the adaptive capacity with the use of **endogenous resources** (i.e. ability to mobilise) to reduce the VC-A's vulnerability.

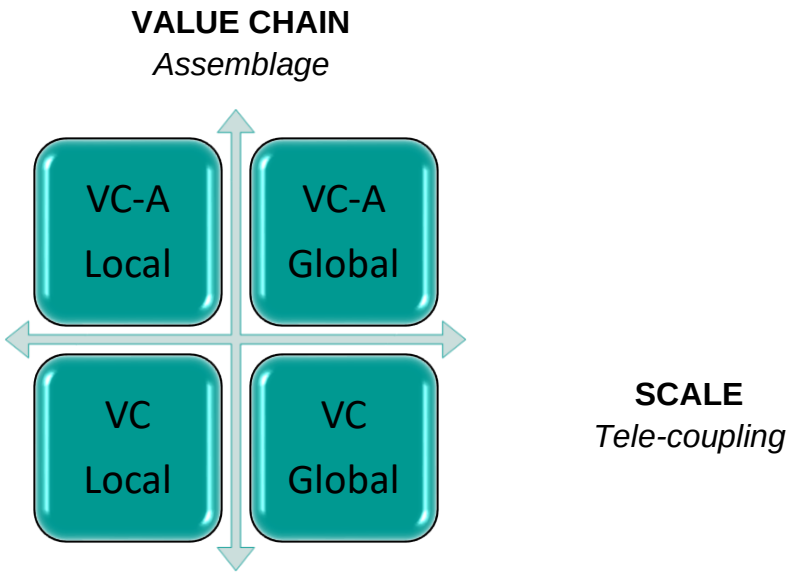
According to the standardised guidelines (see Chapter 4 for details), each research team (using expert knowledge of VC-A) prepared a list of potential ACP in advance of the workshop. At the workshop, the list and description of the preconditions were discussed and completed jointly with participants.

Results show that the proposed adaptive capacity preconditions are of a **multi-dimensional character** and verify the previous research literature about their multiscale, multisectoral, and multigeographical character. Simultaneously, as the data show, some proposed improvements match specific levels of VCs' assemblage. Some preconditions require interventions in a single VC, while others relate to an interaction between multiple VCs. The unit of vulnerability analysis in this project work package was the VC-A, instead of a single VC. However, numerous ACPs proposed by participating actors relate to a single VC level at either a local or more global scale. This aspect highlights specific interventions at the single VC level that would contribute to the resilience of the whole VC-A. Many other proposed ACPs were related to some level of VC assemblages. To maintain results comprehensibly, the wide number of proposed preconditions were grouped into fewer categories. The reported categories pertain mainly to the level at which the proposed improvements are meant to be carried out to increase the resilience of the whole VC-A.

Analysis of the data resulted in **four categories of ACP** with respect to spatial scale and level of VC assemblage (Figure 2).

The horizontal division of ACP categories passes from the local to the global (regional and national) spatial scale. On the other hand, the vertical division starts at the bottom with a single VC and continues towards an assemblage of VCs, sectors, and institutions. Both levels of assemblage can be active on a local (farm or MRL) or more global (regional and national) scale.

Figure 2: Categories of adaptive capacity preconditions



Source: Authors' own work

6.1.1. Categorization of the ACP

- **VC/Local** includes preconditions related to a single VC at the farm or MRL scale. This category includes, for example, practices to reduce soil transpiration, changes in grass mowing, better pasture management, livestock density change, improvement of storage conditions, installation of renewable energy equipment, water saving, etc.
- **VC/Global** encompasses necessary improvements at the regional or national VC scale. The studied regions identified within this category the preconditions as, for example, the introduction of new breeds, dissemination of good practices, advisory services to VC producers, new knowledge creation, knowledge processing – monitoring, documentation and analysis, training of farmers, formation of skilled workers, products' certification, etc.
- **VC-A/Local** deals with interconnections within local territory. It includes cooperation between multiple VCs and institutions. Some examples are infrastructure improvement, water retention infrastructure, water use planning, diversification of farming systems (providing different VCs), increasing grazing areas, forming local action groups, etc.
- **VC-A/Global** refers to regional or national territory, institutions, or society as a whole. It relates to product promotion, society awareness about value products, taxes, public institutions' support, support from external experts, support for the settlement of people in mountain areas, payments for ecosystem services, CAP support, etc.

730 examples of ACP in 23 reference regions were identified in total. The most frequent ACP category identified was the VC/Global, mentioned in 196 cases.

This was followed by the VC-A/Local category with 190 examples (Table 12).

Table 12: Relative frequency distribution of proposed ACP's for categories of threats (%)

Threat category	ACP Category				
	VC Local	VC Global	VC-A Local	VC-A Global	Total
Environmental	33.3	22.7	27.6	16.4	100.0
Social and Economic	19.9	29.3	26.4	24.4	100.0
Institutional and Political	5.9	26.9	21.8	45.4	100.0
Total	21.8	26.8	26.0	25.3	100.0

Reference: Authors' calculation

Table 13 describes the proportions of ACP categories across specific threats. It is apparent that all 4 ACP categories were presented during discussions with stakeholders about ongoing threats and their possible solutions.

The VC/Local category was most important in the cases of adaptation to drought, land use changes, extreme weather events, soil conditions, non-native invasive species (including pests and diseases), and soil quality. On the other hand, the preconditions for this category were less frequently mentioned than the other ACP categories in dealing with demographic changes, incentives and subsidies, legislation, changes in traditional practices, and wildfires.

The VC/Global category showed a relatively high potential in dealing with the use of natural resources, technological innovation, consumers' demands, and even inflation and demographic changes. On the other hand, stakeholders did not see many possibilities of how preconditions for this category could be helpful in the case of energy prices and land use changes.

The third, VC-A/Local category, together with the second category, was the most important for demographic changes. In addition, this more territorial group of preconditions responded mainly to solutions towards biodiversity change, mass tourism, and pandemic situations. In the case of inflation, this category was less frequently highlighted.

The assemblage at the regional and national scale was the most important in legislation changes, incentives, subsidies, changes in traditional practices, and lifestyle changes.

Table 13: Relative frequency distribution of proposed ACP's for specific threats (%)

Threats	Assemblage Local VC Local	Assemblage Global VC Global
Drought	25.7	10.1
	36.7	27.5
Incentives' and subsidies' changes	10.8	**43.1**
	6.2	40.0
Inflation	17.2	19.0
	25.9	**37.9**
Extreme weather events	25.0	20.8
	33.3	20.8
Legislation changes	35.2	**48.1**
	5.6	11.1
Biodiversity Change	**40.0**	25.0
	20.0	15.0
Non-native invasive species	25.0	12.5
	43.8	18.8
Use of natural resources	14.3	14.3
	28.6	**42.9**
Life-style changes (post-productivism)	.	**100.0**
	.	.
Mass tourism and associated infrastructure	**45.0**	25.0
	15.0	15.0
Pandemic situations	**100.0**	.
	.	.
Wildfires	25.0	25.0
	12.5	37.5
Flooding	.	.
	.	.
Water Quality	.	.
	.	.
Demographic changes	**33.3**	24.1
	9.3	**33.3**

Threats	Assemblage Local	Assemblage Global
	VC Local	VC Global
Energy prices	17.2	25.9
	25.9	3.0
Land use changes	22.7	25.0
	34.1	18.2
Air Temperature change	28.6	28.6
	28.6	14.3
Market changes – consumer demand changes	21.9	25.0
	21.9	**31.3**
Soil condition	25.0	25.0
	50.0	.
Change in traditional practices	25.0	**27.5**
	20.0	**27.5**
Soil quality	25.0	25.0
	50.0	.
Change in knowledge production and use	.	.
	.	.
Technological Innovation (digitization)	25.0	.
	33.3	**41.7**
Changes in the political system	.	.
	.	.
Society polarisation (rich vs poor)	.	.
	.	.
Air quality	.	.
	.	.
Water Temperature Change	.	.
	.	.

Note: There were not provided ACP examples for some threats. Dot symbol denotes that the specific category of ACP was missing.

Reference: Authors' calculation

Table 14 provides a quantitative overview of the distribution of ACP categories for different VC elements. These results are also graphically shown in Figure 3. From this visualisation it can be seen that the Production element of the VC-A, most frequently perceived as affected by the

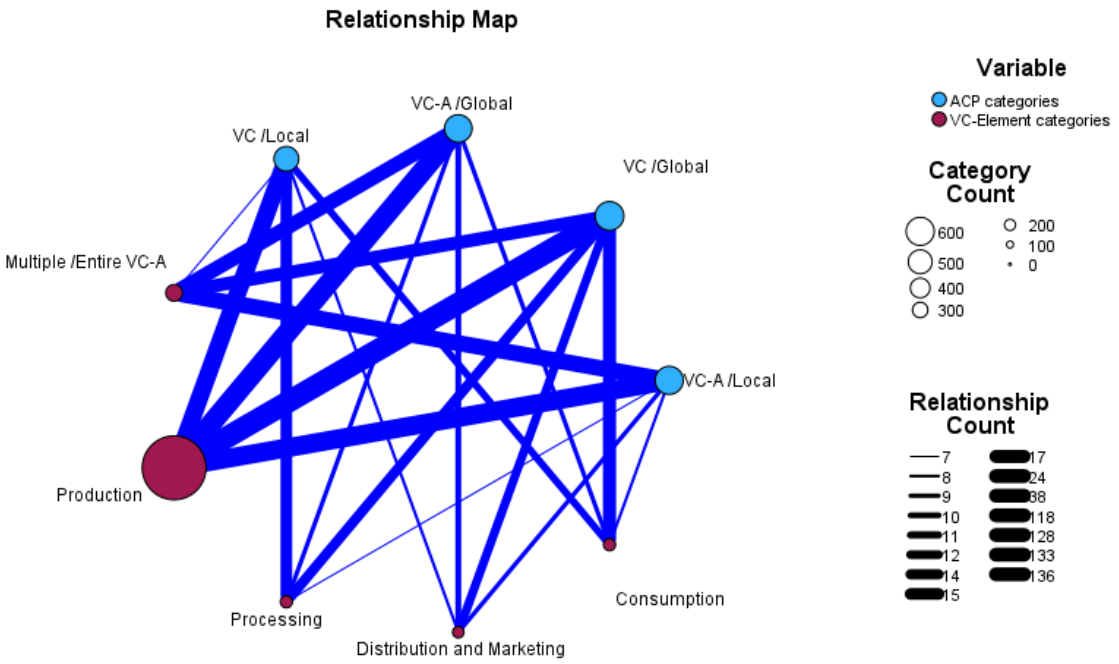
ongoing threats, requires equilibrated action towards resilience at all levels and scales (i.e. all four categories of ACP). The VC as a whole package of elements (category of Multiple/ Entire VC-A) requires adaptations mainly at the local territory (VC-A /Local category of ACPs) and at the global scale at both assemblage levels. In the case of the Consumption element, the proposed preconditions were mainly from the VC /Global group.

Table 14: Distribution of proposed ACP categories for different VC-A elements

Threat category	ACP Category				
	VC Local	VC Global	Assemblage Local	Assemblage Global	Total
Production	118	136	128	133	515
Processing	15	14	7	9	45
Distribution/Marketing	8	12	9	10	39
Consumption	11	17	8	9	45
Multiple/Entire VCA	7	17	38	24	86
Total	159	196	190	185	730

Reference: Authors' calculation

Figure 3: The relational map between VC elements and ACP categories



Reference: Authors' own work

6.2. Abilities of actors to mobilise resources for adaptation

All workshop participants were required to individually evaluate the possibilities of the fulfilment of each of the proposed preconditions. Using the scale from very low (1) to very high (7), they evaluated their **ability to mobilise the resources** for building adaptation capacity. Each of the workshop participants evaluated each precondition individually.

Results from this analysis are presented in Table 15. The strongest average ability to mobilise was identified at the single VC level at local scale, followed by the VC /Global preconditions category. In the category of VC-A/Global, stakeholders felt that they have less ability to mobilise. The figures in Table 16 suggest that none of the threats is fully under control of local territories.

Table 16 shows the relationship between the studied threats and the average Ability to Mobilise. According to the results, stakeholders felt that the local territory is relatively powerful (mean score for ability to mobilise is higher than 4.0) in increasing consumer demand, and improving diversity, soil quality, and non-native species, including pests and diseases.

Stakeholders felt a relatively lower ability to mobilise (mean score for Ability to Mobilise is from 3.5 to 4.0) in mitigating drought, extreme weather, increasing temperature, change in traditional practices, incentives and subsidies, energy prices, inflation, land use changes and technological innovation.

Mountain stakeholders felt the lowest relative ability to mobilise (mean score for Ability to Mobilise is lower than 3.5) in dealing with demographic changes, legislation, soil conditions, pandemic situations and wildfires.

Table 15: Quantitative evaluations of the ability to mobilise per ACP categories

ACP category	Total	Mean	SD
VC/Local	159	4.1	1.4
VC/Global	196	3.9	1.5
Assemblage/Local	190	3.4	1.2
Assemblage/Global	185	3.6	1.9

Note: *Scales for evaluating exposure and sensitivity ranged from 1 to 7.*

Reference: Authors' calculation

Table 16: Ability to mobilise resources for adaptation to threats

Priority threat	Number of answers	Mean value of the score	SD
Drought	99	4.0	1.2
Demographic changes	88	3.4	1.5
Incentives' and subsidies' changes	46	4.0	1.6
Energy prices	54	3.9	1.7
Extreme weather events	46	3.9	1.8
Inflation	42	3.6	1.3
Legislation changes	18	3.9	1.3
Market changes – consumer demand changes	27	3.9	1.2
Land use changes	51	3.1	1.5
Change in traditional practices	22	4.6	0.9
Non-native invasive species	20	4.4	1.6
Air Temperature change	9	3.3	0.7
Biodiversity Change	15	4.1	1.1
Soil quality	40	3.8	1.5
Life-style changes (post-productivism)	0	n/a	n/a
Mass tourism and associated infrastructure	2	5.5	0.7
Pandemic situations	7	0.0	0.0
Soil condition	0	n/a	n/a
Use of natural resources	20	3.2	1.2
Change in knowledge production and use	3	3.7	0.6
Changes in the political system	7	3.0	0.0
Technological Innovation (digitization)	0	n/a	n/a
Wildfires	8	3.4	2.1

Note: *No examples of ACP were recorded for the following threats: Life-style changes, Soil conditions, and Technological Innovation, therefore 'ability to mobilise' score could not be calculated.*

Reference : Authors' calculation

7. Evaluation of vulnerability and resilience

Mountain regions in Europe are facing multiple challenges. For the purpose of this study, the challenges were classified into **3 categories – environmental, socio-economic, institutional and political**.

