

Ecological progress and the prospects for sustainable civilizational development: synergy among the state, environmental protection, the market, and the principle of social self-organization

Viktor Zinchenko^{1,*}, Oleksandr Polishchuk², Olga Gomilko³, Olena Yakovleva⁴, Nataliia Salnikova⁵, and Kornelii-Dmytro Popovych⁶

¹Institute of Higher Education, National Academy of Educational Sciences of Ukraine, Kyiv, Ukraine

²Khmelnitsky Humanitarian and Pedagogical Academy, Khmelnytsky, Ukraine

³H. Skovoroda Institute of Philosophy of the National Academy of Sciences of Ukraine, Kyiv, Ukraine

⁴Kyiv Institute of Business and Technology, Kyiv, Ukraine

⁵Mariupol State University, Kyiv, Ukraine

⁶Higher Educational Institution «Podillia State University», Kamianets-Podilskyi, Ukraine 3Higher Educational Institution «Podillia State University», Kamianets-Podilskyi, Ukraine

Abstract. A comprehensive analysis of the relationship between centralized, market-based, and self-organizing management mechanisms in the context of contemporary environmental challenges has been conducted. The relevance of this study is due to the deepening global environmental crisis, which highlights the limitations of traditional models of public governance based on hierarchical coordination and the logic of economic growth. The study substantiates that the formal functioning of democratic institutions does not ensure an adequate level of citizen participation in making significant decisions of environmental management, which undermines the effectiveness of sustainable development policy. Based on an analysis of the principles of self-organization inherent in natural systems, this study demonstrates the potential of decentralized forms of social interaction to enhance the adaptability and resilience of socio-ecological systems. The study examines the controversial role of centralized management models, which, while enabling the implementation of large-scale environmental strategies, simultaneously limit the initiative of local communities and contribute to the bureaucratization of management processes. The concept of post-industrial development is critically analyzed, and it is proven that the “greening” of the economy within the framework of an unchanging logic of growth does not eliminate the systemic reasons for the ecological crisis, but merely transforms the forms in which it manifests itself. Particular attention is paid to the analysis of the market economy, which, through the mechanisms of externalities, the commercialization of natural resources, and the dominance of the profit motive, reproduces environmental instability. It has been shown that existing models for integrating market forces with social and environmental

* Corresponding author: vvzinchenko@ukr.net

goals have limited potential for resolving the fundamental tensions between economic growth and environmental limitations. The conclusions justify that the prospects for civilizational development are linked to the emergence of hybrid environmental management models that combine elements of centralized coordination with mechanisms of social self-organization, guided by the principles of environmental sustainability, social responsibility, and the balanced use of natural resources.

1 Introduction

In today's world of global transformation, the issue of effective public management is particularly relevant in the context of growing environmental challenges. Climate change, the deterioration of natural ecosystems, the depletion of natural resources, and the growing environmental risks point to a crisis in traditional management models, which rely primarily on centralized decision-making mechanisms. At the same time, while most modern states formally declare democratic principles, this is not always accompanied by the real involvement of citizens in the process of developing environmental management, which reduces its effectiveness and adaptability.

In academic discourse, approaches focused on the study of self-organization as a fundamental principle of complex systems are gaining increasing importance. Natural ecosystems demonstrate the ability to self-regulate, adapt, and maintain a dynamic balance without rigid, centralized control. This raises the question of whether such principles can be implemented in social systems, particularly through the development of mechanisms for people's power, local self-government, and horizontal forms of interaction. At the same time, the limits of the effectiveness of such approaches remain a matter of debate, especially in the situations requiring complex strategic decisions in the field of environmental safety.

The purpose of this article is to provide a comprehensive analysis of the relationship between centralized and self-organizing management mechanisms in social systems, taking into account the ecological dimension. The scientific novelty of this study lies in combining the theoretical foundations of people's power with concepts of self-organization in natural systems to justify effective models of environmental management.

The objectives of this article are to identify the limitations of traditional management approaches, to analyze the possibilities of decentralized practices, and to determine the conditions for their effective combination in the context of achieving sustainable development goals.

