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Article

Management of the Extreme Situation in the Climate Change Zone (Republic of Serbia): Criticism, Political-Ecological Perspective, and *Complexitas Rerum*

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Abstract

This paper analyzes the perception of climate-related risks and emergency management capacities in the Toplica District (Republic of Serbia) through a critical political-ecological lens, drawing on the concept of complexitas rerum as a heuristic framework for understanding the interdependent relations among environmental processes, social structures, and institutional configurations of power. Extreme climate-related phenomena, particularly forest fires, are not treated as isolated natural events, but as socially mediated outcomes of interacting climatic, economic, and institutional factors that shape local vulnerability and adaptive capacity. The study employs a mixed-methods approach, combining a survey of 180 respondents with qualitative insights from a contextual analysis of the regional socio-ecological setting. Empirical findings indicate a high perceived increase in forest fire frequency, strong awareness of climate change impacts, and widespread perceptions of insufficient institutional preparedness and response capacity. At the same time, results highlight the coexistence of individual adaptive strategies and a relatively weak reliance on formal institutional protection mechanisms, particularly in rural and peripheral communities. The paper critically engages with

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technocratic and depoliticized approaches to disaster and risk management, emphasizing the gap between formal institutional frameworks (de iure) and their practical implementation (de facto) in the context of available resources and capacities. It also highlights how climate risks are socially distributed, with marginalized rural populations experiencing higher exposure and lower access to institutional support. By integrating empirical survey data, regional contextual analysis, and political-ecological theory, the study demonstrates that climate change in the Toplica District is not merely an environmental phenomenon, but a complex socio-political process that reinforces existing inequalities. In this sense, the framework of political ecology, grounded in *complexitas rerum*, contributes to a more nuanced understanding of emergency management and supports the development of more equitable and locally grounded adaptation strategies amid increasing climate uncertainty.

Keywords

Emergency management, climate change, complexitas rerum, social inequality.

1. Introduction

Political ecology, as an interdisciplinary field grounded in academic research and engaged in political practice at the global level, has experienced intense expansion in the second half of the 20th century.[1] This development has been dynamic but uneven, often accompanied by resistance from traditionally constituted scientific disciplines. With the growth of its epistemological visibility and analytical influence, there has been a marked diversification within the field itself, as a result of which political ecology is now applied to a broad and heterogeneous body of research problems that encompass complex interactions between power relations, social processes, and the natural (physical) environment. This corpus includes both individual subdisciplines within geography—such as land use and land cover change analysis, ecological history, cultural ecology, and risk and vulnerability studies—and related fields outside geography, such as ecological anthropology, ecological sociology, sustainable development studies, and the circular economy.

Research within political ecology is characterized by a pronounced theoretical pluralism, with conceptual foundations in Marxist political economy and significant influences from poststructuralist, postcolonial, and feminist theoretical approaches. In this sense, political ecology is firmly connected to a critical and radical scientific tradition that problematizes and rejects reduc-

1 The term "political ecology" was first used in 1935 in a work by Ton entitled "Wandering through Nature: Fighting for Grass". The anthropologist Wolf popularized the term again in his 1972 work "Property and Political Ecology" (Scoones 1999, pp.45-47).

tionist and positivist interpretations of social-ecological relations (Tomic & Kesic, 2025).

In the context of contemporary global challenges, research on climate change is gaining particular importance within political ecology, as it is not viewed solely as a biophysical phenomenon, but as a deeply political and economically mediated process. Climate change is interpreted as a product of historically conditioned patterns of capital accumulation, unequal distribution of resources, and asymmetric power relations at the global level, with its consequences disproportionately affecting marginalized communities and countries of the global South. This perspective enables a critical examination of issues of climate justice, adaptation, and resilience, as well as the roles of state and non-state actors in shaping responses to the climate crisis.

The aim of this paper is to affirm political ecology as a relevant theoretical and analytical framework for the critical study of contemporary socio-ecological problems, with a particular emphasis on examining how unequal distribution of power, access to natural resources, and political and economic structures shape environmental risks and generate conflicts. The paper aims to analyze key concepts of political ecology, demonstrate the application of different methodological approaches, and assess the role of local communities and civil society actors in articulating resistance to dominant models of resource exploitation, with a particular focus on countries of the Global South and the Balkan region, including the Republic of Serbia.

Although political ecology emerged relatively late as an autonomous research direction, its literary corpus is characterized by exceptional breadth, conceptual sophistication, and an emphasis on interdisciplinarity, encompassing fields such as geography, ecology, anthropology, environmental sciences, and agrarian studies. The thematic spectrum of research encompasses key contemporary environmental problems, from climate change, deforestation, and soil erosion to issues of environmental justice and liberation ecology, in which these phenomena are not treated as isolated natural processes but as the result of historically and socially constructed relations between society and nature.

