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Guest Editors' Introduction: Population Dynamics and Environmental Challenges

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Population dynamics are increasingly unfolding under conditions of environmental uncertainty. Climate change, pollution, natural hazards, land degradation, and other environmental pressures affect not only health and well-being, but also where people live, how they adapt, and whether they remain in or leave particular places. Yet the relationship between environmental change and demographic behavior is rarely direct. Socioeconomic resources, settlement patterns, age and household structure, institutional capacity, perceptions of risk, and the options available to individuals and communities to adapt in place or through mobility mediate this relationship.

This thematic issue, *Population Dynamics and Environmental Challenges*, brings together six original research articles, complemented by a reflection paper and a conference report, that address different dimensions of the population–environment relationship, primarily in Serbia, while also positioning some of the findings in a broader European context. The issue was intellectually inspired by the questions addressed within the research project *Population Dynamics under Environmental Challenges in Serbia* (POPENVIROS), funded by the Science Fund of the Republic of Serbia (Grant # 7358). The project seeks to investigate in what ways and to what extent environmental challenges affect the three core components of population dynamics – fertility, mortality, and migration – and to advance methodological integration of demographic, socioeconomic, and environmental data from different sources and spatial levels. The contributions collected here extend this broader research agenda by examining environmental mobility, drought and agricultural vulnerability, natural-hazard exposure, riverbank erosion, perceived pollution and noise, flood-related migration, as well as the availability and research usability of health incidence data. Taken together, they demonstrate both the analytical potential and the complexity of studying demographic processes through an environmental lens.

Mobility is the most prominent demographic process addressed in this collection, but the papers approach it from markedly different perspectives. Mirić examines how chronic pollution is experienced in everyday life and translated into a continuum of adaptive spatial responses. Her qualitative findings show that mobility does not necessarily begin with a clear decision to migrate. It may develop gradually through household-level adaptations, moves within cities, suburban or rural relocation, and longer-term migration aspirations. Particularly important is the role of institutional distrust: when environmental protection is perceived as ineffective, households may increasingly individualize risk management and turn to mobility as a means of protection.

Two contributions test environment–migration relationships using aggregate quantitative approaches and, importantly, arrive at more cautious conclusions. Maričić, Vasić, Jakovljević, and Milovanović identify increasing drought pressures and considerable territorial heterogeneity across Serbian districts, but find no statistically significant differences in internal emigration rates between the district segments derived from drought and agricultural indicators. Similarly, Gligorijević, Bakić, and Mijušković examine the effects of the 2014 floods using a Difference-in-Differences design. Their estimates do not support a single robust average effect of flood exposure on formally registered internal out-migration and vary according to model specification and comparison group. These findings are highly instructive: environmental pressures may shape mobility without producing uniform, immediate, or readily measurable migration responses at aggregate territorial levels.

Other papers broaden the demographic–environmental nexus beyond narrowly understood migration. Novković integrates natural-hazard exposure with indicators of demographic vulnerability across Serbian local self-government units. The results show that areas with pronounced demographic disadvantages are not necessarily those with the highest overall vulnerability. Rather, cumulative vulnerability emerges where demographic susceptibility coincides spatially with hazard exposure and exposed settlements. This reinforces the importance of analyzing population structure and environmental risk jointly, rather than treating either as a sufficient proxy for vulnerability.

Dragićević, Langović, Radović, Tošić, Langović, Lovrić, and Manojlović offer a long-term perspective through the case of riverbank erosion in Obrenovac Municipality. By combining historical cadastral sources, UAV data, GIS, land-use information, and demographic analysis, the study documents substantial agricultural land loss alongside long-term population decline and a dramatic reduction in agricultural employment. The authors appropriately avoid attributing demographic decline directly to erosion; instead, they identify land loss as an additional localized stressor operating within the broader processes of rural restructuring. This distinction is important for environmental–demographic research, where multiple slow-moving processes often overlap, and causal attribution is difficult.

Anić provides a comparative European perspective by examining socioeconomic determinants of perceived exposure to noise and pollution. Across the analysed countries, degree of urbanization emerges as the most consistent predictor of perceived environmental exposure, while age, tenure, and poverty also matter, although their effects vary across national contexts. The Serbian case is particularly revealing because the relationship between poverty and perceived exposure differs from the dominant European pattern, reflecting the country's spatial distribution of poverty between urban and rural areas. The paper therefore underlines that environmental inequality cannot be understood independently of settlement systems and national socioeconomic geographies.