2 Discussion

Modern research on complex adaptive systems demonstrates that socio-ecological structures function as systems of nonlinear interactions in which order emerges through local coordination processes rather than through centralized control. In this context, cities, ecosystems, and institutions can be viewed as emergent systems that self-organize on the basis of multiple interdependencies.

At the same time, according to J. Dryzek, a political-philosophical analysis of democracy points to a crisis in representative models of governance [2], particularly in the context of environmental uncertainty. As U. Beck points out, delegating decision-making to institutions often leads to a decline in citizen participation in the development of environmental policy and weakening of the principle of collective responsibility [1]. This creates a tension between democratic legitimacy and the technocratic efficiency of management.

From an environmental standpoint, scientists note that global assessments of the state of the environment confirm that human impact exceeds a number of planetary boundaries, threatening the stability of the Earth system [10]. The IPCC emphasizes that without systemic changes in production and consumption patterns, climate stabilization is doubtful [5]. This means that the issue of environmental management extends beyond the institutional sphere and becomes a matter of civilizational organization.

The economic perspective adds another dimension: traditional growth models do not take environmental limitations into account and generate systemic externalities that are not integrated into market mechanisms. As a result, there is a gap between economic rationality and environmental sustainability.

Therefore, the self-organization of socio-ecological systems cannot be viewed as an automatically effective alternative: its effectiveness depends on the quality of institutions, transparency, and the stability of the rules of interactions. This provides the basis for further analysis of multi-level management models.

3 Crisis of representative governance and the potential for self-organization in the context of environmental challenges

Throughout human history, the idea of establishing a just social order based on the principles of people's power has occupied a central place in political and social thought. From the classical concepts of antiquity to modern democratic theories, the question of genuine citizen participation in decision-making remains open and controversial. Although most modern states declare their commitment to democratic values, the practical functioning of political institutions reveals significant limitations on citizens' influence over strategic management processes. This is particularly evident in the field of environmental policy, where decisions regarding the use of natural resources, environmental protection, or responses to climate change are often made by narrow management structures [5].

Critical analysis of contemporary democratic practices suggests that the mechanisms of representative management do not always ensure the effective implementation of the principle of people's power. In many cases, society is viewed as an object of management rather than an active participant in the process. At the same time, the range of tools used to influence public opinion varies from information technology and socio-psychological mechanisms to administrative and coercive measures. In the context of environmental challenges, this situation is particularly problematic, as the absence of broad public participation reduces environmental responsibility and hinders the implementation of sustainable development principles. The arguments of opponents of direct democracy are traditionally based on the claim that it is technically challenging and ineffective due to the supposedly insufficient competence of citizens. However, modern environmental practices – particularly the development of community initiatives in the field of environmental protection – call into question the unambiguous of such statements [6].

Turning to the patterns that govern the functioning of natural systems opens new avenues for understanding these issues. A wide variety of natural phenomena – from global geophysical processes to local ecosystems – develop through self-organization. These processes, despite their apparent complexity and variability, are governed by objective patterns that ensure stability, adaptability, and resilience. In this context, ecosystems can be viewed as effective models of decentralized management, where coordinated functioning is achieved without a single central authority.

Social systems, as a part of the natural world, are also characterized by self-organizing processes. At the same time, what distinguishes human society is its ability to create consciously normative systems that regulate social interaction. These regulators are legal norms, political institutions, and moral principles; in the environmental sphere, they include

international agreements, environmental safety standards, and sustainable development concepts. The interaction between objective natural laws and subjectively established norms shapes the complex dynamics of socio-ecological systems, in which the significance of certain factors varies, depending on the historical context.

An important characteristic of most natural systems is the absence of rigid centralized control and the predominance of horizontal connections between their elements. Such systems demonstrate high resilience to external influences, adaptability, and the ability to self-regenerate. For example, the behavior of social insects – such as ants, bees, and other species – is based on local interactions, in which coordination is achieved through the exchange of various types of signals. As a result, a coordinated collective behavior emerges, resulting from the sum of individual actions. Such mechanisms are increasingly being viewed as models for developing effective public management frameworks, particularly in the area of environmental governance at the community level [6].