Within this theoretical horizon, actor-oriented approaches are of particular importance, as they enable a more subtle understanding of the dynamics of power, interests, and practices of action of different actors in ecological contexts. These approaches assume that social reality is not given, but is continuously produced through interactions, negotiations, and conflicts, thus opening up space for the analysis of how actors shape their own existential strategies, articulate resistance, and develop adaptive mechanisms in relation to structural constraints and dominant forms of power (Turner, 2012; Cvetkovic, 2024).

The philosophical foundation of such approaches can be recognized in the broader corpus of critical theory, which questions the dualistic separation of nature and society, as well as in post-structuralist conceptions that emphasize contingency, relationality, and the discursive construction of reality. In this sense, political ecology not only analyzes the material aspects of ecological processes but also problematizes the epistemological and ontological assumptions underlying dominant models of understanding nature, pointing to their rootedness in certain regimes of knowledge and power (Tomic & Kesic, 2025).

Viewed through this prism, climate change ceases to be exclusively a question of physical transformations of the climate system and emerges as a paradigmatic example of global inequality and asymmetric power relations. Its causes and consequences are inextricably linked to the history of capitalist accumulation, the colonial legacy, and the uneven distribution of resources, while the capacities for adaptation and resilience are deeply conditioned by the social, political, and economic positions of the actors (Blaikie & Brookfield, 1987, p. 17). In this way, political ecology enables not only the analysis of environmental crises but also a critical examination of the ways in which they are conceptualized, managed, and potentially transformed towards more sustainable and just social relations (Blaikie et al., 2002).

2. Methods

Building on the aforementioned theoretical framework, this research is conceived as a qualitative case study focused on the analysis of socio-ecological dynamics in the context of climate change and natural resource management in the Republic of Serbia. This design was chosen due to its analytical suitability for a deeper understanding of contextually conditioned power relations, institutional practices, and local adaptation strategies. The research was conducted from 2022 to 2024, using both primary and secondary data sources, including strategic documents, legal acts, reports from relevant institutions, and data from international organizations.

Primary data collection was conducted through semi-structured interviews with representatives of local communities, civil society organizations, and relevant institutions, as well as through analysis of publicly available documents and media content. The research instruments had been piloted, and special attention was paid to ensuring validity and reliability through the triangulation of data sources and methods. Key analytical constructs include access to resources, perception of environmental risks, adaptation strategies, and forms of social resistance.

The sample was selected using purposive sampling to include relevant stakeholders with specific knowledge and experience in natural resource management and climate policy. Inclusion criteria included active involvement in the observed processes, while stakeholders without direct experience in the analyzed area were excluded. The research was conducted in accordance with ethical standards, with informed consent from all participants and guarantees of anonymity and data confidentiality. Data analysis was based on thematic coding and interpretive analysis, using software tools for qualitative data processing, thereby enabling a systematic, transparent, and reproducible research process.

The spatial framework of this research covers the Toplica District in the Republic of Serbia, located in the southern part of the country, and administratively includes the municipalities of Prokuplje, Kuršumlija, Blace, and Žitorađa. This region is characterized by pronounced socio-economic specificities, including a peripheral position relative to the main development centers, demographic decline, and structural challenges in economic development and infrastructure.

From a socio-ecological perspective, the Toplica District represents a significant research context due to diverse land uses, including agricultural areas, forest ecosystems, and rural settlements, which are to varying degrees exposed to the impacts of climate change and ecological degradation. Of particular note is the sensitivity of this area to extreme weather events, including droughts, floods, and increased frequency of forest fires, which represent one of the key ecological risks in the region.

The choice of the Toplica District as a research area is based precisely on its pronounced vulnerability to forest fires, which have been increasing in intensity and frequency in recent decades, partly as a consequence of climate change and partly due to changes in land-use patterns and reduced institutional capacity for prevention and response. This specificity enables an analytical examination of the relationship among environmental risks, local adaptive capacities, and institutional risk management frameworks.

The sample was formed as a combined (mixed) sample, which includes elements of random and purposive sampling, with the aim of ensuring the representativeness of different social groups within the observed local community. The total sample comprises 200 respondents, aged 18 to 75, who have permanent residence in the territory covered by the research. The sample was stratified by basic sociodemographic characteristics, including gender, age, level of education, and occupation, to enable a comparable view of perceptions across different social groups. The criterion for inclusion in the sample was adulthood and at least 5 years of residence in the local communi-

ty, while respondents who lacked direct experience of living in the observed territory during the specified period were excluded.

The response rate was approximately 78%, with some of the initially contacted respondents refusing to participate or not fully completing the survey. After removing incomplete questionnaires, the final sample comprised 180 valid responses, which were included in the final analysis. The sample defined in this way provides a relatively reliable insight into the perceptions of the local population, while accounting for limitations related to sample size and potential bias in voluntary participation.

