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# ISSUES OF CLIMATE VULNERABILITY IN ROMANIA - A SPECIAL MENTION FOR AGRICULTURE

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***Abstract***

*This article analyses the concept, evolution and current situation of climate vulnerability in the European Union and highlights the needs for future developments in this sector, in the context of sustainable development and green recovery. The analysis of the current situation reflects some issues of the climate vulnerability in Romania compared with some other Member States, as well as within the development regions of Romania. There are also approached and highlighted some aspects regarding domains with higher vulnerability to climate change and the impact on the agriculture in Romania. The analysis of Romania's vulnerability to climate change was performed based on calculations present in global analyses, which followed the evolution of several composite indicators. The results place Romania in a relatively good position at global level, due mainly to the low exposure to sea level rise. On the other hand, the agricultural climate vulnerability is high due to droughts and floods, as manifestations of extreme weather events in Romania seriously exposed to damage in agriculture. The conclusions reflect the need for further analysis in this area and also provide some recommendations for improving further policy at national level.*

***Key words*****:** *climate vulnerability, vulnerability quantification, agriculture vulnerability, sustainable development, impact*

## INTRODUCTION

Climate vulnerability does not currently have a generally accepted definition. The literature on climate change and natural disasters uses this term to assess the degree of adaptation and exposure to climate variability.
The IPCC promoted a definition of vulnerability related to climate change events: Climate vulnerability is the level at which systems can no longer cope with the damage caused by climate change [13].
Economic analysis dedicated to assessing climate change vulnerability differ significantly by country and region because, at this level, the economic system is adjusted based on the analysis of push-pull factors, which can reduce importantly the direct manifestations of climate change.
In this respect, reducing the economic impact of climate change has become a permanent concern, especially in an attempt to promote a new development in the agricultural sector which has a key role in mitigating this impact.
On a global scale, agriculture is considered to be the largest single contributor to climate change and biodiversity loss, the sector consuming the most drinking water and fertile land and a major chemical pollutant. In order to comply with the planetary limits, this sector will have to transform from a carbon source into a natural reservoir of carbon by reducing the use of water in many basins and decrease the braking biodiversity.
Stakeholders in debates on climate change (public persons as politicians, private investors, the scientific community, and also the media) need to fully understand the dimension of this phenomenon. Since it is a very acute subject, new concepts are designed to help decision makers prioritize the best prevention measures. Until recently, the two basic notions of this field of research were mitigation and adaptation to climate change. In this paper, the authors are presenting two

equally important concepts increasingly present in the research horizon of this field: resilience and vulnerability to climate change. The latest, in order of occurrence, is climate vulnerability with the greatest importance in the process of preventing climate change, especially from an agricultural point of view [3].

## MATERIALS AND METHODS

The objective of this paper is to highlight the necessity to develop and improve the climate vulnerability assessments in order to promote a green and circular economy.
The methodology used was as follows:
-Analyzing data and information existing on print and on line;
-Theoretical-methodological background, delimitation and analysis of concepts;
-Extracting data from cgdev.org database on vulnerability quantification;
-Processing the data extracted, creating tables and synthetic graphs;
-Analyzing and interpreting the processed data, tables and graphs;
-Drawing conclusions and recommendations.

## RESULTS AND DISCUSSIONS

### The importance of vulnerability in preventing climate change

In general terms, vulnerability, adaptation and resilience are beginning to be considered by various fields of research, mainly those related to sustainable development, as concepts of increasing use and relevance. In terms of economic and social systems, vulnerability is often associated with resilience, although not always considered as complementary.
The notion of vulnerability has become part of various institutional and organizational analyses, even if - taking into account specific differences of research methods - it has been defined in many different manners. In general, vulnerability includes the personal as well as group characteristics which allow people and systems to react and cope with disruptions. It applies to environmental systems also helping them to adapt to natural hazards.
Climate change and all extreme climate phenomena lead to economic vulnerability of a country. They are important issues that decision makers cannot address head-on and in a decisive, more or less predictable manner [14].
The type of vulnerability affects the way how the negative effects of climate change are perceived, as well as those related to climate variability and severe weather events. It depends on the scale and frequency of climate variability that defines the exposure of a system and its ability to adapt [1].
Climate change can increase potential vulnerabilities and also deepen existing socio-economic imbalances.
Every time the climate change cause damage to a region with low adaptation capacities, consequences will be severe, affecting territorial cohesion.

