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Visualization of the geophysical settings in the Philippine Sea margins by means of GMT and ISC data

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Abstract: The presented research aimed to perform geophysical modelling (gravity and geoid) and to evaluate the spatio-temporal variation of the marine geological data (distribution and depth of earthquakes) using combination of the Generic Mapping Tools (GMT) and available sources from the International Seismological Centre (ISC-EHB) that produce data on earthquakes as part of seismic survey and regional research projects. The target study area is a Philippine Sea basin (PSB) with two focused marginal areas: Philippine Trench and Mariana Trench, two hadal trenches located in the places of the tectonic plates subduction. Marine free-air gravity anomaly in the PSP shows higher values (>80 mGal) of the gravity fields structure at the volcanic areas and Philippine archipelago. Current study presented comparative geophysical analysis, and mapping free-air gravity and geoid in the Philippine Sea basin area. As a result of this study, the average level of earthquakes located in the Philippine Trench and Mariana Trench areas were compared, and those located in the Philippine archipelago are determined to be in the souther-western part (area of west Mindanao, south-west Visayas islands), while Luzon Islands shown shallower located earthquakes. The results on the Mariana Trench segment shown shallower located earthquakes compared of the other marginal regions of the Philippine Sea Basin. Current paper contributes to the studies on natural hazards through visualization and analysis of the earthquakes activities (occurrence and magnitude intensity), due to increasing interest to the problems of seismicity in the Pacific Ocean, which may have environmental effects causing harmful consequences and possible risks for coastal population of the Philippine islands through aftershocks and tsunامي.

Key words: GMT, cartography, shell scripting, geoid, free-air gravity, geophysics, visualization, earthquake

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1. INTRODUCTION

The study is focused on the Philippine Sea region, a large and tectonically complex area located in the west Pacific Ocean (Figure 1). The Philippine Sea is marked by complex interaction of three tectonic plates: Eurasian, Australian and the Philippine Sea. Subduction of the lithosphere plates is a complex geological process that involves collision, subduction and accretion. Old, heavy and large Pacific Plate is situated eastwards from the Philippine Sea. The Philippine Sea Plate, located beneath the Philippine Sea, between the Pacific, Eurasian, Caroline and Australian plates, is the worlds largest marginal basin plate [1]. It has two back-arc basins formed in Oligocene to Miocene period: Parece Vela and Shikoku Basins.

The region of the Philippines is notable for the Philippine Mobile Belt, a complex part of the tectonic boundary between the Eurasian and the Philippine Sea plates, including subduction zones, deep-sea trenches and Philippine Fault System. The Philippine Sea Plate is bordered by convergent boundaries where tectonic plates collide with cold and dense Philippine Sea plate is sliding beneath the warmer, and less dense Eurasian Plate as a result of subduction process, due to lithospheric density differences.

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Necessarily, it causes active and repetitive volcanism, earthquakes, orogenesis, regional destruction of the lithosphere and local geological deformations.

As Philippine Sea Plate subducts into the mantle, it releases water from minerals dehydration in the oceanic crust. It causes partial melting of rocks in the asthenosphere, which rise up reaching the surface, and forming volcanic island arcs. These volcanic island arcs are notable along the margins of the Philippine Sea, parallel to the chain of the oceanic trenches. For example, prominent volcanic island arcs are in this region include Izu-Bonin-Mariana Arc (including Izu Islands, Bonin Islands, Mariana Islands), Luzon Volcanic Arc stretching from Taiwan to Luzon, and the Philippines. Isotopes and trace elements show unique geochemical characteristics of the volcanic chains (strong niobium anomalies and calc-alkaline characteristics, strontium isotopic ratios) studied previously [2-5].

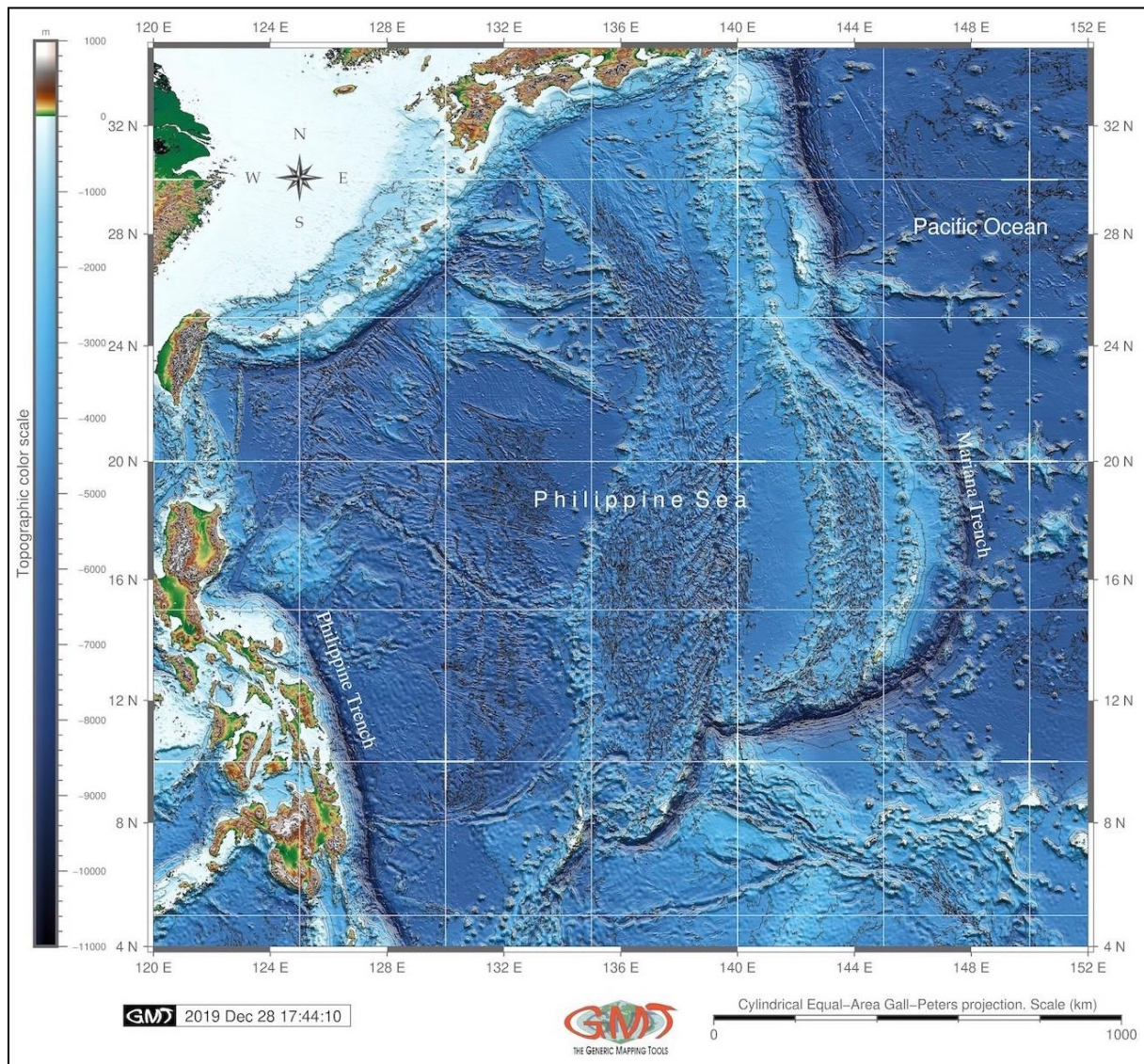


Figure 1. Bathymetric map of the Philippine Sea Basin. Bathymetry: GEBCO Global Relief Model 15 arc sec resolution grid, mapping: GMT
(Source: author)

Several deep-sea trenches are located along the margins of the Philippine Sea (clockwise): Mariana, Yap, Palau, Manila, Philippine, Ryukyu and Izu-Bonin Trench. Current work combines geophysical modelling with visualization of the earthquakes location and depths to visualize seismicity of the area. Hence, Philippine Sea belongs to the seismically active region of 'Ring of Fire' along the margins of the Pacific Ocean, where numerous earthquakes and volcanic eruptions take place. Two specific foci within the study area are two deep-sea trenches, the Mariana Trench (a prominent crescent arc on Figure 1) and the Philippine Trench, located on the east and western margins of the Philippine Sea, respectively. Geodetic modelling and seismic mapping are important parts of the geophysical analysis of the region, because visualizing data observation enables to indicate a coupled or planar tectonic plate interface and

give deeper insights to the plate subduction structure and mechanisms of the interfaces in the colliding tectonic plates. Marine free-air gravity modelling defines details of the crust, upper mantle and slab structure in the subduction zone, based on the available terrestrial and satellite gravity data.

Understanding such complex relationships between tectonic plate subduction, as well as fore-arc and back-arc structures requires precise and accurate modelling and detailed spatial analysis of the seismicity in the region which reflects variations in the crust and upper mantle structure. Geoid, bathymetric and gravity modelling demonstrated in this paper is made using GMT with presented codes, while schematic maps and cross-sections of the earthquake events were derived from the International Seismological Centre.

2. LITERATURE REVIEW

Mariana Trench is a strongly elongated, narrow and lesser rectilinear topographic depression of the seafloor, crescent-like in its geometric plain shape. It is located in the west Pacific Ocean, 200 km to the east of the Mariana volcanic island arc. Stretching for hundreds kilometers, it is formed as a result of the subduction of the Pacific plate beneath the PSP as a result of the subducted cooled plate into the mantle, which leads to the formation of the trench, and originates earthquakes and tsunamis. The subduction boundaries have classified 'Mariana type' where the coupling between the two tectonic plates is either weak or non existent [6]. Westward slope of the Mariana Trench presents a barren trench wall with no uplift, while eastern part is the border along which western edge of the Pacific Plate is subducting beneath the smaller Mariana Plate. As a result, the geomorphic feature of the Mariana Trench is its very steep slopes and depths of 3-5 km width of the bottoms [7].

To date, geological research on Mariana Trench and Izu-Bonin-Mariana (IBM) volcanic arc has focused on various aspects of the tectonic processes and mechanisms of plate movement including subduction system dynamics [8], faulting and consequent deformation in the subducting plates [9], [10], geometry of the lithospheric gradient dips [11], dependance between the plate motion, geologic structure and penetration depths of slabs. [12] in their petrogenetic studies on geochemic traces of volcanic rocks from the Mariana Trench pointed at its tectono-magmatic evolution. Recent bathymetric and topographic analyses [13] indicate that thin lithosphere in the IBM region (20 km) might have been intensely deformed during tectonic evolution of the region. It may explain notable variation in microstructure of samples taken from the ground on the Mariana Trench, which range from coarse granular and intensely elongated texture to fine porphyroclastic and fine-grained equigranular textures.

Philippine Trench is located eastwards from the Philippine archipelago (Figure 1), where the Philippine Sea Plate (PSP) subducts under the Philippine archipelago (4° – 15° N), which is a part of a convergence zone between the Eurasian plate (Sunda block) and the PSP [14]. Subducting PSP causes a high-velocity anomaly in the Kyushu-Palau Ridge (KPR) area. The PSP tears and forms a 'slab window' corresponding to the KPR subduction. Tearing of the tectonic plate in the northwestern corner of the subducting PSP is further discussed by [15]. The Philippine Sea Basin is a complicated region, notable for complex bathymetry and tectonic plate shape [16-18], consisting of many different patchworks of the seafloor ages [19].

3. METHODS AND DATA

Gravity and bathymetric data were examined to obtain a visualization and better understanding of the seafloor fabric and structures within the PSB. The EGM96 gravity grid was visualized based on the with the satellite altimetry data [20] using existing examples [21-23] producing gravity map of the PSB (Figure 2). The subset of the img file was extracted through the following code snippet:

```
img2grd grav_27.1.img -R120/152/4/35 -Ggrav.grd -T1 -I1 -E -S0.1 -V
```

```
A cpt from grid was generated (H=0, C=RGB):
```

```
gmt grd2cpt grav.grd -Cno_green > grav.cpt.
```

The geoid model (Figure 2) was visualized by the following GMT codes sequence:

Generated geoid image with shading:

```
gmt grdimage geoid.egm96.grd -I+a45+nt1
```

```
-R120/152/4/35 -JY140/15/6.5i -Cgeoid.cpt -P -K >ps
```

```
Adding basemap: grid, title, costline:
```

```
gmt pscoast -R -J -P -V -W0.25p -Df -B+t"Geoid gravitational regional model: Philippine Sea Basin" -Bxa4g3f2 -Bya4g3f2 -O -K >>ps
```

```
Adding geoid contour:
```

```
gmt grdcontour geoid.egm96.grd -R -J -C2 -A5
```


-Wthinest,dimgray -O -K >>ps

The gravity model (Figure 3) was visualized through the following GMT code sequence:
gmt grdimage grav.grd -I+a45+nt1 -R120/152/4/35 -JM6i -Cgrav.cpt -P -K >ps.

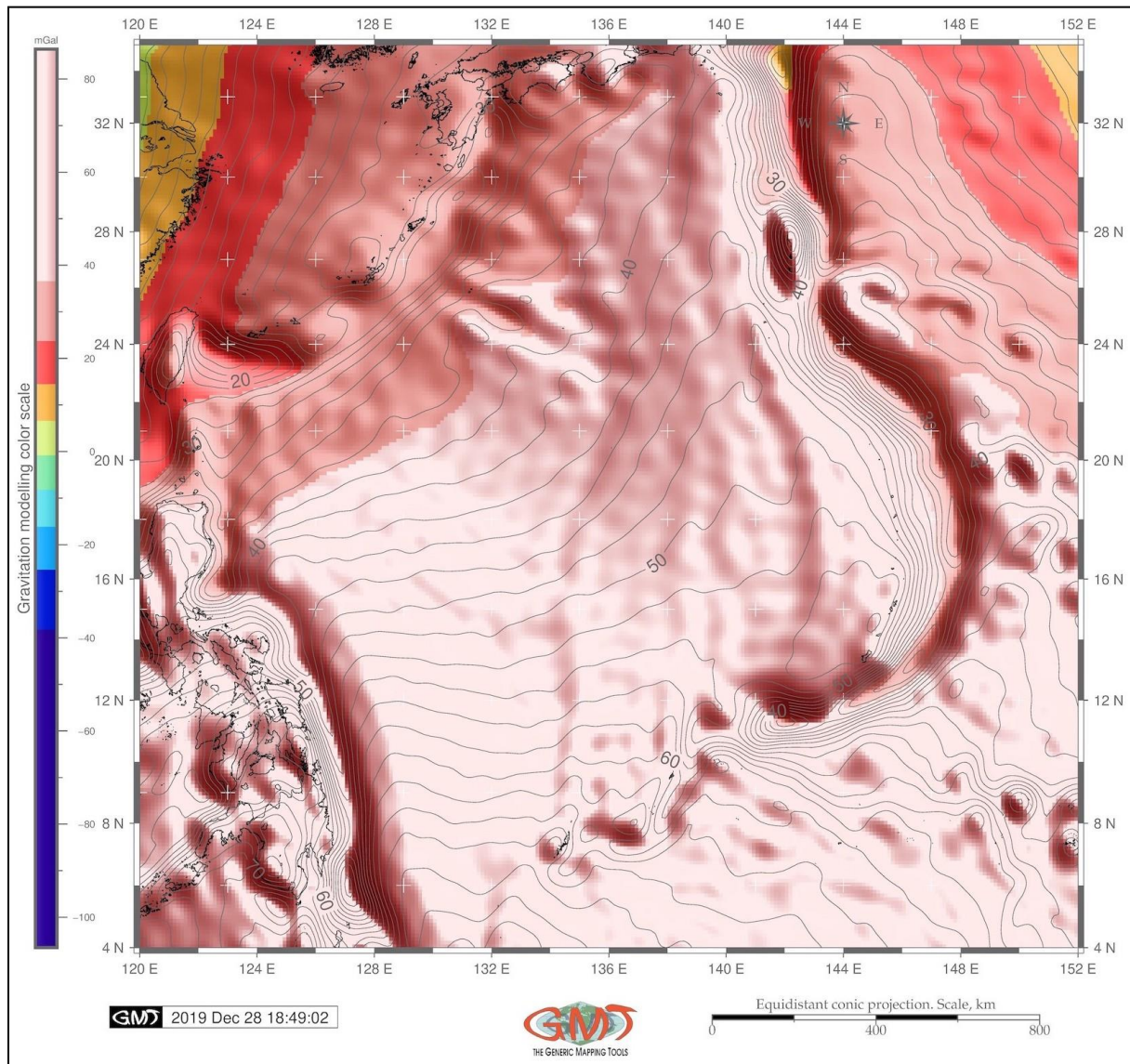


Figure 2. Geoid regional model: Philippine Sea Basin. World Geoid Image EGM96, version 9.2 2-min resolution, mapping: GMT
(Source: author)

Presented cross-section transecting profiles are derived from the existing data source of International Seismological Centre (ISC-EHB). The ISC-EHB is an abbreviation which stands for the “Engdahl-van der Hilst-Buland (EHB) Bulletin” of hypocentres and associated traveltime residuals of the seismic events. It was originally developed and technically described by Engdahl et al. [24] and finished in 2008. It is a widely used seismological data set, which is now expanded and reconstructed.

The cross-section profiles and map visualization location of the earthquake events are presented on Figure 4 and 5. Transecting cross-sections is a common cartographic technique that are described in detail in many existing works [25-30], the main approach consists in deriving information as a table reflecting coordinates of the sample points (X, Y) and a Z-value in each of the sampling points. Variations of attributes values can be analyzed along the transecting line and spatial analysis of the observed trends.

4. RESULTS

Marine free-air gravity anomaly in the PSB is visualized on Figure 3. Anomalies >60 mGal are evident in the trench areas (Figure 3), which are consistent with previous results [31-33]. The results were compared with existing 2D and 3D geophysical and geological maps, visualization of the slab gaps or tears

in the Philippine Sea Plate region [34-42] to highlight the geology, geophysical settings and geomorphic features of the submarine trenches in PSB area. Higher values (>80 mGal) of the gravity fields structure are apparent at volcanic areas and Philippine archipelago, as seen in orange to red colored areas, Figure 3.

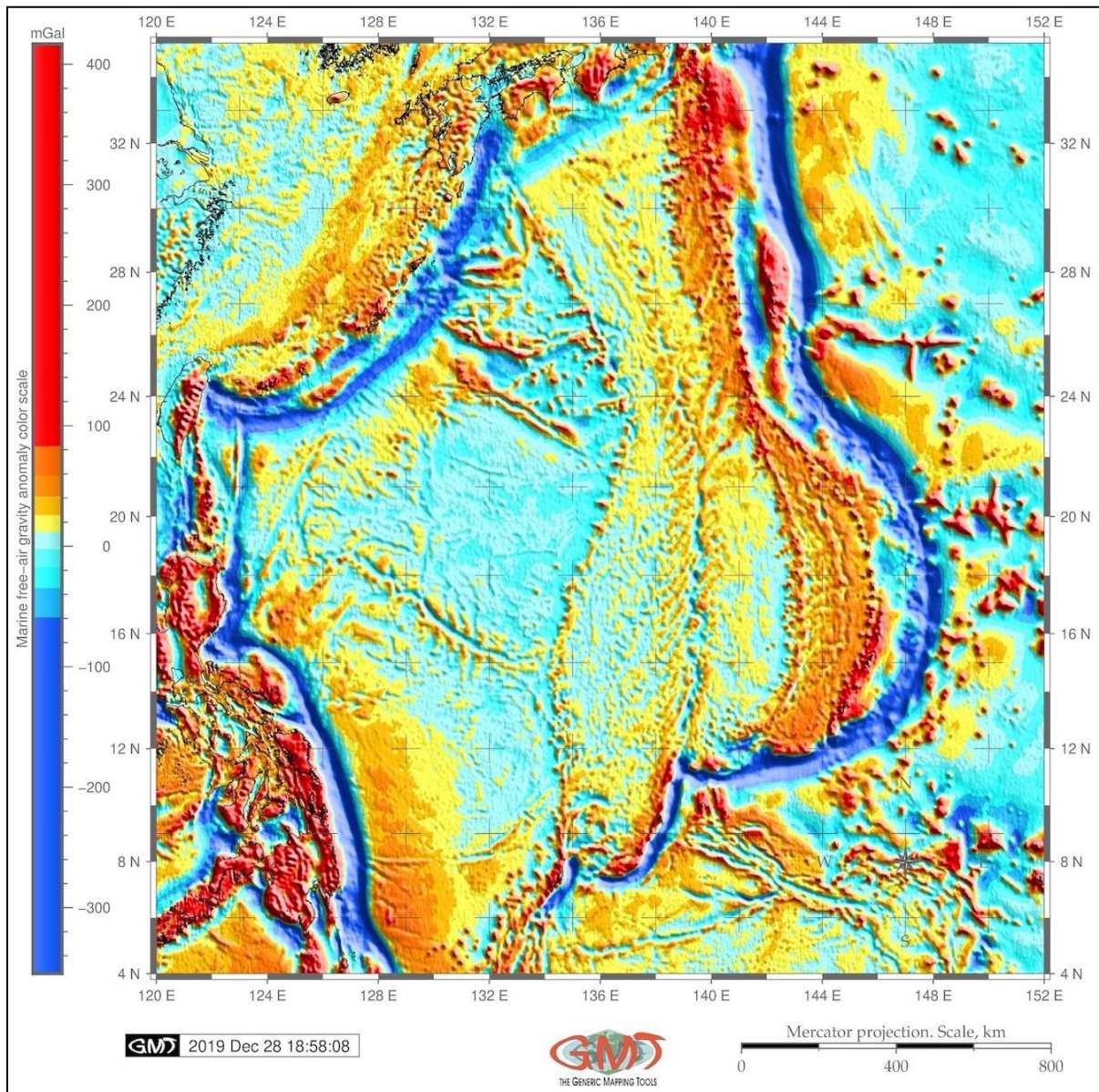


Figure 3. Marine free-air gravity anomaly model of the Philippine Sea Basin. Grids from CryoSat-2 and Jason-1, 1 min resolution, mapping: GMT
(Source: author)

The geoid model (Figure 2) represents a map showing shape that ocean surface would have with the sole influence of the gravity and rotation of the Earth under the condition that other climatical and meteorological influences (e.g. winds, tides) are absent and do not affect the model. The data as a grid raster (geoid.egm96.grd) was visualized. Afterwards, land areas were clipped as gray shaded areas to focus on the ocean region. The model implies graphical representation of the geoid data ranging from -108 to -85 mGal, where the majority of the data range (represented in pale red and rose colors) lies in the interval of 22-85 mGal.

Hadal trenches account for the deepest 45% of the oceanic depth range [43]. The majority of the seafloor ($>83\%$) is occupied by the abyssal depths (3,000 to 6,000 m) [44-45], followed by the extreme depths of $>6,000$ m. Specifically for the Mariana Trench (shown as crescent arc on Figure 4a), the extreme depths are restricted mostly to the deepest part of the trench located in its south-western part (area of Challenger Deep). Depressions of 6,000-7,500 m BSL occasionally occur in the central part of the Mariana Trench crescent forming unique patterns in its geomorphological structure [46]. Figure 5

shows modeled earthquake events (separated as L1, L2 and L3 by various colors) and the location of the trench is marked as a blue triangle.

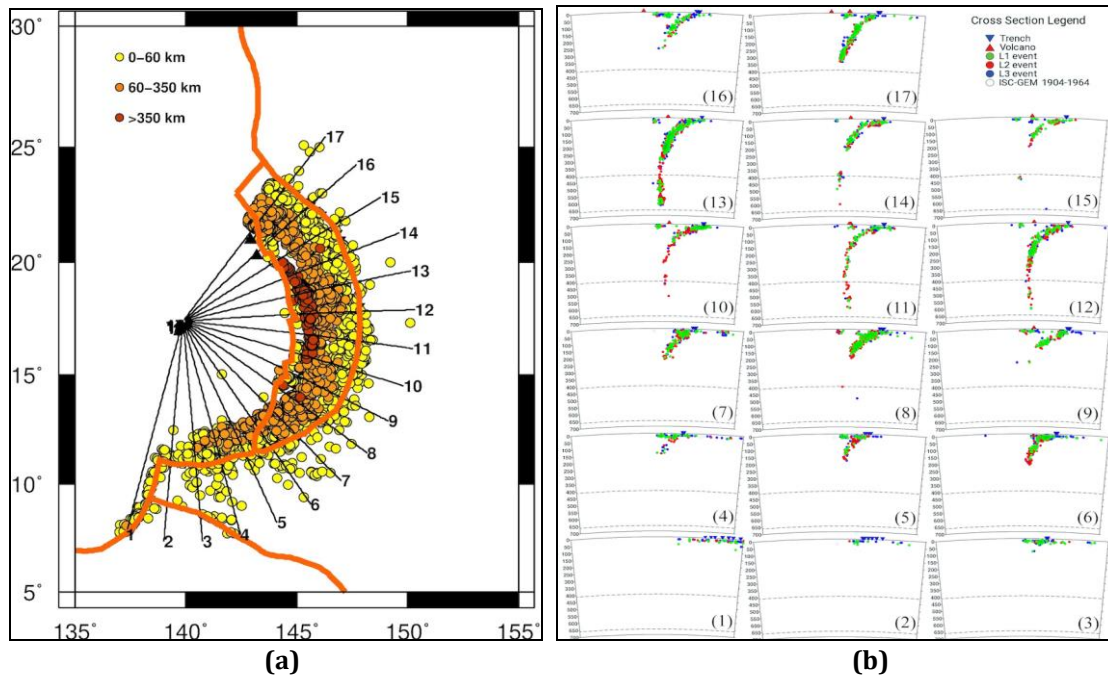


Figure 4. Example of seismic profiling through cross-sectioning:
(a) Map of the cross-sections of the earthquake transects: Mariana Trench;
(b) Cross-sections of the earthquakes (17 transects): Mariana Trench
 (Source: **a.** ISC-EHB; **b.** Modified after: ISC-EHB)

The depth of the submarine volcanoes is highlighted by yellow, orange and brown colors, respectively (Figure 4a). From the analysis of the Figure 4b it can be drawn that the deepest volcanoes (located on the depths >350 km) are located on the western side of the trench while shallow volcanoes (0–60 km) are situated on the eastern flank. The deepest earthquakes occur within the core of the subducting slabs of the Philippine Sea Plate (PSP) that descend into the Earth's mantle from convergent plate boundaries. Here, a dense PHP collides with a less dense continental Eurasian Plate, and sinks beneath it. As a consequence, the plate boundary contact between the PSP and Eurasian Plate generate large, shallow subduction zone earthquakes, only active at shallow depths: 0–60 km (Figure 4a and 4b).

Geomorphological structure of the Philippine Sea is notable for the chain of island arcs (Nampo, Mariana, Yap, Palau) bounding PSB from the East and the corresponding chain of the deep water trenches associated with them. According to the relief, the bottom of the Philippine Sea can be attributed to the ocean bed. The Philippine Sea is divided into the basins of the Philippine, Nampo and West Mariana by underwater ridges that differ in depths (Figure 1, various colors on the topographic map). Thus, the prevailing depths in the PSB are 5,500–5,800 m, in the Nampo and Mariana – from 4,800 to 5,200 m, although individual depressions of the bottom reach >6000 m [47].