Participatory workshops with stakeholders enabled identification of the most urgent threats to the studied VC-A. On the European level, the most urgent threat in mountain areas is **drought**. This threat was pointed out in the majority of MRLs. Drought is followed by socio-economic threats, including **incentives' and subsidies' changes**, and **energy prices**. It is assumed that the perceived urgency of some threats was very high in the period of data collection (end of year 2022), when the energy crisis and associated inflation in Europe escalated. Many MRLs rank demographic changes very high in rural areas. These changes result in issues of generational renewal on farms and a shortage of young people in rural regions in general.

The statistical analysis presented in Section 5 illustrates the impacts of these changes. It is possible to argue that **the most important threats** – perceived by stakeholders – **also result in the highest impacts reported in the VC-A**. This holds for drought and demographic changes that cause a high impact *specifically* on production processes of the VC-A, unlike other economic threats (such as inflation or energy prices) that impact adversely on entire VC-A.

Specific attention needs to be paid to selective threats, such as wildfires, that may not be an omnipresent issue in most of the reference regions, while the impacts of such a threat are obviously devastating.

It is important to note that the **presence of threats does not necessarily imply highly vulnerable** regions and VC-A. A threat should rather be viewed as a factor that potentially contributes to increased vulnerability if a system is not capable of adaptation to changes.

Most of the environmental threats directly impacting on VC-As are those that deal with natural resources. Findings from the study suggest that most regions are aware of adaptation strategies to common environmental threats, such as drought, extreme weather events or air temperature changes. Most of these strategies rely on innovative agricultural practices and specific management practices that farmers are able to apply. Development of these strategies is based on the specific local knowledge (in the form of human capital) that is available in regions. Overall, stakeholders confirmed their confidence in developing these strategies. Most of these environmental threats have a long-term nature, they evolve over time, and allow local actors to innovate their practices and develop new approaches needed for mitigating adverse effects. Environmental threats are perceived as urgent threats to mountain regions.

The **vulnerability of the regions**, due to the high reliance of the mountain value chain on natural processes, is potentially very high. At the same time, in the case of these threats, local actors are the most confident about their capacities for developing adaptation strategies. From this perspective, the reported **environmental resilience** of mountain regions also seems very high.

The category of socio-economic threats seems to affect mountain regions differently and local actors also respond to them differently than to environmental threats. The main difference is that the most urgent socio-economic threats (such as inflation or energy prices) are likely to be associated with the crises that have occurred rapidly in recent years. Mobilising resources for developing adaptation strategies would require more time and hence local actors rely more on coping with, rather than on adapting, strategy. **Social and economic threats** are typically embedded in larger societal processes, such as the ageing of the population, changes in aggregate demand, etc. Adaptation to these changes seems to be beyond the abilities of local actors. The analysis clearly shows that local actors can point out adaptation strategies to these threats. However, such adaptation assumes the mobilisation of resources that are less likely under local control and the mobilisation of which is rather theoretical.

With respect to the identified socio-economic threats, **mountain regions seem to be highly vulnerable**. Whilst the impacts of the socio-economic threats may not be as high, 'the vulnerability of mountain regions in this area seems very high, due to the **limited capacities for developing adaptation strategies** that are **reducing overall resilience**.

In general, local actors in mountain regions perceive themselves as being **more successful in mobilising resources** for developing adaptation strategies that rely on their own practices, local knowledge, farm resources or implementing a new technology. On the other hand, they are **less successful** in developing strategies that require mobilisation of resources that are not directly under their control. This includes not only 'global' resources (i.e. beyond the geographical area of the region), but also 'local' resources that require collaboration of actors within a single VC or across multiple VCs.

The category of **institutional and political threats** is perceived in a similar way as environmental threats, since changes in this area are not rapid and can be predicted. However, the ability of actors to develop adaptation strategies is more difficult, just as in the case of socio-economic threats, because developing an adaptation strategy requires resources that actors do not perceive as something they possess or have under their control. This aspect requires further investigation that goes beyond the scope of this research task and possible interpretation of the collected data.

At the end of our analysis, we have created a **summary view of the vulnerabilities and resilience of each VC-A**. In accordance with the definition of resilience presented earlier (Section 3), we assume that VC-As that are more exposed to threats are more likely vulnerable and less resilient to changes. VC-A resilience is conditioned by the ability to adapt to changes. Such ability is conditioned by resources, which we conceptualized in the study as AC preconditions (see Section 3 for details).

Table 17 provides an **overall view of the vulnerability and resilience of each region from the perspective of stakeholders**. We used the *exposure* and *sensitivity* data for each VC-A region to calculate the *mean susceptibility value*. Analogically, the data on AC preconditions was used for calculation of the *mean AC value*. The means were standardized using a scale with a range of 0-1 to allow for a relative comparison of the values. The detailed data for the calculation can be found in the Appendix 6.

The standardized value describing susceptibility across the 23 MRLs ranges from 0.08 to 0.68, with a median value of 0.51. A higher susceptibility index value indicates a higher vulnerability.

The standardized value capturing AC ranges from 0.44 to 0.77, with a median value of 0.60 A higher value of the AC index indicates better preconditions for building an adaptation strategy.

Based on the values of the **susceptibility index** and **the AC index**, we conducted a relative comparison of MRLs and divided them into groups with relatively higher susceptibility (susceptibility index is greater than or equal to the median value) and cases with relatively lower susceptibility (index is less than the median value). We followed the same procedure for dividing MRLs with respect to AC.

Identification of MRLs with relatively higher/lower susceptibility and relatively lower/higher AC allows us to evaluate **overall VC-A resilience across the 23 MRLs**. It is important to reiterate that this is an assessment of vulnerability **based on perspective of stakeholders**, i.e. their perceived vulnerability and capacity-building for adaptation. The comparison reflects relative differences between the MRLs and must be interpreted with respect to this context.

Table 17: Overall evaluation of the VC-A resilience in each MRL

Nr.	MRL	Main threats	Susceptibility	AC	Group
1	Austrian Alps	Drought, Extreme weather events, Market changes – consumer demand changes, Inflation, Incentive and subsidies changes	Higher	Lower	II
2	Western Stara Planina	Drought, Air temperature change, Biodiversity change, Land use changes, Demographic changes, Changes in traditional practices, Inflation, Energy prices, Legislation changes, Incentive and subsidies changes	Lower	Higher	III
3	Šumava – Český les	Drought, Demographic changes, Inflation, Energy prices, Incentive and subsidies changes	Lower	Lower	IV
4	Corsica	Air temperature change, Non-native invasive species, Land use changes, Demographic changes, Technological innovation (digitalisation), Energy prices	Higher	Lower	II
5	Drome Valley	Drought, Non-native invasive species, Market changes – consumer demand changes, Incentive and subsidies changes	Higher	Lower	II
6	Rethymno, Crete	Extreme weather events, Demographic changes, Energy prices, Legislation changes	Lower	Higher	III
7	Transdanubian	Drought, Land use changes, Mass tourism and associated infrastructure, Inflation, Legislation changes	Lower	Lower	IV
8	Central Apennines	Drought, Demographic changes, Life-style changes, Change in knowledge production and use, Energy prices, Incentive and subsidies changes	Higher	Lower	II
9	Eastern Alps	Extreme weather events, Non-native invasive species, Soil quality, Demographic changes, Energy prices	Higher	Higher	I
10	North Apennines	Drought, Demographic changes, Change in traditional practices, Incentive and subsidies changes	Lower	Higher	III
11	Maleshevski mountain	Drought, Demographic changes, Inflation, Energy prices, Incentive and subsidies changes	Higher	Higher	I

Nr.	MRL	Main threats	Susceptibility	AC	Group
12	Cordilheira Central	Wildfires, Demographic changes, Inflation, Energy prices, Incentive and subsidies changes	Higher	Lower	II
13	Maciço noroeste	Drought, Air temperature change, Extreme weather events, Soil condition, Demographic changes, Life-style changes, Inflation, Energy prices	Lower	Lower	IV
14	Southern Romanian Carpathians	Drought, Land use changes, Mass tourism and associated infrastructure, Demographic changes, Change in traditional practices, Pandemic situations, Legislation changes	Higher	Lower	II
15	Dinaric mountains	Drought, Demographic changes, Change in traditional practices, Market changes – consumer demand changes, Legislation changes, Incentive and subsidies	Lower	Higher	III
16	Slovak Carpathian mountains	Drought, Extreme weather events, Biodiversity change, Non-native invasive species, Land use changes, Market changes – consumer demand changes, Legislation changes	Lower	Higher	III
17	Betic Systems	Drought, Extreme weather events, Soil condition, Demographic changes, Market changes – consumer demand changes, Incentive and subsidies changes	Higher	Higher	I
18	Sierra Morena	Drought, Demographic changes, Energy prices, Incentive and subsidies changes	Higher	Lower	II
19	Spanysh Pyrenees	Drought, Air temperature change, Soil quality, Demographic changes, Incentive and subsidies changes	Higher	Higher	I
20	Swiss Alps	Extreme weather events, Use of natural resources – renewable and non-renewable, Biodiversity change, Land use changes, Demographic changes, Technological innovation (digitalisation), Incentives and subsidies changes	Lower	Lower	IV
21	Swiss Jura	Drought, Extreme weather events, Market changes – consumer demand changes, Incentive and subsidies	Lower	Lower	IV
22	Beydagları	Drought, Extreme weather events, Use of natural resources – renewable and non-renewable, Non-native invasive species, Soil quality, Inflation	Higher	Higher	I
23	Upper Speyside	Drought, Demographic changes, Inflation, Legislation changes, Malting Barley capacity	Lower	Lower	IV

Table 18: Classification of the MRLs based on overall evaluation of their VC-As

Group	Count	MRL	Susceptibility index	AC index
I	5	Betic Systems Beydagları Eastern Alps Maleshevski mountain Spanysh Pyrenees	Higher	Higher
II	7	Austrian Alps Central Apennines Cordilheira Central Corsica Drome Valley Sierra Morena Southern Romanian Carpathians	Higher	Lower
III	5	Dinaric mountains North Apennines Rethymno, Crete Slovak Carpathian mountains Western Stara Planina	Lower	Higher
IV	6	Upper Speyside Maciço noroeste Swiss Alps Swiss Jura Šumava – Český les Transdanubian	Lower	Lower

Note: Higher/Lower denotes if the index was higher or lower than median value of the 23 MRLs

Table 18 shows **criteria for dividing MRLs into 4 basic groups** according to relative susceptibility and relative AC, as well as the result of this classification. The distribution reflects the relative comparison of VC-As across 23 MRLs.

The first group consists of MRLs whose VC-As have relatively higher susceptibility but also have relatively high levels of capacity for building an adaptation strategy. This group thus has **relatively high resilience**.

The second group is made up of MRLs whose VC-A have relatively higher susceptibility and at the same time a relatively lower level of capacity to build an adaptation strategy. This group is **relatively vulnerable**.

The third group consists of MRLs whose VC-A have relatively lower susceptibility. Stakeholders in these regions experience relatively lower levels of vulnerability compared to other MRLs. Nevertheless, the capacity for building an adaptation strategy is relatively higher. This group shows **relatively higher sustainability** compared to the other cases.

The fourth group consists of MRLs whose VC-As have relatively lower susceptibilities. Similar to the third group, stakeholders believe that VC-As are relatively less vulnerable to change at present. At the same time, however, they perceive a relatively lower capacity to mobilize resources to build adaptation strategies. This group is **potentially vulnerable**. Resilience to changes of this group is limited by the lower ability to mobilize resources for building adaptation, as was viewed by stakeholders.

8. Vulnerability evaluation per MRL

The following pages provide specific information for each MRL. This information includes

- list of the most important threats,
- excerpt from the narrative of adverse effect provided by stakeholders at the participatory workshop,
- overview of impacts of the most important threats, presented as a relative frequency distribution of VC-A elements that are adversely affected by the threats,
- list of preconditions for building adaptive capacity provided by stakeholders at the participatory workshop,
- short summary related to the overall vulnerability and resilience of the mountain reference region and the selected value chain.

Austrian Alps

Region number: 1	**MRL:** Austrian Alps
Country: Austria	**VC Name:** Weiz lamb

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Extreme weather events
- Market changes – consumer demand changes
- Inflation
- Incentives and subsidies

The weather extremes such as frosts, heat waves, heavy rain, and severe thunderstorms have increased significantly in recent years in Austrian Alps. These are threatening feed availability as a basic resource for sheep farming. This subsequently leads either to a reduction in the number of animals or to higher production costs due to the need to purchase additional feed. Extreme heat periods in spring lead to increased pest pressure that affect plants and animal health. The inflation reduces the purchasing power of consumers, while cost increases lead to higher prices. In addition, more cheap products will enter the market, and sales of high-quality regional products will decline. This could lead to particularly small family businesses ending sheep farming and, as a result, alpine pasture meadows will be abandoned.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	21.8	.	.	.	.
Extreme weather events	20.3	.	.	.	.
Market changes – consumer demand changes	.	20.2	32.9	.	.
Inflation	29.9	6.7	.	37.2	34.8
Incentives and subsidies	30.9	.	28.0	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Availability of additional pastureland	VC-A / Local	3.8
Knowledge (exchange) about adaptive/improved pasture management practices	VC-A / Local	5.3
Vocational trainings with experts	VC / Global	6.0
Availability of optimised seed varieties	VC / Global	7.0
Knowledge (exchange) about adaptive management practices	VC / Global	4.0
Vocational trainings with experts for grassland management	VC / Global	5.3
Joint winter feed storage: infrastructure	VC-A / Local	3.3
Willingness for joint forage strategies	VC / Global	1.0
Building-up humus measures	VC / Global	4.0
Cooperation with Ökoregion Kaindorf	VC / Local	6.0
Trainings and expert support	VC / Global	5.3
Joining forces in production stage	VC / Global	3.0
Joint infrastructures	VC-A / Local	1.3
Knowledge about optimisation of livestock density	VC / Global	4.3
Analysis of farm capacities	VC / Global	4.7
Availability of adapted sheep breeds	VC / Global	4.7
Consumers' awareness for specific quality	VC-A / Global	3.6
Improved marketing/campaigns about products' added value	VC / Global	5.2
Closer cooperation with tourism	VC-A / Local	3.0
Number of affluent clienteles	VC / Local	3.8
Exploring consumers' new demands & developing more tailored products	VC-A / Global	3.8
Establish a clear distinction with other (cheaper) products	VC / Global	4.4

Adjusting marketing strategies stronger to consumers' needs	VC / Global	4.6
More cooperation in the production stage among farmers	VC / Global	1.6
Cooperation with experts	VC / Global	4.0
Availability of locally sourced farm resources	VC-A / Local	1.7
Focus on product range with the highest margins	VC / Local	2.6
Introduction of additional quality certificates	VC / Global	2.3
Introduction of more efficient production processes	VC / Global	2.3
More organic certification	VC / Global	2.7
Long-term contracts with suppliers	VC / Local	3.4
Introduction of additional quality certificates that justify higher prices	VC / Global	3.6
Improved communication of the specific product values to consumers	VC / Local	3.0
Cross-financing of certain products	VC / Global	4.8
Subsidies for products	VC-A / Global	3.8
Less administrative efforts	VC / Global	2.0
Higher subsidies	VC-A / Global	2.0
Support (counseling & funding) for applying more sustainable practices and for farm take-over	VC / Global	3.0
More recognition for the value of sheep farming in terms of landscape preservation, biodiversity, tourism, and regional development	VC-A / Global	3.6
Support (counseling & funding) for land-use changes	VC-A / Global	3.7
Maintenance of infrastructure funds	VC-A / Local	1.2
Maintenance of funds for products development	VC-A / Global	1.2

Overall evaluation of the vulnerability and resilience of the VC-A

There is already a lot of expert knowledge on adaptive measures, which could be provided by the chamber of agriculture, institutions for vocational education and regional and national research organisations. Essentially three strategies could be applied: a) optimisation of outputs from existing individual farm resources; b) compensation of reduced outputs by means of an expansion of areas; c) sharing resources in order to balance varying outputs from various farms. Adaptive capacity strategies concerning ecological threats mainly focus on farm practice management. Adaptive strategies related to social and economic threats strongly build on the already existing high degree of diversification in the VC, which makes it easier to adapt to changes in consumer demands – as well in regard to the product range as concerning the marketing channels. The adaptive capacity in facing political and institutional threats builds on two strategies: 1) lobbying work in order to better advocate for sheep farmers' interests (adapting policies), and 2) to further adapt the production practices to policy strategies.