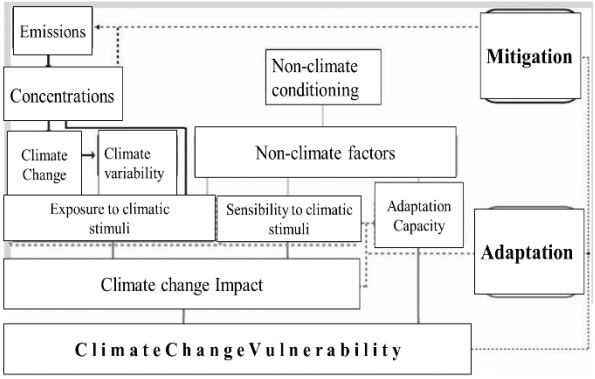


Fig. 1. Vulnerability to climate change framework assessment
Source: processing after Füssela and Klein, 2006 [11].

The analysis in figure 1 shows how important is the vulnerability to climate change when considering the possibilities of streamlining adaptation and mitigation measures [11].
The concept of vulnerability, initially used in the literature toward hazards, has gained increasing importance in the study of global environmental changes, climate change effects and also in sustainable development studies. Identification of climate change vulnerable regions and/or vulnerable groups in society can be done in order to prioritize resource allocation for development. Even if the regional impact of climate change depends on both exposure to anthropogenic and natural climate stimuli, the whole system is analyzed

in terms of specific vulnerability, to assess the aspects related to the adaptation component.

Regional climate vulnerability may be different, depending on particularities and location of systems. It can be assessed using indicators of economic development, such as the Human Development Index (HDI), Index of Sustainable Economic Welfare (ISEW) or the Index of Human Insecurity (IHI).

Global warming has already led to global, regional and local climate changes, while increasing risks, especially where vulnerability complicates the process of implementing adaptation measures. Thus, human systems and ecosystems in Europe are vulnerable to the effects of major climate change, such as floods or droughts, but depending on the region, a combination of different types of impacts can occur, which can exacerbate vulnerabilities [5]. Although differing very much in Europe, depending on local conditions, economic and social developments (demographic dynamics, wealth distribution and others), they are considered to be key factors for the local adaptation to climate change.

From an economic point of view, the adaptation aims at implementing measures corresponding to the current and potential impact of climate change, different from those to reduce vulnerability. Thus, benefiting from the restoration of resilience, the prevention of extremely negative effects of climate change, it will be acquired a natural orientation towards obtaining benefits, maybe as a result of following the implementation of the corresponding measures.

The adaptive cycle is another approach that draws attention to the importance of the cycle of destruction and reorganization of systems. It provides a clear picture of the processes that bring together systemic organization, dynamics, resilience and vulnerability. It presents a sequence of four phases of change in complex systems: exploitation, conservation, creative destruction and renewal and is framed as such or in various development policies aimed at increasing adaptability and resilience.

An assessment of climate change effects can be done, according to the phases of the adaptive cycle. This assessment takes into consideration that each of the four types of adaptation (planned, anticipatory, autonomous and reactive) corresponds to a certain degree of vulnerability, dictated by both territorial and economic conditions.

It must be acknowledged the distinction between:

(a) *the potential impact* - which refers to effects of climate change that will be fully felt by both ecosystems and human society as a result of future climate change, regardless of the effect of adaptation measures;

(b) *the residual impact* - which refers to the potential future effects of climate change, following the implementation of adaptation measures.

The analysis show that the potential impact of climate change is most likely to manifest itself mainly where the conditions of a particular vulnerability are not met (Table 1).

Table 1. Effects of climate change by type of adaptation

| Adaptation | Potential impact | Residual impact | Vulnerability |
|---|---|---|---|
| Planned | x | | reduced |
| Anticipative | x | | normal |
| Autonomous | | x | big |
| Reactive | | x | very big |

Source: synthesis after Boşneagu, 2010 [1].

This comparison shows a possible neglect of adaptation measures given that there is no threat from vulnerability.