The seafloor relief of the PSB, unlike the basins of the marginal seas, is strongly dissected, hilly-shaped, with depth amplitudes 100–500–700 m. The orientation of the ridges is mainly sub-meridional and north-western, corresponding to the strike of large morphological structures. As a consequence of such complex geomorphological structure resulted from the geological historic development, Mariana Trench advances toward the upper plate corresponding to the subduction of very old, Mesozoic oceanic lithosphere, having typical depths of the seafloor at 4–5 km [48–49].

Now comparing the distribution of earthquakes along the cross-sections in the area of Philippine Trench (Figure 5a) to the Mariana Trench (Figure 4a), it can be seen that the deepest volcanoes (located on the depths >350 km) are mostly concentrated on the south-western part of the study area (highlighted as brown on the map), while shallow volcanoes border eastern and north-western areas. Volcanoes located along the axis of the trench mostly have depths of 60–350 km. Moreover, the depths of the volcanoes situated along the Philippine archipelago (Figure 5b) show that the deepest transects (subplots 1, 2 and 3 on Figure 5b) are mostly located at the depths crossing the marked dashed line of 400 km. These are the most southern transects directed SW-NE.

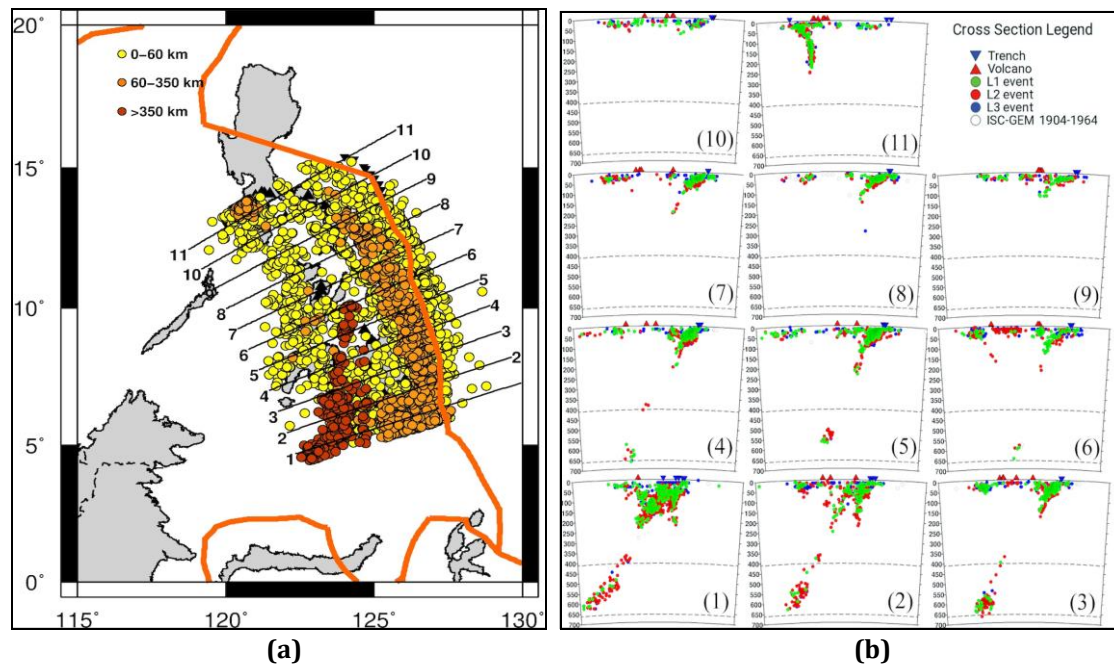


Figure 5. Example of seismic profiling through cross-sectioning:
 (a) Map of the cross-sections of the earthquake transects: Philippine Trench;
 (b) Cross-sections of the earthquakes (11 transects): Philippine Trench
 (Source: a. ISC-EHB; b. Modified after: ISC-EHB)

Since the strength of shaking from an earthquake naturally becomes lesser when the distance increases from the earthquake's source (that is, its depth), therefore the strength of shaking at the Earth's surface resulting from an earthquake is naturally affected: the shake is considerably less from the earthquake that occurs at >350km, and on the contrary, if the same earthquake occurred at shallow depths, e.g. 0-60 km depth, then the consequences, such as shaking, are stronger. This mostly concerns the Philippine archipelago, due to the population inhabiting the islands.

Besides environmental effects, the depths of earthquakes provides crucial information about the Earth's structure, as well as geological and tectonic setting in the area where the earthquakes are happened, because they are associated with a subduction zone. Thus, earthquakes (their depth and magnitude) indicate the subduction zones, where tectonic plates are being dipped one under another as a result of colliding caused by their complex movements.

Plotted location of earthquakes (Figures 4a and 5a) and their depths (Figures 4b and 5b), visualize details of the subduction zone's structure for Philippine and Mariana Trenches, consequently. Specifically, they indicate steepness of the dipping, and if down-going plate is planar or bending with certain degree of curvature. These correlations are important as detailing mechanics and characteristics of the deformation that takes place in the subduction zone for the Mariana and Philippine trenches, respectively.

5. DISCUSSION

Geophysical visualization and comparative assessment of the earthquake events between two trenches based on the cross-section transecting and spatial analysis of their geological, geophysical and tectonic settings based on the geospatial visualization, highlighted differences between the two marginal trenches of the PSB and visualized variations in the seismic situation between deep-sea trenches in their different segments. Presented research contributed to deeper understanding of the geophysical settings of the PSB and Mariana Trench located along its margins, as well as to test a GMT approach for geophysical mapping with example of gravity and geoid grids.

Geophysical hazards, like earthquakes, volcanic eruptions and tsunamis, belong to the category of natural hazards. A natural hazard is understood as a potentially damaging natural event that may lead to the loss of life, injury, property, destructions of buildings and roads or degradation in the neighbor areas that were affected by the events. However, it should be stressed that although earthquakes, as geophysical events, are destructive phenomena, their fundamental nature is a process of the dynamic functioning of the planet. As briefly described before, the nature of the earthquakes and origin of trench formation lie in

the phenomena of the tectonic plates subduction, i.e. is a complexity of movements of the lithospheric plates. Therefore, risk of earthquake hazards in the Philippine archipelago are explained by naturally occurring processes in the earth's interior.

Earthquakes hazards in turn induce consequences such as landslides, tsunamis and volcanic eruptions that may affect sustainability of the local population. One of the most dangerous events that should be mentioned in this context is tsunami, sea waves resulting from the seafloor displacements associated with large earthquakes or exploding volcanic islands.

Specifically for the Philippine area, volcano and earthquake disasters are frequent in the top 10 among other natural disasters according to the EM-DAT: The OFDA/CRED International Disaster Database (<http://www.em-dat.net/>). Plotting hazards in the Philippine area through maps, particularly earthquake events, were visualized with the base map and cross-sections from the ISC-EHB, a dataset of seismic events. The base maps of the Philippine Sea region show the bathymetry and topography of the area together with geodetic modelling. Geographic Information Systems (GIS) software are traditionally used to overlay and visualize hazard maps with other layers. In contrast, this paper presents a GMT visualization which is based on the console commands from the shell scripts.

To increase sustainability of the region, a Philippine Institute on Volcanology and Seismology, PHIVOLCS (<https://www.phivolcs.dost.gov.ph/>) was established to record geotectonic phenomena: destructive earthquakes, volcanic eruptions, tsunami and to mitigate arising disasters providing with information since 1968, through appropriate detection, forecasting and warning system. In view of this, correct mapping of the geophysical settings and visualization of the earthquakes are useful part of such programs.

The actuality of the cartographic visualization of the earthquakes and geophysical settings assists in the following aspects. First, maps can be used to predict the occurrence of volcanic eruptions and earthquakes based on the geospatial comparative analysis of the repeatability and locations on the events. Second, analysis of the visualized geophysical settings may assist to determine probability of the areas affected by eruptions and earthquakes. Third, correctly visualized and sufficient datasets are useful for forecasting volcanic eruptions and earthquakes. Fourth, hazards of volcanic activities can be mitigated through appropriate detection, forecast and warning system that in turn requires mapping as powerful assisting visualization tool for formulation of the appropriate disaster preparedness plans. In view of the above said, mapping geophysical situation has actuality for the Philippine Sea area.

General conceptual idea of the presented study may be extrapolated to other objects of ocean topography where disastrous events and earthquakes take place. Methodologically, the study contributes towards technical application of the GMT for gravity modelling and mapping and earthquakes visualization. Submarine earthquakes located along the two trenches, Mariana and Philippine, as well as structure of the gravity and geoid in the PSB area were examined using high-resolution GEBCO topographic and gravity data grids in NetCDF format, geologic vector layers and modeled profiles.

6. CONCLUSIONS

This paper demonstrated technical application of the GMT based methods for geophysical visualization of the raster data grids, as well as data from the International ISC-EHB, a dataset of seismically constrained events. The cross sections of seismicity in subduction zones around the world provided by the ISC-EHB, enable to get a closer insight to the repeatability and depth of the earthquakes and analyze the risks of hazardous events for the population living in the Philippine Islands.

As mentioned before, trenches of the Philippines Sea region are located on the "Ring of Fire", a Circum-Pacific belt of earthquakes and regular volcanic eruptions stretching on ca. 40,000 km along the margins of the Pacific Ocean. This explains the vulnerability of the area, and specifically, the country of Philippines, towards frequent seismicity and active volcanism. The country is at risk of the repetitive earthquakes of various magnitude that occur on a regular basis, caused by tectonic subduction of the Philippine Sea Plate, as discussed in the above chapters.

Indeed, the analysis of the Philippines Sea marginal area shown high earthquake hazard according to the information derived from the International Seismological Centre Bulletin (ISC-EHB) cross-sections and maps. Hence, there is a high possibility of the risk of potentially-damaging earthquakes shaking in coastal area of Philippines. Based on the data visualization, the impact of earthquakes and submarine volcanism should be analyzed and considered in all phases of the sustainable development of the Philippine cities

during construction of buildings and infrastructure. More specifically, city planning decisions, design, and construction of roads should take into account the possibility of the earthquake hazards and risk to the population.

Besides major earthquakes, there is a risk of secondary hazards that may affect population, such as fires, landslides, tsunami in the coastal areas and aftershocks. In view of this, local building regulations should be adapted to provide earthquake protection in case of the events through engaged engineering communities together with local governments. For example, since coastal areas are the most 'in danger' places, they might be affected much during an earthquake. The illustration can be, for instance, ground failure or landslides in the zones of unstable slopes. Therefore, geotechnical soil investigations should be performed to determine physical soil properties and geomorphological stability of the slopes.

There is a broad interest to the earthquake prognosis and mapping for both the region of the Philippines, since this region is situated in the zone of tectonic plates subduction and is therefore seismically active [50-55]. Practical example of the GMT based code for visualizing free-air gravity aims to contribute to technical development of the geological mapping through cartographic assistance. Visualizing geophysical situation and mapping earthquakes events is useful for deeper understanding of the geophysical settings of the 'areas at risk', located in seismically active margins of the Pacific Ocean. The presented techniques of the gravity mapping can be utilized at similar works for geophysical visualization.

From this point of view, this work presented a spatial analysis of the earthquake activities together with geophysical settings in the study area (gravity and geodetic modelling) supported by GMT based methodology for visualization and modelling. Interpretation of the bathymetric and geological data obtained from the Mariana and Philippine trenches demonstrated GMT-based approaches to the cartographic mapping using high-resolution raster grids. In contrast to the classic cartographic approaches having traditional Graphical User Interface (GUI), e.g. ArcGIS based in geodata mapping [56-61], GMT is notable for its scripting algorithms as a core conceptual methodology.

Understanding geological and tectonic processes and associated seismicity is closely linked to effective visualization. Therefore, plotting various thematic maps visualizing geophysical settings in the Pacific oceans contributes to increase of our knowledge of the oceans in general and possible risks associated with earthquake events (aftershocks, tsunami) for people living in the coastal areas. Hence, visualized seismic and geophysical data is a significant contribution to the increase of the information pool on the marine geohazards, as well as a certain development of the ocean modelling and sustainable marine management. A spatial analysis deepen through enlarged data pools enables to respond appropriately to geohazards. This paper also demonstrated the importance of the high quality data grids for geophysical modelling, and presented snippets of the GMT codes for modelling free-air gravity and geoid with focus on compiling and processing data in command line through shell scripting.

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Factors for (Un) Sustainable Tourism Development

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Abstract: The issue of sustainable tourism development is discussed in numerous academic publications and official documents. Nevertheless practical implications of this concept are very rare in tourist destinations in Bulgaria. Sustainable tourism development can be shortly described as a development where the resulting economic and social changes lead to a decrease in the need for environmental protection. Quite a few publications try to identify the factors for destinations' sustainable tourism development. The present research is an attempt to view sustainability as a result of various impacts tourism exerts on the destinations. It can be accepted that positive tourism impacts enhance sustainable tourism development while negative ones can be blamed for the unsustainability of tourist destinations. In their turn tourism impacts are subject to numerous regional and local factors making their monitoring and evaluation extremely difficult but nevertheless indispensable. The present study focuses on three main factors for tourism impacts in destinations in Bulgaria. The three factors investigated are: level of tourism development, stage of tourism development life cycle and prevailing tourism type. But how do we measure tourism impacts and how do we compare them? The impacts in those destinations are evaluated by the local population. This is a way in which all impacts can be compared since they are measured by one and the same indicator – the values they receive from the local population. 5 000 questionnaires are distributed and 4 397 are processed. One of the most interesting findings shows that the least sustainability can be expected in highly seasonal destinations no matter of the level or the stage of their tourism development. It was found out that all three investigated factors are of great importance for the differentiation of local residents' attitude towards tourism, for their perception of tourism impacts and for overall tourism sustainability in general.

Key words: Tourism, sustainability, development, factor, evaluation, average value

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1. INTRODUCTION

More than 20 years after the United Nations Conference on Environment and Development in Rio de Janeiro the issue of sustainable tourism development as part of the overall sustainable development is being discussed in numerous academic and practical oriented publications [1]. This research is facilitated by the great number of tourism impact investigations and the need for their management. The importance of tourism impacts increased significantly lately in the context of tourism policy and tourism planning and of the widespread sustainable tourism development concept. The equity of economic, social and ecologic tourism aspects is stressed upon. The satisfaction of public needs should be placed in conformity with the limited resources as well as with the equality of present and future generations' rights. Sustainable tourism development should be such a development where the economic and social changes related to it lead to a decrease in the need for environmental protection.

More specifically sustainable tourism development is described as a development where there is:

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1. Integrity of economic development and environment protection goals. From tourism point of view this means the utilisation of tourist resources in such a way so that it would simultaneously bring benefits for the local population as well as satisfaction to the tourists without causing serious damage of the natural and socio-cultural environment;

2. Fair distribution of the wealth created by tourism product sales and also of the costs for the tourist resources preservation in various regions and countries both among them and among the generations;

3. Binding quantitative growth with the environment's quality improvement which is in the mutual interest of the local population and of the tourists looking for attractive and unpolluted vacation environment.

On the one hand sustainable tourism is attempting to have a low impact on the environment and local culture, while helping to generate future employment for local people. Its aim is to ensure that development brings a positive experience for local people, tourism companies and tourists. On the other hand tourism impacts are the effects caused voluntarily or unwittingly by the development and practicing of various tourism activities thus affecting all types of environment – natural, economic, social and cultural. According to their manifestation field Mathieson and Wall [2] classified impacts into 3 categories: social, economic and physical (environmental).

For a long time various institutions and organizations worldwide have been trying to develop indicator systems for the evaluation of tourism impacts. Quite well known and widely used are the Global Sustainable Tourism Criteria developed in 2007-2008 [3]. They are 34 divided into 4 groups as follows:

- Demonstration of effective sustainable management – 7 indicators;
- Enhancement of the social and economic benefits for the local population and decrease of the negative impacts – 8 indicators;
- Enhancement of the cultural heritage benefits and decrease of the negative impacts – 4 indicators;
- Enhancement of the natural environment benefits and decrease of the negative impacts – 15 indicators.

Despite all implementation efforts these criteria have one grave methodological problem - the indicators for each group are incomparable to each other since they are being measured in different units. The volume of tourism income cannot be compared to the numbers of destroyed plants and trees or to the numbers of crimes in the destination. It is difficult to determine which of them is more important and prevails over the others. There is no general measure for all types of tourism impacts. The present study makes an attempt to introduce as such a measure the values given to various tourism impacts by the local population.

Another aspect of the issue of connecting tourism impacts to destination sustainability are the key factors that influence tourism impacts manifestation. Ryan (1991) [4] enumerated many factors for sustainable tourism development. As it turns out in many cases an important factor for sustainability of the destination is its seasonality. Research shows that in destinations with all-year-round tourism sustainability is much higher than in heavily seasonal destinations. Other factors can be the number and the type of tourists, the volume and the structure of tourist spendings, the degree and the stage of tourism development, the differences (economic and social) between the tourist destination and the tourists generating regions. The physical dimensions of the tourist destination and the relative share of domestic tourism entrepreneurs also play an important role for the nature of tourism impacts in the destination. Local tourism policies and management, the homogeneity of the local society and economics and the speed and intensity of tourism development are also important factors for tourism impacts and the resulting tourism sustainability [4]. An interesting approach to the study of sustainability would be a simultaneous research of these three intertwining aspects of tourism development – tourism impacts, factors for them and sustainability itself. The present study aims at focusing on this issue taking as an example tourism development in several Bulgarian destinations.

With the growing number of tourist trips in Bulgaria the problems related to tourism impacts and sustainability are becoming more and more evident. Adequate answers to those issues should be based on systematic and detailed research. Unfortunately with some exceptions [5-9] this issue has not yet been discussed in detail in Bulgarian academic publications.

It is assumed that factors influencing the manifestation and evaluation of tourism impacts are also factors for tourist destinations' sustainable tourism development. In this way this paper is an attempt to identify some general factors for tourism impacts in Bulgaria as perceived and evaluated in a local residents' perspective. Their importance for the overall sustainable tourism development is further revealed and analysed.

2. LITERATURE REVIEW

Over the years many books and articles related to tourism impacts research, sustainable tourism development and residents' perceptions of both were published, for example in the last 15 years: Andereck and Nyaupane (2011) [10], Aref (2010) [11], Assenova and Vodenska (2012) [8], Brida et al. (2011) [12], Chen and Chen (2010) [13], Choi and Murray (2010) [14], Diedrich and Garcia-Buades (2009) [15], Kim et al. (2013) [16], Nunkoo and Gursoy (2012) [17], Vareiro et al. (2013) [18], Vargas-Sanchez et al. (2011) [19], Yu et al. (2011) [20], McGranahan (2011) [21], Dibra (2015) [22], Rodríguez and Espino (2016) [23], Cvelbar and Dwyer (2013) [24], Muresan et al. (2019) [25], Ulus and Hatipoglu (2016) [26], Tsung and Fen-HauhJan (2019) [27], Cruz Ruiz et al. (2019) [28], Cruz Ruiz et al. (2020) [29], Mathew and Sreejesh (2017) [30], Cevirgen et al. (2012) [31], Cottrell et al. (2007) [32], Rasoolimanesh and Jaafar (2017) [33], Zamani-Farahani (2016) [34], Cucculelli and Goffi (2016) [35], Long and Kayat (2011) [36], Fong and Lo (2015) [37], McLoughlin et al. (2018) [38], Bakhat et al. (2010) [39], Gavinho (2016) [40], Aragon-Correa et al. (2015) [41], Barrutia and Echebarria (2015) [42], Cengiz (2012) [43], Scaccia and De Urioste-Stone (2016) [44], Jugurnath et al. (2017) [45], etc.

Thematically all those publications can be differentiated in the following themes: residents' perceptions, tourism sustainability, tourism impacts and sustainability factors. The main areas of investigation are outlined as follows:

- The major issue in most publications reviewed is the residents' perceptions and their attitude towards tourism -25 articles [10-20,25,27-29,31-34,36,37,40,42-45].

It is generally recognized that the inclusion of residents to the process of sustainable development and their involvement in the decision-making mechanisms represent a focal point in sustainable tourism development [31]. It should be kept in mind though that local residents are not fully aware or nor have much knowledge about the concept of sustainability and its principles, yet they still show positive attitude towards them [31].

- Some of the studied publications investigate various tourism impacts in general [9,11,12,30,36,39].
- Other publications discuss the necessity of their measuring and monitoring [8,20]. Some articles investigate residents' perception of the impacts tourism has on their destinations [11,36], on their quality of life, and various relationships between those perceptions, the local economy and the support for tourism in the community [10,16]. Others investigate and analyse the importance and reliability of residents' perceptions of tourism impacts in general [13,19] and for tourism planning and management [43]. Another main research topic is sustainability of tourism in its various manifestations and meanings – 20 articles [5-6,8,14-15,20,22,27,28,30-33,35,37,38,41,43-45]. In some of them attempts are made to connect residents' attitudes to sustainable tourism development [14,20,28,31,32,43-45]. Many authors tackle the issue of sustainability as one of the most perspective ways of tourism development both for the community's benefit and for the perspective of tourism businesses [22,29,41]. As Barrutia & Echebarria [42] explicitly state tourism destinations are the singularly interesting areas for studying sustainability issues.
- Another specific research topic is the role various factors play for residents' perceptions and destination tourism sustainability. There are some publications researching sustainability assessment factors [21], factors influencing businesses to adopt sustainable tourism practices [22], factors in achieving the sustainability of a tourism destination [23], etc. The importance of economic, environmental and social factors to sustainable operations [24] is also revealed. As Muresan et al. [25] point out "Understanding the implications of tourism development from the residents' point of view helps to increase knowledge about the factors affecting the long-term, sustainable success of tourism destinations". Other authors seek the possibility for tourism sustainability in human-related factors [26]. Community attachment and economic dependence are shown to have significant effects on positive tourism impact [13]. Other authors focus on the connections between the demographic variables gender, age, instruction level and salary and the economic, socio-cultural and environmental impressions of sustainable tourism [33,45].
- Some authors investigate the destination's life cycle as a factor as well – Tsung & Fen [27] speak about economic, socio-cultural and environmental sustainability. The three vary significantly in the consolidation, development, and involvement stages of community-based tourism development. They also point out that residents' perceptions differ across the developmental stages. So managers should consider the development opportunities and adopt appropriate strategies across different development stages. Diedrich & Garcia-Buades [15] also use the concept of a tourist area cycle of evolution to prove that local perceptions of tourism impacts may be used as indicators of destination decline. Kim et al. [16] underline the role of both the stage and the level of tourism development in

the community to investigate residents' perceptions of tourism impact (economic, social, cultural and environmental).

- All researchers tried to use various techniques for their investigations and did their best to achieve reliable and significant results. All research on residents' perceptions is based on questionnaire surveys but as a major critique to all studied publications it has to be pointed out that the number of respondents in most of them is quite low (in the researched publications they vary from 43 [21] to 1230 [28]) - [13,14,16,18,27,29,30-34]. Despite the low respondent numbers authors go to certain lengths applying sophisticated quantitative techniques and methodology while the same results can be very easily obtained by using much simpler methods such as average values, correlation coefficients and even the descriptive method [28].
- An interesting approach can be seen in Cucculelli & Goffi [35] who introduce a set of sustainability indicators in order to examine the role of sustainability as crucial determinant of the competitiveness of a tourist destination. Most of the studies are conducted in well developed tourist destinations - Italy [12,35], Portugal [18], Spain [28], Slovenia [24], Ireland [38], Morocco [40], Balearic Islands [42], Turkey [31,43], Mauritius [45], Poland [29], Bulgaria [5-7,9]. Some publications are dealing with residents' perceptions and tourism impacts in new or emerging tourism destinations - Iran [11,34], China [32,37], Namibia [21], Vietnam [36], India [46-48], Zimbabwe [49], Nepal [50-52], Malaysia [53-55], Australia [56], New Zealand [57]. Despite the different geographic and economic context findings are very similar and contribute to the general body of knowledge of the subject matter.

Results show in general that favorable attitudes are found to be linked with tourism socio-cultural impacts, while environmental and economic matters are found to be the least favorable in terms of the perceived impacts of tourism [11]. Recognition of the positive economic impacts of tourism by residents is revealed. Also, the social and cultural impacts are recognized to be positive, but at a lower degree [12].

Choi & Murray [14] state that long-term planning, full community participation and environmental sustainability within tourism, are critically related to support for tourism and to the positive and negative impacts of tourism. According to Vareiro et al. [18] the early stage in a destination's life cycle has a major reflex in the devaluation by most residents of the negative impacts of tourism development.

3. METHODS AND DATA

The main research assumption in this research is the introduction of a general measure for all types of tourism impacts - economic, social and environmental. This measure is their evaluation by local residents. Impacts are evaluated with the help of a 5-stage Lickert Scale so that they can be compared in their intensity of manifestation.

Factors for tourism impacts evaluation by local population are investigated through a field survey in 16 tourist destinations in Bulgaria. Destinations are chosen in a way as to include both territories with a well developed tourism industry and a steady tourist flow and destinations at the start of their tourism development. At the same time they represent the four main tourism types in Bulgaria - seaside, mountain, spa and cultural tourism (four destinations for each tourism type). Within each group of 4 destinations two are with very well developed tourism and two are at the beginning of their tourism development. These characteristics are specified using the methodology proposed by Butler [58] and developed in more detail by Cooper [59].

The following destinations are chosen - seaside: Burgas and Primorsko with well developed tourism and Pomorie and Byala with medium to low tourism development; mountain: Samokov and Smolyan with the two biggest national mountain resorts Borovets and Pamporovo in them, and Bansko and Elena with a medium to low tourism development; cultural tourism destinations: Sofia and Veliko Turnovo with well developed tourism and Koprivshitsa and Jheravna with medium to low tourism development; balneo and SPA destinations: the well developed Velingrad and Sandanski destinations and Varshets and Kostenets with a lower tourism development. All destinations are scattered across the country except for the seaside ones which are at the Black Sea coast (Fig.1). The main tourism characteristics of the municipalities where they are situated are given in Table 1.

A written standard anonymous questionnaire with 66 questions is used. The questionnaire language is Bulgarian. The sections of the questionnaire correspond to the variables of the study - the three main types of tourism impacts - economic, social and environmental as determined by Mathieson & Wall [2]. At the beginning of the questionnaire is the section referring to the socio-economic profiles of the respondents. It is placed there so that the respondents would feel comfortable seeing that they can cope with the questions in it. The impacts were illustrated by various statements dispersed across the questionnaire so as to keep respondents on the alert and not let them slacken and lose attention. Respondents were asked to evaluate them using the 5-stage Lickert Scale. The duration of data collection

was approximately one year and a half. The questionnaire was used before by Vodenska [9] who discussed the issue of its validity and reliability.

Evaluations of the impacts of tourism are analysed within separate destinations and destination types. This is done with a view to their better and detailed clarification. It helped also the definition of the key factors and a more specific and targeted formulation of the problems facing sustainable tourism development in Bulgaria.