At the same time, unlike natural systems, human society is capable of purposeful management, which involves setting strategic goals, selecting the means to achieve them, organizing information flows, and monitoring the implementation of decisions. It is precisely this characteristic that necessitates the search for an optimal balance between centralized and decentralized management mechanisms. In the context of environmental challenges, this issue takes on particular significance, as an effective solution to environmental problems requires both global coordination and active participation of local communities.

Thus, the above leads us to the conclusion that the key aspect of contemporary scientific discourse is finding a balance among different management models, which will ensure not only the effectiveness of social systems but also their environmental sustainability. It is precisely the combination of self-organization principles with elements of centralized regulation that can serve as the foundation for developing new environmental management approaches focused on achieving sustainable development goals.

4 Centralized management models: opportunities and limitations in the conditions of environmental challenges

It is worth noting that centralized management systems are traditionally viewed as an effective tool for achieving large-scale societal goals, particularly in areas that require rapid mobilization of resources and coordination of actions. In the context of environmental management, such approaches help to concentrate financial, technological, and managerial resources on implementing large-scale environmental protection projects, adopting environmental standards, and responding to crises. Further significant advantages of centralization include relative structural clarity, the ability to make decisions quickly, and the chance to share experience and knowledge in the field of natural resource management [10].

Despite the advantages mentioned above, centralized models have a series of significant limitations, which are particularly evident in the field of environmental management. Excessive hierarchy contributes to the growth of bureaucratic structures, which makes it difficult to adapt to rapidly changing environmental conditions. Restrictions on initiatives at the local level reduce the effectiveness of implementing environmental solutions, since it is local communities that often have the most relevant information about the state of the environment. Furthermore, the concentration of power creates the risk of decisions being made with a focus on short-term economic gains, which may conflict with long-term goals of preserving ecosystems and ensuring sustainable development [3].

Historical experience with the functioning of social systems indicates a consistent tendency toward the formation of managerial elites who exercise control over resources and decision-making processes. In today's world, this is particularly evident in the field of natural resource management, where access to resources and the ability to influence environmental

policy are often concentrated in the hands of a limited number of people. This situation can lead to the interests of the general public being ignored and environmental constraints, which, in turn, exacerbates socio-environmental conflicts.

The attempts to establish more equitable models of social organization, in which environmental management and distribution of resources would be based on principles of fairness and broad participation, have had limited success. This is due both to objective factors of the development of productive forces and to the difficulty of reconciling the interests of various social groups. From an environmental perspective, this problem entails reconciling economic development with the constraints imposed by the natural environment. Even in cases of significant progress in raising living standards and expanding citizens' rights, the question of society's actual influence on the management of natural resources remains open.

Thus, analysis of centralized environmental management models points to their contradictory role in ensuring environmental sustainability. On the one hand, they create opportunities for implementing large-scale environmental strategies; on the other hand, they limit the potential for local self-organization and community participation, which are essential for effective solutions to modern environmental problems. This necessitates the search for more flexible management approaches that integrate centralized coordination with decentralized forms of environmental management.

5 The illusions of post-industrial development and the limits of “greening” economic growth

We draw your attention to the fact that the stability of existing socioeconomic models is largely sustained not only by institutional mechanisms but also by social habits, upbringing, and dominant cultural attitudes. Focus on stability, an avoidance of dramatic change, and a desire for comfort create a social inertia that hinders the transformations needed to address environmental problems. In this context, the concept of a gradual transition to the so-called post-industrial society is often presented as a compromise: it is expected that technological innovations, the development of the service sector, and the “greening” of production will make it possible to combine economic growth with environmental protection.

In fact, developed countries are undergoing a process of partial economic transformation: the decline of traditional heavy industry, the development of high-tech sectors, the introduction of resource-saving technologies, and the expansion of waste recycling and alternative energy practices. The importance of the so-called “tertiary sector” – the service sector, which is perceived as having a lower environmental impact – is growing. These trends suggest a gradual shift toward a more environmentally sustainable development model.