It results that adaptation actions and measures will have to follow the requirements and issues of climate vulnerability, being able to influence even more the outcomes, as the adaptability corresponds more and more to the features of vulnerabilities.

## Conceptual delimitations

In the view of the authors of this paper, the notion of "prevention of climate change" is not limited to the two classic phases (mitigation and adaptation), but extends to a complete cycle of prevention. The complete CC prevention cycle has four stages, including concepts of equal importance, such as climate vulnerability, as well as that of climate resilience.

However, the common understanding, which unfortunately is uncritically taken over at the

level of some important programmatic documents for preventing negative effects of climate change, means the application of mitigation (or reduction) measures, as well as those of adaptation.

Even if the latter provide for measures that clearly belong to the category of reducing vulnerability or increasing resilience, as a rule, they are not highlighted as such.

Nevertheless, there are now salutary exceptions, putting things in their natural order. Among them is the latest report of the European Environment Agency, which signals the existence of four prevailing conceptions of environmental policies, interrelated and complementary, which can be equated by adaptation, reduction, avoidance and restoration. The report concludes that the transition to a green economy can be accelerated by the symbiosis of the four approaches, put together to implement current policies and design new ones [8].

Also, sharing the belief that it is equally important to prevent climate change by developing ecosystems, economic and social systems resistant to climate change, in this paper we take the previously developed theoretical model focused on restoring resilience, combining the need to adapt with identification of practical ways to reduce vulnerability to effects of climate change [4]. This global approach also considers the possibility of a disaster risk reduction assimilated to climate change. It recognizes that vulnerability to natural disasters and climate change are not only related to the severity of the events themselves, but also to the exposure and sensitivity of people and the economy to those events, as well as the ability of economies to adapt [10].

Consequently, in our view permanently promoted in this paper, unlike the classic notion of "climate change prevention", which includes in adaptation the components of reducing vulnerability and restoring resilience, in the category of measures to prevent climate change should be included all the four stages of prevention (mitigation, adaptation, vulnerability and resilience) which form an integrated cycle.

In each phase of this complete cycle, there are influenced the pillars of sustainable development, namely:

(i) the environmental quality - at the time of mitigation;

(ii) the social component, with predilection, at the time of vulnerability;

(iii) the economic component, mainly at the time of adaptation.

Finally, at the time of resilience, all three components are targeted, adding perhaps also the cultural component, for the need to ensure education for sustainable development.

Although previous papers [5, 4] have approached other phases, this paper focuses on the second phase of the complete cycle of climate change prevention, taking into consideration vulnerability issues.

Thus, reducing vertical (regional) and horizontal (sectoral) vulnerabilities is the second step in the process of preventing climate change, after the mitigation and before adaptation and resilience.

This process, being directly linked to the global efficiency of mitigation measures and the needs of the social environment, leaves in turn a wide range to be covered, which mitigation measures (due to limitations) cannot fully combat. The elements of vulnerability are complex covering issues related to multiple plans which are manifested as an emergency and are decoupled from mitigation efficiency (calculable, exclusively, in the long term) that must be completed with the next phase of climate change prevention.

When it comes to sustainable development, considering and applying the complete cycle of climate change prevention is becoming increasingly necessary and indispensable.

In short, the transformation of measures of climate change prevention into prerequisites for sustainable development takes place, in this complete cycle in four stages, as follows:

-Once mitigation measures are taken to contribute to the overall reduction of GHG emissions, it means that taking responsibility for sustainable development has given the necessary impetus to move to the implementation of everything that means preventing climate change, a process essential to ensuring sustainable development.

-Certainly, since they cannot cover the entire need for prevention, the second stage is set in motion, by covering measures dedicated to reducing climate vulnerability. At this stage, it is necessary to mobilize the energies of all stakeholders and place resources so that they can effectively continue the initial stage of mitigation, in cases and areas where locally focused measures are needed to complement global mitigation.

**Climate Change impact on agriculture in Romania**

Globally, climate change is particularly affecting agriculture, through the expansion of early flowering areas to the north and declining production yields for some crops due to heat waves and droughts (mostly in Central and Southern Europe). At the same time, the yield of other crops has increased, especially in northern Europe.

The most significant phenomena with economic and social impact, which occur as a result of climate change are: drought, extremely high temperatures - with an effect on the thermal comfort index - and floods.