Figure 1. Researched tourism destinations in Bulgaria

Table 1. Main tourism indicators of the 16 investigated destinations/municipalities (2018)

Tourism type	Municipalities	Beds (No)	Nights (No)		Visitors (No)	
			Total	International	Total	International
Seaside tourism	Burgas	3 824	469 556	100 658	301 395	77 951
	Primorsko	8 384	566 762	331 310	50 882	9 197
	Pomorie	2 478	99 925	17 528	10 077	1 346
	Byala	1 626	40 919	626	4 133	275
Mountain tourism	Samokov	4 309	572 433	400 247	203 230	51 117
	Smolyan	4 932	520 277	102 132	49 628	12 117
	Bansko	2 105	15 972	6 017	9 169	7 109
	Elena	280	6 214	140	5 553	70
Cultural tourism	Sofia	10 379	1 238 218	690 331	522 044	270 439
	Veliko Turnovo	2 774	139 962	31 168	105 853	43 040
	Koprivshtitza	439	12 083	4 196	7 725	3 142
	Jheravna	433	11 074	3 125	5 623	2 075
Balneo and SPA tourism	Velingrad	1 389	80 415	3 514	26 242	548
	Sandanski	2 323	146 640	33 854	53 497	7 758
	Varshets	492	25 911	1 310	6 266	252
	Kostenets	405	10 534	1 068	5 312	249

(Source: National Statistical Institute, 2019)

Two sample types are used – a single stage areal sample and a simple random stochastic sample. The scale types used are: ordinal rank scale, 5-stage Lickert Scale, nominal scale, interval scale, the scale of Gutmann. The average values of local residents' evaluations of tourism impacts are used. In the analysis of the results a value of a 0.5 standard deviation is accepted. It has to be pointed out that in all cases the

standard deviation is below 0.5 which shows a great consistency and concordance in the respondents' replies.

For further and quicker orientation in the impacts evaluation Vodenska [9] introduced three zones of the impact assessment implemented in the present paper as well:

- a green zone where average values of the positive evaluations are above 3.50 and of negative ones – below 2.50 (the lowest value being 1 and the highest - 5). The green zone means that tourism impacts are mostly positive and the level of sustainability is quite good;
- a yellow zone with positive and negative average values between 2.50 and 3.50. In this case the overall tourism impacts are quite controversial and after more detailed research they have to be regulated in order to pass into the green zone. Tourism sustainability is under question;
- a red zone with average positive impact values below 2.50 and average negative impact values above 3.50. Impacts are generally evaluated as negative and they require immediate regulative actions. Tourism sustainability is very low or nonexistent.

The number of distributed questionnaires is 5 000 in the 16 destinations the return rate being quite high- 87.9%. 4 397 representatives of the local population answered the questionnaire. The study covered all age groups over 16 years - people with varying educational background, field of activity and impact of tourism on their income. The respondents' profile is given in Table 2:

Limitations to the present research are to be expected but not proven in two directions: first, the wish of local residents to give a good overall picture of their destination reporting a more favourable tourism development in them, and second, the novelty of the survey topic and the insufficiency of informed knowledge for some of the respondents (see also [31]).

The present paper looks into the nature of three important factors for tourism impacts and the degree of tourism sustainability evaluation as perceived by tourist destinations' local population:

- Prevailing tourism type – seasonal versus perennial tourism;
- Level of tourism development (measured by the density of beds and overnights per local population and per area);
- Stage of tourism development life cycle – according to Butler [58] and determined by the methodology of Cooper [59].

These are the so called external or independent factors pertaining to the destination which cannot and are not influenced by the local population's characteristics such as age, gender, occupation, etc.

Table 2. Profile of the respondents

Age (%)	Below 24	24 - 34	35 - 49	50 - 64	Above 65
	26.9	27.1	29.4	13.7	2.7
Gender	Male		Female		
	40.4		59.6		
Duration of living in the destination (%)	Below 1 year	1-5 years	6-10 years	11-20 years	More than 20 years
	2.9	6.3	8.2	25.5	57.1
Education (%)	Primary	Basic	Secondary	Secondary special	Higher
	0.9	12.6	26.9	24.6	34.2
Profession (%)	Employed	Unemployed	Students	Retired	
	44.5	16.9	34.6	4.0	
Occupation in the tourism sector (%)	Yes - main occupation		Yes - additional occupation		None
	25.4		28.1		47.8
Family member in the tourism sector (%)	Yes			None	
	41			59	

(Source: author's calculations)

4. RESEARCH RESULTS

Among all impacts and across all destinations the highest positive values were given for the social tourism impacts followed by the environmental impacts. Their average values fall into the green zone – 3.92 and 3.63 respectively. Quite surprisingly the economic impacts got the lowest values being at the upper part of the yellow zone (3.46). This may be explained by unjustified expectations of the local population, leakages from the local economic system and the presence of many unlocal tourism business.

The same picture can be observed by the negative tourism impacts evaluation – the economic impacts are again in the yellow zone (average value 3.22). The other two impact types are in the green zone, their average values being below 2.50, the lowest value for the social negative impacts being 2.39.

The greatest difference between positive and negative evaluations is observed by social impacts and the smallest one – by economic impacts.

The role of the main independent destination factors for the values received and for the sustainability of tourism development in various tourism destinations is further analysed.

4.1. Prevailing tourism type

There is a very pronounced dependence of tourism impacts evaluation in various destinations on existing tourism seasonality in them. The highest average values for positive impacts are observed in destinations with prevailing perennial tourism types - cultural (3.92) and spa (3.79) tourism. In winter ski-tourism destinations this value falls to 3.65 (so far all values are in the green zone). The lowest one is observed in seaside destinations - 3.37 (upper part of the yellow zone). This difference of about 0.55 between the highest and the lowest average value indicates that tourism seasonality plays a significant role in local residents' perception and evaluation of tourism impacts.

On the other hand the highest mean value for negative tourism impacts is observed in seaside destinations – 2.51 (the lowest part of the yellow zone, almost in the red zone). The lowest one is received in destinations where cultural tourism is prevailing – 1.87 (green zone). The difference between these two values is 0.64 which again indicates a considerable differentiation among the destinations and a greater discomfort of seaside destinations' population.

Due to the high values of negative impacts evaluation it can be assumed that the more seasonal the tourism type in the destination the less sustainability can be expected in it. This can be easily explained by the yearly irregularity of tourism impacts in them – economic and social benefits are experienced only during high tourist seasons in seaside and mountain destinations. At the same time in SPA and cultural tourism ones they are more evenly distributed throughout the whole year. On the other hand it has to be mentioned that seasonality plays a positive role for environmental tourism impacts since outside the high tourist season natural components have the opportunity to regenerate and recreate in case they are not entirely and fully damaged or destroyed (e.g. vegetation, air, water).

4.2. Level of tourism development

The analysis of the dependence of impact evaluations on the level of tourism development in the destinations is done using correlation coefficients between the positive and negative values of the three impact types on the one hand, and some indicators for tourism development in them – No of beds, visitors and nights spent, percentage of international visitors and nights, incomes, density of beds and nights spent, etc. on the other hand.

The level of tourism development is of medium importance for tourism impacts evaluation in various destinations – correlation coefficients have low and medium values. The highest average values for positive impacts are in the green zone and are observed in destinations with medium (3.56) and lowest (3.52) development level of tourism. At the highest tourism development level this value falls to 3.42 and is already in the upper part of the yellow zone. On the other hand the highest average value (3.02) for negative tourism impacts is observed in most developed destinations, while the lowest one (2.53) is received in the least developed destinations. Both values are in the yellow zone and the difference between them being 0.49 indicates also a significant differentiation among the destinations and greater discomfort of the population in destinations with a higher level of tourism development. The lowest negative values of tourism impacts are to be observed in destinations with the lowest possible level of tourism development.

These findings indicate that the higher the degree of tourism development in the destination the higher the negative values of the impact assessment. This is an important prerequisite for a lower sustainability level in such destinations. This assumption can be easily explained by the pressure of negative tourism impacts in them – economic and social benefits to be received are negligible compared to overpopulation, noise, traffic jams, lack of social and economic accessibility for the local population to certain places and services, uneven distribution of economic benefits, etc.

4.3. Stage of the destination's tourism development life cycle

There is also a strongly pronounced dependence of tourism impacts evaluation in various destinations on their stage in the tourism life cycle. The highest average values for positive impacts are observed in destinations at the early beginning of their life cycle (3.76 – green zone). The lowest value (3.12 – yellow zone) is observed for the social impacts in destinations in the last stage of tourism development - stagnation. This difference about 0.64 indicates that the stage of tourism development plays a more important role in local residents' perception and evaluation of tourism impacts than the type of tourism or the development level in the destination.

On the other hand the highest average value for negative tourism impacts is observed in stagnated destinations – 2.96 (yellow zone), while the lowest one is received in destinations at the initial stage of development – 2.03 (green zone). The difference between these two values is 0.93 which indicates a much greater differentiation among destinations and greater discomfort of local population at a higher stage of tourism development. These results are in full conformity with Butler's model for the local residents' attitude towards tourism and tourists at various stages of tourism development [58]. The stage of tourism development of a destination is the best indicator for the positive and negative tourism impacts to be found in it.

The above values indicate that the higher the stage of tourism development in the destination the less sustainability can be expected. This can be easily explained by the continued manifestation of negative tourism impacts in them.

The results are visualized in more detail in the following two tables – Table 3 and Table 4:

Table 3. Average evaluations by type of impacts and type of destinations

	Economic Impacts		Environmental Impacts		Social Impacts	
Subgroups	+	-	+	-	+	-
Prevailing Tourism Type						
Summer seaside tourism	3.40	3.62	3.56	2.71	3.88	2.51
Balneo and SPA tourism	3.56	3.08	3.79	2.36	4.02	2.34
Cultural tourism	3.36	3.02	3.70	2.20	3.92	2.30
Mountain tourism	3.50	3.15	3.48	2.49	3.85	2.39
Level of Tourism Development						
High	3.55	3.51	3.52	2.69	3.90	2.60
Medium	3.48	3.21	3.71	2.39	3.98	2.41
Low	3.39	3.24	3.54	2.61	3.79	2.40
Very low	3.31	2.71	3.61	1.93	3.97	1.91
Stage of Tourism Development						
Introduction	3.31	2.71	3.61	1.93	3.97	1.91
Slow growth	3.50	3.11	3.79	2.23	4.03	2.35
Rapid growth	3.48	3.41	3.50	2.78	3.79	2.66
Consolidation	3.45	3.42	3.65	2.43	4.07	2.38
Stagnation	3.50	3.58	3.11	3.40	3.33	2.51

Table 4. Tourism impact zones by destination type

	Economic Impacts		Environmental Impacts		Social Impacts	
Subgroups	+	-	+	-	+	-
Prevailing Tourism Type						
Summer seaside tourism	Yellow	Red!!!	Green	Yellow	Green	Yellow
Balneo and SPA tourism	Green	Yellow	Green	Green	Green	Green
Cultural tourism	Yellow	Yellow	Green	Green	Green	Green
Mountain tourism	Yellow	Yellow	Yellow	Green	Green	Green
Level of Tourism Development						
High	Green	Red!!!	Green	Yellow	Green	Yellow
Medium	Yellow	Yellow	Green	Green	Green	Green
Low	Yellow	Yellow	Green	Yellow	Green	Green
Very low	Yellow	Yellow	Green	Green	Green	Green
Stage of Tourism Development						
Introduction	Yellow	Yellow	Green	Green	Green	Green
Slow growth	Yellow	Yellow	Green	Green	Green	Green
Rapid growth	Yellow	Yellow	Green	Yellow	Green	Yellow
Consolidation	Yellow	Yellow	Green	Green	Green	Green
Stagnation	Yellow	Red!!!	Yellow	Yellow	Yellow	Yellow

(Source: author's compilation)

5. DISCUSSION

Analysing the role of the three factors for the nature of tourism impacts and their evaluation the following generalization of the revealed findings can be made:

- For all three factors only some average values for negative economic impacts are in the red zone – in the one-seasonal summer seaside destinations, in destinations with high development level and for destinations at the stagnation development stage (Table 3).

This means that the level of sustainability in Bulgarian tourist destinations is quite good or good (Table 4);

- The stage of the destination's tourism development life cycle plays the most important role for local residents' evaluations of economic, social and environmental impacts and hence influences most strongly the level of tourism sustainability in the destination;

- The level of the destination's tourism development does not generally influence local residents' evaluations but is an important factor for the sustainability of tourism development;

- The prevailing tourism type in the destination is of medium importance in forming local residents' tourism impacts evaluations. In general positive impact values are more evenly distributed among the four groups of destinations. The highest values are to be found in the balneo & SPA destinations. Negative values are more differentiated, the highest negative values given in destinations with only one season (seaside tourism) and the lowest ones in destinations with prevailing perennial tourism;

- The most important finding of the present study is that the greatest influence for tourism impacts' evaluation in Bulgaria is manifested by the seasonality of the prevailing tourism type. This can be explained by the fact that excessive concentration of tourists and various tourism activities in a relatively short period of time causes a significant spatial and temporal concentration of predominantly negative tourism impacts in destinations with prevailing summer seaside recreational and winter ski-sports tourism. Perennial tourism types – cultural and SPA tourism impacts are more evenly distributed in time and space and do not demonstrate any extreme values.

- The higher level of destination's tourism development is characterized by more pronounced local population's perception of both positive and negative social tourism impacts;

- The stage of the destination's tourism development life cycle is the best indicator for negative but not of positive impacts perception.

Findings of the present research underpin results of previous studies discussed in the Literature Reviews section to a great extent.

An important contribution of the present research is that a method has been tested to compare the role and intensity of the three different types of tourism impacts – economic, social and environmental. While it is impossible to compare those using specific indicators for each group, it was proven that they can be easily compared by a common measure – the local population's evaluation using one and the same measurement scale for all tourism impacts.

Another important conclusion is that tourism sustainability in a destination has to be divided into: a) economic sustainability, b) social sustainability and c) environmental sustainability (see also [27]). Hence, all destinations with average values of the corresponding impacts being in the green zone should be considered sustainable; those in the red zone are already unsustainable and those in the yellow zone are on the border of sustainability or their sustainability is endangered. Future efforts of tourism destination managers and the tourist industry should be directed to maintaining the sustainability where it is in place and to improving it in destinations and impact areas where it is endangered (Table 5).

Four future research directions can be outlined:

- Further research of negative economic impacts in order to reveal the reason for their high evaluation by the local population;
- Further research of various tourism impacts in various destinations in order to confirm or discard the findings of this investigation. The possibility of applying local population's impacts evaluation as a tool for general determination of impacts intensity and direction has to be confirmed;
- Further research in order to identify additional factors for the manifestation and evaluation of tourism impacts in the destinations;
- Further research in order to confirm the relationships between: a) tourism impacts and tourism sustainability and b) tourism impact factors and tourism sustainability.

Table 5. Destination tourism sustainability by tourism impacts evaluation and factors

	Economic Sustainability	Environmental Sustainability	Social Sustainability
Prevailing Tourism Type			
Summer seaside tourism	Very endangered	Endangered	Endangered
Balneo and SPA tourism	Endangered	Good	Good
Cultural tourism	Endangered	Good	Good
Mountain tourism	Endangered	Endangered	Good
Level of Tourism Development			
High	Very endangered	Endangered	Endangered
Medium	Endangered	Good	Good
Low	Endangered	Endangered	Good
Very low	Endangered	Good	Good
Stage of Tourism Development			
Introduction	Endangered	Good	Good
Slow growth	Endangered	Good	Good
Rapid growth	Endangered	Endangered	Endangered
Consolidation	Endangered	Good	Good
Stagnation	Very endangered	Endangered	Endangered

(Source: author's vision)

The general problem outlined in the present research lies in the fact that tourism in Bulgaria exerts not only positive but also negative impacts on the environment – economic, physical and social. Possible strategies for solving the more general issue of tourism sustainability in tourism destinations should be

directed toward the regulation of existing negative impacts. Economic sustainability being the most endangered should be regulated by some economic instruments, e.g. higher payment to tourism employed personnel, more local population employed in tourism, not allowing new outside businesses set foot in the destination thus causing substantial financial leakages, etc. Physical negative impacts (environmental sustainability) should be dealt with in two directions – 1) recultivate existing damaged territories by various regulatory instruments, e. g. ordinances and 2) limitation of new territories being included in tourism businesses (e.g. no new construction permits by local authorities). Social sustainability can be reached by integrating local population and local businesses in the tourism industry. Local people should have their say in the tourism development of destinations and they should be engaged in tourism management preferably at prestigious positions.

6. CONCLUSIONS

Studying and forecasting of tourism impacts are vital for tourism policy, sustainable tourism development and regional economy. One of the ways for better investigation of diverse tourism impacts, their identification, management and forecast is through the application of modern methods for processing and analyzing large massifs of spatial data.

The present study has a strong theoretical and methodological input to the body of knowledge of destinations' tourism sustainability and some of its factors, tourism impacts and residents' perceptions. The difference the present study makes in the scientific literature is the implementation of a simple approach used so far only to investigate residents' perceptions of tourism impacts in certain destinations. The important contribution of the present research is that a method has been tested to compare the role and intensity of the three different types of tourism impacts – economic, social and environmental. While it is impossible to compare them using specific indicators for each group, it was proven that they can be easily compared implementing a common measure – the local population's evaluation using one and the same measurement scale for all tourism impacts.

This approach provides completeness to the impact study is based on primary information and allows the construction of an overall picture of the impact manifestations at various spatial levels and the comparison among various impact groups. It helps also identify areas or impacts that require more in-depth and detailed study with the implementation of more sophisticated and specific methods. Furthermore the approach used allows researchers to determine the level of sustainability in various tourism destinations and to direct the attention of the tourism industry and the tourism policy makers to such a development so that the sustainability can be achieved and preserved. Future efforts of tourism destination managers and the tourist industry should be directed to maintaining the sustainability where it is in place and to improving it in destinations and impact areas where it is endangered. The method used to determine various levels of economic, social and environmental sustainability in destinations is a significant contribution to regional and local tourism practice and management as well.

The aim of the conducted investigation was to determine the significance of various factors for tourism impacts in Bulgaria through the research and analysis of their evaluation by local residents. This was done with a view to future sustainable tourism development in the country. It has been found out that the investigated factors can be considered also to be of great importance for the tourism sustainability in tourism destinations.

Another important finding of the study lies in the fact that seasonality in the destination always plays a negative role for its sustainability no matter how well developed or well managed the destination is. The evaluation of various impacts can serve as a baseline from which the future measurement and management of changes occurring as a result of tourism development can be performed. The establishment of such a baseline, as well as the approbation of the proposed methodology will enable the development of future tourism sustainability providing guidance for in-depth and detailed studies of specific tourism impacts. It is an important contribution of the study in the managerial aspect as well. It will draw the attention of planning and managing organisations to the regulation of certain desired or undesired tourism impacts.

It can be assumed that an important role for tourism sustainability is played by the investigated factors. So in order to be more sustainable destinations and their management have to pay special attention to them and try to regulate them. Seasonality being a major factor has to be reduced by the implementation of various managerial instruments and by making Bulgaria a 4-season destination – a strategic goal of the latest Strategy for Sustainable Tourism Development in Bulgaria [60].

The conducted survey reveals the important role of local residents' opinion for the general and the detailed perception of tourism impacts at a local level. It was found out that the investigated factors are of great importance for 1) the formation and the differentiation of local residents' attitude towards tourism and tourists, 2) the perception of tourism impacts and 3) overall tourism sustainability in general. The aim

of the research is fully achieved with the help of a quite simplified methodology allowing for 1) local residents' evaluation of various tourism impacts as well as for 2) the determination of the sustainability level in the researched destinations.

In general sustainability of Bulgarian tourism can be reached by decreasing the negative tourism impacts on the environment. There are not many successful examples in the tourism practice across the world and the conditions in each case are quite diverse. So possible strategies for tourism sustainability in Bulgaria can be summarized as follows:

1. Slow down tourism development. Do not build new tourism super- and infrastructure. Concentrate on loyal instead of attracting more tourists.
2. Keep local population happy with the destination's tourism development by asking and listening to their opinion, by employing it in tourism industry and letting them participate in tourism management and the decision-making process,
3. Try to prolong the high tourist season by introducing new tourism products, organizing various types of events, attracting new tourism segments.
4. Diversify tourism products in such a way as to lower the physical and psychological pressure of tourists and tourism industry on local economy, land and population.
5. Introduce and implement long-term tourism planning with a view to its sustainability in the future.

It has to be mentioned though that with the existence of a private and highly fragmented tourism industry in Bulgaria it would be very difficult for any tourism management at a destination or a higher level to introduce these strategies across the country.

Future research plans should include more empirical research in order to confirm the established relationships among factors for tourism impacts evaluation, among tourism impacts themselves and the sustainability of tourism destinations with various tourism types, levels and stages of tourism development.

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The excessive heatings in the Romanian Plain

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Abstract: The paper study the extremely hot days, with temperature $\geq 35^{\circ}\text{C}$, on the basis of daily data of the maximum air temperature in the Romanian Plain - one of the territories in Romania with the highest excessive heatings. The excessively hot situations were analyzed in detail by: calculating the total number of extremely hot days gathered year by year and extracting the periods of different durations with such successive days, calculating the frequencies for the analyzed period, identifying the maximum duration intervals of each year and outlining the trends of their evolution. The extreme intensity of the heating is described by the manifestation data both in the air and on the ground. The extraordinary magnitude of the phenomenon was also highlighted by the MODIS satellite data, which indicated maximum temperatures above 50°C , during the day and 35°C at night.

Key words: excessive heat, maximum temperatures, evolution trends, satellite data, Romanian Plain.

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1. INTRODUCTION

The global warming trend with its accelerated intensification in the last decade was especially felt during the warm season of the year, the exacerbation of extreme thermal phenomena being one of the main climatic dangers. Studies of these phenomena are of particular importance due to their applicability in a wide range of fields: health, environment, economic activities, etc.

The excessive heating during the hot season of the year is best evidenced in the form of exceeding the temperature threshold specific for extremely hot days - when the maximum temperatures reach and exceed the 35 Celsius degree threshold. Considering the mechanism of heating by the solar radiation of the ground's surface, which, by emitting of long-wave radiation, heats, in turn, the air, the episodes with high air temperatures are revealed by the land surfaces temperature (LST), which can exceed 60°C , depending on the nature of their material. If we focus on the constantly growing urban areas, where majority of the population tends to live and work, we can detect some vulnerable areas that heat up very fast during the day, and remain very hot even during the night, that have a number of negative impacts.

2. LITERATURE REVIEW

Although specific to the summer season, the extremely hot days are a real danger when a longer period persists [1,2], these special situations having a major impact [3] through the different negative effects on the health of the population [4,5], the environment and the socio-economic activities [6].

The rising global temperatures and the increasing number of people living in an urban environment are associated with a phenomenon called the effect of the urban heat island (UHI) [7]. The heat island (UHI) describes the average temperature in an urban environment, compared to the adjacent rural area. This effect is most evident during the night, when the urban environment acts as a battery due to the solar heating, which counteracts the night cooling. Dramatic effect during heat waves, this additional heating

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inhibits the nocturnal recovery of human blood circulation and causes health problems, especially for the elderly [8,9,10,11].

3. METHODS, DATA AND STUDY AREA

The work is based on the meteorological data recorded by the National Meteorological Administration (NMA), available within the European Climate Assessment and Datasets project [12]. The daily recordings of the maximum temperatures (from 1961-2014) were processed from 6 weather stations within the Romanian Plain: Bucharest-Băneasa, Buzău, Călărași, Craiova, Galați and Roșiorii de Vede.

The data processing allowed a detailed analysis of this parameter relevant for the extreme thermal situations in the Romanian Plain. For a proper interpretation and a more suggestive and synthetic image of their territorial distribution, graphs and maps were made.

The excessively hot situations were analyzed by: calculating the total number of extremely hot days gathered year by year and extracting the periods of different durations with such successive days, calculating the frequencies for the analyzed period, identifying the maximum duration intervals of each year and outlining the trends of their evolution.

Romanian Plain, a vast region with low-altitude relief, extended in the southern part of the Romanian territory (between tableland and hills, in the north, and Danube Valley, in the south), is the most exposed part of the country to advections of the tropical hot air and excessive local warming induced by insolation. The weather stations included in this study are located in different local conditions: in the central part of the plain – Bucharest-Băneasa (in the northern limit of the city, at 90 m altitude) and Roșiorii de Vede (on the interfluvium, at 102 m), in northern part of the plain, on the river valleys – Craiova (192 m) and Buzău (97 m), near the Danube Valley – Călărași (19 m) and Galați (at 69 m, between 3 major rivers and in proximity of lakes).

In order to analyse the relationship between the components of the urban environment and the land surface temperature (LST) during the episode of heat wave from the summer of 2007 for the city of Călărași two types of data were used: the land use/cover data from the Urban Atlas (UA) 2006 product of the Copernicus Land Monitoring Services provided by EU Copernicus programme [13] and the LST from MOD11_L2 and MYD11_L2 products of MODIS satellite sensors TERRA and AQUA, which have a moderate spatial resolution (500 m - 1 km), but a daily temporal resolution [14]. The results obtained are meant to highlight the problem areas in the urban environment and may be a possible step to better understand the local urban climate in order for the decision-makers to take the measures necessary to reduce the thermal stress induced for the members of the respective communities.

4. RESULTS

The territorial distribution of the total number of extremely hot days/period shows that the highest values are almost triple compared to the smallest ones: Roșiorii de Vede - 290 extremely hot days/period, Călărași - 267, Bucharest-Băneasa - 216, Craiova - 193, Buzău 139 and Galați - 110 extremely hot days/period (Figure 1). The explanations are very different local conditions. For example, in Galați, the proximity of the aquatic surfaces moderates the incidence of these extreme phenomena, while in Roșiorii de Vede the cumulation of the thermal stress with the hydric one induces the exacerbation of the heating.

On the map of the distribution of the total number of intervals with consecutive canicular days from the entire studied period, the following values are distinguished: Bucharest-Băneasa - 52 intervals, Buzău - 36, Călărași - 61, Craiova - 47, Galați - 28 and Roșiorii de Vede - 68 intervals. Thus we can see clear differences between the stations located in the north of the region and those located in the center of the plain or at more southern latitudes, the highest values, specific for Călărași and Roșiorii de Vede, representing more than double the smallest value, specific to Buzău station (Figure 2).

The maximum intervals of consecutive extremely hot days show that almost all the situations were met in 2007, in the conditions of the hottest year of the analyzed period: 9 consecutive days in Bucharest-Băneasa, Craiova and Buzău, 10 in Călărași and Galați. At Roșiorii de Vede the maximum is represented by the value of 11 consecutive days registered in 1987, but appears the secondary value of 10 consecutive days in 2007.

The analysis of the variability from year to year of the annual amounts of extremely hot days, showed the recording of the increasing values in the last years 2000, 2007 and 2012. The absolute maximums belong to 2012 (34 days / year in Călărași), representing double or even values triple against the amounts collected in other excessively hot years - 1987 and 1998.