At the same time, a more detailed analysis shows that these changes are not always systematic. In many cases, the issue is not about overcoming industrial logic, but about transforming it and expanding it into new areas of activity. In fact, the processes of computerization and technological advancement contribute to the standardization of services, their commercialization, and integration into market mechanisms. This means the further spread of the principles of profit-driven mass production, which continues to put pressure on natural resources, though in less obvious ways [8].

The environmental component of such transformations is also controversial. Despite the implementation of “green” technologies, the very logic of the market economy – based on continuous growth and expanding consumption – remains unchanged. As a result, there is not a reduction but rather a redistribution of the environmental burden: environmentally harmful industries are relocated to regions with lower environmental protection standards, while in developed countries, the illusion of “environmental purity” is created. Therefore, the

global nature of environmental problems does not disappear, but merely takes on different spatial forms [4].

In addition, there is a growing trend toward the commercialization of natural resources and even basic environmental goods. Water, air, land resources, ecosystem services are being incorporated into market transactions, thereby subjecting them to the logic of profit. This approach restricts access to natural resources and exacerbates socio-environmental inequality. At the same time, it contradicts the fundamental principle of environmental sustainability, which calls for the responsible and balanced use of the natural environment.

Thus, the concept of post-industrial development, in its simplified understanding, does not provide a solution to the key environmental contradictions. Maintaining a focus on economic growth by exploiting natural resources – even in more technologically advanced forms – does not address the systemic causes of the environmental crisis. This highlights the need to rethink the fundamental principles governing the relationship between society and nature, as well as to search for alternative models of environmental management that combine economic efficiency, social justice, and environmental responsibility.

6 Market economy and environmental constraints: systemic contradictions of the growth model

A key contradiction in contemporary socioeconomic development remains the dominance of the logic of continuous growth in production and consumption, which even subjugates innovative and environmentally oriented technologies. Under such conditions, technological progress – which could potentially contribute to harmonizing the relationship between society and nature – is often used to intensify the exploitation of natural resources and increase competition. This proves that environmental innovations alone cannot change the nature of human-environment interactions without a transformation of basic economic principles.

In academic discourse, various approaches have been proposed to resolve these contradictions, including concepts that combine market mechanisms with social and environmental goals. The ideas of so-called “market socialism” involve the integration of the principles of competition with elements of self-governance, social justice, and environmental responsibility. However, the effectiveness of such models remains a matter of debate, as they attempt to reconcile diverse incentives: on the one hand, a focus on profit and growth; on the other, the need to limit the use of resources and to preserve ecosystems.

Environmental economics clearly demonstrates that market systems tend to shift a significant portion of environmental costs beyond the immediate producers. This refers to so-called externalities, whereby damage to the environment or public health is not factored into the cost of a product and is effectively passed on to society. As a result, a situation arises in which the economic gains of individual entities are achieved at the expense of environmental damage.

A good example of such processes is the “tragedy of the commons” model, which illustrates the conflict between individual gain and collective interests. The rational behavior of individual economic agents, aimed at maximizing their own benefits, leads in the long term to the depletion of common resources and the deterioration of ecosystems. In contemporary interpretations, this problem is viewed as one that can be partially mitigated through the institutions of local and multilevel self-government described in the works of E. Ostrom [9].

Even under government regulation – specifically through a system of environmental standards, fines, and incentives – the possibilities for significant reduction of negative environmental impacts remain quite limited. This is because the market economy is driven by the profit motive, which often conflicts with the principles of environmental sustainability.

As a result, environmental restrictions are either partially ignored or incorporated into the system as additional costs that do not change its essential characteristics.

A further aspect of the problem is the uneven nature of global economic development, which has a clear environmental dimension. The relocation of environmentally harmful industries to countries with less stringent regulations helps maintain relatively favorable environmental conditions in developed regions, while worsening environmental and social problems in other parts of the world. This imbalance shows the global nature of environmental challenges and the limitations of local solutions.

Thus, analysis of current economic models reveals that achieving ecological balance is unlikely without changing the fundamental principles of production and consumption. This strengthens the argument for seeking alternative approaches that combine economic activity with mechanisms of self-organization, social responsibility, and environmental constraints.