At regional level, climatic conditions influence mostly the development and zonal specialization of agriculture, because each region is specialized in certain cereal crops or the breeding of certain animal species. The effects of climate change can become critical, where there is a high level of water pollution and limited access to aquatic resources for irrigation and quality drinking water, for example in southern Romania. The regional specificity becomes decisive both to establish the vulnerabilities and to the plan the level of support necessary to overcome the situation induced by the effects of climate change [5].

An analysis of the evolution of temperatures and precipitation, significant indicators for the impact of climate change at the national level, showed that temperatures are constantly rising and annual rainfall is relatively constant. However, the violent nature of rainfall (very large amount of water falling in a very short time) has a significant impact on the environment.

In our country, given the difficulty of identifying and calculating the economic costs associated with the effects of climate change, studies have focused on limited areas, especially in agriculture.

By correlating the information regarding the evolution of precipitations with those regarding the evolution of the multiannual average temperatures in Romania, it is possible to delineate the areas with the highest risk of aridization. Thus, as can be seen in Figure 2, the areas with a very high risk of drought are located in Oltenia, Bărăgan and less in the Moldavian Plateau. Several other areas with small surfaces that may develop an increased risk of aridization are in the Western Plain.

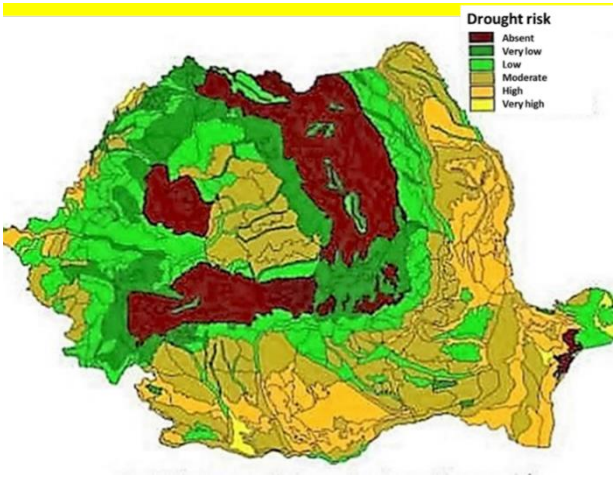


Fig. 2. Areas at risk of drought in Romania
Source: Constantinescu, 2018 [5].

In the category of moderate risk of occurrence of drought are large areas of Transylvania Plateau, the southeastern part of Wallachia (Bărăgan) and much of the Moldavian Plateau. All these areas are plain or plateau and have an agricultural specificity.

Considered one of the economic sectors most exposed to the negative effects of climate change, agriculture suffers due to both rising temperatures, extreme weather events and changes in rainfall regime. Preventing the effects of climate change is a priority in this domain.

Romania's agriculture sector faces inevitable effects of climate change, in turn, it is not only vulnerable but also a significant source of GHG emissions. A significant change of the temperate-continental climate of Romania is expected in the next decades, specifically a raise of the average annual air temperature and a decrease of the annual amount of

precipitation, on average by 10-20%. In this context, vulnerabilities and risks caused by these changes must be taken into account in all strategies that provide measures to prevent climate change in the agricultural sector.

They must also take into account that impact is not uniform, as there are differences both geographically in terms of drought or torrential rains and in terms of the standard of living of the population, those in rural areas affected by these changes, having revenues lower than those in urban areas do. Therefore, these strategies provide for adaptation in accordance with sector-specific activities, promoting food security and sustainable development in rural areas.

The most important programmatic documents that discuss the prevention of climate change in agriculture, in the order of their topicality and, obviously, in the absence of a comprehensive strategy dedicated exclusively to the prevention of climate change in this sector are the following:

- National Rural Development Program for the period 2014-2020;
- Adaptation measures in Romanian agriculture, ANM, 2014;
- Romania's rural development strategy 2014-2020;
- National Strategy for Climate Change and Growth Based on Low Carbon, SNSC–CRESC 2016-2020.

It is necessary to mention that, although at EU level a new document in the field of climate change was launched on July 14, 2021, The European Green Deal, in Romania only the above mentioned documents are still in force.