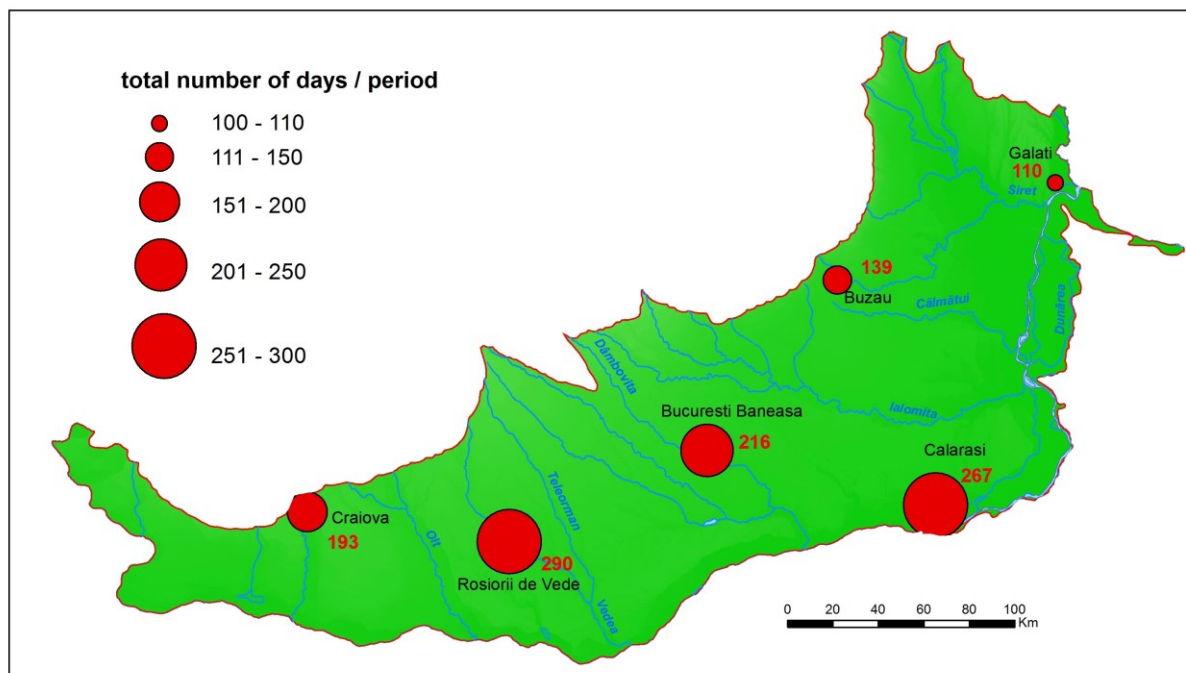


Figure 1. Total number of extremely hot days/period.

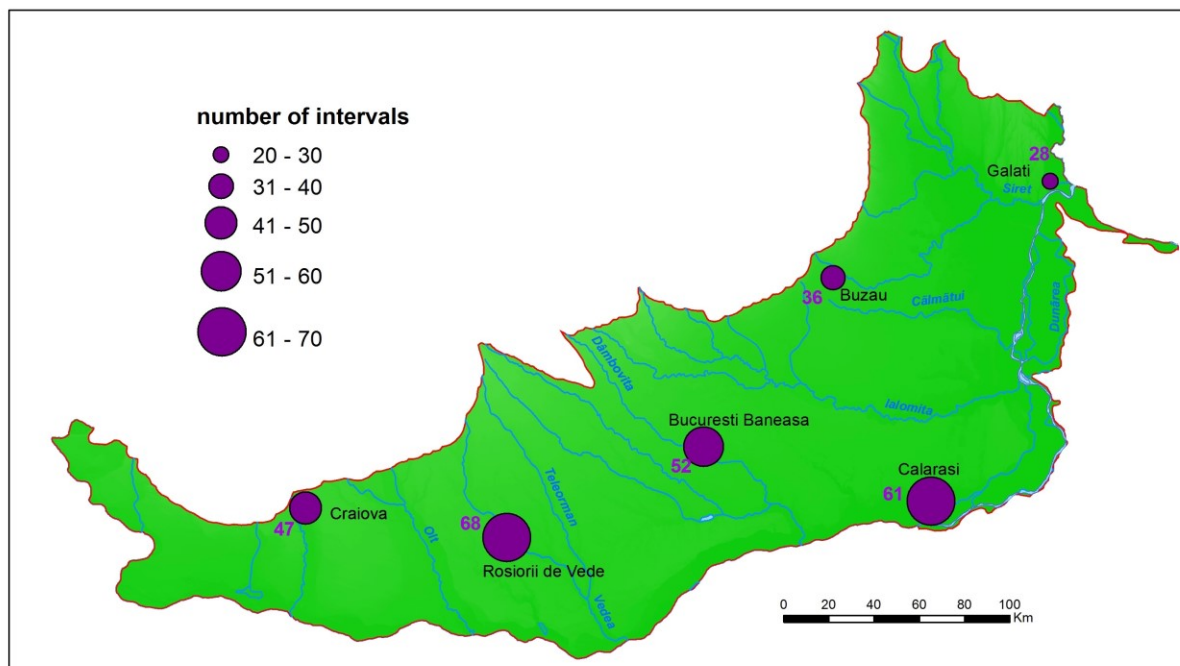


Figure 2. Total number of intervals with consecutive extremely hot days/period.

The absolute frequency by value classes of the duration of consecutive days with heat temperatures, illustrated in the graphs constructed for each of the six stations, shows that in most cases the extremely hot episodes are short, two or three consecutive days, the absolute values indicating clear differences between stations. The record durations of the extremely hot episodes reach 9 or 10 successive days at all the analyzed stations, but the persistent phenomena has a higher frequency in the Roșiori de Vede and Călărași, with high values regardless of the lengths of the intervals (Figure 3).

On the graphs comparing the year-on-year evolution of the total number of extremely hot intervals, regardless of duration, in parallel with that of the maximum durations of consecutive days with such temperatures, it is observed that the values range, although it has different amounts from a station at another, shows similarities in terms of the years of production of the maximum values.

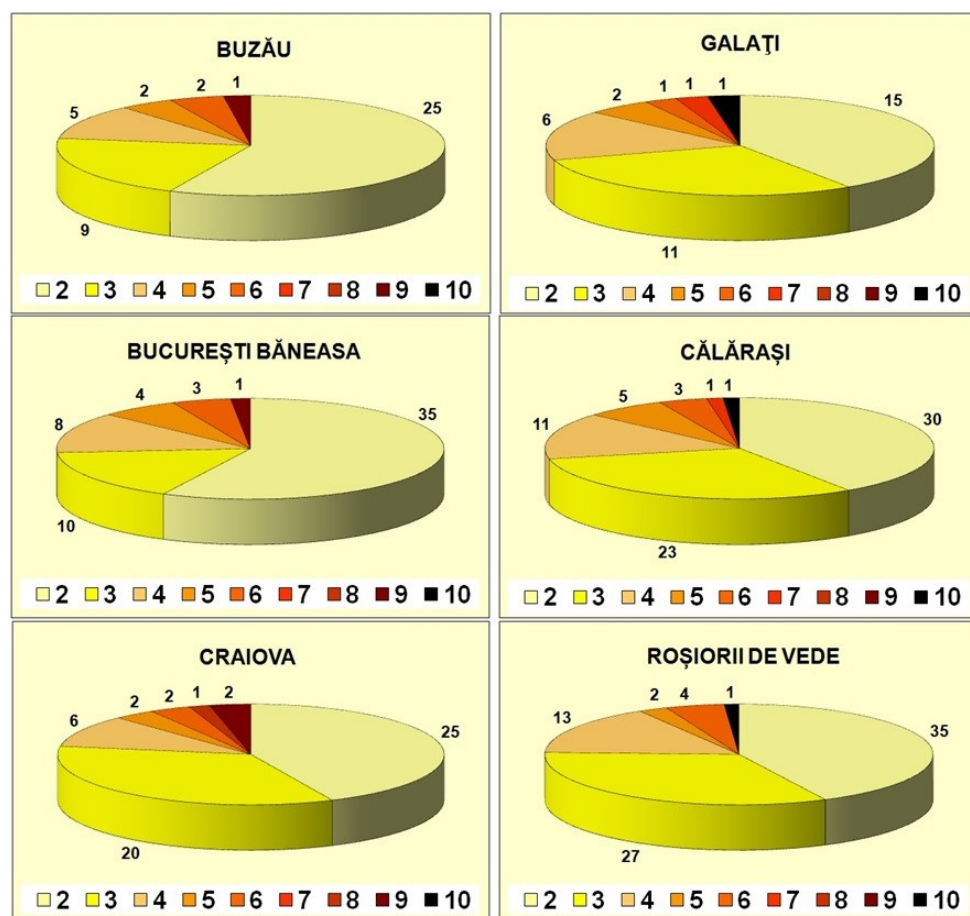
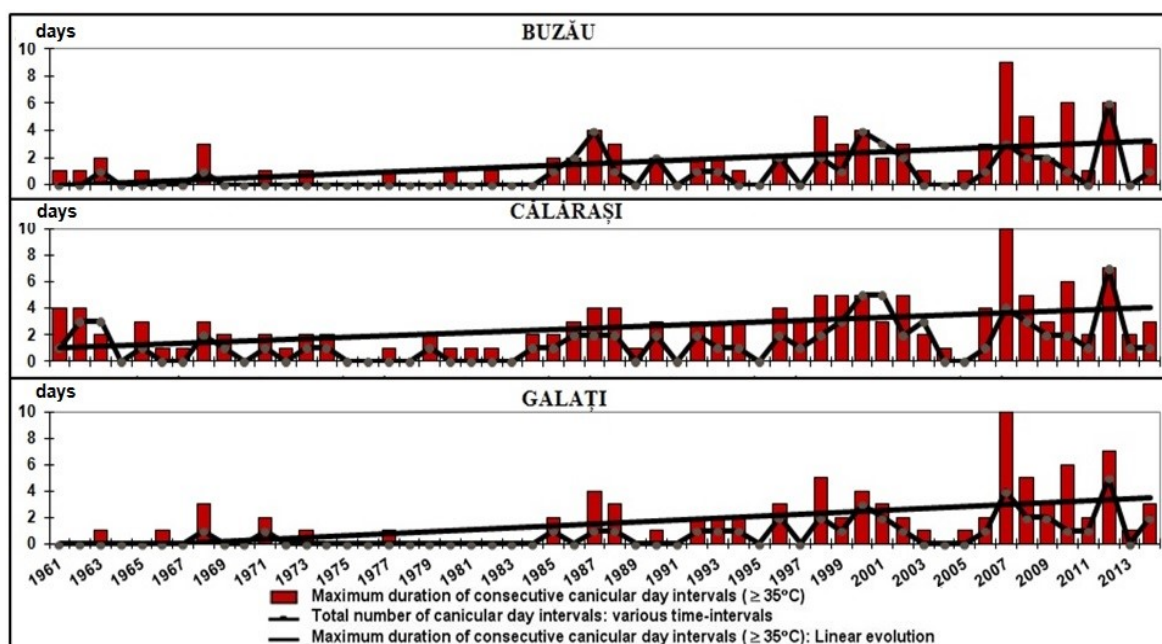


Figure 3. The frequency by values classes of the length of extremely hot intervals



(a)

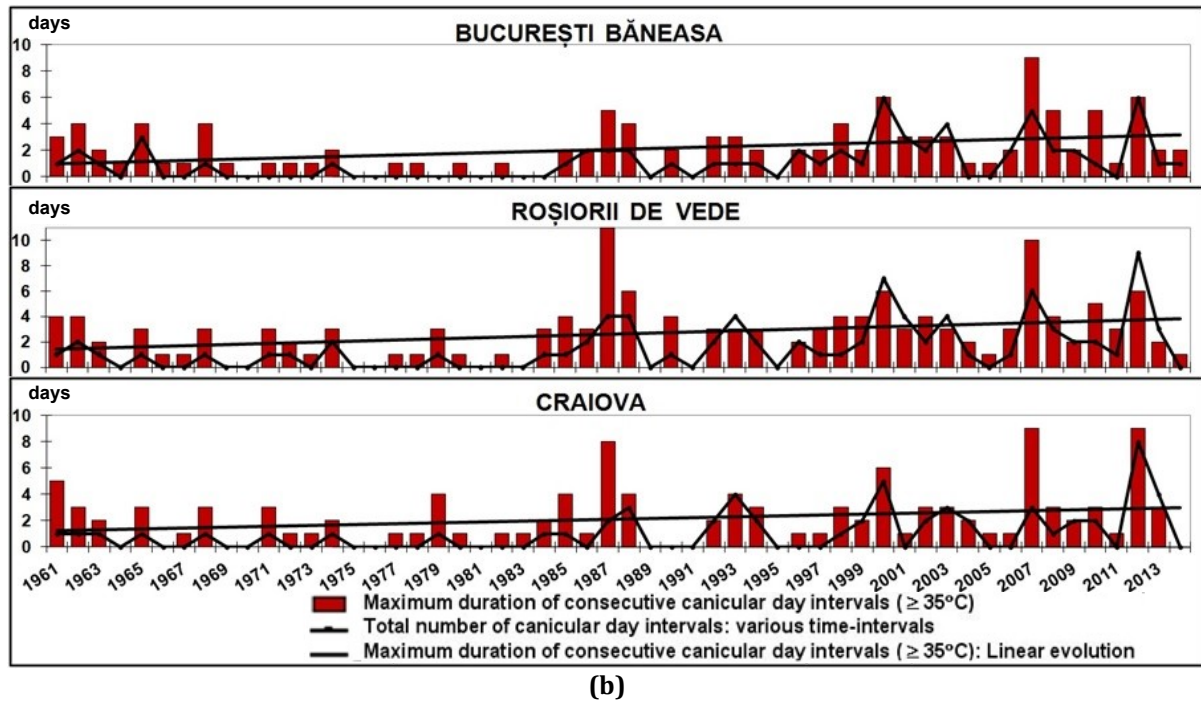


Figure 4. Variation of extremely hot consecutive days intervals: (a) Buzău, Călărași, Galați; (b) București Băneasa, Roșiorii de Vede, Craiova.

Excessive heating with longer durations of the last years (2000, 2007 and 2012 are also highlighted by the outline of accentuated linear trends of increase of the maximum durations of the time intervals, at all the analyzed stations. Thus, we note that 2007 is the warmest by record lengths of consecutive extremely hot days (9-10 days), while 2012 represents the warmest year through record number of such intervals (Figure 4a and b).

The record heat episodes in 2007 and 2012 were the expression of the severest warmings caused by the cumulation of the effect of hot and dry air advection with that of excessive local heating, under conditions of low air humidity and clear sky, specific to the persistence of anticyclonic activity.

4.1. Călărași case study

During the record-breaking episode of July 2007, the exacerbation of heating culminated in exceeding the 40°C threshold in air at many weather stations in Romania. In Călărași it lasted 10 days, between July 16-25, and the highest value of air temperature (42.1°C) was recorded on July 23.

From the MODIS satellite data available for July 23, 2007, the maximum daytime land surface temperature (LST) was over 50°C, the minimum temperature of 34°C, with an city-wide average of 44°C. During the night the maximum temperature reached 35°C (Figure 5a and b).

The UHI of the city is more visible during the day, having an amplitude of 4°C compared to the adjacent surfaces (Figure 5c). An exception is represented by the agricultural areas in the north of the city, where the temperatures are even higher (over 50°C) than inside the city. These agricultural areas are represented by the dark soil from which the crops were harvested. At night the small difference of 1-2°C between the city and its surroundings makes this UHI not significant in terms of amplitude but is more visible, been more concentrated around the city centre (Figure 5b and c). One explanation could be the small distance to the Danube river and the thermal properties of the bare dark soil from the agricultural areas surrounding the city. However, the temperatures inside the city remain higher than 22°C, about 54% of the population enduring at night temperatures exceeding 23°C.

Performing a statistical analysis at the level of land use classes of the Urban Atlas 2006 (2018) database it can be observed that during the day the highest temperatures were recorded at the level of agricultural surfaces, followed by the anthropic surfaces (roads and associated surfaces, industrial areas and residential areas with surfaces sealed in proportion more than 50%) and the lowest temperatures are associated with forests and aquatic surfaces (Figure 6a and b).

During the night the highest temperatures were recorded at the level of the anthropic surfaces (recreational areas, roads and associated surfaces, industrial areas and residential areas with sealed surfaces in proportion more than 50%) and the lowest temperatures are associated with agricultural areas (Figure 6a and c).

According to the National Institute of Statistics data [15] in relation to the number of inhabitants, in 2015, the city of Călărași records an important green area (23.8 m²/inh.) which ensures an increased adaptation capacity of the Călărași municipality to the extreme climatic phenomena. However, it is also to be noted that the green areas are located more on the Danube meadow, within the city, these being very small in size. Also, the large surface of the sealed areas causes, during periods with heat waves (as in the case of the period 16 - 25 July 2007), the daytime temperatures to exceed 46°C.

During the day the agricultural areas in the north and northeast of the city, which during this period were harvested, behave like a black soil without vegetation, heating very strongly, thus exerting an important influence on the urban temperature (Figure 5a).

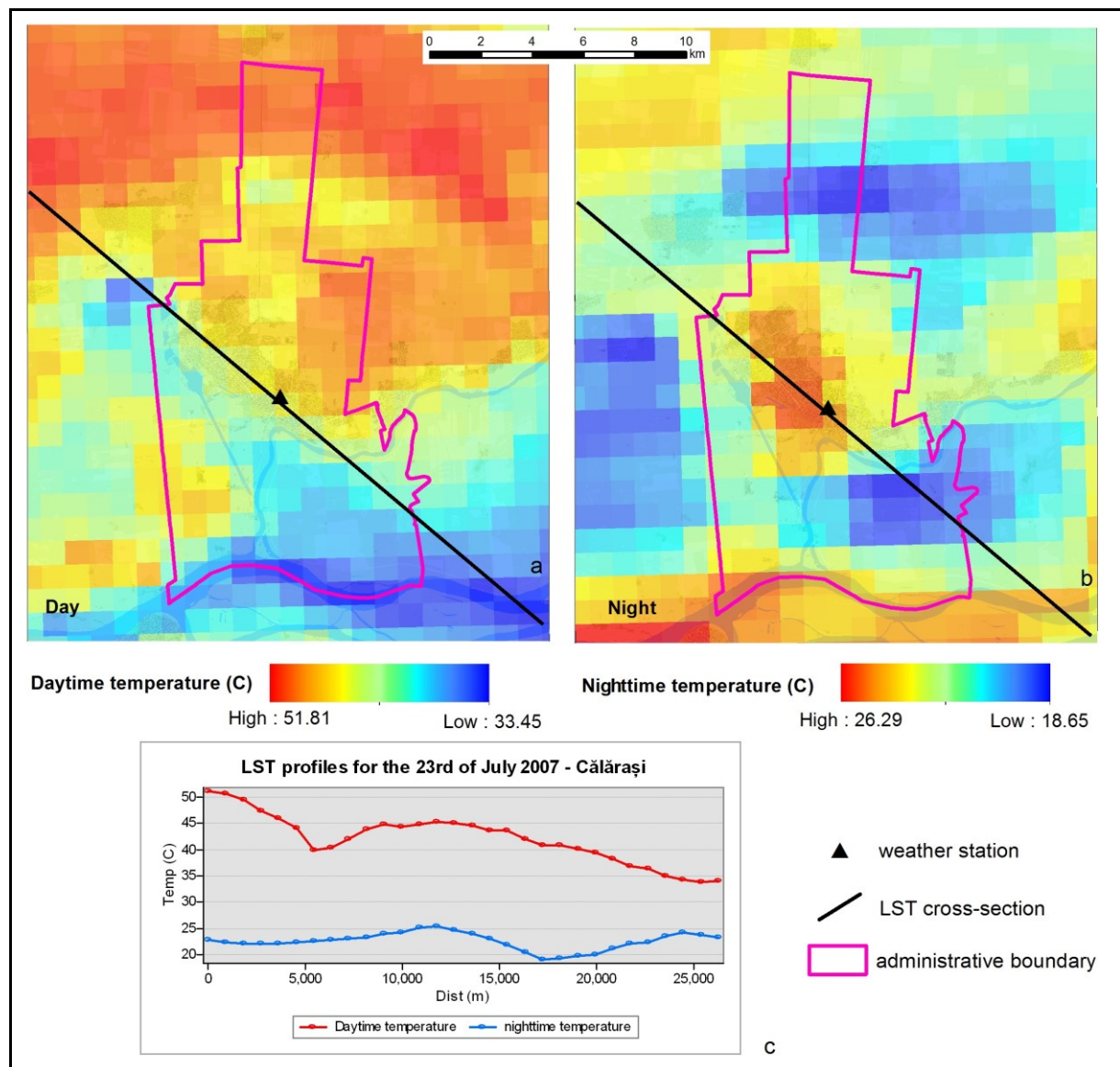


Figure 5. LST data for Călărași City: **(a)** spatial variation of the daytime temperature; **(b)** spatial variation of the nighttime temperature; **(c)** daytime and nighttime variation along a NW-SE profile.

5. CONCLUSIONS

From the description of the different parameters chosen for the characterization of the excessive heatings situations, we note that this extreme phenomenon, specific during the summer in the regions of

Romania with low-altitude relief, is felt with greater duration and intensity, but also more frequently in the central parts of the Romanian Plain and in its southern extremity, on the Danube Valley.

The tendency of heating is becoming more and more pronounced in recent years (from 1987) in the studied region, regardless of the local influences and climatic nuances.

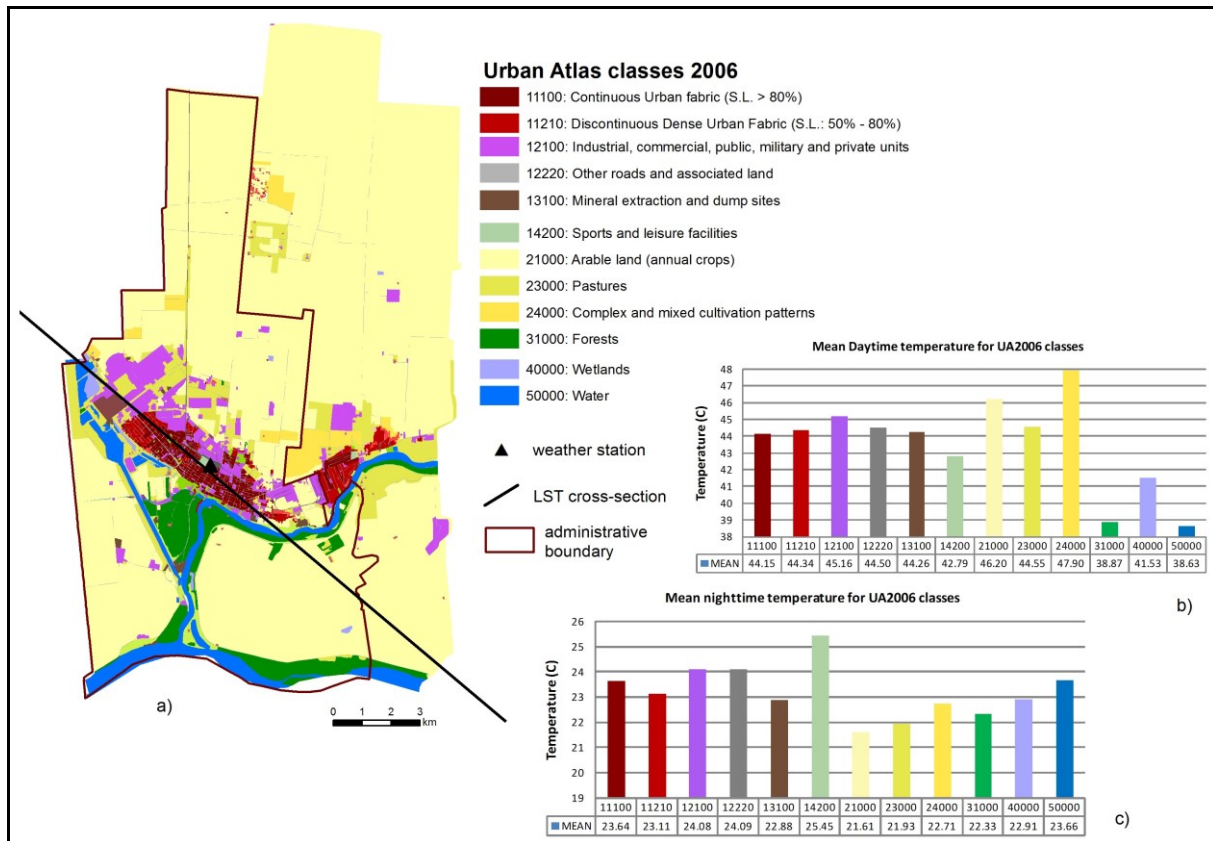


Figure 6. Statistical analysis of the LST at the level of land use classes of the Urban Atlas 2006 for Călărași city: **(a)** the land use classes of the UA 2006; **(b)** mean daytime temperature for UA 2006 classes; **(c)** mean nighttime temperature for UA 2006.

The exacerbation and prolongation of the presence of the upper thermal threshold of the heat represents a major thermal stress, and the frequency of these phenomena is considered to continue to increase in the following decades. A major impact is expected especially in urban agglomerations, with negative consequences primarily for the human health, but also with severe consequences on the environment and several economic sectors.

Taking into account the great danger of exacerbation and increase lasting of excessive heatings, is imperative necessary to take preventive measures through education and raise of public awareness, and by developing disaster management system.

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Supporting small and medium size enterprises through the COVID-19 crisis in Romania

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Abstract: Since 31 December 2019 and as of 01 June 2020, 6,136,085 cases of COVID-19 (in accordance with the applied case definitions and testing strategies in the affected countries) have been reported, including 371,857 deaths. The rapid evolution of the COVID-19 pandemic has triggered challenges for the medical system, economic and social systems of world and EU Member States. This crisis has affected thousands of lives and continues to put enormous pressure on economic systems. For these reasons, it is necessary to manage economic and social problems as soon as possible and to support/ promote solutions to sustain the sectors affected by the pandemic crisis. Small and medium size enterprises are the most vulnerable ones because of their size, scale of operation, limited financial managerial resources. The SME sector was one of the hardest hit sectors during the C-19 crisis, in both Romania and at global level. This fact determined the governments of the world states, including the one of Romania to take urgent measures for keeping the sector afloat. According to official statistics, in Romania, three out of ten companies are in the risk zone, with expenditures higher than incomes (Financial-Banking Analysts' Association) and with a total number of 850.000 employees (one-fifth from the total number of employees in the private sector). This paper analyzes the effects of the COVID-19 crisis on the SME sector in Romania, attempting to contribute with solutions and proposals for post-crisis resilience and recovery.

Key words: COVID-19, entrepreneurship, economic and pandemic crisis, resilience, recovery, SMEs

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1. INTRODUCTION

Globally, SMEs represents more than 95% of all firms, accounting for approximately 50% of value added and 65% of total employment (both formal and informal businesses) [1]. A widespread collapse of micro, small and medium-sized enterprises could have a dire impact on national economies and global growth prospects. In their response to the COVID-19 pandemic, governments should prioritize policies that support SMEs.