Western Stara Planina

Region number: 2	**MRL:** Western Stara Planina
Country: Bulgaria	**VC Name:** Public goods from HNV farming

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Air temperature change
- Biodiversity change
- Land use changes
- Demographic changes
- Changes in traditional practices
- Inflation
- Energy prices
- Legislation changes
- Incentive and subsidies changes

Since the collapse of communism Bulgarian agriculture and farmland underwent privatisation and restitution. This caused a decline in the number of grazing animals accompanied by increase in the abandonment of grasslands used for grazing and haymaking. The rate of depopulation, especially by young people, has increased, whilst the remaining population is aging. This has impacted upon traditional livestock breeding and the viability of small-scale farming. Unfortunately, the threat of land abandonment has increased even more during 2022 due to the growing financial crisis in Europe, including the huge increase in energy prices. With rapidly rising farm costs, most farmers are finding it significantly harder to be profitable and consequently many are considering the possibility of giving up farming altogether.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	20.0	.	.	.	31.0
Air temperature change	17.8	.	.	.	29.8
Biodiversity change	23.6	.	.	.	44.8
Land use changes	24.4	.	.	.	40.6
Demographic changes	19.0	.	.	.	14.5
Changes in traditional practices	24.4	.	.	.	39.4
Inflation	10.3	.	.	.	9.1
Energy prices	10.0	.	.	.	6.7
Legislation changes	16.6	.	.	.	22.0
Incentive and subsidies changes	29.1	.	.	.	12.0

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Access to CAP Pillar 2 compensatory payments for compliance with site-specific restrictions (RDP Measure 12.1 – Compensation payments to Natura 2000 agricultural areas)	VC-A / Global	6.6
Improved governance and management of common grazing	VC-A / Local	3.6
Improved management of privately owned grasslands	VC / Global	4.6
Stronger advisory and innovation support for HNV farmers	VC-A / Global	2.6
Increased eligibility of semi-natural grasslands for CAP Pillar 1 payments (Single Area Payment Scheme)	VC-A / Global	2.6
Increased eligibility of semi-natural grasslands for CAP Pillar 1 payments (Single Area Payment Scheme)	VC-A / Global	2.4
CAP Pillar 2 compensatory payments for maintenance of traditional farming practices (RDP Measure 10.1 – "Agri-environment-climate payments for restoration and maintenance of HNV grasslands")	VC-A / Global	5.6
CAP Pillar 2 investment support for HNV farms (production and processing)	VC-A / Global	4.6
Advisory and innovation support for HNV farmers	VC / Global	2.8
Support for new entrants / young farmers	VC-A / Global	5.6
Regional/local branding and marketing schemes	VC-A / Local	3.6

Overall evaluation of the vulnerability and resilience of the VC-A

The VC under study was constructed as an innovative new policy mechanism for biodiversity conservation that was introduced specifically in the context of EU enlargement and preparation for Bulgaria's adoption of the agricultural chapter of the cumulative body EU legislation (the so-called *acquis communautaire*). The workshop participants pointed out that the 'adaptive capacity' and 'resilience' of the VC was therefore primarily the responsibility of policymakers through the ongoing processes of monitoring, evaluating and reforming the policies. Frustration was expressed that national policymakers did not have this capacity. Furthermore, there was doubt that this capacity would be developed given that national policymakers appeared to have little interest or motivation to make the best use of CAP funds for the maintenance of traditional farming practices and the conservation of farmland biodiversity.

Šumava – Český les

Region number: 3	**MRL:** Šumava – Český les
Country: Czech Republic	**VC Name:** Organic Beef

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Demographic changes
- Inflation
- Energy prices
- Incentives and subsidies changes

Although farming in the higher areas of the Šumava is not as exposed to the threat of drought, water scarcity is seen as an important risk for agriculture. Moisture limitation during important parts of the growing season significantly affects the quantity and quality of forage for livestock during summer and winter. Rising price levels can also be counted among the current threats to agriculture. Other threats include changes in subsidy policy. A radical change in subsidy conditions would significantly affect farm economics. Farms are struggling to find suitable employees to work in agriculture and product processing, and there is a lack of young, qualified people in particular. On some family farms, this problem is compounded by the uncertain future of passing on the farm to children.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	29.6	.	.	.	.
Demographic changes	.	11.3	.	.	.
Inflation	.	15.5	14.5	.	.
Energy prices	15.2	.28	.	.	.
Incentives and subsidies	12.5	.	.	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
New approach for cutting meadows	VC / Local	4.5
Decrease pasture intensity (number of cattle)	VC / Local	4.5
Focus on intra-family farm succession	VC / Local	3.0
Cooperation with vocational schools	VC / Global	3.0
Bringing-up family farm successor	VC / Local	3.0
Create safety budget in good times	VC / Local	2.0
Energy production on farm	VC / Local	3.0
Change electricity provider	VC / Local	3.0

Overall evaluation of the vulnerability and resilience of the VC-A

Information from the workshop suggests that the region is facing well-known threats that are associated with global climate change and other social and economic risk. At this moment, farmers and processors have adequate resources to build adaptive strategies for environmental threats – such as drought. They have been successfully coping with the economic threats (i.e. inflation and energy prices) and expect that these threats may not exist in a long term. The region and practices of farmers are significantly impacted by institutional arrangement and financial resources provided from EU and the State. Economic performance of farms that are providing ecosystem services in National Park and significantly contribute to landscape management would be significantly affected by reduction of the financial subsidies that are provided at this moment. Such situation would require building a new economic strategy that is not available at this moment.

Corsica

Region number: 4	**MRL:** Corsica
Country: France	**VC Name:** Chestnut flour

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Air temperature change
- Non-native invasive species
- Land use changes
- Demographic changes
- Technological innovation (digitalisation)
- Energy prices

The state of the chestnut forest and orchard in Corsica is in a worrying situation because it is aging, poorly maintained, and exposed to extreme climatic events. The increase in temperature in Corsica results in the decreased productivity of the chestnut tree, and catalyses chestnut diseases, mostly non-native invasive species which affects the yield. Because of intense rainy episodes the erosion and deterioration of the soil of the chestnut grove structures occur. Due to demographic decline, there is difficulty in the installation of young producers and recruiting personnel for collection and sorting. This results in loss of rural practices and knowledge. The increase in energy prices have an impact on the cost of processing, storage, and distribution.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Air temperature change	28.9	.	.	.	.
Non-native invasive species	22.1	.	.	.	.
Land use changes	28.6	.	.	.	.
Demographic changes	23.4	.	.	.	.
Technological innovation (digitalisation)	20.2	.	17.6	.	.
Energy prices	33.3	.	.	25.0	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Access to chestnut orchard	VC / Global	2.4
Access to chestnut orchard young and healthy	VC / Local	2.0
Renewing of chestnut orchard	VC / Local	2.4
Control of pests and diseases	VC / Local	2.8
Optimization and diversification of the exploitation	VC / Local	3.8
Soil fertilization	VC / Local	3.2
Efficiency of the transformation process	VC / Local	3.8
Capacity for productivity cooperation and mutualisation	VC / Global	1.6
Renewable energies	VC / Local	3.0
Taxes support	VC-A /Global	3.2
Land use access	VC-A /Local	2.0
Optimization and diversification of the exploitation	VC-A /Global	3.8
Capacity for productivity cooperation and mutualisation	VC / Global	2.0
Multiactivity production unit	VC-A /Local	5.4
Multiactivity production unit with mutualisation system	VC-A /Local	2.0
Soil fertilization and protection	VC / Local	3.6
Preservation and promotion of local and resistant chestnut varieties	VC / Global	3.0
Farmer training	VC / Global	2.8
Creation of new VC	VC-A /Local	3.2
Multiactivity production system	VC-A /Local	5.2
Training – qualification	VC / Global	2.6
Taxes support	VC-A /Global	3.0
Pool of qualified employees	VC / Global	2.6
Cooperation with other VC	VC-A /Local	3.0

New product – new way of communication	VC-A /Local	3.6
Rationalisation of production costs	VC / Global	3.4
Rationalisation of the product quality	VC / Global	3.6

Overall evaluation of the vulnerability and resilience of the VC-A

MAP members indicated the pluriactivity unit production, the optimisation and diversification of production process and product, the access and promotion to young and resilient chestnut orchard and varieties, and input subsidies as the most effective circumstances. For MAP members, the promotion of pluriactivity unit production and optimisation of production process appears to be the preconditions with the most potential to be mobilised. However, they have little to do with the territorial capitals for several reasons as the diversity of land use and access, the antagonism between different type of activities due to new practices, high level of administration and workload, lack of suitability with the public administration and subsides policies, lack of training and training capacities. For the pluriactivity there is a risk, in case of bad management, to deteriorate the resource unit, or loss one activities for an another. Nevertheless, all these capacities are centre to keep and develop the functioning of the VC-A system. The possibilities of new products or VC are also conceptualized for the sustainability of the VC-A system and resource.

Drome Valley

Region number: 5	**MRL:** Drome Valley
Country: France	**VC Name:** Sheep meat

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Non-native invasive species
- Market changes – consumer demand changes
- Incentives and subsidies changes

The pastoral resource is the main resource in Drome Valley. Access to this resource and the production of winter stocks are largely threatened by droughts and predation. Seasons are becoming increasingly unpredictable, and the climate is changing quickly. Reduced rainfall in spring and summer, mild winters and multiple heat waves affect the natural vegetation cycle of grass on mountain pastures. The quality and quantity of grass and fodder is reduced. The increase in the number of wolves in the region and consequently the increase in predation on flocks has an impact. In addition, there are several repercussions at the environmental level, such as limited secure grazing areas, a risk of overexploitation of the nearest grazing areas, the closure of certain environments and thus the increased risk of forest fires and avalanches.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	35.2	.	.	21.1	.
Non-native invasive species	25.3	.	.	.	.
Market changes – consumer demand changes	22.2	29.0	.	31.4	.
Incentives and subsidies changes	30.3	.	10.2	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Knowledge of other plant species present in the area to optimise the use of the local resource (getting the animals used to new species).	VC / Local	3.8
Coordination with other farmers and CPs to optimise grazing schedules.	VC-A / Local	4.0
Increasing the grazing area involves the use of areas that are not yet fully exploited (intermediate areas, wetlands, undergrowth) or by shredding, as well as by exploiting production areas (intercultural grazing, between rows of vines, under walnut trees, etc.)	VC-A / Local	4.4
Reducing livestock units/ha or stocking implies a better use of the products	VC / Local	4.2
Greater availability of (formerly grazed) areas for mowing, to increase fodder storage.	VC-A / Local	3.0
Crop diversification and establishment of new drought resistant species/varieties requires knowledge of these new crops (sorghum, chicory, millet, fescue...) or new mixtures	VC / Global	4.4
The establishment of catch crops (intercropping for value) requires technical availability and knowledge to implement this practice.	VC / Global	3.6
The creation of equipment and the development of water points (catchment points, impluviums, pipes) depends on the economic availability to carry them out or the availability of funds	VC-A / Global	5.0
Water storage requires the availability of technical equipment to store water and transport systems to bring it to the pasture	VC / Global	5.4
In order for farmers to be listened to in the context of their difficulties with predation, local authorities should create arenas for debate and time for exchange with the various stakeholders and inhabitants of the territory	VC-A / Local	4.2
The well-being of farmers depends on the recognition of their role in maintaining an activity that is socially, economically and environmentally favourable for the territory - this recognition is given in monetary terms through subsidies from the second pillar of the CAP	VC-A / Global	3.8
In order for livestock farmers to feel heard in their difficulties with the availability of pastoral land, communities should be able to identify the plots	VC-A / Local	3.6

available in the land register and promote their use for pastoral activity		
In order for the work of farmers to be recognised as fundamental for food production and landscape maintenance, and for their working environment (farms, huts, mountain pastures) to be respected, awareness-raising and educational activities need to be proposed to the general public	VC-A / Global	4.2
In order to keep their margins, producers must be supported in diversifying their activities (on-farm hospitality, agrotourism, educational farms, etc.)	VC-A / Global	3.4
A better remuneration for the breeders goes through the use of a label valorising their anchorage to the territory (like the Park Mark)	VC-A / Local	3.8
To maintain their margins, producers must be supported in their search for autonomy (feed and energy)	VC-A / Global	4.6
Guaranteeing the proper functioning of the transformation platforms depends on the capacity of the local authorities to invest the necessary capital (economic, human, technical)	VC-A / Local	4.8
Reducing emissions at processing platforms requires better use of renewable energy (photovoltaic, wood, other)	VC / Local	4.8
Civil society and consumers must be able to recognise forms of agriculture that value carbon storage (biogenic cycle)	VC-A / Global	3.8
French organic farming must be supported and encouraged as a virtuous form of production	VC-A / Global	4.4
Collective catering must include products from forms of agriculture that make efforts in terms of climate resilience (organic, local etc.)	VC-A / Global	4.8
Educational programmes should integrate climate issues through workshops on sustainable food	VC-A / Global	4.8

Overall evaluation of the vulnerability and resilience of the VC-A

Pastoral systems by essence have the capacity to adapt to the environment in which they are located and to the changes that this environment undergoes. Within the framework of the lamb/sheep meat production sector in the Drôme, the actors are clearly aware of the constraints linked to the mountain, as well as the impacts of climate change and the socio-economic issues that affect the sector and the territory. This awareness is due in part to the sharing of knowledge between pastoralists, to the fact that the sector is structured in such a way as to bring together the various actors involved, and to the fact that the local authorities are making the inhabitants aware of these current issues. The deployment of these territorial capitals, both from a cultural point of view and through the presence of an active governance structure close to the actors, is also accompanied by an environment rich and diversified in animal and plant species that favours the implementation of new adaptation techniques. The combination of these elements and the capacity of local stakeholders to engage in adaptation and change in the face of external constraints results in a significant adaptive capacity. In particular, the collective projects proposed by the pastoral collectives for the development of pastoral areas (drinking troughs, opening up of environments, means of protection to counter predation) are concrete actions that demonstrate the commitment of groups of breeders to face the difficulties encountered by the sector.