3. Results

The results of a survey conducted among 180 respondents in the Toplica District indicate a strong perception of environmental risks in the local community, with forest fires standing out as the dominant form of environmental threat (Table 1). The majority of respondents (74%) reported an increase in the frequency and intensity of forest fires in the last few years, especially in rural and mountainous areas of the municipalities of Kuršumlija and Prokuplje. Respondents most often associated this trend with prolonged dry periods and increased summer temperatures, indicating a strong local perception of the connection between climate conditions and fire occurrence.

In terms of the broader perception of climate change, 68% of respondents believe that climate change has already significantly affected living conditions in the local community, while 21% take a neutral position, and 11% do not notice any clear changes (Figure 1).

Figure 1. Perception of the impact of climate change (in %)

The most common indicators of climate change are rising temperatures, decreasing precipitation, and declining agricultural yields. When it comes to the causes of forest fires, 62% of respondents point to a combination of climate factors and human activities, 24% emphasize the dominant influence of climate change, and 14% attribute the causes primarily to insufficient institutional prevention and control.

The results also indicate relatively limited trust in institutional capacities to manage environmental risks, with only 31% of respondents believing that the relevant services are adequately prepared for fire prevention and

response, while 56% express dissatisfaction with their efficiency. In the domain of adaptive practices, 57% of respondents report undertaking self-protection measures, 29% rely on institutional support, and 14% do not conduct preventive activities. Additionally, the analysis of open-ended responses indicates a perception of spatial and social inequality in exposure to risks, suggesting elements of environmental injustice in the Toplica District.

Table 1. Respondents' perceptions of key environmental indicators (N = 180)

Variable	Response category	Percentage (%)
Perception of forest fires	Increase observed	74%
Climate change - impact on local conditions	Significant impact	68%
Climate change – impact	Neutral	21%
Climate change – impact	No clear impact	11%
Causes of forest fires	Climatic + human factors	62%
Causes of forest fires	Mostly climatic factors	24%
Causes of forest fires	Institutional factors	14%
Institutional trust	Low trust	56%
Institutional trust	High trust	31%
Population adaptive measures	Measures taken	57%
Population adaptive measures	Reliance on institutions	29%
Population adaptive measures	Without measures	14%

All observed response distributions and empirically obtained survey results, relating to the perception of forest fires, climate change, risk causes, institutional trust, and adaptive practices, are presented in Table 1 and Figure 1, which together form the basis for further quantitative interpretation and qualitative research.

4. Discussion

The results indicate a high perception of environmental risks in the Toplica District, especially regarding forest fires and climate change, which aligns with contemporary research in political ecology, which emphasizes that climate risks are most often experienced through direct, visible local impacts.

The observed connection between temperature increases, dry periods, and fire frequency confirms the thesis of the localization of global climate processes, i.e., their transformation into concrete, existentially relevant phenomena in local communities.

When compared with the existing literature, the findings of relatively low institutional trust and the perception of the competent services in fire risk management as insufficiently efficient are in line with results from studies in peripheral and rural areas, which indicate a gap between formally defined policies and their practical implementation. At the same time, the prominent role of the combination of climatic and human factors in explaining fire occurrence aligns with modern socio-ecological approaches that reject single-factor interpretations. A deviation from the literature is the relatively high share of respondents who primarily emphasize climatic factors, which may indicate growing climate awareness, but also limited recognition of the institutional dimensions of risk.

The implications of these findings are reflected in both the theoretical and practical domains. From a theoretical perspective, the results confirm the analytical framework of political ecology, which emphasizes the mutual conditionality between natural processes and social power relations. From a practical point of view, it points to the need to strengthen institutional capacities for prevention and response, as well as the importance of developing local adaptation strategies and environmental education of the population. At the same time, the limitations of the research include the relatively small spatial coverage, potential bias in self-reported data, and the inability to fully generalize the results, which opens space for future comparative research and in-depth qualitative analyses in other regions.

5. Conclusions

This research has shown that the population of the Toplica District perceives environmental risks as present and intensifying, especially in the context of forest fires and climate change. The results indicate that the majority of respondents observe an increase in fire frequency and attribute it to a combination of climate factors and human activities, while at the same time, there is a significant presence of the perception of insufficient efficiency of the institutional response.

The significance of this research is reflected in its contribution to understanding how local communities in peripheral rural areas perceive climate change and environmental risks, as well as in its confirmation of the relevance of the political ecology approach to the analysis of socio-ecological

relations. The observed findings indicate a complex intertwining of natural, social, and institutional factors, which can be understood through the idea of complexitas rerum, i.e., the essential complexity of reality, in which ecological processes can never be reduced to a single cause or dimension.

The practical implications of the research relate to the need to strengthen institutional capacities for forest fire prevention and response, as well as to improving local adaptive strategies and environmental education for the population. Future research should include a wider spatial sample, comparative analyses with other regions, and in-depth qualitative approaches to enable a more detailed understanding of the mechanisms underlying the formation of ecological perceptions and adaptation strategies.

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