The COVID-19 pandemic affects and will continue to disturb for a considerable period the economic and social activities from Romania, and at international level. This perspective is supported by the extreme evolution of COVID-19 contagion at global level and at the level of countries in various geographic areas.

Over the period December 31 – June 01 [2], the reports regarding the contagion with the new Coronavirus at global level indicated 6.13 million COVID-19 cases at global level, with 371,857 persons dying because of this contagion (a death rate by 0.69 per 1000 inhabitants) [3].

In Europe, the situation worsened by the beginning of March, currently (1 June 2020) the situation is as follows: 1,951,284 cases: the five countries reporting most cases are Russia (405,843), United Kingdom (274,762), Spain (239,429), Italy (233,019) and Germany (181,815) [4].

The COVID-19 crisis in Romania was felt in the first half of March 2020, while information about this epidemic with the virus originating from China was circulating already by mid-December 2019. The virus

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spread rapidly in the ranks of the population, and the population fell sick - residents and labor force from other areas, including from Romania. By the time various measures of sanitary protection were announced, including here closing the borders, the seasonal employed population has left the region heading towards their countries of origin. Thus, large part of the population originating from Romania returned home, bringing also the contagion with SARS-COV2. The situation on 1 June 2020 was the following: confirmed cases 19,257, out of which 1,262 deaths, and 13,427 recovered cases (the situation changes on a daily basis).

The average number of confirmed cases per 1000 inhabitants was by 0.49. As compared with other countries, Romania had a lower number of confirmed cases per 1000 inhabitants, as in Italy this number was by 12.8/1000 inhabitants, in France by 12.1/1000 inhabitants, in Great Britain by 12.7/1000 inhabitants, and in the Netherlands 9.9/1000 inhabitants. At county level, the situation shows that in Suceava there were 3.74 cases/1000 inhabitants, in Arad – 0.98, Hunedoara- 0.97, Botoșani – 0.82, Neamț – 0.82, Covasna – 0.8, Brașov – 0.63 and Vrancea – 0.62 cases/1000 inhabitants (Figure 1) [5].

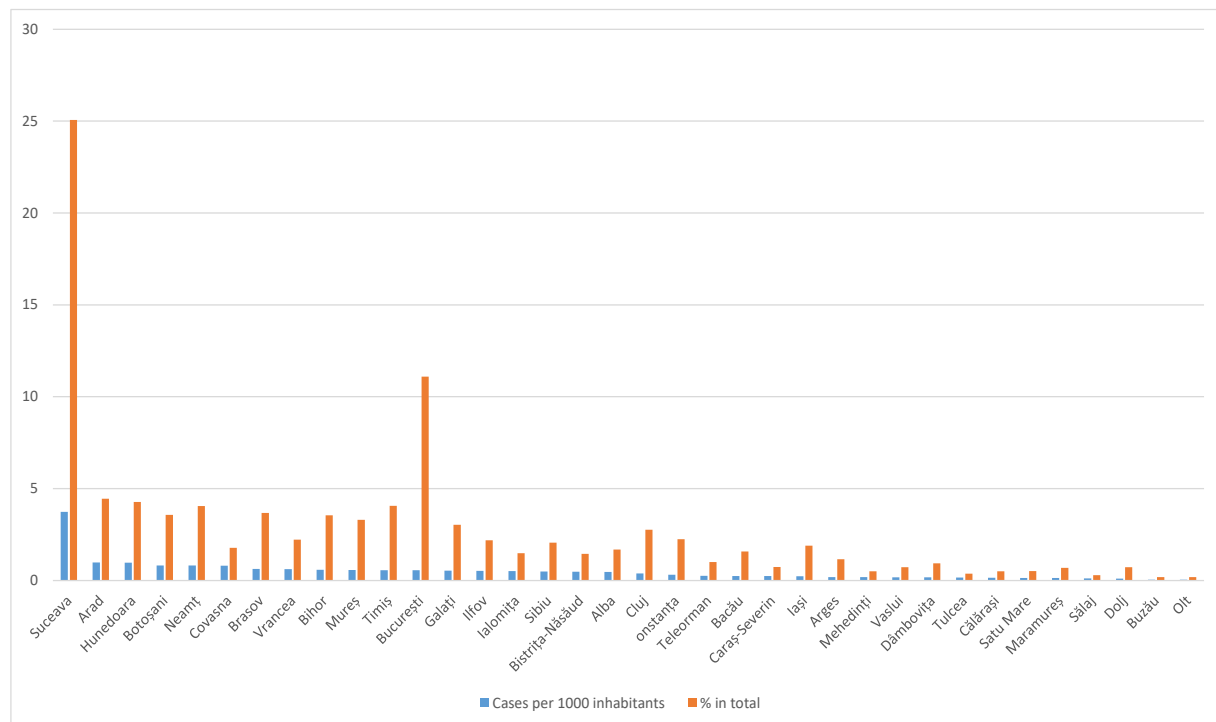


Figure 1. Confirmed cases at county level, 22 April 2020

Source: Data processing <https://coronavirus-esriro.hub.arcgis.com/>, [6]

One of the most affected economic sectors is the one of Small and Medium Enterprises, that confronted with lacking financial reserves necessary for paying fixed costs (especially employees' wages and office rents), while faced simultaneously with a series of difficulties depending on the nature of the generated activities/services.

In the context mention above, affected by COVID-19 crisis, the article try to analyze the effects of the COVID-19 crisis on the SMEs sector in Romania, attempting to contribute with solutions and proposals for post-crisis resilience and recovery.

2. LITERATURE REVIEW

There is no consensus in the literature on the effects of an economic crisis on entrepreneurial activity. Some authors consider that situations of weak growth, recession, or stagnation may favor discovery of opportunities and innovation; whereas others claim that economic slowdowns have a negative effect on entrepreneurial attitude, reducing discovery of opportunities and investment in innovation.

From a general approach, entrepreneurship has been enriched by four big perspective (Verheul et al., 2002; Veciana, 2007) [7, 8]: economic, psychological, organizational, sociological and institutional. The latter approach argues that the social and cultural environment determines the individual decision to start a business (Bruton et al., 2010) [9]. Some research has taken institutional theory as the theoretical framework to explain the differences in entrepreneurship levels between regions and countries (North, 1990) [10]; (Fritsch and Storey, 2014) [11]; (Urbano and Alvarez, 2014) [12]).

Most of this research understands institutions as the rules of the game regulating political, social and economic relationships in a society, providing the structure and order for exchanges to take place, reducing risks and providing human inter-action (North, 1990) [10]. These institutions not only influence the level of entrepreneurship, but also the characteristics and quality of entrepreneurship initiatives, by making them more or less productive.

3. METHODOLOGY

The methodology used in the presented paper consists, mainly, in economic evaluations for SMEs sector in Romania, in period of COVID-19. The scientific researches and analysis methods take into account the fact that identifying the impact of pandemic crisis is limited to scarcity of statistical data and can be done, mainly, with the help of the qualitative estimation and opinion and specialists.

The study contains certain quantitative and qualitative estimates on the economic effects generated by COVID-19 crisis in Romania, in period March – May 2020. Some data and information presented in the research paper regarding the impact are limited to the effect on short term.

4. THE INITIAL STATE OF THE SME SECTOR (BEFORE THE COVID-19 CRISIS)

Before the emergence of the C-19 crisis, the evolution of the economic-social active operators had an ascending, positive trend, per total as it recorded from the numerical viewpoint an increase by 14.3% (2018 as compared with 2013), from 942 thousand companies to 1.077,5 thousand companies. The highest increase registered small enterprises (0-9 employees) by 15.37%, followed by large companies with over 250 employees (6.67%). A slow evolution was recorded by companies with 50 to 249 employees, of only 0.65% (Table 1).

Table 1. Evolution in the numbers of economic-social operators active within the national economy, on size-classes over the period 2013-2018

	Total	0-9 employees	10-49 employees	50-249 employees	250 and over	Increase against previous year
2013	942.266	869.641	57.820	12.646	2.159	-
2014	1.002.177	929.991	57.716	12.288	2.182	106,36
2015	1.013.907	940.881	58.153	12.630	2.243	101,17
2016	1.024.186	950.560	58.508	12.844	2.274	101,01
2017	1.050.797	976.377	59.324	12.813	2.283	102,60
2018	1.077.536	1.003.365	59.139	12.729	2.303	102,54
2018/2013	114,35%	115,37%	102,28%	100,65%	106,67%	

Source: Data processing from Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

This positive evolution led to an increase in the weight of small companies (0-9 employees) in total SMEs from 92.29% (in 2013) to 93.12% (in 2018), while the weights for the other company categories recorded decreases (Table 2).

Table 2. Evolution of economic-social operators active in the national economy on size-classes (% in total)

	0-9 employees	10-49 employees	50-249 employees	250 and over
2013	92,29	6,14	1,34	0,23
2014	92,80	5,76	1,23	0,22
2015	92,80	5,74	1,25	0,22
2016	92,81	5,71	1,25	0,22
2017	92,92	5,65	1,22	0,22
2018	93,12	5,49	1,18	0,21

Source: Data processing from Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

Table 3. Evolution in the numbers of economic-social operators active in the national economy on size-classes, 2013-2018 (% of total)

	2013	2014	2015	2016	2017	2018
Agricultural enterprises	3,45	3,44	3,58	3,63	3,60	3,56
Industrial, constructions', trade and other services' enterprises	95,09	95,17	94,98	94,79	94,90	94,95

Financial and insurance enterprises	1,46	1,39	1,44	1,58	1,51	1,49
Total enterprises	100	100	100	100	100	100
Public administration	1,38	1,28	1,28	1,28	1,27	1,23
Private administration	18,66	18,24	18,72	19,08	18,61	18,66
Private entrepreneurs	28,45	29,83	29,31	28,10	27,41	26,59
Enterprises	51,51	50,65	50,69	51,55	52,72	53,52
Total	100	100	100	100	100	100

Source: Data processing from Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

Most active SMEs are in the industrial field, in constructions, trade and services (95,1% weight in total, year 2018) with a slight decreasing trend (from 95%) concomitantly with an increasing evolution of enterprises in the agricultural field (from 3.5% to 3.6%) (Table 3).

At the same time, the number of private companies had an increasing trend in total from 51.5% (2013) to 53.5% (2018) in parallel with a decreasing number of private entrepreneurs (from 28.5% to 26.6%).

In the year 2017, the structure on fields of activity for the SMEs shows high shares of active companies in the field of retail trade (32.8% from total), followed by those in scientific and technical professional activities (12.5%), constructions (10.04%), manufacturing industry (9.48%), transport and warehousing (9.20%), hotels and restaurants (5.02%), information and communications (4.53%). The same structure is maintained also for the year 2018 (with very small percentage differences), as follows: hotels and restaurants decreased their weight in total (-0.06 p.p.), trade (-1.24 p.p.), support services (-0.07 p. p.) (Table 4).

Table 4. Evolution in the number of active companies, in the years 2017 and 2018 (no., %)

Field of activity	2017		2018		2018 vs. 2017
	Nr.	%	Nr.	%	
Extractive industry	1014	0,19	1033	0,19	0,00
Manufacturing industry	49837	9,48	52451	9,58	0,10
Electricity, heat, gas, warm water and air conditioning production and supply	1206	0,23	1200	0,22	-0,01
Water supply, sanitation, waste management, decontamination activities	3022	0,57	3074	0,56	-0,01
Constructions	52792	10,04	55978	10,22	0,18
Wholesale and retail trade, vehicles and motorcycles repair	172435	32,80	172856	31,57	-1,24
Transport and warehousing	48382	9,20	51944	9,49	0,28
Hotels and restaurants	26414	5,02	27182	4,96	-0,06
Information and communications	23837	4,53	25452	4,65	0,11
Real estate transactions	16704	3,18	17867	3,26	0,09
Professional, scientific and technical activities	63350	12,05	66739	12,19	0,14
Administrative support activities and support services activities	22285	4,24	22848	4,17	-0,07
Education ¹⁾	5811	1,11	6393	1,17	0,06
Health care and social assistance ¹⁾	15251	2,90	17114	3,13	0,22
Shows, culture and recreation activities	9003	1,71	9945	1,82	0,10
Other services' activities	14317	2,72	15494	2,83	0,11
Total	525.660	100	547.570	100	

Source: Data processing from Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

An analysis of the SME sector (active companies) on size-classes shows that small companies are preponderant (0-9 employees). Thus, in services' activities, microenterprises are about 96% from total, in real estate transactions by 82.13%, in health care 94%, in the extractive industry – 89.74%, transport and

warehousing – 91.69%, hotels and restaurants – 91.1%, health 70.67%, and in the electricity, heat, gas, warm water and air conditioning production/supply industry, with about 75.56% from total.

According to official statistical data, the number of SMEs in industry, constructions, trade and other services was by 545.843 (small- and medium sized companies) the most in wholesale and retail trade (31.6% from total). Their number registered an ascending evolution over the period 2014-2018, from 481.425 active companies to 545.843 active companies (113%) (Table 5).

Table 5. Active small and medium-sized companies in industry, constructions, trade and other services on types of activities (no., %)

Activity (CAEN Rev. 2 sections)	2014	2015	2016	2017	2018	2018 /2014 (%)
Total	481425	486529	498730	523955	545843	113,38
Extractive industry	1092	1085	1060	1000	1019	93,32
Manufacturing industry	47309	47633	47580	49066	51700	109,28
Electricity, heat, gas, warm water and air conditioning production and supply	1468	1426	1316	1172	1167	79,50
Water supply, sanitation, waste management, decontamination activities	3092	2981	2898	2949	2998	96,96
Constructions	47727	48245	49621	52716	55901	117,13
Wholesale and retail trade, vehicles and motorcycles repair	176031	171786	169524	172239	172654	98,08
Transport and warehousing	39568	41639	44391	48264	51816	130,95
Hotels and restaurants	25083	25468	25582	26383	27150	108,24
Information and communications	19426	20537	21932	23748	25354	130,52
Real estate transactions	13838	14467	15344	16700	17862	129,08
Professional, scientific and technical activities	56828	57755	60260	63288	66674	117,33
Administrative support activities and support services activities	19232	19775	20614	22094	22646	117,75
Education	3771	4251	4940	5811	6393	169,53
Health care and social assistance	10076	10942	13170	15232	17092	169,63
Shows, culture and recreation activities	5738	6754	7717	8982	9928	173,02
Other services' activities	11146	11785	12781	14311	15489	138,96

Source: Data processing from Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

The SMEs ownership form is private in majority (96%), being followed by foreign capital owned companies (3.8%), and majority state owned capital by only 0.2% from total. Most private capital owned companies are found in the fields of wholesale and retail trade (31.6%), followed by professional, scientific and technical activities (12.2%).

In whole, small- and medium-sized companies own 64.6% from the personnel employed in total SMEs and 57.3% from the turnover. As compared with the year 2014, the turnover, and the employed personnel underwent a slight decreasing trend in the year 2018 (a decrease by 0.9 pp).

The analysis of the concentration of turnover realized by SMEs and of the numbers of employees on fields of activity for the year 2018 shows the following:

- The highest concentration of turnover achieved by Top 5 companies is found in the tobacco goods manufacturing sector (99.9%), followed by coke-products and oil processing (99.2%), oil and natural gas extraction (97.2%), metallic ores extraction (93.3%) and air transports (89.2%);
- As regards the concentration in the numbers of employees for the companies in Top 5, the sector of tobacco manufacturing stands out (99.6%), followed by crude oil and natural gas extraction (98.6%), air transports (85.9%), metallic ores extraction (85.6%), and the coke-products and oil processing sector (85.2%);

- The following situation can be highlighted: there is a series of fields that have higher concentration in the numbers of employees in parallel with a relatively low turnover such as in superior and inferior coal extraction (61.3% against 94.5%), activities of tourism agencies and of tour-operators, other reservation and touristic assistance services (7.0% vs. 13.8%);
- A different situation is noticed in the sector of wood processing and wood and cork manufacturing, save for furniture manufacturing (32.7% turnover vs. 11.8% for employees) (Table 6).

Table 6. Analysis of turnover and numbers of employees concentration in the SME sector (%)

Sector	Cumulated in % from total turnover	Cumulated in % from total number of employees	Sector	Cumulated in % from total turnover	Cumulated in % from total number of employees
Metallic constructions and goods industry, excluding machinery, tools and installations	2,2	5,3	Furniture manufacturing	19,7	14,7
Other professional, scientific and technical activities	2,4	9,9	Cinema, video, TV programs, productions, audio recordings and musical editing	21,6	16,0
Real estate transactions	3,3	8,5	Research-development	22,3	25,7
Other services' activities	3,6	5,0	Printing and support reproduction of recordings	22,5	10,5
Education	3,7	2,5	Other extractive activities	22,9	24,1
Construction of buildings	3,8	2,1	Social assistance activities without accommodation	22,9	16,4
Wholesale trade, save for vehicles and motorcycles trade	3,9	4,9	Services' activities for labor force	23,6	33,2
Special construction works	4,1	3,6	Gaming and bets activities	24,4	35,0
Publicity and marketing activities	4,9	11,2	Digital services activities	24,9	39,4
Artistic creation and interpretation activities	4,9	6,0	Combined health care and social assistance services with accommodation	27,2	20,3
Veterinary activities	5,3	3,4	Paper and paper products manufacturing	28,7	20,1
Food industry	6,6	6,0	Ancillary extraction services activities	29,3	40,2
Terrestrial transportation and pipeline transportation	6,6	14,0	Editing activities	30,4	22,5
Activities of tourism agencies, and tour-operators; other reservations and touristic assistance services	7,0	13,8	Electric equipment manufacturing	30,5	26,3
Hotels and other accommodation facilities	7,7	7,0	Substances and chemical goods manufacturing	31,7	25,3
Clothing manufacturing	7,8	4,1	Wood processing, wood and cork products' manufacturing, save furniture manufacturing	32,7	11,8
Wholesale and retail trade, vehicles and motorcycles maintenance and repair	7,9	5,5	Road transportation vehicles, trailers, and semi-trailers manufacturing	34,6	25,3
Rental and leasing activities	8,1	12,9	Rubber and plastic goods manufacturing	35,9	19,1
Collecting, treating, and eliminating recovered waste. Recyclable materials	8,2	20,4	Computer, electronic and optical products manufacturing	37,3	30,5
Activities of the centralized administrative offices (headquarters), management and consulting activities in management	9,0	11,5	Water caption, treatment and supply	37,6	23,5
Computer, personal and household use articles repairs	9,9	13,0	Manufacturing of other transportation means	38,5	40,7
Restaurants and other food service activities	10,2	6,9	Machinery, tools and equipment manufacturing n.c.a.	40,4	24,1
Machinery and equipment repair, maintenance, and installation	10,7	21,2	Water transportation	45,6	42,7
Landscaping and building services' activities	11,3	10,3	Basic pharmaceutical products and pharmaceutical preparation manufacturing	48,1	38,1
Investigative and protection activities	12,1	11,5	Beverages manufacturing	53,4	36,9
Civil engineering works	13,0	16,2	Metallurgic industry	53,6	42,5
Secretarial office activities, support	13,6	14,6	Postal and courier services	54,7	69,5

services and other service activities delivered to enterprises					
Architectural and engineering activities: testing and technical analysis	14,9	10,0	Library, archive, museum activities and other cultural activities	56,1	35,3
Human health related activities	15,0	10,5	Superior and inferior coal extraction	61,3	94,5
Information technology service activities	15,3	14,5	Program broadcasting activities	65,0	66,9
Sports, recreational and entertainment activities	15,4	9,5	Decontamination activities and services	66,0	67,2
Electricity, heat, warm water, gas production and supply	15,6	42,6	Wastewater collection and treatment	66,4	50,6
Retail trade save for vehicles and motorcycles	15,9	11,9	Telecommunications	68,7	55,1
Textile manufacturing	17,2	17,8	Air transportation	89,2	85,9
Leather tanning and finishing, travel and leather articles manufacturing, harnesses, footwear, fur preparation and dyeing	18,1	10,2	Metallic ores extraction	93,3	85,6
Manufacturing of other non-metallic ores products	18,3	12,5	Crude oil and natural gas extraction	97,2	98,6
Other industrial activities n.c.a.	18,6	14,4	Coke products and oil processing	99,2	85,2
Warehousing and transportation ancillary activities	19,6	41,1	Tobacco products manufacturing	99,9	99,6
Legal and accounting activities	19,6	11,4			

Source: Data processing from Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

In the year 2018, the main economic and financial indicators for the SME sector are presented in Table 7. It can be noticed that the highest contribution to the turnover of the SME sector is the one of small enterprises (35.54%), followed by companies with over 500 employees (32.59%). The same situation is found also in the case of gross investments (41.72%, respectively 37.53%), GVA at factors' cost (37.09%, respectively 35.72%) and the gross outcome of the exercise (53.39%, respectively 25.79 %). Regarding direct exports, the situation undergoes a change between the two categories, the highest weight being the one of the companies with over 500 employees holding 63.16% from total, followed by the companies with 250-499 employees (13.05%), and the ones with 100-249 employees (11.94%) (Table 7).

Table 7. Main economic and financial indicators of companies (%)

	Turnover	Gross investment	Direct exports	GVA at factors' cost	Gross output of the exercise
2018					
Total	100	100	100	100	100
0 – 49	35,54	41,72	6,81	37,09	53,39
50 – 99	8,95	5,73	5,04	7,75	6,20
100 - 249	13,85	8,91	11,94	11,62	10,29
250 - 499	9,07	6,11	13,05	7,83	4,33
500 and over	32,59	37,53	63,16	35,72	25,79
2017					
Total	100	100	100	100	100
0 – 49	35,14	39,85	6,42	34,79	45,08
50 – 99	9,02	6,24	6,34	7,88	8,03
100 - 249	13,74	9,56	11,26	11,48	8,44
250 - 499	8,32	6,68	12,80	8,26	5,33
500 and over	33,78	37,66	63,19	37,59	33,13

Source: Data processing from Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

At regional level, most active local entities are found in the region Bucharest-Ilfov (in 2018), as these represent 25.07% from total, followed by North-West (14.92%). The last place is held by South West-Oltenia with only 7% from total (Table 8 and Table 9).

Table 8. Active local entities in industry, constructions, trade and other services, in territorial profile (%. in total)

	TOTAL	0-9	10-49	50-249	250 and over
North - West	14,92	14,98	14,75	13,66	11,81
Centre	11,66	11,50	12,84	13,64	14,00
North - East	10,79	10,73	11,55	10,29	8,20
South - East	10,77	10,78	10,87	9,99	8,26
South - Muntenia	10,85	10,78	11,40	11,71	10,93
Bucharest - Ilfov	25,01	25,22	22,78	25,24	29,96
South - West Oltenia	7,00	7,04	6,85	5,91	7,16
West	8,99	8,98	8,94	9,56	9,68
Total	100	100	100	100	100

Source: Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

Table 9. Active local entities in industry, constructions, trade and other services in territorial profile (no.)

	TOTAL	0-9	10-49	50-249	250 and over
North - West	83880	74859	7521	1284	216
Centre	65556	57470	6547	1283	256
North - East	60620	53612	5890	968	150
South - East	60512	53880	5542	939	151
South - Muntenia	61005	53891	5813	1101	200
Bucharest - Ilfov	140.588	126.054	11.613	2373	548
South - West Oltenia	39348	35169	3492	556	131
West	50521	44887	4558	899	177
Total	562.030	499.822	50.976	9.403	1.829

Source: Romania's Statistical Yearbook 2019, NIS, Bucharest [13]

5. EFFECTS GENERATED BY COVID-19 ON THE SME SECTOR

In the month of April 2020, the business environment in Romania registered a drastic drop as regards entrepreneurial initiative, as compared with the same period of the previous year, and the number of new companies being the smallest as level for the last 5 to 10 years (Source: National Office of the Trade Registry) [14].

As of the beginning of the current crisis, which affected strongly on the business environment, 22.5 billion Euros were lost from the turnover of the companies, one million persons entered into technical unemployment, and 35.000 companies from the HoReCa industry are closed.

In the month of March 2020, the COVID-19 crisis influenced harshly the entrepreneurial initiatives, irrespective of their legal form (Ltd. Authorized Natural Person, II, etc.), as decreases of up to 74% were recorded as compared with the year 2019. The estimates show that this situation might worsen even more over the following months.

Regarding the registration of professional per total, their number decreased in March 2020 against March 2019 by about 73.8%, from a number of 13.076 professionals to a number of 6.023 professionals. As regards limited liability companies (Ltd), the number of newly established was of 4.238 in 2020, against 8.434 in the year 2019 (on decrease by about 66%). As regards authorized natural persons, the year 2020 registered a number of 1.257, on decrease against 2019, when there were cumulated 2.843 de ANPs (about 77%). The most affected counties as regards registrations were Olt (-72.36%), Mehedinți (-72.33%) and Argeș (-71.71%).

Table 10. Total number of registrations in the first COVID-19 period

CAEN section denomination	Total no. of registrations over the period 01.01.2020 - 31.03.2020	Total no. of registrations over the period 01.01.2019 - 31.03.2019	Dynamics	Total no. of registrations over the period 01.03.2020 - 31.03.2020
Activities of private households as employer of household staff; activities of private companies in goods manufacturing and services for own consumption		1	-100,00%	

Administrative service activities, and support services activities	1416	2177	-34,96%	281
Show, cultural and recreational activities	831	1914	-56,58%	189
Professional, scientific, and technical activities	2501	3874	-35,44%	599
Public administration and defense, public system social insurances	2	3	-33,33%	
Agriculture, forestry and fishing	1113	2122	-47,55%	343
Other service activities	1819	2717	-33,05%	347
Wholesale and retail trade, vehicles and motorcycle repairs	5839	8880	-34,25%	1218
Constructions	3550	4695	-24,39%	836
Water supply, sanitation, waste management, decontamination activities	76	139	-45,32%	16
Hotels and restaurants	1389	2404	-42,22%	314
Extractive industry	18	35	-48,57%	2
Manufacturing industry	1701	4696	-63,78%	344
Information and communications	1628	2115	-23,03%	399
Financial intermediation and insurances	250	333	-24,92%	64
Electricity, heat, gas, warm water and air conditioning production and supply	24	18	33,33%	8
Health care and social assistance	713	1239	-42,45%	140
Transport and warehousing	2961	3070	-3,55%	643
Real estate transactions	633	696	-9,05%	148
Education	665	906	-26,60%	132
Total	27129	42034	-35,46%	6023

Source: <https://www.onrc.ro/index.php/ro/statistici> [14]

Still, over the period 1 March -31 March 2020, is found a number of registrations in various fields of activity, most in the following: wholesale and retail trade (1.218 companies), constructions (836 companies), transport and warehousing (643) (Table 10).

Regarding companies' wind up, their number dropped by about 36% in March 2020 as compared with March 2019, respectively 2.068 against 2.975. The most affected counties were Satu Mare (+26.09%), Covasna (+15%) and Brasov (+14.67%). On the other hand, against March 2019, Bucharest registers a decrease by about 33.40%, from a number of 521 in March 2019, to a number of 347 in March 2020.