Rethymno, Crete

Region number: 6	**MRL:** Rethymno, Crete
Country: Greece	**VC Name:** Carob flour

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Extreme weather events
- Demographic changes
- Energy prices
- Legislation changes

Although carob is an undervalued and neglected crop, it is an economic resource to smallholder farmers of the Central Rethymno's villages. However, extreme weather events have become a threat in the past years, affect both the quality and quantity of the crop. The demographic changes have become a threat of late by impacting the availability of workers for harvesting and qualified workers. This threat is also tied to loss knowledge of traditional farming practices. These changes, combined with legislative changes, with absence of support and neglect from agricultural directorates have impacted production. Energy prices have "skyrocketed" and placed great economic pressure, placing the sustainability of the value chain in precarious economic positioning.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Extreme weather events	4.6	.	.	.	.
Demographic changes	.	.	.	.	3.9
Energy prices	4.6	3.4	3.4	.	.
Legislation changes	4.1	.	.	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Inherent resilience to climate change	VC-A / Global	5.3
Support from the directories	VC-A / Global	5.5
Cooperative modes of production	VC / Global	5.2
Scientific support	VC-A / Global	5.3
Training of personnel, focused in the different phases of production	VC / Global	4.6
Local seed processing to gum production	VC / Local	4.8
Renewable Energy production and use	VC / Local	5.4
Agritourism & Gastronomic tourism	VC-A / Local	5.3
Promotion of Cretan diet	VC-A / Global	6.2
Nutritional consciousness	VC-A / Global	5.4
Quality certification	VC / Global	5.6

Overall evaluation of the vulnerability and resilience of the VC-A

Regional investment in scientific capital that has led to research exploring the varieties / genotypes of Cretan carob, their production capacities, and how they can be utilized in food formulation industries increase adaptive capacity and decrease vulnerability. Producers, processors, and consumers develop specific knowledge about the dietary, nutritional, and nutraceutical properties of the VC-A and produce better products and byproducts. Furthermore, local initiatives that develop the cultural capital of the VC-A strengthen the resilience, as they deploy local resources and traditional knowledge. Participants raised concerns that despite the developed territorial capital in the region, the long distances in travel for production, processing and distribution have raised costs exponentially (e.g., given that energy prices are skyrocketing) and are of concern. Most of the preconditions of adaptive capacity discussed by participants do not require radical changes in the VC-A. For instance, tourism can increase the competitiveness of the VC-A connecting tourism and agriculture in various ways, but this solution does not require local actors and stakeholders to interact in radically different ways and does aid in altering the projected demographic decline in the mountainous areas.

Transdanubian

Region number: 7	**MRL:** Transdanubian
Country: Hungary	**VC Name:** Ecotourism

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Land use changes
- Mass tourism and associated infrastructure
- Inflation
- Legislation changes

The ecotourism services in Transdanubian region are under threats of environmental degradation related to climate change. Inability to produce due to drought and extreme weather conditions undermine credibility, knowledge production and processing conditions and lead to loss of income in the hospitality sector, increase expenditure. Changes in land use, increases in real estate prices prevent development, expansion, arrival of new value-added people, promote out-migration. Changes in the regulatory environment may open the way to urbanisation or prevent any development or change for the 'non-selected'. Cessation of grants and subsidies may cause problems in funding, knowledge generation and processing, and thus increasing credibility, reducing the number of participants and revenues.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	3.1	.	6.7	9.0	20.5
Land use changes	4.0	.	4.4	4.7	40.0
Mass tourism and associated infrastructure	4.0	.	5.6	8.0	32.0
Inflation	7.5	.	10.0	22.4	.
Legislation changes	4.0	.	6.4	4.7	40.0

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Knowledge - monitoring, documentation and analysis	VC / Global	2.5
Knowledge - development of transferable knowledge materials	VC / Global	2.5
Community functioning, governance, decision-making	VC-A / Local	2.8
Livelihoods, basic needs, family functioning	VC-A / Global	4.0
Human and community resources, capacities	VC-A / Local	4.0
Credibility, communication within the community	VC-A / Local	4.7
External support by peers, experts and volunteers	VC-A / Global	5.3
Successful agricultural production	VC-A / Local	4.5
Off-grid energy and water management success	VC / Local	4.7
Credibility, visibility in the local cultural environment	VC-A / Local	3.7
Quality and infrastructure of hospitality as a knowledge transfer location	VC-A / Local	5.2
Communication - social media	VC-A / Global	3.5
Knowledge transfer - acting as a knowledge owner	VC / Local	5.2
Credibility, awareness among TG actors and knowledge seekers	VC / Global	5.5

Overall evaluation of the vulnerability and resilience of the VC-A

Increasing adaptive capacity is a central issue for the value chain. The territorial capital for doing all this seem to be rather poor: there is high inclination, eroded, bad soils, lack of water, no electricity, bad roads, strict environmental and building rules, etc. However, this area is very typical of those that can still be available for those people, looking for some land to start a new life. Also, the area is the most fashionable rural tourism destination of the country, with beautiful views, no or very little pollution by agriculture during the last 30-40 years, so it is especially suited for the activities, aimed for by the VC. Thus, all external factors seem to be favourable, the actual adaptive capacity/viability of the value chain mainly depends on internal factors, the strength of individual human resources and the community as a whole. The main strengths and the weaknesses in this field are strongly connected to each other and to the character and common history of the VC members.

Central Apennines

Region number: 8	**MRL:** Central Apennines
Country: Italy	**VC Name:** Spun pasta cheese

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Demographic changes
- Life-style changes
- Change in knowledge production and use
- Energy prices
- Incentives and subsidies changes

Droughts in Central Apeninnes reduce the profitability of dairy farms through impact on quality of animal feed and subsequent reduction and/or lower quality of milk. Depopulation, ageing and high energy prices increase the risk of reduction in local production and loss of traditional practices and availability of high-quality local products due to exits from the sectors and concentration of production in few enterprises. These exits are further exacerbated by the launch of the new CAP due to its lower level of support provided to local farms. Unfair practices exploiting the reputation of the area's products also contribute to low availability of high-quality products. Knowledge developed by techno-structures threaten to replace the local zootechnical and dairy culture and the existing horizontal and vertical relationships.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	31.9	.	.	.	.
Demographic changes	33.1	.	.	.	34.2
Life-style changes	26.0	.	.	27.6	.
Change in knowledge production and use	20.3	.	20.2	.	.
Energy prices	38.9	.	34.8	.	.
Incentives and subsidies changes	21.6	.		.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Regional irrigation infrastructure policies	VC-A / Global	4.4
Farmers' training (transfer of research results and good practices)	VC / Global	5.2
Introduction of dual-purpose breeds	VC / Global	3.7
Direct processing (milk/meat)	VC / Local	4.1
Tourism diversification of the business offer	VC-A / Local	3.8
Introduction of production regulations	VC / Global	4.1
Strategic planning of the 'reserve' offer	VC-A / Local	4.4
Strategic valorisation of Stracciata	VC-A / Global	4.8
Guardian breeder/farmer programmes (indigenous varieties and breeds)	VC / Global	3.7
Introduction of dual-purpose breeds suitable for grazing	VC / Global	3.8
Training of breeders on rational grazing	VC / Global	3.9
Breeders' training (transfer of research results and good practices)	VC / Global	3.8
Training of farmers on rational grazing	VC / Global	3.7
Diversification (processing and/or tourist accommodation)	VC-A / Local	4.1
Exploration of new markets (ICT)	VC / Global	4.4
Innovation in distribution practices and policies	VC-A / Global	4.3
Efficient waste management	VC / Local	4.2
Breeders' training	VC / Global	3.6
Introduction of production regulations	VC / Global	3.8
Farmers' training (transfer of research results and good practices)	VC / Global	3.6

Overall evaluation of the vulnerability and resilience of the VC-A

The adaptive capacity of the social-ecological system can be traced back to the triad of regional policies, education and planning. The sectoral macro policy framework is the essential precondition for the survival of the socio-ecological system underlying VC-A, conditioning both the arrangement of tangible and intangible resources committed to it and the business customs and social relations of the actors involved. The adaptive capacity of the socio-ecological system would also seem to depend on opportunities for training and transfer of research results (academic and non-academic) to VC-A actors, who could be supported in strategic choices and/or operational decisions by the adoption of evidence-based criteria and/or techniques. Finally, the last component of the triad, planning, is embodied in the workshop participants' sharing of the importance of developing a strategic plan centred on linking dairy products to the territory-articulated on the introduction of one or more production specifications, on the enhancement of fresh products (stracciata) on the diversification of livestock farms (dairy processing, tourist reception) and the introduction of ICT.

Eastern Alps

Region number: 9	**MRL:** Eastern Alps
Country: Italy	**VC Name:** Mountain wine

What are the main threats and their impacts on the VC-A within the MRL?

In the Eastern Alps, extreme weather events, especially intense rainfall, late frosts, hail and soil erosion, represent high degree of risks for viticulture. They affect vines vegetative growth and health, as well as the yield and leads to higher risks of massive landslides and vineyard destruction. The level of damage can sometimes reach up to 100% of annual production. Urgent threat is also deterioration of soil quality which is detrimental to water holding capacity, and the availability of nutrients. Increasing incidence of pathogen attacks negatively affect grape yield and quality and increase the production costs. Furthermore, increase of energy prices affects almost every step of wine VC. Demographic changes led to work force scarcity especially for seasonal tasks.

PRIORITY THREATS

- Extreme weather events
- Non-native invasive species
- Soil quality
- Demographic changes
- Energy prices

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Extreme weather events	26.6	.	.	.	.
Non-native invasive species	22.8	.	.	.	.
Soil quality	25.2	.	.	.	.
Demographic changes	36.0	33.3	.	.	.
Energy prices	15.6	.	15.1	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Nets protective from hail	VC / Local	5.0
Candles against late frosts	VC / Local	3.7
Correct choice of vine varieties for planting, including resistant varieties	VC / Local	5.4
longer rest period before replanting the vineyard	VC / Local	6.0
Using of cover crops and other innovative agronomic practices	VC / Local	5.7
Multifunctionality of farms (combination of viticulture and small animal husbandry	VC-A / Local	4.9
On-farm renewable energy production	VC / Local	6.2
Substitution of materials and/or suppliers	VC / Local	6.2
Changing focus to local markets	VC-A / Local	3.9
Easier administrative procedures for assumption, including foreigners, pay rise	VC-A / Global	5.0
Easier assumption for young workers (students, not only internship possibilities), pay rise	VC-A / Global	4.2

Overall evaluation of the vulnerability and resilience of the VC-A

Implementation of innovative and environmental**ly** friendly agronomic practices along with accurate change of vineyard varieties for new plantings would significantly increase the resilience of VC-A, especially in terms of soil quality and health, yield and quality of produced grapes and longevity of the vineyards. Policy and conceptual changes regarding the employment of foreign workers and young people could make the sector more dynamic and attractive for workforce, which could help to carry on all the necessary agronomic and winery operations every year. It was observed by many stakeholders that this dynamic is also related to the market and the effort of wine producer of valorisation of proper production. If the final product is well valorised and sold, it can give enough profit for a decent payment even to low qualified workers making the sector much more attractive to them than it is right now. The most vulnerable point of the VC-A is connected to the threat of extreme weather events because they change the pattern and severity every year in different zones of the MRL and sometimes it remains still unclear to which developments one should be prepared.

North Apennines

Region number: 10	**MRL:** North Apennines
Country: Italy	**VC Name:** Chestnut tree

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Demographic changes
- Change in traditional practices
- Incentives and subsidies changes

Drought has influenced chestnut production in North Apennines. Changes could be seen through loss of biodiversity, drying of water streams, and yield instability. Additionally, depopulation and migration to urban areas encouraged groves' abandonment. Consequently, there has been a dramatic drop of chestnut flour production and a lack of qualified labour. The change in traditional practices causing the loss of a cultural heritage and traditional knowledge. Regarding subsidies a lack of interest from local representatives and politicians and mismanagement to efficiently allocate incentives and subsidies across the VC. A conflict has raised between groves owners, forest authorities, and environmentalists to limit these wild animals spread and their devastating activity to chestnut.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	19.4	27.6	.	.	.
Demographic changes	29.0	.	.	.	27.9
Change in traditional practices	20.5	.	.	.	24.2
Incentives and subsidies changes	27.4	22.7	.	.	15.6

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Initiate soil cover practices to reduce soil transpiration.	VC / Local	4.0
Encourage the growing use of rainwater and wastewater recovery systems	VC / Local	5.1
Manage the chestnut grove to reduce the outflow of water (reduce slopes, maintaining terraces and embankments)	VC / Local	4.8
Facilitate a transition to alternative energies (possibly based on natural resources); and launching energy community paths to produce electricity by exploiting solar or hydraulic energy and redistribute it during the periods of greatest production.	VC-A / Local	4.9
Encourage young people to join those who manage drying buildings and mills.	VC / Global	5.5
Bringing young people closer	VC / Global	5.6
Inventory the different varieties of chestnut and avoid losing knowledge about them	VC / Global	5.6
Promote the creation of a local fresh product market (chestnuts at profitable prices)	VC-A / Local	4.5
Bringing local secondary schools closer to productive activities	VC-A / Local	5.3
Use incentives to reduce production costs and increase the quality of the final product	VC-A / Global	6.0
Increase the number of drying buildings and mills in the area	VC-A / Local	4.8
Promote the impact on the territory with joint projects with local authorities	VC-A / Local	5.2
Helping small associations in the management of public resources	VC-A / Local	6.1

Overall evaluation of the vulnerability and resilience of the VC-A

Agricultural practices based adaptive capacity preconditions (i.e. adopting cover crops, reducing slopes, creating and maintaining terraces, etc.) would dramatically decrease the water loss and consequently reduce the effects of water stress, which means less vulnerability to drought. Being more active and taking part in joint projects with public authorities and local civil society (e.g., associations) would help to spread awareness, share knowledge, and most importantly would create a bridge between theory and practice. The other type of suggested preconditions (i.e. financial support), would allow stakeholders to become more economically resilient and able to overcome difficulties and times of extreme crisis. The ideas discussed during this session are attainable only if some conditions are present, for instance the willingness of different actors, the abundance of territorial capital stocks, the availability and well-management of financial resources, etc.