On the other hand, we can say that actions in the field of agriculture contribute to a major extent to the prevention of climate change, especially through three types of measures:

- afforestation in order to retain GHG emissions;
- use of biomass to obtain energy;
- the contribution of organic farming to the preservation of biodiversity and water resources.

As a complex sector, agriculture needs to adapt the general measures on climate change present in the strategy papers to local needs. Prevention strategies in agriculture also take into account significant uncertainties, in particular as regards the direction and impact of climate change on agriculture and the affected community in rural areas. An approach is being sought to reconcile and integrate the challenges of the new climatic conditions into the requirements of achieving more resilient agriculture to climate change and improving living standards in rural areas.

Regarding agriculture in Romania, the combined effects of warming and rainfall variation are expected to lead to lower yields in different crops. This requires the choice of those adaptation options by farmers, in collaboration with the administration and other stakeholders, able to give the best yield, in changing irrigation practices and the use of land for crop production.

The strategies of this sector in Romania are based on specific studies made in all regions of the country, which are justifications for regional responses to the challenges of climate change. GHG emissions from the agricultural sector, in 2010, represented approximately 52.80% compared to 1989, representing 14.28% compared to total national GHG emissions [5]. In order to achieve the priority objective of integration and harmonization of adaptation measures for agriculture, those economic and social factors that influence the adaptation potential of farmers must be taken into account.

In addition, SNSC 2013-2020 advances a series of measures aimed at reducing GHG emissions and promoting organic farming, both by modernizing agricultural holdings and supporting the development of SMEs, and by helping farmers through agri-environment payments and the use of new technologies for renewable energies, biofuels, as well as the exploitation of other local energy sources.

The agricultural sector is a key sector for Romania, extremely vulnerable to climate change. It is responsible for approx. 30% of employment in Romania (by far the largest share in the EU).

The CRESC strategy 2016-2030 shows that the impact of climate change on agriculture can sometimes be positive, but it is usually mostly negative.

The agriculture and rural development sector in Romania is currently experiencing a mainly negative impact, manifested primarily, as follows [5]:

- Changes in agricultural productivity (by changing the growing seasons of crop plants);
- Increasing flood frequency has become an increasingly common problem in agriculture;
- Increasing the frequency and intensity of drought periods - leading to aridization, especially in the southern regions of the country;
- Risk of soil exposure to erosion and desertification - due to increasing drought;
- Increasing the frequency of severe weather events (storms and hail) with a direct influence on the increase of damage recorded in agriculture.

PNASC 2015, a detailed document containing measures and solutions for the implementation of the CRESC Strategy 2016-2030, presents Romania's contribution to preventing the effects of climate change in two directions: reducing GHGs according to quantifiable targets in line with EU 2030 aspirations and adapting to climate change to promote protection of the economic and social environment. Agriculture has a contribution of 15.31% to the total GHG emissions at national level (at the level of 2016). The proposed investments in agriculture within PNASC are of 4,845 mil. Euro. These are planned to take place both in the period covered by PNASC, respectively 2016-2020, and in the next period, 2011-2022. Investments will be relatively constant (approximately 800 million Euros per year), as all planned measures are expected to cover the same period, respectively 2016-2022. The financing of the investments will be made from the available budgets and from the FC 2014-2020, POIM and ERDF.

Corroborating the previously analyzed data, regarding the evolution of temperature and precipitation, we can see that agriculture is one of the sectors that will suffer the most from the loss of productivity in certain crops and by changing the specifics of land use.

## Quantifying Romania's Climate Change Vulnerability

In this section, there will be analyzed some recent outcomes of quantifying the climate change vulnerability, by taking into consideration the particular case of Romania and the regions in Romania, and the main issues of concern here.

According to the doctoral research conducted in [5], in relation to climate change events, the most vulnerable region of Romania is considered to be the South-East (a climate vulnerability index score 60), followed closely by South Muntenia (with score 56, Table 2).

Table 2. Exposure of Romania's regions to climate change

| NUTS II regions | Climate change vulnerability index*, regional score |
|---|---|
| Northeast | 38 |
| Southeast | 60 |
| South Muntenia | 56 |
| Southwest Oltenia | 41 |
| West | 39 |
| Northwest | 33 |
| Center | 30 |
| Bucharest-Ilfov | 39 |

Source: Own processing based on data from the Regional Development Plan 2014-2020, South East Regional Development Agency (Agentia de Dezvoltare Regionala Sud-Est Romania), 2020 [12].