The fields of activity recording the highest rates of wind up were the manufacturing industry (+44.83), information and communications (+12.90%), transport and warehousing (+11.99%). A descending trend is encountered also in the case of suspensions, as their number decreased by about 49% in March 2020, as compared with March 2019. Thus in March 2020, was recorded a number of 709 suspensions, against 1.393 in March 2019. On counties, the situation was as follows: Mehedinți (-91.67%), Satu Mare (-76.47%) and Călărași next to Vrancea (-50%). A decrease is noticeable also at the level of the Bucharest municipality, from a number of 146 in March 2019, to a number of 76 in March 2020 (-47.95%).

The situation of wind up on fields is as follows:

Drops in companies' wind up

-100% decrease in the fields: Show, cultural and recreational activities, Extractive industry, electricity, heat, gas and warm water production and supply;

-between -90% and -80%: Professional, scientific and technical activities;

-between -80% and -60%: water supply, sanitation, waste management, decontamination activities. Electricity, heat, gas, warm water and air conditioning production and supply:

-between -59% and -40%: Manufacturing industry, information and communication, show, cultural and recreational activities, manufacturing industry, financial intermediation and insurances, education.

Increases in companies' wind up

+200% in the field of public administration and defense; public system social insurances;

+142% in Agriculture, forestry and fishing;

+150% in financial intermediation.

The fields of activity recording the highest drops in activity suspension were agriculture, forestry and fishing (-52.97%); Water supply, sanitation, waste management, decontamination activities next to the extractive industry and the electricity, heat, gas, warm water and air conditioning production and supply (-50%), and Education (-47,85%).

Regarding deregistration, a decrease by about 89.67% is noticed for March 2020 as compared with March 2019, respectively 3.739 against 36.195. Nonetheless, it should be mentioned that, as result of declaring the state of emergency, the opposition right against the wind up of a company was suspended, and because the deregistration period is a stage subsequent to the wind up, the procedures were suspended actually until the termination of the state of emergency. As result, because the wind up procedure cannot be finalized, then neither the deregistration procedure can be carried out.

In this period, under the impact of the COVID-19 crisis, there were a series of analyses and ad-hoc statistical researches addressed mainly to the managers of the enterprises in the manufacturing industry, in constructions, retail trade, and services as regards their perception about the development perspectives regarding activities for the company they manage [15].

This analysis was realized in the period 17-19 March on a sample of 8.831 economic agents, representative at the level of the economic sectors and in total economy. The answering rate was by 71.3%. In order to evaluate the economic impact of the pandemic, the evaluations of the managers were used, as well as the turnover of the enterprises over the period January 2019 – January 2020. The information obtained is useful for evaluating the evolution in the volume of activities in the economy for the period March – April 2020 compared with:

- the corresponding months of the preceding year (2019);
- the month January 2020;
- the monthly average of turnover corresponding to the period January 2019 – January 2020.

In all three working variants, the negative impact was higher at the level of the month April related to the preceding month.

In estimating these evaluations, a questionnaire addressed to economic agents was used in the period 17-19 March of the current year, before the enforcement of concrete measures for fighting against COVID-19.

The following conclusion is the outcome of the analysis of changes in the economic agents' activity volume in Romania, over the period March-April 2020, as result of the COVID-19 epidemic outspread. The impact of the COVID-19 epidemic on the volume of economic activities is determined by the high level of uncertainty as regards the future of businesses in the period March – April 2020, and by its increases in April, against March 2020. Hence, if in March 2020, the weight of 21.2% of economic agents could not estimate how their businesses will evolve, in the month of April, their weight increased to 34.3%. The increase is explained mainly based on the drop in economic agents' weight that did not foresee constrictions of the economic activity from 12.9% in March 2020 to 6.4% in April 2020. This result was obtained by considering the weight of the economic agents estimating compressions in the volume of activity by up to 25% from 14.3% in March 2020, to 7.7% in April 2020.

Taking into account the weight of non-replies (28.6%) in both March and April 2020, it resulted that more than 50% of the economic agents in March and 62.9% in April could not realize an estimate about the evolution in their volume of activity. On the other hand, the same statistical research indicates a trend of aggravation for the COVID-19 epidemic impact on the activity volume for economic agents that could estimate the magnitude of activities' constriction together with the increase in the time horizon for which the estimates are made. Thus, the weight of economic agents that did not foresee a compression of their activity decreases by 8.6% in April 2020 against the level by 26.1% in the foregoing month, while the weight of those estimating a constriction of up to 25% drops by 7.8% in April, against the value by 28.7% recorded in March 2020.

At the same time, the weight of those for which the activity constricts by more than 25% increases from 33.3% in March 2020 to 45.0% in April 2020, and the rate of activities' closure increases from 9.8% in March 2020 to 13.8% in April 2020.

The impact of the COVID-19 pandemic on the activity volume in the manufacturing industry increases together with the expansion of the time horizon. Uncertainty is the main feature of the estimates regarding the volume of activity, because the weight of those who cannot estimate the future direction to which the activity is heading increases from 24.5% in March 2020 to 40.1% in April 2020.

The uncertainty increase regarding the evolution of the activity in industry is triggered by changes in the category of those estimating that the activity will not constrict (-9.8 pp in April against the level in March), and by the category of those estimating an activity compression by up to 25% (-8.9 pp in April against the level in March).

In the framework of the manufacturing industry subsectors, the most affected by uncertainty regarding the evolution of the activities' volume on the date of the statistical research are Manufacturing of road transport vehicles, of trailers and semi-trailers, Manufacturing of other transportation means, Manufacturing of electric equipment, Metallic constructions and metallic goods industry, except machinery, tools and installations, Metallurgic industry.

As it may be noticed, all these activities of the manufacturing industry are one way or another related to the international supply chains affected by the 'lockdowns' decreed by the various countries affected in their turn by the COVID-19 pandemic. If in March 2020 at the level of the manufacturing industry from among the economic agents who could estimate the while 30.2% did not estimate any changes, in April 2020 these weights were smaller by 9.8 pp for the first category, and 13.9 pp for the second.

At the same time, the weight of economic agents foreseeing a compression in the activity volume of over 25% was higher by 19.4 pp in April, against March 2020, while the share of those estimating a wind up of the activity increased by 4.2 pp for the same interval.

The transportation and warehousing sector is one of the most affected by uncertainties related to the COVID-19 pandemic impact on the activity volume at the time of realizing the statistical research. Thus, the weight of economic agents from this sector who cannot make estimates regarding the evolution of the activity volume increases from 25.9% in March to 40.1% in April 2020. This is because of the drop in the numbers of those economic agents who had a vision about the evolution of the activity volume for the period March-April 2020, save for those who foresaw the closure of the activity. From the viewpoint of economic agents who had data that allowed for estimates about the evolution of the activity volume for the period March-April 2020, the weight of economic agents who did not foresee a decrease in the activity volume, and of those who estimated a compression of activity volume by up to 25%, decreased in April 2020. In the same period, from among the economic agents who could estimate the evolution of the activity volume, a weight by 52.2% foresaw in April 2020 a compression of activity by over 25%, against only 44.4% in March 2020.

The impact of the COVID-19 pandemic on the activity volume in the constructions' sector has two characteristics: on one hand, the uncertainty in the evolution of businesses increases together with the expansion of the time horizon, on the other hand, the increase recorded in the weight of businesses affected by the activity volume compression by more than 25%, or by activities' closure. Thus, at the level of all economic agents from the sector, who were included in the statistical research, the weight of the economic agents who cannot estimate the evolution of the activity volume increases from 21.6% in March to 33.1% in April 2020, while the weight of those estimating an impact, or estimated an impact by up to 25% decreased. From the economic agents who could estimate an impact of the COVID-19 on the activity volume in April 2020, 61.4% foresaw an activity volume compression by more than 25% or the closure of activities, against only 39.2% in March.

In the retail trade sector, the impact of the COVID-19 epidemic on the activity volume is at a level close to the average on economy, though the statistic research was realized before the decisions regarding the closing of some commercial entities, others than food entities, or pharmacies. Thus, the weight of the economic agents who could not estimate the impact of the epidemic on the activity volume increased from 20.7% in March to 32.6% in April 2020, while the weight dropped for the economic agents who estimated maintaining the activity volume or an impact by up to 50%. Out of the economic agents of the sector who could estimate an evolution for the activity volume in April 2020, a weight by 21.6% foresaw the closing of the activity, or its compression by more than 25% against 22.1% in March 2020.

In the hotels and restaurants sector, the impact of the COVID-19 epidemic is dominated by the same uncertainty in estimating the future evolution and by the forecast regarding the complete closure of the activity. Thus, from total economic agents included in the statistic research a weight by 11.7% could not estimate the evolution of the activity volume in March, respectively 27.8% in April 2020.

The doubling in the weight of economic agents with an uncertain vision on businesses is due predominantly to the change in the vision of those who foresaw either the closure of activity (difference by 5.1 pp in April against March 2020), or a constriction higher than 50% in the activity volume (difference by 6.1 pp in April against March 2020). From among the economic agents in the sector who could make an estimate regarding the impact of the COVID-19 pandemic on the activity volume in April, 95.4% foresaw a compression of the activity by more than 25% or closure, against 92.9% in March 2020. Other estimates:

- Impact on the manufacturing industry – 40.1% cannot estimate the future possible evolution direction;
- Impact on the transportation and warehousing sector – 52.1% from the agents answering the questionnaire mentioned an activity compression by over 25%;
- Impact in constructions – 61.4% foresee an activity constriction by over 25%;

- Impact on retail trade is estimated to be an activity constriction by over 25%, or activity closure;
- Impact on the hotels' and restaurants' industry – 95.4% estimate a constriction by over 25% or activity closure.

It is estimated that 580.000 workplaces will be created by public and private investments.

6. RESTRICTIONS BUT OPPORTUNITIES AS WELL OVER THE COVID-19 CRISIS PERIOD FOR SMES

Some of analysis in the field of entrepreneurship consider that SMEs are faced with the biggest challenge of the last three decades. This challenge comes with both negative and some positive aspects that might be changed into true opportunities for this very important sector for the economy of each country/region. Some opportunities were identified already by the beginning of the crisis. Thus, the destabilization of the import chains led to amplified sales of local goods. A study realized by NIS [15] shows that about 35.3% from Romania's importers consider that the imports' volume will decrease by 25%.

In order to create opportunities from this perspective, it is necessary to relaunch production before relaunching consumption for exiting this crisis. Moreover, on this element is substantiated also the SME Invest program that pursues to restart industry with those who want to get involved and have the capacity therefore. This program supports a public-private partnership that must generate safeguarding effects concomitantly with promoting autochthonous goods.

The banking system is not faced with lacking capital yet. Therefore, entrepreneurs must assume various investment plans. There are already some entrepreneurs in search for solutions to adjust, even in the restaurants' system, which was affected severely by the crisis and by the decisions regarding lockdown at home.

Other opinions related to turnaround are related to the fact that production must be restarted simultaneously with consumption, and the first thing needing support is the chain between consumer and producer, which must operate properly for things to happen quicker. The state should focus on supporting the value chain for stimulating consumption, on systemic investment, and on ones of the support type.

Other opportunities are taken into account also in the present situation like the massive increase of public investments in education, agriculture, and food industry, supporting the value chain, stimulating consumption, granting voucher or consumption tickets to persons in unemployment, and supporting large enterprises, etc.

Another example of an opportunity already fructified is the one of the company Electric from Focsani a package manufacturer that had to import certain products, such as sprays from Turkey or China, because the factory had no specific line for producing them. Under these conditions, the company saw an investment opportunity in a new business division for adjusting and beginning to produce locally these sprays.

Another opportunity is given by promoting innovative acquisitions and identifying innovative solutions that can be used for the direct or indirect treatment of COVID-19 patients. At the same time, providing for the needs of hospitals and health care institutions with innovative solutions that may be proposed by certain companies, especially by SMEs, is another opportunity, in the following fields:

- Medical devices, managing the supply and logistics chain for assisting in the COVID-19 hot spots;
- biotechnology/health – drugs, antimicrobials, promoting new medication, antimicrobials and medication for mitigating the effects of the new virus;
- tools for forecasting and putting a halt to the disease outspread.

A significant boost received the IT industry which has the opportunity to develop products and solutions that make easier, more efficient, and healthier the life of individuals thus determining the technological revolution to receive the impetus it required for transitioning into the next development stage.

The telecommunications' industry is, as well, one of the big winners because the need of the individuals for quick internet anywhere anytime is now higher than ever. The low traffic from large cities like Bucharest is supported and it helps in increasing awareness about the benefits of clean air. Thus, there are high chances to notice, on medium-term an increase in concerns for clean environment and business sustainability with positive consequences for air and water quality, but also for food products, beverages, personal care products, or cosmetics. The European Environment Agency (EEA) has developed a viewer that tracks how the reduction in transportation affects the concentration of air pollution. They use weekly updated data from EEA member countries to show that the concentration of nitrogen dioxide (NO₂) (a well-known pollutant emitted by road transportation) decreased in many European cities where restrictive measures have been implemented. To clearly visualise the effect the reduced traffic has, the EEA shows the level of air pollution compared to last year. Furthermore, an increase in greenhouse gases from other sources is observed. For example, the amount of landfill waste has risen due to cuts in

agricultural and fishery export, suspension of recycling activities, the re-introduction of plastic bags and the increased amount of take-away food with single-use plastic. Due to the decay of this waste the level of methane (CH₄), a greenhouse gas, is expected to rise. So, it might be questionable to truly speak of a silver lining for the environment. The long-term impact of the coronavirus pandemic on climate change will depend on how countries and corporations respond to this situation [17].

The majority of companies with office activities implement the “work from home” concept for the first time at general level. The practice could be maintained also after the crisis ends, and this might change positively the dynamics of the working program in the future, by diminishing the over-agglomeration of the city and increasing the productivity of the employees. In these circumstances, laptops and videoconferencing systems were among the first goods sold at large scale in the big European capitals, as the virus began to spread out on the old continent. On this occasion, a new Wall Street index was created called “Stay at Home” which comprises 33 companies that might profit as result of the fact that employees work from home. The index includes Netflix (already gaining 8%), Amazon (one may visualize programs by means of Amazon Prime Video), Facebook, Sonos (selling wireless audio systems based on Wi-Fi), shares of video game producing companies, shares for “software assisting in working from home, and to participate in online conferences/teleconferences.

At the same time, pharmaceutical companies with research-development activities communicating that they entered into the race of finding a treatment against the coronavirus have obtained massive capital injections or substantial increases in their shares on the stock market, while generic companies registered colossal sales.

Long-term opportunities exist for technology companies delivering online services or facilitating the supply of online services. This crisis will change the mindset of large corporations and will transform the way they relate to work from home. The same thing might be said also regarding the mindset of consumers, as they will access more online services, online shopping, courier services, etc. It is very possible that the first sustained increases will be noticed here, after the present critical period passes, or even sooner.

On short term, the massive drops of the last month generated opportunities of high increases for companies beginning to become attractive for sale, while traders resorting to Short Selling might record huge gains. Short Selling is a mechanism allowing for valorizing a price difference on a decreasing market, while Hedging is a mechanism allowing for protecting the portfolio against unwanted fluctuations.

7. CURRENT MEASURES FOR SUPPORTING THE SME SECTOR

In the attempt of assisting the SME sector to avoid complete and irrecoverable collapse because of the COVID-19 outspread crisis, a series of actions were promoted that we mention in the following:

1. Postponing payments for utilities – electricity, natural gas, water, phone and internet services, as well as postponement of rent payments for the building representing the registered office, and secondary offices. The beneficiaries are SME that suspended their activity totally or partially based on the decisions issued by the competent public authorities and that have the emergency certificate issued by the Ministry of Economy, Energy, and Business Environment for the duration of the emergency. These dispositions are also valid for the following professions providing services of public interest: notary public offices, lawyers, judicial executors, etc. For other contracts in development concluded by SMEs, force majeure may be called upon against them only after the attempt proven by writs communicated between the parties by any means, including electronic ones, of renegotiating the contract for the adjustment of its clauses by considering the exceptional conditions generated by the emergency.
2. The statement regarding the sole beneficiary – the term for filing the statement is extended by up to three months as of the date of terminating the emergency instituted by Decree no. 195/2020, regarding the establishment of emergency on the territory of Romania. For the entire duration of the emergency, the filing of this statement is suspended.
3. SME Invest Romania – the Program for supporting small and medium sized enterprises that provides for state guarantees in favor of each beneficiary participating to the program. The guarantees are foreseen for one of the following categories of credit:
 - one or several credits for realizing investments. Additionally, one or several credits/credit lines for working capital, guaranteed by the state represented by the Ministry of Public Finances to a share of maximum 80% from the value of the financing, excluding interests, commissions, and bank charges corresponding to the guaranteed credit. The maximum accumulated value of the financing guaranteed by the state that may be granted to a beneficiary in the framework of this facility is of 10.000.000 Lei. The maximum value of credits/credit lines for financing working capital granted to a beneficiary cannot exceed the average of expenditures corresponding to the working capital for the last two fiscal

years within the limit of 5.000.000 Lei. For investment credits, the maximum value of the financing is by 10.000.000 Lei. For SMEs that did not file the financial statements on the date of applying for the guaranteed credit, the maximum value of the financing for credits/credit lines for working capital will be calculated as the double of the average expenditures corresponding to the working capital in the monthly balance sheets;

- another alternative is one or more guarantees for credits/credit lines for financing working capital, excluding interests, commissions, and bank charges corresponding to the credit guaranteed by the state to a share of maximum 90% granted to a microenterprise or small enterprise. The maximum value is by 500.000 Lei for microenterprises, respectively, maximum 1.000.000 Lei for small enterprises. The maximum value of each granted financing to a beneficiary cannot exceed the average of expenditures corresponding to the working capital for the last 2 fiscal years within the limits of the thresholds provided before. For microenterprises, or small enterprises that did not submit financial statements on the date of applying for the guaranteed credit, the maximum value of the financing for the credits/credit lines for working capital will be computed as the double of the average expenditures corresponding to the working capital in the monthly balance sheets. The period of subsidizing the interest is as of the moment of granting the credits/credit lines contracted after the enforcement of the present Emergency Ordinance and might last up to 31 March 2021. Subsidizing the interest is approved annually by a normative act with power of law for the first year and for the subsequent 2 years only under the conditions in which the economic growth estimated by the National Commission of Strategy and Prognosis for the period is placed below the level of the one recorded in the year 2020. The maximum duration of the financing is 120 months for investment credits and 36 months for credits/credit lines for working capital. The credits/credit lines for working capital may be extended for maximum 36 months, following that in the last extension year, these will be reimbursed under the conditions provided for in the methodological norms for enforcing the emergency ordinance [18].

8. FINANCING SOURCES IN SUPPORTING THE SME SECTOR OVER THE PERIOD OF THE C-19 CRISIS

The following sources of supporting the SME sector were identified, grouped as hereunder.¹ Sources from European Funds, Non-reimbursable aid from the state budget, Bank credits in advantageous conditions and Investment funds.

Hereunder, the following are presented synthetically:

1. European Funds granted to SMEs are allocated especially by ROP – Priority Axis 2.2 [19].

Thus, microenterprises and small-/medium-sized companies (SME in the urban area, and in the rural area only medium-sized companies) may obtain European funds with a value between 200.000 Euro and 1 million euro under certain conditions by investments in 10 counties. The projects may be filed with the electronic application MySMIS. European funds may be requested by companies in various fields, from small textile factories to workshops for computer repairs, software editing companies, video production, etc. They may invest money including in online trade means. The budget allocated to this axis is by 68 million euro and is addressed only to the development regions where there are still unspent money from the 2016 call (save for the Bucharest-Ilfov region, which is not eligible). The call for projects is valid for the following investments:

- North-East region (counties Bacău, Botoșani, Iași, Neamț, Suceava and Vaslui). Total available budget is by 31.4 million euro.
- West region (Timiș, Arad, Caraș-Severin and Hunedoara). The total available budget is by 36.6 million euro.

On 30 April 2020, other support forms for SMEs were negotiated with the EC by four new intervention instruments with a total value by 1 billion euro [20]. The four new working instruments negotiated currently with the European Commission are the following:

- *Grants in fixed amount related to the turnover* – they are intended for the working capital for financing the current activity of the companies. There has to be a proportionality by 10% between the value of the grant and the value of the turnover. These are aimed at activities with indirect impact for stimulating the domestic demand (stocks of raw materials, necessary material, ware stock, etc.).

¹ For some financing, Accessing Calls are already open, and for others the sessions were budgeted for preparing Calls of Proposal.

- *Consumption vouchers* – it is pursued to stimulate domestic consumption for goods manufactured in Romania. There is a variety of vouchers that may be used in the activity of the SMEs like consumption vouchers, digitalization, and innovation ones (for this type of financing there is still a certain reticence showed at the level of the European Commission)
- *Subsidizing the wages for employees in private companies with public money*; this instrument is aimed for subsidizing the costs with wages for the personnel that is currently in technical unemployment for a limited period, and within the limit of 50% of the wage costs. This subvention may be aimed also for compensating social contributions, and wage taxation. It might be supported by the SURE² fund at European level.
- *Classic grants for supporting investments*; these grants enter under the incidence of the state aid schemes. A state aid scheme operating during the C-19 crisis already exists up to the end of the year 2020 with a value by maximum 800.000 euro (credits with subsidized interests up to the end of the year 2020, in the framework of SME Invest).

These new instruments for SMEs will be launched in either June or July 2020 and will be managed at domestic level either by the Ministry of Economy, or by the Ministry of Development and Public Works.

From the budget of 1 billion euro allocated by European Funds will be distributed 300 million euro for grants, 500 million for vouchers, 200 million euro for investments (intended for medical and protection equipment, related to specific investments for the epidemic crisis, etc.). It is estimated that in the week 4-8 May the negotiations with the EC will be finalized, and the intervention value by 1 billion euro is included as budget.

2. Start-Up Nation 2020 [21] - The state budget for the year 2020 provides for 1 billion Lei, in engagement credits aimed to the Start-Up Nation program. The money may finance about 5.000 companies by a new Start-Up Nation program 2020 (by 2 times less than the level of the program up to now, which aimed to support 10.000 SMEs). The National Council of the Small- and Medium-Sized Enterprises from Romania (CNIPMMR) requests a maximum eligible package by 25.000 Lei from the non-reimbursable aid by maximum 200.000 Lei that should be allotted compulsory at least for a site for company's presentation, a data management software, and the electronic signature.

3. The Micro-industrialization Program - The 2020 micro-industrialization program has an allocated budget by 65.000.000 Lei in credits of engagement and 65.000.000 Lei in budgetary credits by means of the state budget for 2020. In the Micro-industrialization program for 2018, a number of 247 companies were qualified for obtaining non-reimbursable funds of up 450.000 Lei each from the state budget. The majority of SMEs requested the maximum amount of 450.000 Lei. In the year 2019, the government published an organization procedure of the program Micro-industrialization but did not open the session. The Ministry of Economy is the organizer of the program Micro-industrialization.

4. The Program Trade 2020 is aimed at developing trading activities of market services and has an allocation proposed by the budget draft amounting to 40.000.000 Lei in credits of engagement, and 40.000.000 Lei in budgetary credits. In the Program Trade 2018, a number of 209 private microenterprises and small- and medium-sized companies (SMEs) were qualified for non-reimbursable financing amounting to maximum 250.000 de Lei from the state budget. In total, over 1.000 companies were registered with the program in 2018. Not all SMEs requested the maximum amount. The Ministry of Economy is the organizer.

5. The Program Internationalization 2020 is intended to support the internationalization of the Romanian economic operators and the allocation for amounts to 10.000.000 Lei in credits of engagement and 10.000.000 Lei in budgetary credits for the year 2020. In the preceding years, the Romanian private companies could obtain non-reimbursable funds from the state amounting to maximum 25.000 Lei each, for travelling abroad to fairs and exhibitions by means of this program. The financed companies were from the information technology field, the food sector, furniture manufacturing, textile industry, and research, scientific and medical innovation. In the year 2018, for instance, were favored the companies that chose as target-markets areas outside the European Union with priority in Africa or Asia. The organizer is the Ministry of Economy.

² SURE is a solidarity instrument by 100 billion EUR that will help workers to maintain their incomes and will support enterprises to remain operational. From this support will benefit, as well, farmers and fishers, as well as most vulnerable persons. The current EU budget is the basis for all these measures, and it will put to good use, and to the maximum each available euro. This proves the necessity for the EU to avail itself of a long-term sound and flexible budget. The Commission will take measures to ensure that EU can rely on such a sound budget that would allow for exiting the crisis and to make progress towards turnaround. By means of the new solidarity instrument, jobs will be maintained and enterprises operational.

6. Loans for small businesses – In the framework of this program, entrepreneurs may obtain banking credits between 4.000 and 200.000 Lei from TB Mic, a company within the Fiancial Group Transilvania Bank aimed at crediting small businesses. The companies applying must fulfil also some conditions, among which at least three months of activity length. The companies may borrow up to 120.000 Lei without material warranty; however, a real estate warranty might increase the amount to up to 200.000 Lei. For companies in the agricultural field, maximum 200.000 Lei may be accessed without material warranties and up to 400.000 Lei with real estate warranties (TB Mic- site).

7. Credits with European guarantees for SME that can obtain banking credits in advantageous conditions, with the aid of some guarantees from the European Union based on the Regional Operational Program (ROP), by means of the axis aimed to the Initiative for SMEs. This ROP line of financing avails itself in total of 250 million euro. The money may be accessed directly from the banks that signed in Romania agreements with the European Investment Fund, and the financing cost is lower than in the usual market conditions. The loan is guaranteed to 60%.

8. Romanian investment funds - Romanian entrepreneurs may use investment funds for venture capital financing that provide financing and receive in exchange minority packages of shares. For the past 2 years, at least 3 Romanian investment funds supported by the European Union emerged on the market providing for financing from 25.000 euro to 5 million euro, respectively GapMinder, Early Game Venture, and Morphosis Capital. Another Romanian investment fund for startups is Roca X constituted by experienced businessmen.

9. The Program the Entrepreneur Woman 2020 is aimed at developing entrepreneurship among women in the sector of small- and medium-sized enterprises [22]. In the editions of the past years, by means of this program 80 Romanian businesswomen could pursue entrepreneurship courses in Romania, but some of them pursued them also abroad (for instance, in 2018, the foreign destinations for the women qualified in the final stage were London, Paris, Madrid and Rome).

10. The Program for Entrepreneurship Courses EMPRETEC 2020 – In this year a budget of 504.000 Lei is allocated for launching a new session of the Program UMCTAD/ EMPRETEC Romania, aimed at supporting the development of SMEs. In the year 2018, about 100 Romanians could pursue the free entrepreneurship and management courses by means of the governmental program EMPRETEC. The basic program provided for the participants was the workshop for developing personal entrepreneurial skills developed by the Harvard University jointly with Management Systems International and McBeer & Co.