Maleshevski Mountain

Region number: 11	**MRL:** Maleshevski Mountain
Country: North Macedonia	**VC Name:** Tourism region

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Demographic changes
- Inflation
- Energy prices
- Incentives and subsidies changes

The most significant threat for tourism development in Maleshevski Mountain is the drought caused by the temperature change. This is affecting the flora in this region composed mainly by pine trees and pastures. As a results of very hot weather in summer and human factor wildfires are more frequent. This is damaging as this MRL attractiveness is linked to clean air resulting from vast forest areas. The high-quality fodder pasture is decreasing due to high temperatures and is causing migration of farmers. Due to lack of employment opportunities and low quality of live, youth is massively leaving this MRL. The prises for production, packaging, transport are rising, and it represents a serious threat on entire VC. The owners of new private accommodations are less interested in preserving natural environment.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	25.0	.	.	.	.
Demographic changes	43.5	.	.	.	.
Inflation	26.0	4.4	29.1	.	.
Energy prices	.	39.0	.	.	.
Incentives and subsidies changes	32.3	.	.	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Input substitution	VC / Local	6.4
High -schools and business partnership for practical education	VC-A / Local	5.6
Decrease costs/ using environmentally friendly packaging	VC / Local	4.6
Support for local marketing	VC-A / Global	6.6
Investing in renewable energy production on farms	VC-A / Global	4.7
Institutional support for organic farmers (especially women and youth)	VC-A / Global	1.7
Institutional support for young entrepreneurs	VC-A / Global	1.6
Institutional support	VC-A / Global	1.4
Long- term contracts	VC / Global	4.0

Overall evaluation of the vulnerability and resilience of the VC-A

Adaptive capacity in the context of Maleshevski region, as mentioned in other sections of the report is directly linked with the support to the region from the national government and coordination of the local stakeholder for jointly mitigating effects of climate change and those of socio- economic aspects, with bold attention to demographic changes. Prioritising protection of woods and introducing new innovative approaches towards responsible farming, tourism and job offers will decrease vulnerability of the MRL. All strategic documents prepared by the local governments in the MRL must start with implementation as the MRL is already highly vulnerable to demographic changes and climate change effects on the woods. Especially focus must be given to creating new employment opportunities for youth- the success business stories, digitalisation of offers, increased quality of socio- cultural engagement and motivating the youth with financial support to develop profitable rural tourism offers. Campaigns for education citizens for responsible usage of woods, trees, landscapes and investments in renewable energy will contribute to vulnerabilities related to environmental and economic vulnerabilities. The resilience of the VC-A will be further increased by implementing the preconditions considered as solutions for drought and demographic change.

Cordilheira Central

Region number: 12	**MRL:** Cordilheira Central
Country: Portugal	**VC Name:** PDO cheese

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Wildfires
- Demographic changes
- Inflation
- Energy prices
- Incentives and subsidies changes

The Serra da Estrela DOP cheese is the most important asset of Serra da Estrela mountain. Nevertheless, the last decades are marked by a reduction in the herd of sheep, as well as the abandonment of high-altitude pastures. This is due to the reduction in the number of animals in the region and greater availability of low altitude pastures. The region has strong depopulation and ageing trends, contributing to labour shortages. With the abandonment of pastures, the area of scrubland and the risk of forest fires has increased. Fires burn and destroy pastures, affecting the availability of pasture and milk production and leaving the soil more susceptible to erosion. The allocation of subsidies has evolved from direct payments to a single area payment scheme, discouraging landowners from renting out their land.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Wildfires	38.2	.	.	.	.
Demographic changes	29.2	.	.	.	42.9
Inflation	39.8	.	9.0	23.3	.
Energy prices	36.0	28.0	27.6	15.0	.
Incentives and subsidies changes	27.8	.	.	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Organization of the milk producers and cheesemakers in an association	VC / Global	3.5
Support for the settlement of people	VC-A / Global	4.0
Clear delimitation of property – Clarity in ownership	VC-A / Global	4.0
Advisory services	VC / Global	7.0
Financial incentives	VC-A / Global	2.5
Path clearing by the municipality	VC-A / Local	4.8
Path clearing by the INCF	VC-A / Local	4.0
Path clearing by the parishes	VC-A / Local	2.5
Rehabilitate altitude shelters	VC-A / Global	5.0
New markets	VC / Global	3.0

Overall evaluation of the vulnerability and resilience of the VC-A

The VC of the Serra da Estrela PDO cheese is its most vulnerable in its connection with the territory. Because it is a PDO product, there are specifications that need to be followed such as the breed of sheep used for the milk, but is geographic broadness means it can be produced at the foothill and not only at the mountain area. Much of the adaptive capacity discussed revolved around how to reconciliate the VC with the territory, in particular how to increase the number of sheep grazing in altitude. This would counteract the shrub encroachment that has been felt in the last decades, increasing the risk of wildfires, maintain the landscape and the people traditionally associated with the Serra and the cheese. Keeping altitude pastures open would also allow to maintain access to quality pastures, as temperature increase and rainfall decrease start to affect productivity at low altitude pastures, contributing to coping ability.

Shepherds and cheesemakers are spread through the (large and disconnected) territory as the business model evolves from a family business where the cheese was made from the milk of their own herd. The organization of milk collection would allow milk producers (shepherds) to negotiate higher prices, but also reduce the costs of the cheese factories that currently go shepherd to shepherd to collect the milk. Advisory services to producers and cheesemakers, would strengthen them in their business, increasing sanitation, productivity but also their ability access the market and negotiate prices.

Maciço noroeste

Region number: 13	**MRL:** Maciço noroeste
Country: Portugal	**VC Name:** Wine

What are the main threats and their impacts on the VC-A within the MRL?

Depopulation is the main threat in Maciço noroeste, affecting not only the wine value chain but the whole socio-economic sustainability of the region Increasing temperature is impacting wine quality, and water from main source Douro River is mainly used for other scopes than vineyards irrigation. Because of increased temperatures and heat waves, but also with the increase of the area dedicate to intensive viticulture, the risk of loss of soil organic matter and soil fertility arises. Young people of the area usually move to other Portuguese areas. Moreover, specific manpower availability for vineyard work is increasing. Inflation is a concern, impacting the economic sustainability of the VC, putting at risk its development.

PRIORITY THREATS

- Drought
- Air temperature change
- Extreme weather events
- Soil condition
- Demographic changes
- Life-style changes
- Inflation
- Energy prices

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	15.9	.	.	.	.
Air temperature change	19.0	.	.	.	.
Extreme weather events	6.5	.	.	.	.
Soil condition	15.0	.	.	.	.
Demographic changes	41.9	38.6	.	.	.
Life-style changes	25.7	.	.	.	.
Inflation	7.4	.	4.0	.	.
Energy prices	11.9	.	12.9	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Territorial structuring (infra)	VC-A / Local	2.9
Migrants policies	VC-A / Global	3.2
Water use planning	VC-A / Local	3.6
Innovative agronomic practices	VC / Global	4.4

Overall evaluation of the vulnerability and resilience of the VC-A

Participants at the workshop indicated political planning and policies to be the key for the main threats: depopulation, manpower availability, water availability. On the other hand, the more “physical” threats were recommended to be approached through innovation (that includes research, training, demo, sensibilization etc of both farmers, farm managers and advisers). The innovation activities are already started and, in some case**s,** quite advanced. The most challenging solutions to implement are the ones linked to social capital and governance, as they require a multi-actor cooperation and long-term vision. The adaptive capacity increase coping capacity of the actors. If changes are well planned and implemented, building adaptation may require incremental and not radical changes.

Southern Romanian Carpathians

Region number: 14	**MRL:** Southern Romanian Carpathians
Country: Romania	**VC Name:** Certified ecotourism

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Land use changes
- Mass tourism and associated infrastructure
- Demographic changes
- Change in traditional practices
- Pandemic situations
- Legislation changes

The most visible environmental threat in the region is drought, affecting the landscape and biodiversity by influencing species to move to higher altitudes. The water access in the area is an important element for tourists' satisfaction, however, accommodation units put pressure on the water infrastructure. While the local population left the area in search for better work opportunities in other EU countries, they continued to build holiday homes or accommodation units that do not comply with the National Park regulations. Labour force shortage contribute to loss of local culture and traditions. High energy prices and inflation are obstacles for the business providers. A weak governance, misunderstanding of the legislation and sustainable tourism principles, as well as a poor multi-level governance is the most relevant threat.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	32.6	.	.	.	23.4
Land use changes	33.3	.	.	.	20.5
Mass tourism and associated infrastructure	31.0	.	.	.	22.4
Demographic changes	25.4	.	.	.	32.6
Change in traditional practices	34.4	.	.	.	24.9
Pandemic situations	11.0	.	.	.	27.1
Legislation changes	30.7	.	.	.	24.7

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Public consultation regarding local architecture guides – considering the perspectives and opinions of diverse stakeholders (farmers, accommodation units' owners, National Park Administration, local community).	VC-A / Global	2.8
Raising awareness, promoting, explaining, and raising the number of people accepting the principles of local architecture.	VC-A / Global	3.8
'Phantom' buildings, holiday homes – supplementary taxes	VC-A / Global	1.4
Electric fences against wild animals.	VC-A / Local	4.4
Building capacity for public authorities to verify and control the regulated no. of animals on pastures and the rules regarding the positioning of the animals (and subsequently the enriching of the soil).	VC-A / Global	2.8
Prioritising local animal breeds on pastures. Clarifying the traditional role of 'master of the mountain'[1] and incentivizing or sanctioning (depending on the situation) them for taking or not taking locals' animals in their herds.	VC / Global	3.6
Training courses, information sessions and supporting the farmers in legalizing their activities and products.	VC / Global	3.4
Training courses, information sessions and supporting the farmers in getting certifications for their products (e.g. registering for the Optional Quality Term "Produs Montan").	VC / Global	4.0
Product innovation, notably wool[2].	VC / Global	3.2
Building governance capacity at local and regional level.	VC-A / Local	3.2

[1] Master of the mountain – the person that collects the animals from the local community and takes them to the mountain during summer and is paid by the local community.
[2] There is much scope for fostering innovation in wool, including the the scaling-up of successful innovation via well-targeted investment. Two innovative businesses already established elsewhere in Romania are the Naked Sheep start-up (https://www.nakedsheep.ro/) and Lanaterm house insulation (https://lanaterm.com/ro/)

Better understanding of the law and of the touristic sector, so that public authorities can support business owner in adapting the regulations to their specific requirements (e.g. labour legislation for seasonal activities.	VC-A / Global	2.4
Drought and water access: • Evaluating the existing water sources. • Developing a resilience plan against drought, that considers the expertise and opinion of multi-stakeholders (academia, public authorities, locals, NGOs, etc.). • Protected areas (as the Piatra Craiului National Park) need tailored solutions for the environmental threats. • Building a water basin in the village for rainwater collection. • Renewing the water infrastructure. • Using water meters for tourist accommodation to measure the consumption of water and enable establishment of a fair payment system.	VC-A / Local	3.2
Stronger community: • Activating civil societies and forming an action group / local parliament. • Weekly meetings (after church) with the members of the local community and National Park Administration representatives – for the local community to understand the benefits of being part of a National Park and the responsibilities of the National Park Administration. • Disseminating good practices among the local community. • Building capacity at public authorities' level for ensuring the complying with local council decisions. Keeping active the school in Măgura village and engaging the local youth in community events.	VC-A / Local	3.2

Overall evaluation of the vulnerability and resilience of the VC-A

The adaptive capacity of the VC-A depends on the 4 main groups of preconditions. By providing the space for public consultation regarding the local architecture guides (which are included also in the National Park regulations) and by promoting them among the local community, together with properly implemented sanctions for those disregarding the regulations in place, the vulnerability of our VC-A towards improper building development can be reduced. Moreover, by prioritizing the locals' animals for the usage of the pastures and offering advisory services and knowledge and information through trainings on topics such as requirements for different certifications (mountain product, traditional product, etc) and how to create a business, the vulnerability of the VC-A towards losing the traditional practices and having a reduced number of local producers will be reduced, but also the resilience of the VC-A towards maintaining the natural landscape and biodiversity will be increased. The resilience of our VC-A will be further increased by implementing the preconditions considered as solutions for drought: developing resilience plans in partnership with multiple stakeholders, renewing the water infrastructure and complying with the 'polluter pays principle' (i.e.: using water metres for proper measurement of water consumption and payment). Furthermore, by creating a stronger and informed community, which is based on efficient collaboration between multi-stakeholders, the vulnerability of the VC-A will be further reduced, and its resilience further increased.