Marinković complements these empirical contributions with a reflection on a fundamental prerequisite for population–environment research: the availability, reliability, and research usability of health data. Focusing primarily on cancer incidence data in Serbia, he draws attention to the difficulties researchers face in obtaining sufficiently disaggregated data for small territorial units by sex, age, and diagnosis, as well as to insufficient transparency regarding data processing and quality assurance. His contribution raises a broader methodological and institutional issue: the capacity to investigate environmental effects on population health depends not only on analytical methods, but also on whether reliable, well-documented, and appropriately disaggregated data are accessible for research. Improving access to verified aggregate data, while safeguarding confidentiality, is therefore an important prerequisite for strengthening the evidence base for population–environment research in Serbia.

Several cross-cutting insights emerge from the contributions. First, environmental challenges do not translate mechanically into demographic outcomes. The absence of a statistically robust migration effect in some aggregate analyses does not contradict qualitative evidence that pollution or environmental insecurity enter household decision-making. Rather, the studies reveal different stages, scales, and manifestations of the same broader process. Perceptions, aspirations, temporary adaptations, registered migration, and long-term population redistribution are related but not interchangeable phenomena.

Second, spatial heterogeneity is fundamental. Environmental exposure, demographic vulnerability, socioeconomic resources, and adaptive capacity are unevenly distributed across Serbia, and the same environmental pressure may have different consequences in different territorial contexts. Third, the contributions repeatedly point to the mediating role of institutions. Monitoring systems, access to reliable data, spatial and environmental planning, disaster recovery, land management, enforcement, and public trust influence both how environmental pressures are experienced and how effectively their demographic consequences can be understood and addressed.

The collection also demonstrates the value of methodological pluralism, while drawing attention to the data infrastructure on which such pluralism depends. Focus groups reveal mechanisms and lived experience that aggregate statistics cannot capture; longitudinal spatial datasets identify slow territorial transformations; comparative microdata illuminate socioeconomic differentiation; and quasi-experimental and multi-criteria approaches test relationships that are often assumed rather than demonstrated. At the same time, the reflection on health incidence data shows that methodological advancement alone cannot overcome limitations in the availability, granularity,

documentation, and reliability of underlying data. Advancing population–environment research therefore requires both stronger integration across analytical approaches and data systems capable of supporting research at appropriate demographic and spatial scales.

Future research should move toward linked, multilevel, and longitudinal designs that combine objective environmental measurements with demographic records and subjective assessments of exposure and risk. Greater attention should be paid to distinguishing temporary displacement, residential adjustment, migration intentions, registered moves, and permanent migration. Individual- and household-level longitudinal data would help clarify why similarly exposed populations respond differently, and allow stronger testing of the roles of income, age, household composition, employment, housing, and institutional trust. There is also clear scope for integrating environmental, socioeconomic, institutional, health, and spatial data more systematically and for examining spillovers across neighboring municipalities and regions.

The thematic balance of this collection points to a further research gap. Migration and territorial vulnerability are strongly represented, whereas the effects of environmental challenges on fertility, mortality, and morbidity remain less developed empirically. Marinković's reflection indicates that, at least in the case of morbidity, addressing this gap may also depend on improving the availability and research usability of sufficiently disaggregated health data. Future studies should therefore extend the emerging Serbian evidence base towards reproductive behavior, environment-related morbidity and mortality, ageing under environmental stress, and the cumulative life-course effects of environmental exposure. Comparative research linking Serbia with other European and Southeast European contexts would further help distinguish context-specific mechanisms from more general demographic responses to environmental change.

The conference report by Bakić, *International Scientific Conference: "Population and Environment: Challenges and Perspectives"*, complements these contributions by documenting the broader interdisciplinary discussion from which many of these questions emerge. The conference brought together researchers from demography, climatology, ecology, medicine, geography, spatial planning, and economics, illustrating the extent to which population–environment research increasingly requires dialogue across disciplinary boundaries.

Taken as a whole, this thematic issue suggests that the demographic consequences of environmental challenges are best understood not as isolated effects, but as outcomes of interactions among environmental exposure, population structure, socioeconomic conditions, spatial context, and institutional capacity. Developing evidence capable of capturing these interactions is essential both for advancing demographic research and for designing policies that strengthen resilience, while reducing environmentally induced inequalities.

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Coauthor contributions

Marijana Pantić: Conceptualization, Data Curation, Formal Analysis, Funding Acquisition, Investigation, Methodology, Project Administration, Resources, Software, Supervision, Validation, Visualization, Writing - Original Draft, Writing - Review & Editing.

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