THE SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACT OF CAPITALIZING ON SOLAR ENERGY RESOURCES IN THE ROMANIAN PLAIN

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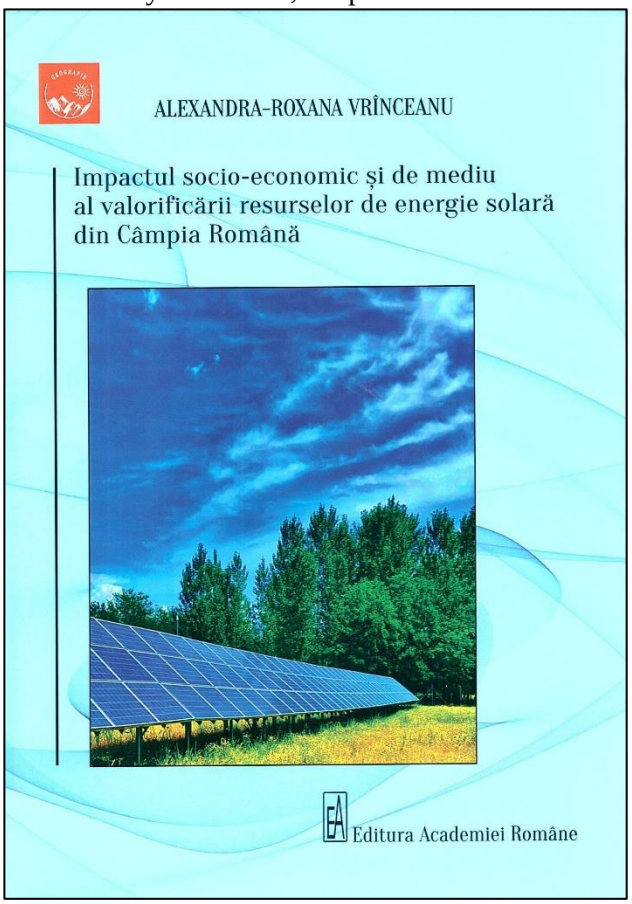
Today's climate changes are reshaping the world and amplifying the risks of instability in all its forms. Understanding climate change in the sense of the intensification of extreme weather phenomena is essential in order to stabilize them through human actions that can dictate the future course of the climate.

Rethinking energy production methods is a necessary stage for the reduction and magnitude of climate change, as well as for the transition to sustainability. Therefore, the present work deals with a current issue at the international level, that of decarbonization, meaning the decrease in the dependence on non-renewable resources. The latter have negative implications for the socio-economic and environmental fields. Decarbonization is done in favour of the development of new energy capacities that make use of renewable resources. In addition, amid recent events in Ukraine, the European Union has set out to reduce its dependence on fossil fuels imported from Russia.



In the first chapter, starting from the main international and European legislative documents through which the general context of the importance of the study was explained, specialised works published on a national and international scale that dealt in detail with photovoltaic solar energy were reviewed, in accordance with the topics of each chapter within. In terms of renewable sources energy production, the European Union's target has increased from 40% to 45% for the 2030 horizon and the process of faster authorization of renewable sources has been established through new legislation and recommendations. Romania contributes to the achievement of European targets through a series of actions undertaken as part of the National Recovery and Resilience Plan.

The second chapter addresses the methodology by which the methods and data sources used were presented. After studying the specialized literature, the location of each power plant was pinpointed using Google Earth and the data were validated with those available at Transelectrica. The resulting data on the locations of the photovoltaic power plants, together with a set of statistical and spatial indicators derived based on the locations (distribution by land and soil use categories and distance from natural protected areas, forests, roads, waters and settlements), were processed in order to quantify the environmental impact of the photovoltaic plants. The territorial distribution highlighted local and regional particularities, useful for the selection of case studies. During the three field trips, questionnaires and interviews were carried out, which, following the processing stage, revealed an overview of the social and economic impact that photovoltaic power plants have. The work resulted in the spatial modelling of land suitability for the construction of new photovoltaic power plants. Land suitability determination was carried out using a multicriteria analysis and the Weighted Overlay

spatial analysis. The results were correlated with the investments in each county and studied differently, from economic, social and legislative points of view.

In the third chapter, the current situation of the renewable energy sector in Romania was summarized from the perspective of the policies adopted in the energy field, the changes that occurred with the implementation of European policies, but also the development of renewable energies, taking into account the high potential of the physical and climatic conditions available on the country's territory.

The fourth chapter tackles the geographical and climatic elements of the Romanian Plain, relevant for the development of photovoltaic solar energy. The presented aspects provide justification as to why the study area was chosen, namely a relief with low slopes, high values of solar radiation and duration of sunshine, but also a high availability of land, which also explains the high number of power plants in the plain area, compared to other regions. An extensive sub-chapter is devoted to the analysis of climatic factors and climatic scenarios, which are directly responsible for the optimal operation of the plants.

In the fifth chapter, the impacts on the environmental components of the development of photovoltaic power plants are presented, with reference to all phases of operationalization, namely construction, exploitation, maintenance and decommissioning. The main affected component is the land, which undergoes various degradation processes. However, the examples of good practices found on the international level prove the auspicious combination of the use of land simultaneously with the production of energy, so the impact on the land is considerably reduced. Potential impacts were studied by calculating a spatial proxy indicator for a range of environmental components, such as soils, biodiversity, protected natural areas, forests, water bodies, settlements and road infrastructure. The proximity of the plants to the previously mentioned components can explain the location decisions of these investments, to be detailed in chapter seven.

The sixth chapter includes an analysis of the socio-economic impact of the development of photovoltaic power plants, outlined in field campaigns following the application of questionnaires and interviews, both to employees and investors, representatives of public institutions and the local population. The impact on the creation of new jobs in the green sector was analysed, as, globally, the photovoltaic industry, compared to other renewable energy sectors, provides the most jobs, especially in the production, construction and installation phases of solar capacities. Information related to the condition of the land, the cleaning and maintenance of the plants was analysed from the perspective of the actors involved, through which the research hypotheses were validated.

The last chapter deals with the modelling of land readiness for the construction of new photovoltaic power plants in accordance with the potential impacts studied in the previous chapters. Thus, 9 criteria (solar radiation, maximum altitude, slope, sunshine duration, average annual temperature, average wind speed, land use/cover category, proximity to access roads and proximity to settlements) and one constraint (natural protected areas) were established, by means of the elements observed in field campaigns and specialized literature. Subsequently, weights were assigned to the criteria using the Weighted Overlay (WO) spatial analysis method and the Multi-Criteria Evaluation (MCE) principles. The results were validated by mapping the current distribution of photovoltaic power plants and the final readiness map was generated by overlaying the analysis layers. Overall, 77% of the total surfaces in the study area fall into the *very high* and *high* suitability classes, Teleorman, Olt, Ilfov, Dolj and Giurgiu counties being representative as such. The modelling results also coincide with the average investments made for the 2010-2019 period, the highest value being recorded in the vicinity of Bucharest and Ilfov counties, areas where the economic factor determined a higher density of photovoltaic parks.

In conclusion, in accordance with European requirements regarding modernization and transformation towards a neutral economy, the use of solar resources and increased investment in this area are crucial. At the same time, investments must be made in areas chosen as accurately as possible from the point of view of socio-economic and environmental impacts. The paper lays bare the main problems that can result in the case of location in inappropriate areas, and viable solutions based on a multi-criteria analysis are presented. The resulting map can be a support framework for decision-makers in order to operationalize new plants. However, at the same time it can be a template for future studies that propose the analysis of regions similar to the Romanian Plain.