* Index based on changes related to the population affected by floods, the population in coastal areas below 5m, potential risk of drought, vulnerability of agriculture, fishing and tourism, taking into account changes related to precipitation and temperature.

Nevertheless, at European level, 26 EU regions are more vulnerable than the South East Region of Romania [15].

This long-term forecast becomes all the more important if we take into account the ease with which one or another item on the public agenda is lost. For example, according to the latest European barometer of opinion, Romanians admit that they do too little to fight climate change. The lack of civic culture in this regard is also evident in the high percentage (69%) of those who admit that they have done nothing to combat climate change [7].

Vulnerability to climate change still raises questions about the method of analysis. One of the newest methods exposed [15] involves determining risk indicators for three critical issues:
-Increasing the number of disasters related to extreme weather events;
-Decreased agricultural productivity;
-Sea level rise.
To determine the vulnerability of a region or a country to climate change, a specific methodology has been created, based on classic statistical indicators. The methodology can be applied easily and with good results for any country, for all three problems analyzed or for any of them individually.

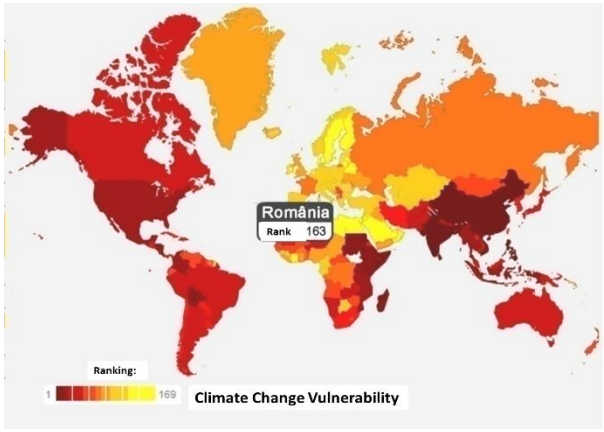


Fig. 3. Romania's position according to vulnerability to climate change in the world
Source: own selection from Wheeler D., 2016 [15].

The model analyzes the risk of climate impact depending on the accumulation of $CO_2$ in the atmosphere. Data on the number of inhabitants and per capita income are from the World Bank database.
The model includes the following variables:
-Increasing concentration of $CO_2$ in the atmosphere;
-Per capita income;
-Transparency of information;
-Compliance with regulations (legislation).
Per capita income has a significant influence, directly proportional to the reduction of vulnerability to climate change: for every percentage (1%) of a per capita income increase, the risk due to extreme climate phenomena decreases by 1.2%.
As expected, the increase in greenhouse gas (GHG) concentration has the greatest influence on climate vulnerability: a 1% increase in the GHG concentration in the atmosphere leads to a 30% increase in the risks due to extreme weather events.
The period used for this particular model was 1995-2008, because the data existing in the database (www.em-dat.be) before this period are not very accurate. The above analysis was performed for 233 countries worldwide [6].
In a classification according to the vulnerability to climate change (Figure 3), Romania is on the position 163.
This score and the light color (yellow) on the map shows the ranking of Romania in a very favorable position regarding the vulnerability to climate change, compared to the other nations presented in this classification [15].
However, it must be highlighted that, depending on the specific issue analyzed, the degree of vulnerability varies significantly as shown in Table 3:

Table 3. Quantification of vulnerability to climate change

| Country | Climate Vulnerability Indicator TOTAL **(CVI)** | Extreme Temperature Vulnerability Indicator **(WCVI)** | Sea level rise Vulnerability Indicator **(SCVI)** | Damage in agriculture Vulnerability Indicator **(ACVI)** |
|---|---|---|---|---|
| Bulgaria | 4.019 | 0.002 | 0 | 14.31 |
| China | 100.000 | 100.000 | 6.56 | 4.99 |
| Germany | 1.310 | 0.003 | 4.62 | 4.83 |
| Hungary | 2.635 | 0.009 | 0 | 8.32 |
| India | 90.783 | 49.755 | 5.44 | 61.90 |
| **Romania** | **4.884** | **0.0004** | **0.60** | **10.98** |
| Serbia | 6.815 | 0.153 | 0 | 14.31 |
| USA | 4.027 | 2.702 | 3.78 | 7.49 |
| Turkey | 8.322 | 0.012 | 5.08 | 26.96 |

Source: own data processing from www.cgdev.org, [2].