The destructive effects of the market economy not only reproduce their own internal contradictions but also significantly exacerbate the environmental consequences of previous models of centralized, bureaucratic management. Although the temporary decline in industrial production in post-Soviet countries has led to local improvements in the environment, this trend is temporary in nature. Instead, the establishment of market mechanisms has been accompanied by the dominance of short-term economic interests, a focus on profit maximization, and intensified exploitation of natural resources. Under such conditions, environmental restrictions are systematically ignored or marginalized, and the environmental costs are passed on to society.

These processes are particularly evident in countries with economies in transition, where there is a lack of effective environmental regulatory and control institutions. The reluctance of capital to invest in the environmental modernization of industry, the energy sector, and the agricultural sector goes hand in hand with environmental dumping practices, including the potential disposal of hazardous waste. In agriculture, market incentives encourage excessive intensification of land use, leading to soil deterioration, erosion, and chemical contamination. International organizations estimate that a significant part of agricultural land in the post-Soviet region is already at environmental risk, which threatens long-term food security.

Models of decentralized self-governance based on horizontal ties, collective decision-making, and the prioritization of the public good over profit are offered in theoretical discourse as an alternative to these trends. However, historical experience shows that, in a market-dominated environment, such models of environmental management either remain localized or are forced to integrate into the system, thereby losing their transformative potential. Moreover, the very structure of industrial labor organization, which is focused on standardization and the functionalization of human labor, limits the potential for the development of environmentally oriented forms of economic activity. In this context, the issue of the environment is not viewed as a separate policy sector, but as a fundamental aspect of the transformation of the socio-economic system as a whole.

7 General conclusions of the study

Scientific and research analysis of current models of environmental management reveals their insufficiency in the context of the environmental crisis. Both centralized and market-based mechanisms display systemic limitations stemming from either excessive hierarchy or the dominance of economic rationality over environmental considerations.

Under these circumstances, the concept of self-organization emerges not as a utopian alternative but as a theoretical model that allows us to comprehend the possibilities for harmonizing social and natural systems. This is not about a rejection of the management as such, but about transforming it into networked, decentralized, and environmentally focused forms.

The future development of civilization, therefore, depends on the ability of mankind to rethink the balance between centralization and self-organization, between economic efficiency and ecological limits, and between technological progress and the preservation of the natural foundations of life.

References

1. U. Beck, *Risk Society: Towards a New Modernity* (Sage, 1992)
2. J. S. Dryzek, *Deliberative democracy and beyond: Liberals, critics, contestations* (OUP Oxford, 2002)
3. J.-O. Engler, M.-F. Kretschmer, J. Rathgens, J. A. Ament, T. Huth, H. von Wehrden, 15 years of degrowth research: A systematic review, *Ecological Economics* **218**, 108101 (2023) URL: <https://doi.org/10.1016/j.ecolecon.2023.108101>
4. J. Hickel, *Less is more: How degrowth will save the world* (London: William Heinemann, 2020)
5. IPCC, *Climate Change 2023: Synthesis Report* (Geneva, Switzerland: Intergovernmental Panel on Climate Change, 2023) URL: <https://doi.org/10.59327/IPCC/AR6-9789291691647>
6. T. Jackson, *Post Growth: Life after Capitalism* (Polity Press, 2021)
7. M. Mazzucato, *Mission economy: A moonshot guide to changing capitalism* (Allen Lane, 2021)
8. M. Mitchell, How do we know how smart AI systems are?, *Science*, **381** (6654), 1–3 (2023) URL: <https://doi.org/10.1126/science.adj5957>
9. E. Ostrom, Beyond Markets and States: Polycentric Governance of Complex Economic Systems, *American Economic Review*, **100** (3), 641–672 (2010) URL: <https://doi.org/10.1257/aer.100.3.641>
10. W. Steffen, K. Richardson, J. Rockström, S. E. Cornell, I. Fetzer, E. M. Bennett et al, Planetary boundaries: Guiding human development on a changing planet, *Science*, **347** (6223), 1259855 (2015) URL: <https://www.science.org/doi/10.1126/science.1259855>