BASIC METHODOLOGY FOR ASSESSING VULNERABILITY AND RESILIENCE TO CLIMATE CHANGE

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1. - GENERAL CONTEXTUALIZATION

Vulnerability to the Climate Change effects is the degree to which a system is susceptible to, or unable to cope with the adverse effects of climate change. It will be higher or lower depending on the character, magnitude and rate of change of climatic indicators and the variation to which a system is exposed, its sensitivity and its capacity to adapt (IPCC).

Vulnerability comprises a variety of concepts that include sensitivity or susceptibility to damage and lack of response and adaptation capacity, so the Vulnerability Indices are obtained from these components.

However, the indices used provide a good measure of vulnerability, and must be adapted to the characteristics of the landscape and the community in question. We present a general approach to the different indicators that should include a study of the vulnerability of a GIAHS territory to the effects of Climate Change.

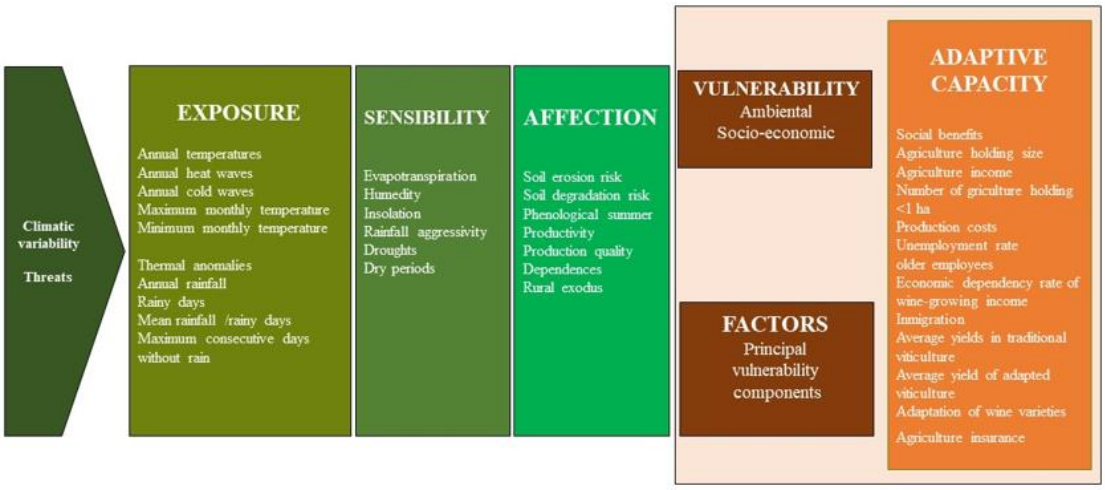

Fig. 6. Methodological scheme for determining the vulnerability and resilience of GIAHS with examples of potential indicators

At first, in a climate change vulnerability and resilience assessment study, the main steps to follow would be:

- Describe the geographical (physical and human) and especially climatic characteristics of the study area.
- Locate the study area in the future predictions issued by the reports of international agencies in the context of climate change (IPCC, UN, etc.).
- Generate a comparative visualisation between the information obtained from the reports and the real data managed by the local administrations, which gives rise to the main thread of the analysis.

2.- EXPOSURE

The analysis of the exposure of the study area must begin with the evaluation of possible changes in the main climatic factors.

Thus, it is important to know the extreme nature of these factors, as they can give rise to the greatest occurrence of natural hazards and, therefore, to classify the territory in a situation of greater vulnerability.

There are many variables to consider; however, the choice of these variables will depend directly on the climatic area in which the area in question is located.

The following should be considered as fundamental elements:

- Annual temperatures
- Annual heat waves
- Annual cold waves
- Maximum monthly temperaturas
- Minimum monthly temperatures
- Tropical nights
- Equatorial nights
- Termal anomalies
- Annual rainfall
- Rainy days
- Rainfall intensity
- Rainfall erosivity
- Maximum consecutive days without rain

3.- SENSIBILITY

Starting from the factors to which GIAHS is exposed, it is necessary to identify the elements to which the territory in question is most sensitive, taking into account the possible limitations that the predominant crop may face.

The key variables in the study of GIAHS sensitivity would be:

- Evapotranspiration
- Insolation
- Humidity
- Water availability to plants

4.- AFECTION

Assess the direct impact of the factors considered on the territory and, more specifically, on the survival of the predominant crop. This conditioning must be considered key to talk about territorial vulnerability, as it has a direct impact on physical, social and economic variables.

In this way, the effect must be approached from the very phenology of the plant and the main territorial modifications that could have a direct impact on it.

In short, the effect should be assessed:

- Considering the relationship between the climatic conditions derived from climate change and the basic needs of the crop, which is the backbone of the GIAHS.
- Analysing the response of the crop to a general modification of the eco-geomorphological system, such as a loss of soil quality.

5.- VULNERABILITY

The analysis of the main geographical characteristics of the GIAHS area, of the environmental changes in the context of climate change and of the needs and weaknesses of the overall main crop leads to the identification of a large number of variables determining the vulnerability of the territory.

In this context, factors belonging to an environmental block must be differentiated from those directly related to economic and social aspects.

- <u>Environmental vulnerability:</u>
    - Physiography

- Lithology
- Edaphology
- Vegetation cover
- Rainfall
- Erosion
- Land use

- Socio-economic vulnerability:
  - Average age of the population
  - Population under 18 years of age
  - Population aged 65 and over
  - Average household size
  - Single-person households
  - Population
  - Population with income per unit of consumption below 40% of the median
  - Population with income per unit of consumption below 50% of the median
  - Population with income per unit of consumption below 60% of the median
  - Population with income per unit of consumption below 140% of the median
  - Population with income per unit of consumption below 160% of the median
  - Population with income per unit of consumption below 5,000€.
  - Population with income per consumption unit below 7,500€.
  - Population with income per consumption unit below 10,000€.
  - Population with "pensions" as source of income
  - Population with "unemployment benefits" as source of income
  - Population with "other income" as source of income
  - Average income per person
  - Average income per household
  - Average disposable income
  - Registered unemployment

7.- MAIN FACTORS OF VULNERABILITY

The total number of variables analysed should be subjected to a factor analysis (principal component analysis) in order to obtain which factors most affect the current dynamics of the GIAHS area.

8.- RESILIENCE

Resilience or adaptive capacity to the new conditions resulting from climate change will vary widely depending on the GIAHS area under study.

The vulnerability identified will be affected by aspects such as:

- Agricultural resilience. This refers to the crop and its adaptation to the new climatic conditions.
- Landscape resilience. Related to the control measures that can be used to slow down the modifications of the territory itself.
- Demographic resilience. Relating to population dynamics and its characteristics.
- Economic resilience. Linked to the profitability of the main activity and the economic capacity of the population living in the GIAHS territory.
- Cultural resilience. Referred to the historical, artistic and cultural characteristics of the GIAHS, in addition to the traditional activities that can create a strengthening of the area.
- Sociological resilience. Referring to anthropological aspects, the role of public management in the territory, local associations, the role of the FAO as guarantor of the agricultural heritage, etc.