11. The Small- and Medium-Sized Enterprises Fair – a budget of 5 million Lei is allocated for organizing the fair in 2020, with certain gratuities for the exhibitors, respectively small- and medium-sized companies (SME). Moreover, conferences, seminars, round tables, workshops and presentations can be organized with the purpose of increasing the number of successful entrepreneurs and of entrepreneurial skills. For the past years, the fair was budgeted by the Government, but was no longer organized.

12. The Program Crafts and Handicrafts 2020 – money for hand-made is budgeted with about 890.000 Lei, for organizing a profile fair to which will be invited and financially supported to participate craftsmen and artisans from the entire country. In 2019, the fair of hand-made products was held in the locality Bran. By means of the Program, the transportation expenditures could be supported for the beneficiaries and for their products for a maximum value of 2.000 Lei, as well as the accommodation expenditures amounting to maximum 1.600 Lei/beneficiary for maximum 4 nights accommodation; however, the amount was of not more than 200 Lei/night/person.

It is estimated that the implementation of the support instruments for SMEs will be more easy based on grants in fixed amounts and consumption vouchers, and more difficult on the investment component. The evaluation of the projects by the Management Authorities will be relatively difficult from the perspective of the low analysis expertise of the projects from the business environment (financial sustainability, market success, etc.).

9. ACTIONS AND POSSIBLE SOLUTIONS FOR SMES RECOVERY

Proposal	Instrument	Description
Supplementing the financing in the framework of the SME Invest Program	SME Invest	On 1 May were analyzed 47.896 applications formulated by a no. of 37.089 SMEs registered in the application www.imminvest.ro . A number of 20.139 applications (43.56%) were sent to the 22 partner banks for analysis in view of obtaining the financing agreement. Because the number of SMEs needing this support is still unknown, a supplement of funds in the framework of this program might be taken into

		<p>account.</p> <p>Considering that in Romania are about 547.570 small- and medium-sized companies, and a drop by 30% is estimated in their numbers (164.271 companies), an extension of the program is proposed for at least 100.000 companies.</p> <p>SME INVEST ROMANIA is open until 31.12.2020, with an allocated ceiling by 15 billion Lei.</p>
Support for domestic producers and local businesses	Online platforms	<p>The creation of an online mechanism is suggested, where local production SMEs may trade their products. An example is the one of the National Agency of the Mountain Area that created the platform www.produsmontan.ro, dedicated to producers in view of promoting this type of goods. By this initiative, the consumers from Romania are informed about the ability of purchasing these products in an online system.</p> <p>Another proposal is to create a strategic program for supporting the Warehousing, Collection, and Distribution Centers for Romanian agricultural food products that would provide, among others, also for the obligation of large retailers to have a share by at least 30% of goods manufactured in Romania corresponding to a certain article sold by their networks.</p>
Promoting special financing programs from EU funds	ROP OPSGD	<p>Promoting/advertising programs aimed to vocational investments, training and reskilling and development programs for the economic environment.</p> <p>For the period 2021-2027, SMEs have available the following operational programs:</p> <ul style="list-style-type: none"> - the 8 Regional Operational Programs (a division of ROP is planned which is managed now by the Ministry of Public Works in eight ROPs, one for each region and one management authority for each. Finance may be granted for investment in the digitalization of local public services, smart city, smart specialization, and technological transfer, innovation, smart parks, SME, robotics, digitalization. - The Operational Program Smart Growth and Digitalization. Smart specialization projects at national level will be financed in synergy with the EU Horizon program that is accessed directly at the European Commission by beneficiaries within the EU and from partner-states (for instance, Israel). Also, in this operational program will be included projects of internationalization, industrial transition, nanotechnologies, robotics, research-development-innovation infrastructure, as well as financial instruments for companies' financing.
Creating a National Program for supporting industrial parks and business incubators	ROP 2021-2027	<p>This program may be a relaunch for some older programs that pursued and financed such ROP projects. It can be implemented at regional or country level.</p>
Simplification of the procedures for all European financing	ROP OPHR	<ul style="list-style-type: none"> - The extension of the implementation period for projects financed from European funds under development, beyond the maximum period provided for initially; - Financing of some projects by ROP – OPHR aimed to skilling, reskilling and improvement of labor force, to the endowment with equipment and materials necessary for developing their activity in the new conditions, digitalization of the enterprises' activities; - Simplification of the mechanisms for accessing European funds, diminishing bureaucracy (reports, evaluations, etc.); - Promoting the EEN network (Enterprise Europe Network) launched by EC (the largest SME support network). The EEN networks are financed based on projects in a share by 60% by the European Commission, and the remaining 40% is born by the host structures from each country. The co-financing share by 40% becomes difficult to be born in the current situation by private entities (Commerce and Industry Chambers, business associations, private companies, universities and research institutes). The suggestion is to support from the budget the 40% contribution corresponding to the functioning of these networks in Romania.
Creation of support centres at regional level	OPHR 2014-2020	<p>The support-centers will deliver free of charge the necessary and useful services for companies (that will be severely decapitalized) over the post-crisis period (the types of services aim to accounting, legal, human resources, financial advice and mediation services, digital transformation, consulting for adjusting to the new socio-economic context, business restructuring advice, etc.</p>

Declaring some disadvantaged areas after the model of the Emergency Ordinance no. 24/1998 regarding the regime of disadvantaged areas	ROP 2021-2027	The disadvantaged areas represented by counties with industrial development of the mono-product type with orientation towards export and one employer. The companies in these areas are characterized by the bank indebtedness degree (agricultural producers, from the food industry, etc.). For instance, county Suceava where the most important weight in GDP is given by the exploitation and manufacturing of natural resources, constructions, trade and services, tourism, processing industry, food and textile industry, transports, as many companies were completely closed or reduced.
Supporting a national investments program	NPLD or another program financed by SIF	<ul style="list-style-type: none"> - investments from public funds for the transport infrastructure (highways, national, and county roads, railway, airports, etc.), health care, education, energy and environment, agriculture (irrigations), by granting some priority rights for execution tenders to companies from Romania; - launching holiday vouchers for relaunching Romanian tourism. In the context in which the state aims to return either totally or partially, the sums paid in advance by the tourists as requested by some of them, the money may be allocated from the European funds aimed at the fields affected by COVID-19 under the form of lunch tickets or holiday vouchers for touristic services in Romania. These should be valid up to the end of the year 2021; - promoting Romanian investments and exports in public-private partnership a measure that might be beneficial by rendering substantial dynamics to the volume of investments and exports made by Romanian producers, and increasing the prestige of Romania by creating the most friendly business environment in south-eastern Europe; - improving the legislation as regards public-private partnerships by regulating some simpler forms of public-private partnership, such as design, development and exploitation contracts, including some special provisions regarding the access of companies to public-private partnerships, and the public-private partnership with the non-profit sector;
Digitalization of public administration	National funds, EU funds	Digitalization of public administration, mainly by employing Romanian companies (concept, services, etc.).
Supporting the agricultural sector		<ul style="list-style-type: none"> - anticipated payments of subsidies in agriculture, investments for reactivating the irrigation systems existing in Romania up to 1989, irrespective of the subsequent classification of the latter - subsidizing, at least partially, energy costs for the energy used in pumping water for irrigations in the 3rd and 4th watering stages; - resuming and extending the programs for creating forest curtains in order to protect agricultural cultures from draught; setting up by means of credits with subsidized interest the entities for processing vegetables and fruits produced in Romania; - state intervention by support schemes for farmers in extreme or severe draught conditions, after the model of those implemented in the year 2008.

Source: own processing

10. CONCLUSIONS

The SME sector was one of the hardest hit sectors during the C-19 crisis, in both Romania and at global level. This fact determined the governments of the world states, including the one of Romania to take urgent measures for keeping the sector afloat. According to official statistics, in Romania, three out of ten companies are in the risk zone, with expenditures higher than incomes (Financial-Banking Analysts' Association) and with a total number of 850.000 employees (one-fifth from the total number of employees in the private sector).

In Romania, the measures of supporting the SME sector amount to 2% of GDP, while in other countries the provided support amounts to about 10% of GDP. The supports provided by the Government for the companies that suspended the contracts of their employees cover only a part of the wages. The measures enforced up to date by the Government, pursue to safeguard a number as high as possible of companies, but they cannot save all of them. From among them, we mention ensuring the payment of technical unemployment in value of 75% from the gross wage of the employee, but not more than 75% from the average gross wage, and credits' guarantees for investments and working capital for SMEs, by means of state subsidized interest.

In the scenario according to which SMEs, the basis of economy in any state are not kept afloat, then also the state will suffer. "The budgetary incomes will be smaller, and the expenditures higher (including the ones for supporting technical unemployment), and the result will be higher deficits" (CFA) [23]. Additionally, the banking sector might be hit because neither population, nor companies will be able to pay the rates. Over the last three years, expansionist fiscal policies were implemented, and the fiscal room was relatively low. An example of how things should be done is the one of Germany, which starts with a surplus by 1% and supports extremely aggressive programs for restarting the economy.

The measure packages addressed to SMEs affected by the C-19 crisis should involve all national resources, including ones that may be obtained from EU. According to the opinion of some important economists from Romania, the most important measures address social protection but also SMEs protection [24,25]. Despite fiscal and monetary measures that are taken, protection measures cannot last infinitely. The costs triggered by the C-19 crisis are forecasted to amount to over 10 billion euro. The current crisis is considered as more severe than the crisis of the year 2009 (then Romania borrowed about 20 billion euro from IMF, the World Bank and EU).

An analysis of the consulting company Frames [26] estimates that in a first stage, over 300.000 companies from Romania will be affected by the second wave of the crisis generated by the coronavirus. Most of them are microenterprises, and small enterprises with maximum 20 employees in fields like HoReCa, and services for the population (events, beauty saloons, gaming rooms, district shops, etc.), that closed their activity on the background of administrative decisions and, in many cases, as result of the dramatic decrease in cashing. Many companies instead of deciding on technical unemployment for their employees cancelled their labor contracts. These companies will have problems in the future in bringing them back into the company.

Therefore, instead of a conclusion, in this period is necessary good communication from the Government regarding the measures aimed at the SME sector, but also better collaboration with the business environment for identifying ongoing the emerged needs and issues. The business environment knows what is to be done, which are the tax reductions, and which are the new fiscal charges, and how business plans will be built in the future, etc.

In conclusion, the C-19 crisis is different from the 2008 one, and the role of the decision factor is vital in restarting the activity for the SME sector so that it contributes to relaunching economic growth. Authorities have to encourage companies to begin activity and a clear and concise dialogue is necessary between entrepreneurs and local or central authorities. Important measures such as increasing the guarantee ceiling, higher flexibility between funds, private investments, public investments, etc. can contribute to restarting and rebuilding the economy in Romania, after this unprecedented crisis. Moreover, all actions and measures taken in this period must pursue the rebuilding of the national economy and not just relaunching.

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The Roman Road on the Teleajen Valley

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Abstract: Although it is among the oldest vestiges found in northeastern Muntenia region (Romania), the roman road established on the Teleajen Valley was never taken into consideration by recent scholars. This economic, commercial and military axis was crossing the mountainous and hilly units of the Carpathian Curvature, facilitating the link between the Roman settlements from Transylvania and the ones fixed along the Danube. The existence and the use of the road were strongly related to the roman fortifications established in Drajna de Sus, Mălăiești, Târgșor and also, to the salt resources from Slănic-Teișani area. The main road paved with stones was intersected in some points by secondary branches, having a local role only. After the withdrawal of military troops, some parts of the road continued to remain operational, while others have been deteriorated until they disappeared from the landscape. At the end of the 19th century, the roman road on the Teleajen Valley figured in the oral tradition under various names, such as “the Trajan's road”, “the Roman road”, “the Tatar road”, “Troian” or “Caldarâm”.

Key words: Roman road, Troian, Teleajen Valley, Curvature Subcarpathians, Drajna de Sus

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1. INTRODUCTION

The existence of the Roman castra outside the Carpathian arch, located within the localities of Drajna de Sus, Mălăiești and Târgșor, has been the subject of intense archaeological debates since the 20th century. According to the general opinion, their function was related to the military defense of the occupied territories, and at the same time, to the supervision of the economic and commercial interests of the Roman Empire, among which an important role was played by the exploitation of saliferous resources in the Curvature Subcarpathians [1] (p. 121).

The Roman castra at Drajna de Sus, Mălăiești and Târgșor had a relatively short period of operation, from the end of Trajan's military campaigns in Dacia to the beginning of Hadrian's reign [1] (pp. 112-113). According to another hypothesis, their construction could have taken place between the two wars between the Dacians and the Romans, or even before the first conflict, which took place between 101-102 AD [2] (p. 11).

Regardless of the time spent by the Roman troops in northeastern Muntenia, they had sufficient material and human resources to organize a local transport infrastructure, consisting of paved roads. The present article aims therefore to bring into discussion the written and oral testimonies that have been preserved regarding the Roman road on the Teleajen Valley, an ancient road corridor on which many historical and geographical uncertainties still persist.

2. BRIEF HISTORY OF RESEARCH

The first written reference to the Roman road on the Teleajen Valley is due to Cezar Bolliac and was published in the Carpathian Trumpet magazine (1869), in the context of the discoveries made north of Slon (Coliba Veche point) [3].

New data regarding a section of paved road (“Troianu”) visible within the villages of Olteni-Teișani (Prahova) were collected in 1873, through the *Archaeological Questionnaire of A. Odobescu* [4]. The Roman

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road also benefited from a detailed description in the *Questionnaire of N. Densușianu* (1894) [5], and soon afterwards in the *Geographical Dictionary of Prahova County* (1897) [6]. Isolated, inconsistent mentions will be made until the Second World War, by authors such as Gh. Murgoci (1909) [7], E. Zaharescu (1912) [8], I. Costeanu (1930) [9] and O.G. Lecca (1937) [10].

The figure that was distinguished by the most consistent contribution, both in terms of establishing an approximate route and in specifying the road construction technique, was Gh. Zagoriș (1912) [11]. The data provided by Gh. Zagoriș were the only ones obtained on the field, through the campaigns carried out by his brother in 1912. In the summer of 1928, Colonel C. Zagoriș, making new excavations, would have found other fragments of the road [9] (p. 9). However, it cannot be specified whether the new results have been published.

The information from 1912 of C. Zagoriș regarding the Roman road has remained until today the most detailed and pertinent. The road on Teleajen was also mentioned by the archaeologist I. Andrieșescu, in the manuscript entitled *Antiquities of Prahova*, only as an "ancient road" [12].

During the communist and post-communist period, for objective reasons, the efforts of archaeologists focused more on sites with a superior complexity and a richer inventory, such as those in the vicinity, from Drajna de Sus, Târgșor, Mălăiești, Slon, or Budureasca. This happened, however, to the detriment of the Roman road, which remained largely unknown.

3. THE AGE OF THE TRANSCARPATHIAN ROAD FROM THE CARPATHIAN CURVATURE

Important transit route through the region of the Curvature Carpathians and point of convergence of roads with various functions (economic, military, etc.), the Teleajen Valley illustrates the succession of several generations of Transcarpathian roads: the ancient road (natural), the Dacian road, the Roman road, the medieval road and the modern road.

The sickles deposit discovered at Drajna de Jos, dating from the Bronze Age, which includes Transylvanian elements, has shown that the use of the communication route through the Tătaru pass is very old [13] (p. 4). The pieces of this treasure made Vasile Pârvan call the Teleajen Valley "the ancient road to Ardeal", in the work *Getica* [13].

The abandonment of the natural roads in favor of the arranged ones happened gradually, with the political and economic ascent of the Dacians, or much more surely, after the establishment of the Roman power. That there was an important road here in the time of the Dacians, which had the function of a link between Transylvania and Muntenia, is shown quite clearly by the fortified points along the Teleajen.

A first Geto-Dacian fortress guarded at Gura Vitioarei, from the top of Movila, which is on the left bank of Teleajen, at the confluence with Valea Danciului. Archaeologists have found traces of habitation here from the Neolithic era, the Bronze Age and especially from the Geto-Dacian era [14] (p. 11). Also, at the top of Cetățuia, which separates the Teleajen valley from that of Drajna, traces of the Bronze Age (Monteoru culture) and the second Iron Age (Geto-Dacian culture) have been brought to light [15] (p. 79). The Plateau of Cetățuia is surrounded by terraces that seem to be of anthropogenic origin and has been fortified with beds of earth and stone [15]. These things show us that the Teleajen road was the "backbone" of human settlements and fortified points from the Iron Age (La Tène).

But the strategic and economic importance of this ancient sector of human habitation is reflected the best in the improvements brought by the Romans, by building castra and paved roads. The construction of the castra from Drajna, Târgșor and Mălăiești between the two wars between the Dacians and the Romans or even before the first conflict, is a plausible variant in the opinion of the archaeologist Bogdan Ciupercă [2] (p. 11). The hypothesis seems to be confirmed by an accidental discovery, from the end of the 19th century, narrated by the teacher D. Bazilescu (1894) [5]. According to this witness, some workers working on the Teleajen Valley found on *Căldărâm* (on the ancient paved road) a coin with the face of the Emperor Dometian (81-96), a coin that he himself saw [5] (f. 281).

The control of the Roman administration in the Teleajen Valley area was limited to the stationing of auxiliary troops, meant to monitor the key economic activities, to control the roads and to intervene quickly in situations of need. The existence of the paved roads as well as of the three castra in the area of the Prahova and Teleajen rivers, at Drajna de Sus, Mălăiești and Târgșor, can be attributed to the saliferous resources, quantitatively and qualitatively significant.

In this context, it cannot be omitted that some archaeologists hypothetically place the Ramidava fortress, mentioned by Ptolemy in the Muntenian Carpathians, at Drajna de Sus [1] (p. 113, footnote no. 17). The abandonment of the Roman fortifications from Târgșor, Drajna de Sus and Mălăiești took place, most probably, in the first decades of the 2nd century AD [15] (p. 14). After this date, the roads began to be neglected, to deteriorate and eventually disappear from the humanized landscape.

4. THE ROMAN ROAD - STATE OF PRESERVATION AND TECHNICAL CHARACTERISTICS

Historical, geographical and socio-economic factors have made the Roman road on the Teleajen Valley not last until today. Its physical condition has permanently deteriorated due to neglect, climatic weather (rain, freeze-thaw) and anthropogenic activities.

In the sub-Carpathian sectors, where the population density was higher, and on the fertile terraces of Teleajen, the road was destroyed in a very large proportion by seasonal agricultural practices (spring plowing). Its degradation intensified as people became more numerous and the land dwindled through the multiple divisions of land lots. At the end of the 19th century, after the social and agrarian reforms undertaken by Alexandru Ioan Cuza, the inhabitants saw themselves in the situation of capitalizing on every piece of land. Thus, people began to plow more and more frequently with the plows the cobbled roads hidden in their gardens, and were forced to destroy them in order to gain agricultural space [9] (p. 9).

We cannot specify whether the condition of the road was affected to any extent by the construction of the narrow gauge railway, from Măneciu Ungureni to Vama Buzăului, which climbed the Teleajen valley to Boncuța, between 1913-1968 [16] (p. 94). What is certain is that during the socialist regime, a part of the road was covered by the waters of the Măneciu storage reservoir.

In isolated or incompatible areas of agriculture, nature has fully entered into its rights. D. Bazilescu noted at the end of the 19th century that on Devil's Valley, in the mountain area, "trees of 3-5 meters in circumference are grown on the cobblestones" [5] (f. 281).

The Roman roads, built with expense and a lot of work, usually included two elements: *agger* (the middle part, paved with stone or river slabs) and *crepido* (elements that framed and delimited the road like sidewalks) [17] (p. 12). Along them, from mile to mile (1472 m), stones were installed that indicated the distance and from place to place were arranged rest areas or with special functions (Civitates, Mutationes, Mansiones) [17] (p. 12).

Two primary sources from the end of the 19th century and the Zagoriț brothers speak about the construction technique of the Roman road on the Teleajen Valley. The Roman road is described by the teachers-informants from Draja de Sus and Șoimari with a minimum width of 2 fathoms (according to D. Bazilescu-1894) and a maximum of 4 fathoms (according to I. Alecsandrescu - 1873), which in the metric system represents 3.92 m, respectively 7.84 m (measured with the fathom of C. Brâncoveanu). This fact attracted the attention of C. Zagoriț who, making observations and measurements at the "Troianu" point and elsewhere, will conclude that the width of the path on the Teleajen Valley was of maximum 6 m [11] (pp. 75-76, footnote 5).

As for the *agger*, popularly called "caldarâm" (cobblestones), it was usually made of brook gravel. The stones were placed "partly standing (the small ones), partly scaled (= mounted, the big ones and the wide ones)" [11]. North of Vălenii de Munte to Teleajenel, the road had "patches", an indication of the advanced degree of damage or perhaps of a hasty execution. According to C. Zagoriț, the cobblestones were framed between two standing stone edges and deeply embedded, forming what archaeologists call *crepido* [11].

From a planimetric point of view, the road was sometimes built at ground level ("it has no ditches on the edge" - D. Bazilescu 1894), and other times it was built on a bed of earth (embankment), popularly called "troian". In this sense, the most conclusive remains the example of the *Troian* that measured a length of 80 m, first described in 1873, in the *Archaeological Questionnaire* of Alexandru Odobescu, and researched in more detail by C. Zagoriț, in 1912.

According to the descriptions made at the turn of the XIX-XX centuries, the best preserved part of the road - probably to this day - was in the mountainous sector, on the Teleajen Valley [6]. In the centuries dominated by migrations and wars, deprived of the care it deserved, the Roman road lost its luster but remained in the use of the local population. Between the 2nd and 9th centuries, from the withdrawal of the Roman troops to the rise of a new political, economic and military force in the Balkans - respectively, the establishment of the South-Danubian Slavic administration - the Roman road remained among the main strategic roads in the Carpathian Curvature.

5. THE ROUTE OF THE ROMAN ROAD ON THE TELEAJEN VALLEY

The lack of field research and the contradictory information from the written and oral sources, made the route of the Roman road on the Teleajen Valley to be most often intuited. It was stated, for example, without any scientific basis, that the Roman road would have passed into Transylvania through the Bratocea Pass [27] (p. 521). However, many historians and archaeologists have confirmed the fact that the road passed through the Carpathians through the Tabla Buții pass (Tătaru Mountains), and to the south it advanced to the ports of Oltenița and Giurgiu [27] (p. 521). Regarding the detailed route of the Roman

road in the hilly and mountainous sector of the Carpathian Curvature, the hypotheses set out below crystallized.

5.1. Grigore Tocilescu's hypothesis

The first hypothesis, which found support from G. Tocilescu, states that the Roman road coming from Ploiești left the actual valley of Teleajen near the village of Teișani, crossed the Stănești plain and climbed the Drajna Valley to Crai Peak (Vârful lui Crai). The change of direction was made by the saddle between Piscul Domnului and Cetățuii hill.

The priest Ioan I. Costeanu, confessed about this, in the 30s of the last century: „At the point called Hanul Madamei, on the Ploiești-Bratocea road, there is a natural road, which leads through the Teleajen river ford to the Grădiștea plain (Stănești plain n. n.), between the villages of Drajna de Sus and de Jos. Some say that the old Roman road to Păducel and Crai Peak would have been here”[9] (p. 9).

Finally, at the beginning of the 20th century there were locals who confessed that they had seen traces of cobblestones (paving) on Grohotiș (under Craiului Peak) [11] (p. 73) The main reason for this route was related to the presence of the castrum from Drajna de Sus, an objective that had to have direct access to a transport route. This hypothesis was rejected by the Zagoriț brothers.

5.2. The hypothesis of the Zagoriț brothers

The hypothesis presented by Gh. Zagoriț was based on the descriptions offered by the teacher D. Bazilescu from Drajna de Sus, and on the field observations of his brother. Gh. Zagoriț claims that the Roman road sought to keep the bottom of the valley as long as possible, using the terraces and meadows a little high on the right of Teleajen [11] (p. 76).

In his opinion, the road came from Ploiești and passed through the localities of Boldești, Măgurele, Gura Vitioarei, Văleni, Homorâciu, Izvoarele, Măneciu Pământeni and Măneciu Ungureni. From here it "took the Teleajen Valley, the Devil's Valley, among the Clabucet and Craiului mountains and passed beyond to Poiana Fetei" [5] (f. 281). Upstream, the traces of the paved road could still be seen on the right bank of the Devil's Valley [6] (p. 172). The road crossed the mountains in Transylvania reaching the maximum altitude of 1089 m, at the spring of Boncuța [11] (p. 76).

5.3. One road or more? A new hypothesis

Before moving on to the presentation of a new hypothesis regarding the route of the Roman road on the Teleajen Valley, it is worth mentioning the premises (at least doubtful) from which it started previously:

- a. The premise that there was only one road that crossed the Teleajen Valley integral - longitudinally, on the north-south direction;
- b. The premise that all the road remains found between the city of Ploiești and Crai Peak came, with small exceptions, from one and the same road;

Among the remains of the road studied by the forerunners, the Trojan described in the *Archaeological Questionnaire* of Alexandru Odobescu has the greatest importance. It measured approximately 80 fathoms in length (176 m, measured with C. Brâncoveanu's fathom of 2.2 m) and 4 fathoms in width (7.84 m) and "deviated" (sic!) - as the sources say - from the main road to Teișani commune, on the east-west direction [4] (f. 556v-557).

Despite its size, the Trojan was seen in the previous stages only as a secondary road, due to its atypical orientation. It is normal, therefore, to ask whether the Zagoriț brothers did not hurry with the presumption that the main direction of the Roman road was north-south, respectively, that it spread entirely on the Teleajen Valley.

Considering the east-west direction of the Trojan, the relief configuration and the existence of the castra from Drajna de Sus, Mălăiești and Târgșor, in a relatively small area, the Roman road could unite these centers. As a result, the most plausible route is the following: Crai Peak-Drajnei Valley (Draina de Sus Castrum) - Stăneștilor Plain - Teleajen River ford - current area of Teișani village - Slănic Valley-Vărbilău Valley (Mălăiești Castrum) - Târgșor Castrum.

The described route could be related to a much older road (along which, it must be emphasized, the famous golden helmet from Coțofenești was discovered), but it was also justified by the existence of the salt mines opened in the Slănic-Teișani area.



Figure 1. Stănești Valley – Area crossed by the Roman road and supervised by the Roman castrum from Drajna de Sus

Source: Cruceru Alexandru-Ionuț, 2016

The main saliferous points used in the area over time were the following: 1. on the eastern bank of the Teleajen, above the entrance of the Stăneștilor Valley, 300 m from the top of the Cetățuia; 2. On the western bank of the Teleajen, at the entrance of the Dragomir valley; 3. To the east of the village of Teișani, in the immediate vicinity of the village and a little further, at the place called Hanul Madamei [18] (p. 74) According to the priest Ioan I. Costeanu, the Roman legions extracted salt from the lakes popularly called “Lacurile fără fund” (Bottomless lakes), located east of the village of Teișani [9] (p. 8).