Dinaric mountains

Region number: 15	**MRL:** Dinaric mountains
Country: Serbia	**VC Name:** Dinaric mountain lamb

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Demographic changes
- Change in traditional practices
- Market changes – consumer demand changes
- Legislation changes
- Incentives and subsidies

Sjenica area is experiencing increased temperatures, summer drought and uneven precipitation. Pasture soil quality and soil conditions have shown negative effects such as less humus content and erosion. This have led to less productive pastures. Poorer animal feed affects the quality of final product, and this is further linked to the market prospects. The changes in the market demands, consumer habits and insufficient marketing contribute to loss of competitiveness on Sjenica lamb PDO. Outmigration from the region is a threat seen as transformational for the rural way of life and livestock production. Finally, there is lack of support through subsidies and investment measures, while the reaction of policymakers is slow and belated, posing high risk of a possible reduction or cancelling of subsidies.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	15.7	.	3.8	.	.
Demographic changes	19.3	.	.	26.5	6.6
Change in traditional practices	15.4	.	21.1	.	22.4
Market changes – consumer demand changes	17.3	.	16.8	17.1	.
Legislation changes	20.2	.	.	.	21.0
Incentives and subsidies	15.9	.	.	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Use of fodder from other sources	VC / Local	4.4
Change in grass mowing and preparation technology	VC / Local	4.5
Improvement of pasture management	VC / Local	4.6
Earlier mowing	VC / Local	5.2
Grass mixtures more resistant to drought	VC / Local	4.8
Management analysis and improvement - business analytics	VC / Global	3.9
Advisory work and education of producers	VC / Global	4.8
Adjustment of the educational system and profiles, application of educational models for adult learning, "import" of labour force	VC-A / Global	3.3
Continuous support with the aim of preserving livestock and the number of farms	VC-A / Global	4.3
Comprehensive support programs for the professionalization of agriculture	VC-A / Global	4.0
Infrastructure improvements	VC-A / Local	4.5
Information flow and involvement of educational institutions	VC-A / Global	5.0
Other forms of training (internet, learning from mentors, etc.)	VC / Global	4.9
Comprehensive support programs for the professionalization of agriculture	VC-A / Global	3.7
Designed and targeted promotional campaigns Improved communication and marketing about the quality and characteristics of Sjenica lamb	VC-A / Global	5.2
Market placement, quality management, sales with marketing	VC / Global	4.8
Campaign about Sjenica products, Pešter quality	VC / Global	5.3
Application and introduction of the quality mark system, improved communication and targeted marketing	VC / Global	4.9

Introduction of good practices of process automatization and productivity improvement	VC / Global	4.9
Comparative analysis of production and factors that differentiate them, overview of good practices	VC / Global	4.0
Integral cooperation with institutions from different fields and institutions	VC-A / Global	4.2
Availability and sharing of information through services and advisors	VC / Global	5.7
Liaison with development and advisory actors	VC / Global	5.3
Educational program on entrepreneurship for high school students and adults	VC-A / Global	4.6
Advocating the continuation of per head subsidy payments	VC-A / Global	6.2
Organized support for communication with the Directorate for Agrarian Payments and preparation of requests	VC-A / Global	6.3
Exchange of information and education	VC-A / Global	6.3
Analysis and creation of solutions proposals for mountainous and extensive production.	VC-A / Global	6.0
Better organization and creation of associations, as well as the joint advocacy of producers	VC / Global	5.3
Better organization and association as well as the joint performance of producers	VC / Global	5.1
Dialogue and the creation of an inter-actor platform	VC-A / Global	4.4
Increasing the visibility of importance	VC / Global	4.8

Overall evaluation of the vulnerability and resilience of the VC-A

Adaptive capacity strategies to large extent rely on improved coordination and cooperation, as well as the better representation and advocacy of farmers interests. There is strong potential for quality management and collective practices that would raise awareness and prospects of application of good practices. This would help to adapt to the new market requirements and address the consumers' expectations and preferences in order to capture added value of production in the mountain region and the quality properties of Sjenica lamb PDO. Some of the adaptation practices and actions (regarding production and management of pastures, marketing and promotion practices) could have visible results in relatively short time. Establishing closer relations with the national networks and digitalization/communication of production related issues to the public would additionally contribute to overall reduction of vulnerability and better prospects at the market and in public policies. Though there is understanding that these actions would increase the adaptive capacity, it seems that the socio-economic and human capitals are reduced and need additional efforts to trigger collective action. While the territorial capital is still considered very high, regarding the quality and available land as the most relevant resource, the human and economic capitals are depleted. This is relevant to all aspects of VC activities, as new knowledge and practices are poorly disseminated and adopted, and there are few initiatives to increase efficiency or improve access to investment funds or share information. The educational system, though part of the local systems, is not sufficiently employed by the VC actors.

Slovak Carpathian mountains

Region number: 16	**MRL:** Slovak Carpathian mountains
Country: Slovakia	**VC Name:** Bio honey

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Extreme weather events
- Biodiversity change
- Non-native invasive species
- Land use changes
- Market changes – consumer demand changes
- Legislation changes

The production of honey in Carpathian Mountains is currently menaced by multiple threats. Drought causes a predominance of drought-resistant species, which result in less diverse, and thus less favourable plant composition for bee grazing. The heat waves, cause reduced production of nectar, honeydew, and pollen. Reduced biodiversity means a reduction in nutritional diversity for bees. The health of bee colonies is affected too, due to a risk of overpopulation of mite. Land use changes affect the abandonment of pastures and meadows and begin the process of natural succession. The legislative consideration of beekeeping as an obvious part of farms is disappearing, and legislation doesn't seem to protect beekeepers' rights. Additionally, according to stakeholders perception, environmental regulations may start to put restrictions on beekeeping in new designated protected areas.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	28.1	.	.	.	.
Extreme weather events	30.2	.	.	.	.
Biodiversity change	23.4	.	.	.	.
Non-native invasive species	21.8	.	.	.	.
Land use changes	17.3	.	.	10.8	.
Market changes – consumer demand changes	.	.	.	18.4	.
Legislation changes	18.4	.	.	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Water retention in landscape	VC-A / Local	4.5
Mowing meadows after flowering, ideally hand mowing, replace mulching with mowing	VC-A / Local	5.1
Appropriate place choice for beehives	VC / Local	4.5
Reduction of encroachment of grazed animals in permanent fences	VC / Local	4.1
Planting of pollen and nectar producing plants / for example implementing bio belts	VC-A / Local	4.6
Promotion of local honey by beekeepers, regional brands - protective logo, Slovak honey brand	VC / Global	6.3
Legislative changes should be consulted with legitimate beekeeping experts	VC-A / Global	3.1
Stage mowing / time factor and Mosaic mowing / space factor	VC-A / Local	5.1
Meandering water streams	VC-A / Local	4.0
Replace mulching with mowing	VC / Local	4.6
Support communication between beekeepers and farmers	VC-A / Global	4.6
Selection of suitable breeding bee colonies	VC / Local	5.3
Promotion of honey quality, analysis - certificates - consumer education	VC / Global	5.5
Direct communication between beekeepers and consumers when selling honey – promoting trust	VC / Local	6.2
Experiential and professional activities for non-beekeepers	VC / Local	4.4
Compensation of beekeepers from subsidies for unforeseen situations (similar to farmers)	VC-A / Global	2.7

Overall evaluation of the vulnerability and resilience of the VC-A

The bee honey production is impacted by multiple ongoing changes. The proposed adaptive capacity strategies require actions at different spatial scales and collaboration levels. Important is a landscape planning improving water retention in the land, supporting plant diversity and allowing the selection of suitable locations for bee colonies. Furthermore, there is a need to improve communication between farmers and beekeepers so that agronomic practices are adequate for bees. Communication is also needed between beekeepers and consumers to maintain and build trust in local products. The regional brand logos and education of the general public are also necessary. The process of new agricultural legislation should consult relevant experts in beekeeping.

Betic Systems

Region number: 17	**MRL:** Betic Systems
Country: Spain	**VC Name:** Organic mountain olive oil

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Extreme weather events
- Soil condition
- Demographic changes
- Market changes – consumer demand changes
- Incentives and subsidies changes

In a Betic system, the drought comes in the form of a reduction and changes in the seasonal distribution of rainfall. It occurs in spring and autumn, periods considered critical for fruit setting and ripening, as well as for the olive oil formation process. The effects of drought combined with persistent heat waves have resulted in a drastic reduction of the current olive crop, small size, and poor quality of the fruit, as well as loss of income and a reduction of the labour market. These combined effects severely affect the sustainability of mountain olive groves. Temperatures have a direct effect on pests and diseases. The quality of the soil deteriorates and organic matter is lost. Declining and ageing rural population is leading to changes in management practices, changes in land use and occasionally abandonment.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	38.4	.	35.1	.	43.0
Extreme weather events	39.0	.	37.0	.	41.5
Soil condition	32.6	.	17.9	.	26.8
Demographic changes	23.7	.	20.6	.	34.6
Market changes – consumer demand changes	17.9	.	43.6	.	30.5
Incentives and subsidies changes	23.9	.	25.0	.	31.8

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Covered management with livestock	VC / Local	1.8
Vegetation covers	VC / Local	6.7
Promotion of local varieties	VC / Global	5.8
Adapted pruning management	VC / Local	6.5
Diversification of activities	VC-A / Local	5.4
Better internal organisation of the sector	VC / Global	4.3
Circular / regenerative farm management	VC-A / Local	5.0
Landscape, culture and tourism	VC-A / Global	4.7
Economic valorisation of ecosystem services	VC-A / Global	4.4

Overall evaluation of the vulnerability and resilience of the VC-A

There is agreement that many of the preconditions for adaptation can be activated and there is a reasonable capacity of local actors to do so, except in the case of precondition 1, which requires the availability of livestock and the overcoming of important restrictions and limitations. In any case, it would be very positive to have local strategies or at least a larger sectoral and territorial articulation that would give more generalised support to the necessary changes in management, implementation and monitoring of results. Concerning the available territorial capital, the activation of these preconditions is framed in a context where we can observe:

- An unequal correlation of forces where the immobilism of the most conservative actors coexists with the fear of risk that the more innovative and risk-taking actors do not cease to feel.
- A context of evident political and media pressure from groups linked to intensive and agro-industrial production systems.
- An environment of a global lack of analysis and strategies to respond to the evident threats described in a general scenario of slowness and lack of collective political and sectoral leadership.

Sierra Morena

Region number: 18	**MRL:** Sierra Morena
Country: Spain	**VC Name:** Iberian ham

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Demographic changes
- Energy prices
- Incentives and subsidies changes

The region of Los Pedroches stands out for having one of the most valuable dehesa (silvopastoral system) landscapes in the Iberian Peninsula. Pig production under the Los Pedroches PDO certification is closely linked to the acorns. The fewer or smaller the acorns are due to drought and water scarcity, the fewer pigs can feed on them and, therefore, the fewer units can be sold. Drought also affects the quality of the soil, making its erosion easier and weakening its microbiota. The "seca" disease is a threat, weakening or killing oaks. Because of the higher price of inputs, the profit margin is diminished, negatively affecting the economic sustainability of the VC. Finally, the lack of subsidies and incentives is a major threat to the sustainability of the dehesa, because it is not sufficiently considered in the CAP.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	30.0	.	.	25.7	.
Demographic changes	29.9	.	.	.	26.1
Energy prices	29.9	.	.	.	27.1
Incentives and subsidies changes	24.9	.	.	.	25.0

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Trees renewal	VC / Local	4.4
Pruning improvement	VC / Local	4.1
Increase in selling price	VC / Local	3.7
Producers' cooperation	VC / Global	4.7
New sale channels	VC / Global	4.0
Improvements in dehesas' management	VC / Global	4.7
Formation in sustainable practices	VC / Global	4.4
Decrease in livestock density	VC / Local	4.0
Replacement of cows by sheep	VC / Local	1.8
Sowing grassland species to avoid bare soil	VC / Local	3.7
Proximity feed	VC / Local	3.7
Role of COVAP in prices regulation	VC / Global	3.3
Commitment to organic feed	VC / Local	2.1
Use of renewable energies	VC / Local	4.1
Improvements in labor conditions (holidays…)	VC-A / Global	3.8
Increasing the socio-cultural attractiveness of the villages	VC-A / Local	4.3
Land and sector's access	VC-A / Global	3.0
Subsidies access	VC-A / Global	4.7
Courses on dehesas' management	VC / Global	4.5
Local knowledge transference	VC / Global	4.4
Subsidies adapted to the sector's reality	VC-A / Global	4.4
Subsidies for the incorporation of young people into the sector	VC-A / Global	4,4

Overall evaluation of the vulnerability and resilience of the VC-A

Adaptive capacity reduce vulnerability and increase resilience by reducing exposure and sensitivity of the elements of the value chain. Feasibility of practices to achieve more adaptive capacity depends on nature of the threat. There are threats as soil quality which can be addressed by farmers changing the livestock overload in their farms. But there are other threats which come from external factors which control goes beyond the stakeholder's capacity to adapt. For example, external conflicts as wars (affecting market prices) or the current social trend of rural depopulation. These threats can be tackled with big efforts in the present to see some results in the long term. In these two cases, lowering the level of dependence on external inputs and increasing the attractiveness of the sector to young people and of towns in Los Pedroches.

Spanish Pyrenees

Region number: 19	**MRL:** Spanysh Pyrenees
Country: Spain	**VC Name:** Mountain wine

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Air temperature change
- Soil quality
- Demographic changes
- Incentives and subsidies changes

Drought and increasing air temperature resulting in strong heat waves are two drivers, which increase plant water stress, ripening of the grapes, and put at risk the grape yield. Deterioration of soil quality and loss of organic matter affect water holding capacity and availability of nutrients that leads to poor vegetative growth, grape yield and quality. Poor social infrastructure and lack of essential services are leading to the labor shortage for agricultural operations and depopulation. Replacing small farms with large companies making investments and buying land not only reinforces the depopulation trend but also ruins environmental equilibrium and biodiversity. Incentive and subsidies do not sufficiently address the small and young family farms. They mostly favor large companies' investments.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	36.8	.	.	.	.
Air temperature change	34.9	.	.	.	.
Soil quality	28.9	.	.	.	.
Demographic changes	32.4	.	.	.	.
Incentives and subsidies changes	32.1	.	.	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Introducing vine varieties with longer ripening period	VC / Global	4.9
Valorisation of minor local varieties	VC / Global	5.3
Using of cover crops and other innovative agronomic practices	VC / Local	5.1
Advantage small farmers committed to the land	VC-A / Global	3.9
Encourage young entrepreneurs to establish winegrowing activities	VC-A / Global	4.1
Payments for ecosystem services	VC-A / Global	3.5
Fostering innovation by training of farmers	VC / Global	4.8
Fostering of organic viticulture	VC / Global	3.9
Development of attractive infrastructure	VC-A / Local	4.4
Valorisation of the product = better payment for the job	VC-A / Global	4.8

Overall evaluation of the vulnerability and resilience of the VC-A

Implementation of selected solutions can reduce vulnerability and increase the resilience of the VC-A from environmental, social and economic points of view. Accurate choice of vine varieties, trainings on innovative agronomic practices (organic, soil quality preservation, etc.) and their consequent implementation will surely help to contrast the environmental changes. However, this can be achieved only if the crucial role of the farmer and processor in the territory preservation is recognised and has an appropriate remuneration, for example in the form of payments for ecosystem services. According to MAP members, available territorial capitals could be sufficient, but the adaptive capacity of the VC-A depends significantly on politic and institutional will and ability to support small and medium farmers, young people willing to establish new wineries in the region, foster organic viticulture and other innovative practices for environmental sustainability and develop suitable infrastructures. This implementation of these challenging solutions requires a long-term vision and elaborated regional strategy for the wine sector. All the ideas of solutions emerged during the discussion of adaptive preconditions could definitely increase the ability to cope with changing conditions making both the VC and SES more flexible and resistant. None of the production phases in the base of the VC would not be altered, moreover the whole functioning of the VC-A system could benefit of even partial implementation of proposed solutions.

Swiss Alps

Region number: 20	**MRL:** Swiss Alps
Country: Switzerland	**VC Name:** Mountain grain

What are the main threats and their impacts on the VC-A within the MRL?