(1) For exposure to declining agricultural productivity (ACVI), Romania has an extremely high climate vulnerability indicator (10.98). Therefore, this column is highlighted red in Table 3;
(2) For exposure to extreme weather phenomena (WCVI), Romania has an extremely low climate vulnerability indicator (of 0.0004);
(3) For exposure to sea level rise (SCVI), Romania has a climate vulnerability indicator of 0.6.
The total climate vulnerability indicator for Romania is 4.884, sharing quite the same level with other East-European countries (Bulgaria, Serbia). This level of climate

vulnerability indicator (CVI) may not be very high; still it is higher than the CVI of other EU countries, such as Germany.

Nevertheless, it can be stated that Romania has a relatively low degree of vulnerability to overall climate change.

Out of the three climate vulnerability issues indicators analyzed, only one has worrying values for Romania, namely the one that assesses agricultural productivity.

Although it has a really high and concerning value, the *exposure to declining agricultural productivity* indicator is quite comparable to neighboring countries (Hungary, Serbia and Bulgaria). This means that the decreasing agriculture productivity due to climate change in not a local problem, not even a national one. It can be considered a serious regional problem, at European level.

According to the analysis, in Romania the predominantly suffering regions are located in the southeast and south, where the increase of average annual temperatures, lack of forest protection curtains and violent meteorological phenomena (storms) will result in large losses in agricultural productivity. Therefore, it is necessary that horizontal strategies to prevent climate change not be limited to the sustainable use of resources, but take into account the two-way relationship between climate change and sustainable, green economic development.

As highlighted in previous research, green economy involves a sustainable management of environmental resources, taking into consideration the complex biosphere as a closed system with important renewable and non-renewable natural resources but with a limited capacity for self-regulation and self-renewal. Only a green, climate-neutral and circular economy model may be the ideal solution for relaunching more sustainably the European economy, which has suffered in recent years and was also considerably hit by the Covid-19 pandemic [9].

Within the European Green Deal, the EU has assumed most ambitious commitments, such as becoming the first climate-neutral continent by 2050. This also involves first measures of climate change mitigation such as the decision to reduce greenhouse gas emissions at least by 55% (by 2030 compared to 1990 levels).

The European Union also aims to reach resilience to climate change, reverse biodiversity loss and degradation of the environment and to leave nobody behind in the process. In this purpose, the current EU policy of green recovery and transition to a sustainable, green and circular economy should address efficiently the climate vulnerability issues according to the gravity of each issue in each EU country.

## CONCLUSIONS

All actions dedicated to restoring the quality of the environment can be assimilated to the joint effort to reduce vulnerability and exposure to the dangers of climate change. Evaluated together with all mitigation measures, the measures dedicated to saving the quality of environmental factors are the first two stages of the complete cycle of prevention. Their proper application gives new impetus to the idea of rational use of resources, despite conflicting interests that make both mitigation and reduction of vulnerability to fall under the clear incidence of sustainable development.

The complete cycle of climate change prevention is the only approach that recognizes that vulnerability to climate change is not only related to the severity of weather events, but also to the exposure, sensitivity and ability of people and of the economy to adapt to these events.

Thus, prevention measures taken at the level of the economy will lead to positive feedback from sustainable development, provided that the mix of policies to prevent the effects of climate change and sustainable development allows a unified perspective of all economic sectors. In the particular case of Romania, all these aspects are related to the model of economic and social development that will be followed. The climate change has not been one serious aspect of concern and of action in Romania but it must become in order to comply with the opportunities and transformations requested by the European

Union Green Deal and sustainable development strategy.

Agriculture is one the most active and important economic sectors in Romania and the real threat of agricultural climate vulnerability resulting from this paper`s analysis, should be taken into very serious consideration by the decision-makers.

Such a perspective influences the conditions for international development, especially in the European Union, as the connections that exist at the institutional and governmental levels in terms of reducing the impact of climate change and severe weather events aim to apply the most effective methods of rebuilding resilience and reduce climate vulnerability in Romania.

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