The respective places were exploited in the medieval period (as demonstrated by the historical documents from the 18th century) but, as in the case of the exploitations from Slănic, it is not excluded that they operated with interruptions from the Roman period. The Roman castrum from Drajna de Sus seems to watch over these lands, from a distance of 3-5 km, through the Stăneștilor Valley (Figure 1).

Compared to the other castra in northeastern Muntenia, the one in Drajna de Sus has a special significance, a fact highlighted by the strategic position, the construction technique and dimensions [19] (p. 95).

In addition to the main road discussed, it must be admitted that there were also secondary roads. Cezar Bolliac pointed out such a branch in the mountainous sector since 1869: “then a Roman road descends to Telejenelu, from which there were signs of a branch gone towards Coliba-vechiă” [3].

The same section could include the part of the road north of the village of Teișani, and the one that leaves from the Drajna-Teișani area, through the current town of Vălenii de Munte, in the direction of Ploiești. Finally, another important branch of the Transcarpathian Roman road headed east, towards the Buzău lands and the mouth of the Danube. It can be stated, therefore, that the “Trajan's road” was rather a network of roads with different ranks, which ensured the rapid transport of people and material goods (especially salt) (Figure 2).

6. THE ROMAN ROAD IN THE FIRST MILLENNIUM AND IN THE MIDDLE AGES

It is no longer a novelty in the archaeological literature that Roman roads continued to be used long after the fall of the empire [20] (p. 151). We also find the idea exposed to the geographer Cezar Popescu, who stated about the Roman road on the Teleajen Valley that “it has been maintained for many centuries” [19] (p. 95). How long the latter continued to function can be understood by analyzing the available archaeological, historical and toponymical data.

The first indications regarding the maintenance of the Roman road date, according to the author of the present study, from the period of the early Middle Ages (the 9th century), and are directly related to the Byzantine-type fortification that functioned north of Slon village (Prahova county) [21,22].

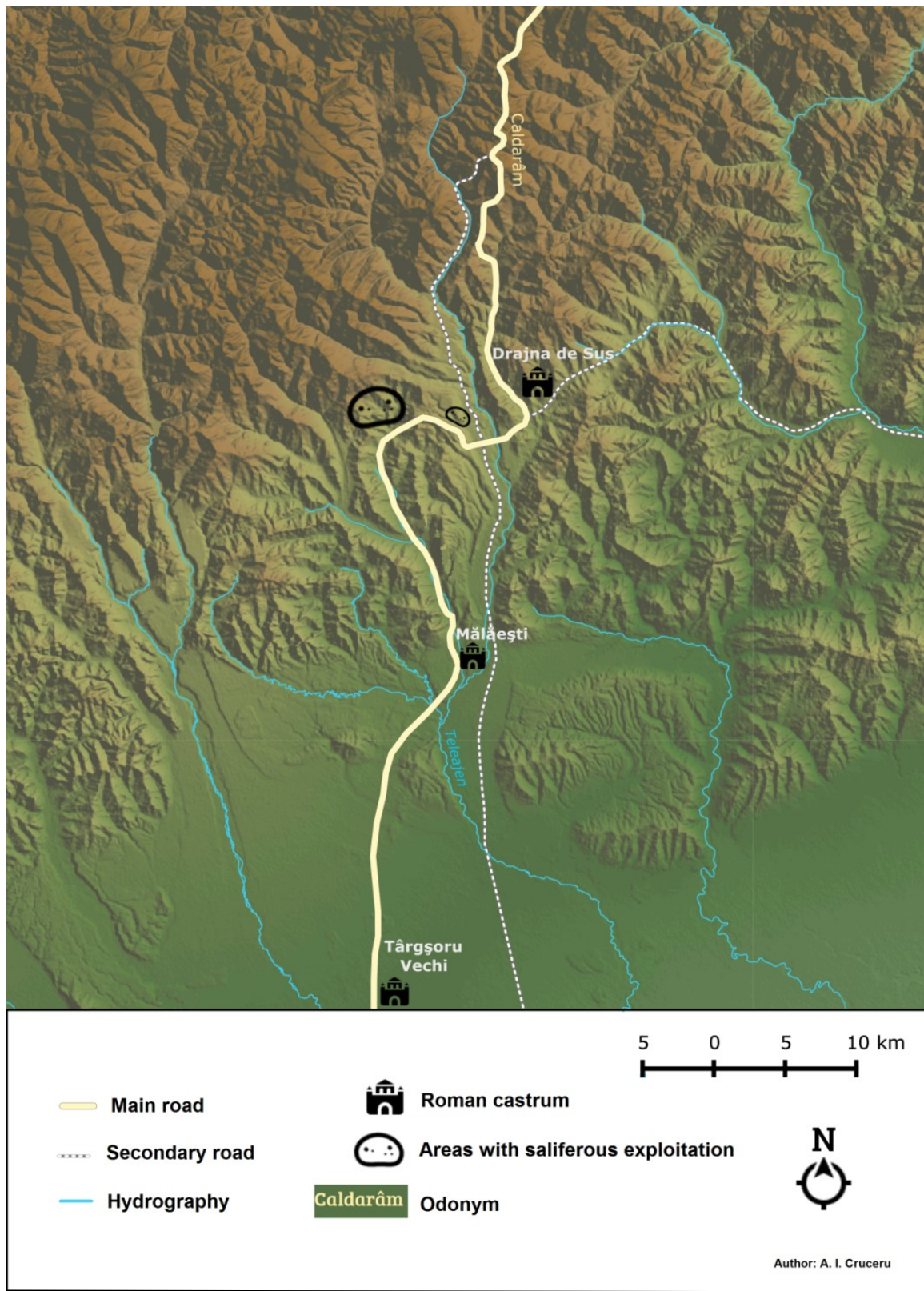


Figure 2. Hypothetical route of the Roman roads in the Teleajen Valley area
Source: Cruceru Alexandru-Ionuț, 2020

Whether the fortification was the center of power of a local leader, as Maria Comșa believed, or was only a means of surveillance and control imposed from the south of the Danube, the fortress obviously occupied a strategic position on one of the important salt roads. It is about the road over the Tătar mountains and Tabla Buții (the old Roman road), which connected Transylvania with the ports at the mouth of the Danube and the Balkan Peninsula. Geographical toponymy also provides us with interesting clues, which could indicate the persistence of the Roman road in everyday life and collective memory.

After the withdrawal of Roman troops from the Carpathian and Pericarpathian lands, valleys and watercourses were often differentiated on the basis of accessibility, thus giving rise to two categories of valleys or waters: valleys / waters with roads and valleys / waters without roads. The dichotomous division of the valleys / rivers (with a road / without a road) is reflected until today in some local place names, such as Bâsca cu Cale (=Bâsca with a road) and Bâsca fără Cale (=Bâsca without a road), but especially in the hydronym Teleajen.

The name of the Teleajen river appeared in internal documents in the 15th century, but as far as its formation is concerned, a previous period can be admitted. The most common etymological theory belongs to E. Petrovici and states that Teleajen comes from Slavic and translates as "road of chariots", "road of buckboards" [23] (p. 194). Another hypothesis is the one presented by G. Weigand, in the work *Ursprung der subcarpatischen flussnamen in Rumänien*, taken over by the philologist N. A. Constantinescu: Telejna dolnia „roadway” [24] (p. 461).

In fact, it is very important to emphasize that the real Teleajen, in the historical sense, is not the river currently accompanied by the DN1 A road, but the Telejenel brook, located further east, along which it is known that the road paved with stone descends.

Both etymologies specified above lead to the conclusion that during the period of expansion of the power of the Bulgarian Empire on the southern slopes of the Carpathians (the 9th century), the South-Danubian Slavs found in operation parts of the Roman road. For economic and military reasons, they fortified the highlands and encouraged the use of the summit road (Plaiul Buților), contributing decisively to shaping the persistent socio-economic realities during the Middle Ages. Therefore, it would not be excluded that Teleajen was, originally, the "Slavicized" version of a toponym inherited from the Latin substratum, with reference to the Roman road. At the semantic level, the Slavic form Teleajen ("road of chariots", "roadway") has similarities with the toponym *Via Lapidea* ("paved road"), mentioned in a document from 1346, designating the Roman imperial road Ulpia Traiana Zarmizegetusa-Apulum, in the Cricău-Galda de Jos sector [25] (p. 56).

At the contact of the Curvature Subcarpathians with the mountain, other toponyms also draw attention, which refer with some prevalence to the lithic element. Regarding the name of human settlement of Starchiojd, the most widespread etymology derives it from the Slavic "star", which means *ancient*, and the Magyar Kövesd, *rocky*. Starchiojd translates as "old (and) stony place" [26]. Geographically, the explanation becomes less ambiguous if we interpret the name of human settlement of Starchiojd in the context of the paved Roman road that transits the area. The interpretation of Starchiojd as "old (and) stony road" seems all the more plausible to us as the toponym had the strength to impose itself before the 14th century. Related to the same aspect, it should be noted that the Roman road sector on the Telejenel valley, paved with stone slabs, was preserved in the folk dialect until the end of the 19th century under the name *Caldarâm* (pavement executed with boulders) [5] (f. 281).

The socio-economic changes that have taken place at the regional level, and those at the level of the local communities, having in their center the groups of elders, have caused that over time the old Roman road (or more precisely, its main branch) to degrade and lose its initial configuration. From a single road that crossed the valleys of Draja, Teleajen (in the Stănești-Teișani sector), Slănic and Vărbilău, it gradually reached two separate sections, functionally independent: the first section, the Teleajen road, was the heir of the Roman transcarpathian summit road and had two variants, towards the Buzău valley and to the south, on the Teleajen Valley. This road of Teleajen has been found since the 16th-17th centuries, recorded by the nickname "the old road" [28, doc. 75] (pp. 79-81) or "the old way" [29, doc. 458] (p. 170). The branch to the Buzău valley, which offered the shortest connection between Transylvania and the mouth of the Danube, appears in the 15th century as an objective of strategic importance at the Carpathian Curvature. In the opinion of the historian Laurențiu Rădvan, this road is referred to by the act of 1358, by which Louis the Great granted the Saxon merchants from Brașov the right to move freely "between Buzău and Prahova", until the Ialomița and Siret flow into the Danube [30] (p. 74-75).

The second section was *the salt road* that had its starting point in the Slănic-Teișani area (the richest in saliferous resources) and descended on the Slănic and Vărbilău valleys, with the main destination the Balkan Peninsula. Contrary to expectations, the toponym "salt path" is used as a reference point in the sale-purchase deed of 1689, concluded by Mihail Cantacuzino with the elders of Slănic people, for the future Spătarului exploitation [31] (p. 103). This apparent anachronism (attestation of the salt road before

the opening of the salt mines) should not be surprising, given that the most important economic activity of the villages in the middle basin of Teleajen, in the 15th-17th centuries, was related to the salt trade. In the customs duty registers of Braşov from 1503-1554 there are numerous carriers from settlements such as Berevoieşti (Vălenii de Munte), Ghitioara, Slănic, Teişani, Homorâciu, Ogretin, Teleajen (unidentified) and others [32] (pp. 259-303), which prove a long tradition in the exploitation and transportation of salt.

The Roman road on the Teleajen Valley has been preserved in the collective memory under various names, most of them referring to the people or the figure considered to be the founder. Thus, we have: "the Tatar road", "the Roman road", "the Trajan's caldarâm", "Troian" [4, 5].

7. CONCLUSIONS

The Roman road on the Teleajen Valley was counted next to the castra from Drajna de Sus, Mălăieşti and Târgşor, among the strategic requirements imposed by the saliferous exploitations in the Slănic-Teişani area. According to the descriptions, the road was paved with river stones and its width varied between 2 fathoms (3, 92 m) and 4 fathoms (7, 84 m).

The main branch, popularly known as *Caldarâm*, crossed the Carpathian Mountains through the Tabla Buţii pass, descended on the Drajna Valley, passed between the Lord's Peak and Cetăţuie at Teişani and from here descended on the Slănic and Vărbilău valleys, from where it went to the castrum at Târgşor. In the sub-Carpathian sector, the road benefited from several secondary branches.

After the withdrawal of the Roman administration in the 2nd century AD, the road remained in the use of the local population and over time began to deteriorate. However, in the mountainous sector, the road could be maintained for a longer time, reviving in a first stage under the administration of the south of the Danube (the 9th century) - in the context of the construction of the fortifications from Slon - and in a second stage, under the rise of the trade in the Middle Ages.

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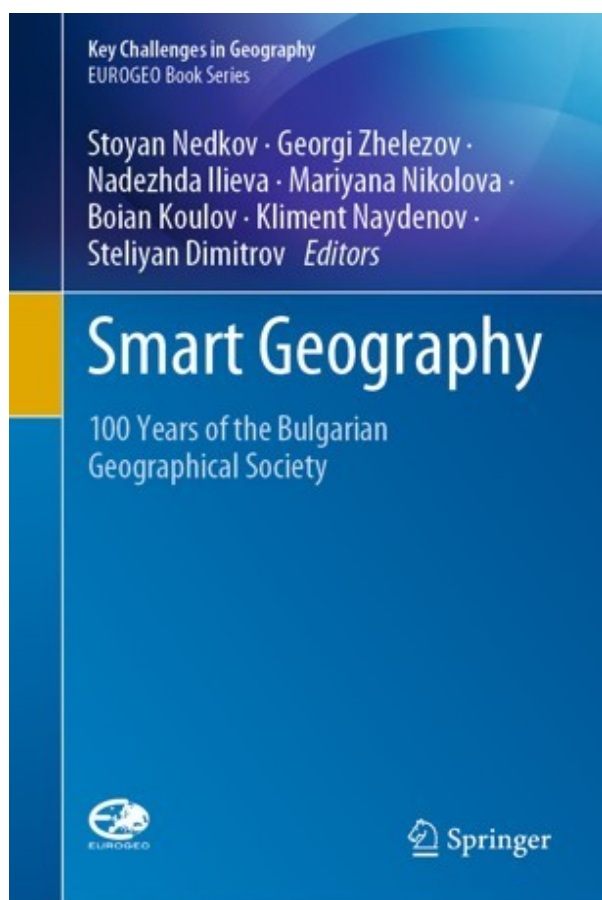
BOOK REVIEWS

SMART GEOGRAPHY: 100 YEARS BULGARIAN GEOGRAPHICAL SOCIETY

Editors: NEDKOV STOYAN, ZHELEZOV GEORGI, ILIEVA NADEZHDA,
NIKOLOVA MARIYANA, KOULOV BOIAN, NAYDENOV KLIMENT, DIMITROV STELIAN

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The book “Smart Geography” is prepared as a response to the challenges of the 21st century to the geographers who are expected to contribute to the development of human capital and the knowledge society by spatial solutions for various problems. It contains selected contributions from the international conference “Smart Geography” dedicated to the 100th anniversary of the Bulgarian Geographical Society. This celebration was also an occasion to pay tribute and extend gratitude to the founder of the Society, Academician Anastas Ishirkov, as well as to all geographers who gave their best for its development in the past century. The book is focused on new and innovative spatial approaches based on smart solutions and developed in the field of geography and related interdisciplinary fields such as urban and regional studies, landscape ecology, and ecosystem services. It covers various themes related to smart spatial solutions in different geographical disciplines as well as interdisciplinary studies with a pronounced spatial aspect. The book illustrates the great variety of themes the contemporary geography is dealing with. Most of them have real potential to contribute by the smart spatial solution to human well-being. The examples presented in the book cover case studies from Bulgaria and many other countries worldwide. Such a volume is intended for the global geographical research community, as well as

professionals and practitioners in all fields that deal with space, including regional planners and environmental managers.

The book is organized into five parts, corresponding to the main conference themes. The first part includes contributions from the plenary session dealing with various aspects of the geographical science and the perspectives for its development. There is an overview of the history and development of geographical science and higher education in Bulgaria over the years and the important role of the Bulgarian Geographical Society in this process. Very interesting and topical is the work on the local consequences and responses to the changing geographies of economic governance. The structure and practice of these geographies have become more influential in response to the financial crisis of 2008, which led to the development of smart specialization strategies. The other contributions in this part are focused on cluster analysis for classification of general climate characteristics and modern education reform demonstrated by the shift from the classic teacher-centered model to one where interdisciplinary and holistic approaches play a central role in the curricula.

The second part of the book contains contributions to physical geography, which deal with the interaction between smart technologies and studies in Climatology, Hydrology, Geomorphology, and Geology. One of the most interesting is the study on the impact of climate change and other natural and man-made stressors on human health and the quality of the living environment. It discusses the climatic factors of the highest effect and gives "an idea about the general vulnerability of the human health sector in Bulgaria" to climate change. Other contributions present different aspects of climate change influences and the hydrological response, the use of microclimate data in students learning, flood hazard, as one of the most common natural disasters, the problems of water quality in the river, etc.

The third part of the book covers the human geography field concerning the profound demographic transformation that has taken place in Europe since the Industrial Revolution, evidenced by the changes in the reproductive attitudes and values and human migratory behavior. The dynamics of various social-economic processes affect both the number and geospatial distribution of the population, as well as the transformation of ethnic and national identities. One challenge, which requires smart decisions, is urban shrinkage. While this process is typical for many developed states, the dramatic political, economic, and social transformations in the postsocialist countries since the beginning of the 90s, have led to changes in the settlement patterns, caused by large-scale external

and internal migrations to metropolitan and the largest regional urban centers at the expense of the remote, mountainous and peripheral regions. Three different contributions deal with minority issues. The first one states that Roma integration and the intensifying geo-spatial segregation processes affecting that ethnic group as another issue that requires the application of smart decisions. It analyzes geospatial development trends and the internal structure of the Roma quarters aided by remote sensing and field research methods. The other one identifies the reasons for the difficulties that face Europeans in their attempts to integrate the Roma into their cultural system. The authors review and analyze successful integration policies towards the above ethnic group in Europe and points to those that can be adapted and implemented successfully in Bulgaria. One of the crucial problems is the smart decisions in the respect of specifically related to the integration of the Roma minority, is education should target the disbandment of segregated schools and the creation of mixed school establishments. The third contribution analyzes the specifics and the trends of the Roma school segregation in Bulgaria, based on a case study of the Roma children from Harman Mahala in the city of Plovdiv. Further, in this part there are works on a grouping of the Bulgarian cities, according to the causes and the dynamics of their shrinkage throughout the last century and up until 2017, assessing of the quality of life of the population, the socio-economic and political development of the rural town of Orania in the Republic of South Africa. Special attention should be paid on the regional geospatial and statistical analyses of the urban-rural relationships in Romania. The study results help identify areas with different rural development potential and allow for a better understanding of the urban-rural interactions in the last several decades.

The fourth part of the book is focused on various problems in the field of landscape ecology. There are studies on the presence of tree cover on agricultural land monitoring heavy metals in the river sediments, structure, and peculiarities of the karst and development of geospatial reconstruction models of the landscapes in wetlands. An empirical study of the geoecological state of selected landscapes in North-Central Bulgaria aims to reveal the contemporary geoecological problems, based on semi-stationary and field investigations. The results show nine categories of geoecological problems, grouped into three main groups.

The application of the ecosystem services (ES) concept, as a tool for smart geospatial solutions of human-environmental problems, features in the fifth part of the book. The ES concept is based on the assumption that ecosystems provide a range of services of fundamental importance to human well-

being and their sustainable use could balance environmental conservation and economic activities and interests. The geospatial aspects of ecosystem services attracted significant attention in the last years through the development of various mapping and modeling methods and tools. The contributions in this part deal with various aspects of mapping and assessment of ecosystem services based on field observations, remote sensing data, geo-spatial proxy methods, modeling approaches for the generation of geo-spatial data, and production of ES maps. It is stated that climate change, together with other stressors, decrease the capacity of ecosystems to buffer impacts from extreme events, like fires, floods, and storms. Some case studies illustrate the advantages and challenges of both the deterministic and holistic approaches to cost-benefit analysis for climate change adaptation. Another work is focused on mapping wetlands in the trans-boundary river basin which provides baseline knowledge on connected areas of high value for biodiversity and seeks to support management and conservation interventions. The important topic on the societal demand for ES, due to the construction of an open-pit mining project in the semi-arid is analyzed using the well-known matrix approach. It produces

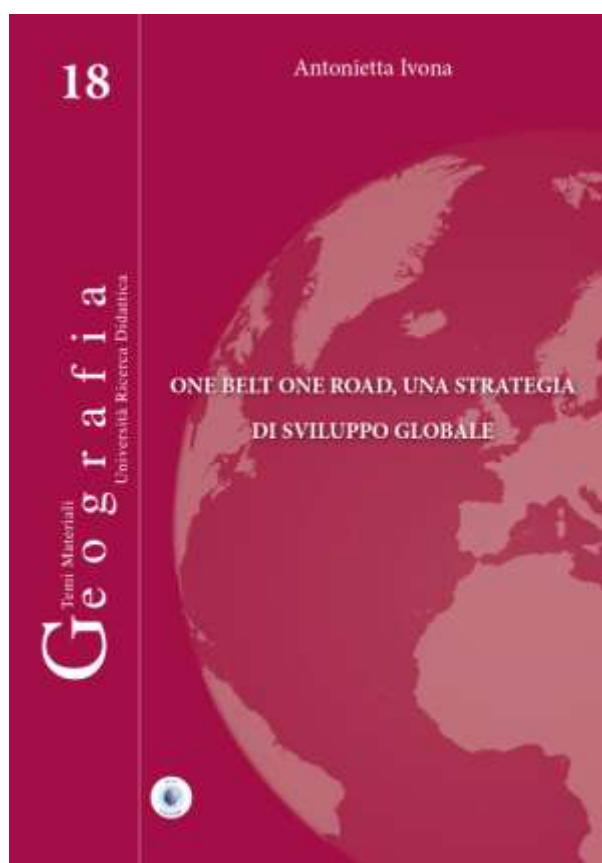
supply/demand maps which reveal a geo-spatial understanding of the ES, in the hypothetical judgments of the involved stakeholders. There is also a study on the role of mountain forest in the provision of a wide range of ES which uses a LPJ-GUESS Ecosystem Model to analyze carbon sequestration in mountain forests. It defines tendencies in the vulnerability and adaptive potential of the mountain forests. Another work focused on forest ecosystems deals with their ability to supply erosion control services. The investigators use field observations, direct measurements, and data of growing stock, basal area, and soil erodibility to assess the statistical relationships of soil properties and forest inventory data. The results show that the higher number of trees per unit area reduces the erosion rates. The book illustrates the great variety of themes the contemporary geography is dealing with. Most of them have real potential to contribute by smart spatial solutions to human well-being. The examples presented in the book cover case studies from Bulgaria and many other countries worldwide. The geographical scope of the studies ranges from the USA to Singapore and from Romania to South Africa.

ONE BELT ONE ROAD, UNA STRATEGIA DI SVILUPPO GLOBALE

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The book “One Belt One Road, Una Strategia di Sviluppo Globale” is prepared as a response and a deepening to the promotion of New Silk Road, also called the Belt and Road Initiative (OBOR). The plan of development of this new growing project was initiated by Xi Jinping, President of the People’s Republic of China, in 2013. It focuses on investment

for railway, highway and port construction and links countries in Europe, Asia, and Africa together and promote global cooperation and economic development. It also representing the interests of China for geopolitical and strategic influence.

The New Silk Road is a continuation of previous initiatives, such as the Going out policy, promulgated at the end of the Nineties to support, through a liberalization of the regulations, outgoing foreign direct investments of Chinese companies, in particular state-owned enterprises, for the purpose to improve international competitiveness and protect the labor market from industrial conflicts. The result has been a progressive internationalization of Chinese public companies and also private but still under the auspices of the Chinese state. The OBOR, now renamed Belt and Road Initiative (BRI), is the pillar of Chinese foreign policy, on the basis of which the Chinese government intends to build a future world order that will have its reference point in the People’s Republic of China. The BRI is as a platform for promoting trade.

This book explores and quantifies parts of the BRI strategy, the impact on other BRI participating economies and some of the implications for emerging and developing economies countries. The new project will eventually cost more than one trillion dollars and will involve over seventy countries, where three quarters of the planet’s energy resources are present and represent almost a third of the global gross domestic product.

In 2014, the Xinhua State Press Agency made the Project known to the international community by publishing the official map of the junctions of the

New Terrestrial Silk Road, and those of the New Maritime Silk Road. Since the early stages of the OBOR project and with the establishment of the Asian Infrastructure Investment Bank (AIIB), businesses have once again been encouraged to invest in the global economy, even though they were experiencing strong resistance and widespread criticism abroad. To definitively sanction the importance of the project, the New Silk Road strategy was included in the Chinese Constitution in 2017, together with the abolition, the following year, of the limit of mandates for the current President Xi Jinping.

The book is organized into three parts, corresponding to the main and actual geopolitical theme on New Silk Road. The first part includes the historical background of the Silk Road, with a reference to the past when the silk routes were many as there were many types of goods transported outside and inside the country. On the other hand, to understand the current strategy it is necessary to retrace the historical excursus that led China, in almost forty years, to weave a dense network of alliances and infrastructures that have allowed geo-economic and geostrategic alliances with at least one hundred and forty countries.

The articulation of the Chinese strategy is explained in the second chapter, which refers to the six land corridors and the two seafarers, cornerstones of the entire OBOR structure. A detailed description of the funding allows the understanding of the realization of this project built over time and certainly not improvised. In fact, this initiative is implemented today through strategies already planned by the government and implemented with the tenth Five-Year Plan. It is based on the need to stimulate Chinese state-owned companies to make investments in foreign countries and within the country by locating industrial plants in the different regions and generating a multiplier effect on the internal economy. The Chinese economic and political commitment can be explained for at least two reasons: commercial relations will also be able to sanction political ones, ensuring access to raw materials for the first Asian economic power (e.g.

oil and new markets); the consolidation of existing markets as in the case of relations with Europe.

A second northern junction of the Maritime Silk Road was recently announced; across the Arctic Ocean, it will allow for a faster connection between China and northern European destinations.

Finally, the great economic strategies that in almost forty years have built and defined the characteristics of today's China and which, above all, explain the definition of the OBOR strategy, have been studied in detail, with minuteness and precision, in the last chapter. The long-term end goal of this Chinese government policy is to increase its influence in the international community. Its antecedent was the planning and implementation of various strategies to attract foreign capital, which allowed China to grow rapidly and sustainably. Today the People's Republic of China has the economic and political capacity to make investments abroad more than in the past.

Reading the book suggests that the author confirms the success and effectiveness of the Chinese strategy of a policy oriented mainly to global markets but also with neighbouring countries at least in a double sense: as a strategy for improving internal GDP of the country and, more generally, for the expansion of political and commercial relations with the supplier countries of raw materials (of which China had and has a great need to maintain its level of economic and social development), and with the Countries that buy its finished products. The attempt of the Antonietta Ivona is certainly worthy, also in virtue of the void that tightens the Italian culture when it comes to reflecting from an epistemological, theoretical and empirical point of view on such a burning and current geopolitical theme. Furthermore, openness towards the global scientific panorama is certainly a source of pride, capable of both hosting international literature and making reflections freely usable. A useful and worthy of attention book that allows us, through the lens of an international project, to have a greater understanding of Chinese society. It also allows the reader a complex but coherent picture of the phenomenon investigated.