In Swiss Alps extreme weather events are occurring more frequently and outside the usual time. Biodiversity change has been a main challenge for farmers to find appropriate cereal seeds, as the old breeds have been lost and diversity of seeds adapted to variable conditions is not available. Threat is coming from the reintroduction of wolves to whose presence the inhabitants, farmers and tourists are no longer accustomed. Land use change is probably the biggest threat to the upscaling of VC production. Digitalisation is an issue, a lot of the VC is lagging, potentially being overtaken by 'bigger players'. Incentives and subsidies contradict promoted multidisciplinary approach. Instead, money is spent on advertising for the Swiss meat industry or as investment in animal housing infrastructure.

PRIORITY THREATS

- Extreme weather events
- Use of natural resources – renewable and non-renewable
- Biodiversity change
- Land use changes
- Demographic changes
- Technological innovation (digitalisation)
- Incentives and subsidies changes

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Extreme weather events	28.8	3.6	2.8	3.5	.
Use of natural resources – renewable and non-renewable	13.6	30.7	2.4	6.6	.
Biodiversity change	22.9	5.5	6.0	8.8	.
Land use changes	18.1	28.7	6.6	4.0	.
Demographic changes	12.3	31.8	14.3	5.4	.
Technological innovation (digitalisation)	10.1	31.2	22.5	6.0	.
Incentives and subsidies changes	28.2	12.5	15.3	13.3	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Financial support	VC-A / Global	3.7
Apt infrastructure	VC-A / Local	2.6
Skilled labour	VC / Global	2.8
Demand/market	VC-A / Global	4.1
Quality of raw ingredients	VC / Local	3.6
Management and communication along VC	VC / Global	4.5

Overall evaluation of the vulnerability and resilience of the VC-A

There is a visible openness to proactively creating the conditions for adaptability, e.g. by seeking financial support from the canton. However, it became clear that not all companies or "stages" of the value chain have the same possibilities to access certain preconditions, making some parts of the value chain more vulnerable. However, it is difficult to single out one particular type of business as most vulnerable, as the real situation is very complex and intertwined. It was also a rather complex question to be discussed and the feeling was that actors did not necessarily had thought about it before or saw it in their hands.

The single VC have limited capacity to mobilise all the capital, but when they communicate with each other and/or collaborate they are on the way to find better solutions. It can be said that overall**,** in the MRL the territorial capital is delivering enough resources (landscape for tourism and marketing stories, protection from some weather events, cultural values) for further increasing adaptive capacity and overall resilience. However, the main factor hindering favourable development is the complexity of the system for accessing this capital and an insufficient culture of communication between actors, which the actors said themselves.

Swiss Jura

Region number: 21	**MRL:** Swiss Jura
Country: Switzerland	**VC Name:** Tete de moine

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Extreme weather events
- Market changes – consumer demand changes
- Incentives and subsidies

The key variable in Swiss Jura is availability and quantity of grass. However, vulnerability of this variable to climate change is very high. Droughts affect the quantity and quality of grass, resulting in decrease in the quantity of milk, which has a direct effect on the farmers' income. Constraints related to the lack of fodder and heat waves can discourage producers to the point of abandoning production. Cheesemakers are affected by the consequences of the loss of grass quality and thus by the decrease in milk quality. This decrease in quality affects the cheese yield and the quality of the cheese. Regarding governance, wooded pastures are not recognized for its true value: they constitute a cultural and natural heritage. Policies could also encourage greater use of local resources such as grass.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	35.6	24.0	6.7	5.8	34.8
Extreme weather events	15.5	7.3	4.8	5.8	17.6
Market changes – consumer demand changes	10.1	23.8	14.8	19.8	22.1
Incentives and subsidies	10.6	.	12.6	.	13.5

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
To reduce the use of mineral nitrogen, it is necessary to know how to manage rotations and plant cover and to have access to the necessary plant species	VC / Global	4.4
To reduce the purchase of fodder, it is necessary to improve the storage capacity on the farm (barn dryers, hot air recycling, etc.).	VC / Local	4.2
To reduce the purchase of fodder and concentrates from abroad, it is necessary to have on-farm or at least national production	VC / Local	4.8
To reduce dependence on fossil energies, it is necessary to mobilize capital to install renewable energies (photovoltaic, methanization, etc.)	VC / Local	5.0
Availability of seeds or other plant material (cuttings, rhizomes, etc.)	VC / Global	3.6
Knowledge related to the management of these forages	VC / Global	5.0
Availability of concentrates locally sourced to supplement the ration	VC / Global	3.8
To reduce the livestock units/ha or the breeding rate implies a better valorization of the products	VC-A / Global	4.6
To reduce the livestock units/ha implies the support of public authorities	VC-A / Global	3.6
Milk prices must be the result of agreements between the stakeholders of the interprofession	VC-A / Global	4.4
For milk prices to compensate for farmers' efforts toward climate resilience, public incentives are needed	VC-A / Global	3.4
To keep their margin, producers must be able to diversify their farming systems (forage, meat, horses, ...)	VC-A / Local	4.2
To keep their margins, producers must be supported in diversifying their activities (on-farm hospitality, agrotourism, educational farms, etc.)	VC-A / Global	3.6

To keep their margins, producers must be supported in their search for autonomy (forage and energy)	VC-A / Global	4.0
To reduce emissions in cheese dairies, it is necessary to improve the use of renewable energies (photovoltaic, wood, others)	VC / Local	4.8
To reduce emissions in cheese dairies, it is necessary to be able to invest the necessary capital	VC / Local	4.2
Tourism actors must communicate about wooded pastures to strengthen cultural identity and contribute to the awareness of the value of wooded pastures. This will also promote the farmers who develop service activities (reception, landscape management, etc.)	VC-A / Global	4.4
Political and institutional actors must participate in the patrimonialization of wooded pastures through an official recognition of the particular and fragile status of these landscapes shaped by human activity	VC-A / Global	4.0
Civil society and consumers must be able to recognize forms of agriculture that value carbon storage (biogenic cycle)	VC-A / Global	3.8
Swiss organic agriculture must be supported and encouraged as a virtuous form of production (forage autonomy)	VC-A / Global	4.0
Public procurement must include products from forms of agriculture that make efforts in terms of climate resilience (PDO, organic, etc.)	VC-A / Global	4.8
Educational programs should integrate climate issues through workshops on sustainable food systems and diets	VC-A / Global	5.0
Marketing should not only aim at increasing sales and capturing customers, but should also send messages about the efforts made by the value chain to adapt ("responsible" marketing)	VC-A / Global	4.0

Overall evaluation of the vulnerability and resilience of the VC-A

The adaptive capacity is especially evident at the level of production systems. Indeed, the actors are working on a parallel research project: SPAD (Sustainable Agricultural Production Systems). Implemented in the current context of climate change, the SPAD project aims to increase the sustainability of beef production in the French departments of Jura, Doubs, the territory of Belfort and Haute-Saône as well as in the Swiss regions of Jura and the Bernese Jura. The project will make it possible in particular to highlight scenarios for the evolution of production systems within homogeneous geomorphological units, to construct a scale of sustainability encompassing economic, environmental and social aspects, but also to test measures in pilot areas, conducive to the adaptation of farms.

Beydaglari

Region number: 22	**MRL:** Beydaglari
Country: Turkey	**VC Name:** Green house tomatoes

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Extreme weather events
- Use of natural resources – renewable and non-renewable
- Non-native invasive species
- Soil quality
- Inflation

Non-native invasive species are recognized as a main threat in Beydaglari because they cause yield and quality losses, leading to increased costs and reduce income. Same effects are caused by drought, which foster changes in agricultural product pattern and eventually abandonment of agriculture. Drought increases the need for new irrigation investments, which increases costs. Very specific threat for this area is flooding, affecting yield and quality losses and reduce income. Soil quality is perceived as significant environmental problem, affecting yield and its quality, which in combination with inflation causes continuous increase in input prices and reduced income.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	30.0	.	.	.	.
Extreme weather events	27.2	.	.	.	.
Use of natural resources – renewable and non-renewable	20.4	.	.	.	.
Non-native invasive species	36.0	.	.	30.5	.
Soil quality	28.2	.	.	.	.
Inflation	.	36.4	39.3	.	40.4

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Input support	VC-A / Global	5.1
Farmer training	VC / Global	5.5
Providing support to cooperatives	VC-A / Global	6.4
Contract farming	VC / Global	6.0
Promotion of direct sales techniques (consumer cooperatives, community supported consumer groups),	VC / Global	5.2
Development of logistics infrastructure for direct sales	VC / Global	5.3

Overall evaluation of the vulnerability and resilience of the VC-A

MAP members indicated marketing cooperative support, farmer training, input subsidies, and contract production as the most effective circumstances. These may have the following impact on VC:

- As marketing cooperatives would ensure collective sales and supply, farmers' production costs would decrease and their income would increase
- Product quality and output will improve as a result of farmer training, which will increase income. Input subsidies will both protect natural resources and increase farmers' income. Thus, vulnerability will decrease and flexibility will increase.
- The contract production model, on the other hand, will ensure that the value chain is planned from the beginning to the end, thereby reducing vulnerability and increasing flexibility.

Farmer training is the simplest condition to implement in terms of regional capital. This is possible due to the presence of skilled specialists in the area. Farmers are open-minded about co-operation and there is no opposition against it. The dissemination of the contract farming together with cooperatives will increase the effectiveness of this model.

Upper Speyside

Region number: 23	**MRL:** Upper Speyside
Country: Scotland, UK	**VC Name:** Whisky

What are the main threats and their impacts on the VC-A within the MRL?

PRIORITY THREATS

- Drought
- Demographic changes
- Inflation
- Legislation changes
- Malting Barley capacity

Drought in Highlands and Islands relates to changes in the levels of precipitation impacting on surface and groundwater quantity available. Drought influences the availability of surface water necessary for year-round abstraction for process and cooling in whisky distilling. The issue of demographics relates to the movement of people in and out of an area which may impact on employment opportunities and housing availability. Within the MRL there is an ageing population, with many younger people moving out of the area due to lack of long-term job opportunities or suitable housing. Rising energy prices are a major constituent of the inflationary pressures. Finally, UK government fiscal budget reversed as proposed freeze on duty for spirits and instead alcohol duty will rise in line with inflation. Malting barley capacity was raised by stakeholders about infrastructure constraints for local processing for distilleries.

What is the overall impact of the priority threats on selected stages of the local VC-A?

Priority threat (selected from the list)	Production	Processing	Distribution Marketing	Consumption	Multiple stages Entire VC-A
Drought	.	24.3	.	17.8	.
Demographic changes	.	31.8	.	.	.
Inflation	.	21.6	.	26.0	.
Legislation changes	10.1	.	.	19.1	.
Malting Barley capacity	18.5	.	13.7	.	.

What are the adaptive capacity preconditions for increasing resilience of the VC-A?

Adaptive capacity precondition	Category	Ability to mobilize
Water saving and heat reduction technologies	VC / Local	4.7
Flexible production plans	VC / Global	3.6
Riparian woodlands and leaky dams	VC-A / Local	4.3
Catchment restoration success stories	VC-A / Local	4.3
Training, apprenticeships, promotion of industry to young people	VC / Global	6.1
Wider services, facilities in area	VC-A / Local	4.0
Payment of Living Wage	VC-A / Global	4.7
Cairngorm National Park Partnership Plan affordable housing targets	VC-A / Global	4.0
Highland council planning regulations	VC-A / Global	3.7
Tied housing for distillery workers	VC-A / Local	3.3
Tactical added value to visitor experiences	VC-A / Local	4.9
Fixing input costs	VC / Local	3.5
Distillers supporting communities to reduce energy costs	VC-A / Local	4.3
Energy efficiency, generation, & behaviours	VC / Local	5.0
Marketing strategies	VC / Local	5.6
Agro-forestry and peatland restoration	VC-A / Local	4.0
Extensification of beef industry	VC-A / Global	2.7
Invest in Scottish next generation facilities	VC-A / Global	3.4
Low(er) carbon transport to other maltings	VC / Local	3.7

Overall evaluation of the vulnerability and resilience of the VC-A

Nearly all of the adaptive capacity mechanisms would require significant investment, particularly changes to greener energy and production and increases to affordable housing and wages. Some participants hope to be able to attract private investment to help with these, particularly in regarding peatland restoration. Not all the barriers were financial, however. There were also issues regarding human capacity. An issue faced when trying to recruit young people to work in the sector was the inability of schools to allow students time to explore the value chains; there often isn't the time in the syllabus or the teaching resources available to introduce young people to the industry opportunities. Adaptive capacity reduces vulnerability and increases resilience of the whisky, food and drink tourism value chains by providing buffers to threats that would otherwise have negative impacts. These work by addressing the different threats (water temperature and low flows, demographic changes, inflation, and policy changes) specifically. The identified adaptive capacities could increase the coping ability of the whisky, food and drink tourism value chains without radically altering the functioning of the VC-A system. Therefore, these approaches should improve resilience and reduce vulnerability, provided the necessary investments can be found.

9. Conclusions

Evaluation of the vulnerability and resilience of the mountain regions was conducted in **23 reference regions**, in accordance with standardised guidelines.

Task 4.5, presented in this report, focused on **deepening the knowledge about the vulnerability and resilience of selected VC-A in 23 regions**. Through applying the participatory vulnerability/ resilience assessment in each region, we obtained a rich empirical and up-to-date overview of the perceived threats and necessary adaptive capacity preconditions in mountain value chain assemblages across European mountain regions.

The participatory procedure of the present task involved **multiple actors** in the evaluation process, including farmers, processors, beekeepers, consumers, researchers, policy makers, members, and other civil society members interested in the topic.

The report, at its end, **provides a synthetizing vulnerability/resilience matrix comparing the studied** regions. However, all information in this report is relevant to comprehensively understanding the current situation regarding mountain VC-A vulnerability and resilience.

Findings of the study suggest that that all **categories of threats** – environmental, socio-economic, institutional and political – **are considered relevant** in mountain areas from the perspective of stakeholders. The differences in mean values, showing how important the threats are from the stakeholders' points of view, are relatively small.

Stakeholders in the mountain regions perceived *drought* as the main threat. Reduced precipitation is viewed as a threat by the majority of mountain reference regions. Within the VC-A, impacts of drought are mostly evident across production VC-A elements, and rather less evident in the area of processing, distribution or consumption. Other threats that are considered important include *demographic changes*, *inflation and rising energy prices*. It is important to note that the perception of these threats was probably affected by the ongoing energy crisis in Europe (at the end of the year 2022). *Demographic changes* are associated with the long-term issue of generational renewal in European agriculture and the shortage of young people in agriculture and rural regions in general. Impacts of this socio-economic threat are not specifically associated with a clearly delineated process in agriculture, but impact on the VC-As as such.

The results from the qualitative analysis show that forms and **impacts of adverse effects are not uniform** across all types of value chains studied. In each region the intensity and scale of impacts of adverse effects on value chains differ. However, an important commonality across all regions studied is the “domino” effect of adverse effects on a value chain of a given focal product. The “trigger” could be any of the adverse effects listed, although there are dominant ones that are shared across most of the regions in Europe, such as drought, demographic changes, incentives' and subsidies' changes, extreme weather events and inflation. These “triggers” effectively cause lowering quality or lack of basic resource, which lead to need to invest into supplements or reduction of primary resource. These reductions are further causing imbalance in a) a countryside in terms of provision of ecosystem services and loss of biodiversity and b) the ability of local actors

to continue to utilize and preserve often traditional know how and skills. This chain of events may eventually lead to severe negative impacts.

Most of the external threats that were evaluated by stakeholders are perceived as threats that have **medium impacts**. There is a relatively high diversity among mountain regions and their VCs, which creates specific conditions for mitigating the adverse effects of these threats.

Stakeholders managed to generate an **extensive list of examples that are viewed as preconditions for building the capacity** to allow regions to develop their own adaptation strategies.

Findings suggest that stakeholders in the local landscapes feel capable of mobilising resources for adaptation to environmental threats (namely drought or extreme weather events, to mention the most important threats). Despite the fact that these threats are considered as the most important, they mostly affect processes that stakeholders are probably able to control and, on this basis, to create an adaptation strategy. Most of these strategies are based on the utilisation of local knowledge (e.g. local farmers training, cooperation and knowledge exchange among local actors) and on implementing innovative practices in agricultural production (e.g. using renewable energy, innovative pasture management, introducing new plant varieties).

On the other hand, the threats from the socio-economic, institutional and political areas make mountain regions vulnerable in a sense that they impact VC-As on a larger scale (e.g. changes in subsidy schemes). Developing an adaptation strategy by local MRL actors is more difficult, due to the high sensitivity of VC-As to these changes and perceived lack of possibilities to intervene in the processes from which these threats originate.

Threats that should be addressed at the global level are those that have high perceived susceptibility and at the same time low ability to mobilise ACP using local sources. According to the results, local stakeholders consider such threats especially wildfires, air temperature changes, soil quality and condition, demographic changes and overall life-style changes.

Demographic changes notably threaten a vast majority of analysed VC-A, concretely 17 VC-A from 23. Yet, dealing with this problem at the local, MRL scale is perceived as insufficient, as the results suggest.

Besides, no proposed adaptive capacity preconditions were identified for life-style changes, even if they are considered essential threats for two assessed VC-A, concretely in Central Apennines and Portuguese Maciço Noroeste.

Wildfires represent an unmanageable danger in Portuguese Cordilheira Central. In Maleshevski mountain, Drome Valley, and Hungary mountains, wildfires can appear as a secondary effect of drought and temperature fluctuations and as a consequence of abandoning farming in mountain areas. Wildfires destructively impact VC-A, mainly the pastures, contributing to soil erosion but also decreasing landscape attractiveness for several subsequent years and, most importantly, threatening the safety of people.

The increasing temperature (air temperature changes) is an additional threat for which local actors lack adequate adaptive capacity. It mainly impacts the mountain VC-A in southern European countries like Portugal, Spain, France, and Bulgaria.

Changing soil conditions or quality are also perceived as essential threats for VC-A of organic olive oil in the Betic system, mountain wine in the Eastern Alps, Portuguese Maciço Noroeste, Spanish Pyrenees, and greenhouse tomatoes in the Beydaglari region. However, the ability to mobilise appropriate adaptive capacity to this threat at the local scale is perceived to be relatively low.

Realization of the study encountered **several difficulties**. There was not available any examples of studies that focus on empirical measurement of social vulnerability. Main challenge was to translate abstract concepts of susceptibility and resilience to empirical level and make these concepts accessible for local stakeholders that participated in the workshops.

Results of the study carried out within the task 4.5 have **multiple implications for further work** in the project. Findings on the adaptation capacity (including specific examples of the preconditions for building adaptation strategies) will be utilized in following task 4.6 focused on upgrading strategies for the VCs. The main issues that emerged from each region were expressed in digital stories published on the project website[3].

Grouping of the MRLs based on overall resilience of the VC-As will provide important information for upcoming research work focused on clustering of the value chains in mountain regions across Europe (WP5).

Specific data from the workshops that are summarized for each MRL will be used as an input for interpretation of future scenarios for VCs that are being explored within the WP6.

Finally, findings on the existing drivers of change (threats) that adversely impact on mountain VCs are important source of information for the WP7 focused on policy analysis and modernization of multi-level policy approaches.

[3] H2020 MOVING website – Library with Digital Stories

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11. Appendix

Appendix 1: Timeline of the study

Milestone	Description	Responsibility	Deadline
Guidelines – Draft version	Task leader publishes a draft version of the Guidelines	CZU	6 October 2022
Guidelines - Discussion	Task leader presents the Guidelines at the consortium online meeting	CZU	6 October 2022
Guidelines - Feedback	Research teams provide feedback to the published draft version of the Guidelines	All research teams	13 October 2022
Guidelines – Final version	Task leader publishes a draft version of the Guidelines	CZU	28 October 2022
Organisation of the workshops	Research teams organise workshops	All research teams	25 November 2022
MRL Reports – Submission	Research teams finalise and submit outputs from the research	All research teams	9 December 2022
Deliverable D4.5 – Draft version	Task leader publishes a Draft Report (D4.5)	CZU	10 January 2023
Deliverable D4.5 – Final version	Task leader publishes a final version of the Report (D4.5)	CZU	28 February 2023

Appendix 2: Data collection sheet for recording exposure score

Exposure evaluation: *To what extent are the following VC-A elements exposed to changes induced by a set of a selected threats?*

Note: Use a separate table for each selected threat to record score of participants at workshop. If your reduced list of threats includes more than 3 representatives of threats, you add more tables (up to 6) simply by copy and paste.

Exposure assessment	To what extent are the following VC-A elements exposed to changes induced by a given threat? (1 = the least exposed; 7 = the most exposed)											
	Threat 1: [add here name the threat from your reduced list]											
	Elements of VC-A* // Participants	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**
	[Element 1 of VC-A affected by Threat 1]												
	[Element 2 of VC-A affected by Threat 1]												
	[Element 3 of VC-A affected by Threat 1]												
	. . .												

* Add rows if necessary

Appendix 3: Data collection sheet for recording sensitivity score

Sensitivity evaluation: *How big are the impacts of such change on the VC-A element?*

Hint: The list of VC-A elements is the same as in the tables recording exposure.

Note: Use a separate table for each selected threat to record score of participants at workshop. If your reduced list of threats includes more than 3 representatives of threats, you add more tables (up to 6) simply by copy and paste.

Sensitivity assessment	How big are the impacts of the change on the VC-A element? (1 = the least sensitive, 7 = the most sensitive)											
	Threat 1: [add here name the threat from your reduced list]											
	Elements of VC-A* // Participants	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**P12**
	[Element 1 of VC-A affected by Threat 1]												
	[Element 2 of VC-A affected by Threat 1]												
	[Element 3 of VC-A affected by Threat 1]												
	. . .												

* Add rows if necessary

Appendix 4: Data collection sheet for recording adaptation capacity preconditions

VC-A Elements*	Capital**	Adaptive capacity preconditions***	What is the overall ability of local actors to mobilize the selected resources enabling adaptation to change? (1 = very low, 7 = very high)											
			P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
	[TE, EN, SC, EC, GS]													

* Add or delete rows if necessary based
** Please use the following symbols: TE = territorial capital, EN = environmental capital, SC = socio-cultural capital, EC = economic capital, GS = governance structures
*** It is possible to record more than one precondition for a selected VC-element

Appendix 5: Average impacts of threats on VC-A element categories

Threats	VC-A elements categories (% within VC-A elements category)				
	Production	Processing	Distribution Marketing	Consumption	Multiple stages
Drought	27.0	25.3	13.1	14.2	30.3
Air Temperature change	24.6	.	.	.	29.8
Extreme weather events	25.0	5.5	14.9	5.0	33.5
Wildfires	38.2	.	.	.	.
Soil condition	26.0	.	17.9	.	26.7
Use of natural resources	16.0	30.7	2.4	6.6	.
Biodiversity Change	23.3	5.5	6.0	8.8	44.8
Non-native invasive species	25.1	.	.	30.5	.
Soil quality	27.4	.	.	.	.
Land use changes	25.1	28.7	5.2	6.5	28.4
Mass tourism and associated infrastructure	25.6	.	5.6	8.0	24.8
Demographic changes	29.0	29.8	17.4	16.0	25.4
Life-style changes	25.8	.	.	27.6	.
Change in traditional practices	24.2	.	21.1	.	26.8
Market changes – consumer demand changes	17.7	24.1	26.0	20.3	27.7
Change in knowledge production and use	20.3	.	20.2	.	.
Technological Innovation (digitization)	12.6	31.2	20.1	6.0	.
Inflation	18.4	16.7	18.9	23.1	28.1
Energy prices	20.9	17.7	18.1	20.0	16.9
Pandemic situations	11.0	.	.	.	27.1
Legislation changes	17.8	.	6.4	11.9	24.9
Incentives and subsidies changes	25.6	17.6	16.6	13.3	19.8

Note: *Dot symbol denotes that the impact of the threat on selected VC-A element category was not indicated.*
Mean values were categorized in intervals: (2.4-14.9) = low; (16.0-20.3) = medium; (20.9-26.0) = high; (26.7-44.8) = very high

Reference: Authors' calculation

Appendix 6: Overall evaluation of the VC-A resilience in each MRL

Country	MRL	VC	Main threats	Susc. mean	AC mean	AC* local	AC* global	Susc. index (0-1)	AC index (0-1)	Group
Austria	Austrian Alps	Weiz lamb	Drought, Extreme weather events, Market changes – consumer demand changes, Inflation, Incentives and subsidies	25.8	3.5	12	30	.53	.50	II
Bulgaria	Western Stara Planina	Public goods from high nature value farming	Drought, Air temperature change, Biodiversity change, Land use changes, Demographic changes, Changes in traditional practices, Inflation, Energy prices, Legislation changes, Incentive and subsidies changes	20.5	4.5	2	9	.42	.64	III
Czech Republic	Šumava – Ceský les	Organic beef	Drought, Demographic changes, Inflation, Energy prices, Incentives and subsidies changes	14.1	3.3	7	1	.29	.47	IV
France	Corsica	Chestnut flour	Air temperature change, Non-native invasive species, Land use changes, Demographic changes, Technological innovation (digitalisation), Energy prices	25.9	3.1	16	12	.53	.44	II
France	Drome Valley	Sheep meat	Drought, Non-native invasive species, Market changes – consumer demand changes, Incentives and subsidies changes	27.9	4.2	10	16	.57	.60	II

Greece	Rethymno, Crete	Carob flour	Extreme weather events, Demographic changes, Energy prices, Legislation changes	4.0	5.3	3	8	.08	.76	III
Hungary	Transdanubian	Ecotourism	Drought, Land use changes, Mass tourism and associated infrastructure, Inflation, Legislation changes	11.3	4.1	8	6	.23	.59	IV
Italy	Central Apennines	Spun paste cheese	Drought, Demographic changes, Life-style changes, Change in knowledge production and use, Energy prices, Incentives and subsidies changes	29.8	4.1	5	15	.61	.59	II
Italy	Eastern Alps	Mountain wine	Extreme weather events, Non-native invasive species, Soil quality, Demographic changes, Energy prices	25.0	5.1	9	2	.51	.73	I
Italy	North Apennines	Chestnut tree	Drought, Demographic changes, Change in traditional practices, Incentives and subsidies changes	22.9	5.2	9	4	.47	.74	III
North Macedonia	Maleshevski mountain	Tourism region	Drought, Demographic changes, Inflation, Energy prices, Incentives and subsidies changes	29.6	4.3	3	6	.60	.61	I
Portugal	Cordilheira Central	PDO cheese	Wildfires, Demographic changes, Inflation, Energy prices, Incentives and subsidies changes	30.1	4.0	3	7	.61	.57	II
Portugal	Maciço noroeste	Wine	Drought, Air temperature change, Extreme weather events, Soil condition, Demographic changes, Life-style changes, Inflation, Energy prices	18.3	3.6	2	2	.37	.51	IV

Romania	Southern Romanian Carpathians	Certified Ecotourism	Drought, Land use changes, Mass tourism and associated infrastructure, Demographic changes, Change in traditional practices, Pandemic situations, Legislation changes	27.0	3.2	3	8	.55	.46	II
Serbia	Dinaric mountains	Dinaric mountains lamb	Drought, Demographic changes, Change in traditional practices, Market changes – consumer demand changes, Legislation changes, Incentives and subsidies	17.1	4.8	8	27	.35	.69	III
Slovakia	Slovak Carpathian mountains	Bio honey	Drought, Extreme weather events, Biodiversity change, Non-native invasive species, Land use changes, Market changes – consumer demand changes, Legislation changes	22.5	4.7	11	5	.46	.67	III
Spain	Betic Systems	Organic mountain olive oil	Drought, Extreme weather events, Soil condition, Demographic changes, Market changes – consumer demand changes, Incentives and subsidies changes	30.6	5.1	5	4	.62	.73	I
Spain	Sierra Morena	Iberian ham	Drought, Demographic changes, Energy prices, Incentives and subsidies changes	28.2	4.0	10	12	.58	.57	II
Spain	Spanysh Pyrenees	Mountain wine	Drought, Air temperature change, Soil quality, Demographic changes, Incentives and subsidies changes	33.4	4.5	2	8	.68	.64	I
Switzerland	Swiss Alps	Mountain grain	Extreme weather events, Use of natural resources – renewable and non-renewable, Biodiversity	15.8	3.5	2	4	.32	.50	IV

			change, Land use changes, Demographic changes, Technological innovation (digitalisation), Incentives and subsidies changes							
Switzerland	Swiss Jura	Tete de moine	Drought, Extreme weather events, Market changes – consumer demand changes, Incentives and subsidies	15.8	4.2	6	17	.32	.60	IV
Turkey	Beydagları	Green house tomatoes	Drought, Extreme weather events, Use of natural resources – renewable and non-renewable, Non-native invasive species, Soil quality, Inflation	30.6	5.4	0	6	.62	.77	I
UK (Scotland)	Upper Speyside	Whiskey	Drought, Demographic changes, Inflation, Legislation changes, Malting Barley capacity	22.8	4.2	12	7	.47	.60	IV

*Note: *) Absolute counts of AC preconditions provided by local stakeholders during the participatory workshop.*

Reference: Authors' calculation

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