STRATEGIC GUIDELINES FOR SUSTAINABLE MANAGEMENT OF WETLAND ECOSYSTEM SERVICES

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Wetlands are one of the most productive ecosystems on Earth and therefore perform important ecological, economic, and social functions. They are a source of biodiversity, water, and primary productivity, on which numerous species of plants, birds, fish, amphibians, mammals and invertebrates depend, and they also hold a significant layer of genetic information. Ecosystem services of wetlands are a crucial factor in the functioning and development of many sectors of the national economy and human potential of both individual local communities and the country's society. The flow of benefits provided by wetlands is directly used by water management, agriculture and forestry, energy, recreation and tourism, pharmaceuticals, and other sectors of the economy.

However, the degradation of many wetlands makes it impossible to fully utilize their ecosystem services and significantly reduces the potential for utilizing the benefits of wetlands for posterity. Ecosystem services remain underestimated by business, government, and society. As a result, the loss of natural capital and services of wetlands and other ecosystems continues [3].

Therefore, there is an urgent need to modernize the fundamental principles of wetland management and incorporate ecosystem services into the management system of economic entities at different hierarchical levels of management.

To take into account, the value of ecosystem services in the process of functioning of economic entities and implement them in relevant management decisions, it is necessary to develop an organizational and economic mechanism for ecosystem management of wetlands. Unlike other mechanisms for managing natural objects, which have a developed methodological basis, as well as strategies and methods, the process of ecosystem management of wetlands is only at the stage of formation. A factor that increases the complexity of developing an organizational and economic mechanism for ecosystem management is the lack of a comprehensive definition and inventory of wetland ecosystem services, as well as the lack of consistent methodological approaches to determining the value of ecosystem services as a central element of this mechanism. For these reasons, there are no uniform methods for accounting for ecosystem services and their inclusion in the system of national accounts [1].

Such problems require the formation of a unified theoretical and methodological approach to understanding the essence of ecosystem services, the formation of lists of benefits received by different groups of beneficiaries and stakeholders, as well as a unified understanding of the process of making management decisions by individual business entities and authorities.

To build an effective ecosystem services management system, it is advisable to consider the “economies of scale”. The benefits derived from a single wetland ecosystem are spread over large areas and are distributed unevenly. For different hierarchical levels of ecosystem management, as well as beneficiaries and stakeholders, the importance of certain ecosystem services of wetlands may be different the effective use of ecosystem services for some may lead to the loss of others.

As defined by the UN Millennium Ecosystem Assessment, such principles of management of wetland ecosystem services should be improved at the following hierarchical organizational levels at the local level (by individuals and stakeholder groups of the local population who are dependent on and influence the wetland ecosystem); at the regional level (by public institutions and individuals responsible for making management decisions); at the global level (by international organizations through the adoption and implementation of multilateral international conventions, agreements and strategies for managing wetland ecosystems) (Table 1). [7].

Table 1. *Initiatives and benefits of sustainable management of wetland ecosystem services at different hierarchical levels of management*

LEVELS OF MANAGEMENT OF ECOSYSTEM SERVICES OF WETLANDS	INITIATIVES IN THE MANAGEMENT OF THE ECOSYSTEM SERVICES OF WETLANDS	POTENTIAL BENEFITS OF RATIONAL MANAGEMENT OF ECOSYSTEM SERVICES OF WETLANDS STATE
STATE	1. Creation of a new system of national accounts considering the value of changes in natural capital stocks and ecosystem services of wetlands; 2. Continuous monitoring of changes in physical, human, natural, and social capital based on developed indicators; 3. Formation of a coordinated system of accounts to account for forest stocks and ecosystem services of wetlands, necessary for developing new incentives and mechanisms for carbon sequestration by forests; 4. Development of methodology, indicator systems, and standards for long-term sustainable management and comprehensive consideration of ecosystem services of wetlands; 5. Reforming and redirecting subsidies that threaten ecosystem services of wetlands in sectors such as agriculture, fisheries, transport, and water supply; 6. Certification, licensing, and labeling system for products based on their impact on ecosystem services of wetlands; 7. Balancing private, state, and public ownership rights to natural resources and services to ensure their fair distribution; 8. Considering ecosystem services of wetlands in "public procurement"; 9. Integrating ecosystem services of wetlands into the country's agricultural policy strategy.	1. Improvement of Ukraine's macroeconomic indicators; 2. Enhancement of the country's image as environmentally responsible; 3. Increase in the standard and quality of living of the population; 4. Reduction of degradation and restoration of ecosystem services of wetlands in the country; 5. Benefits for the state budget; 6. Ensuring the country's food security.
REGIONAL LEVEL	1. Creation of protected areas with ecosystem-based management; 2. Development of regional compensation mechanisms for payments for wetland ecosystem services.	1. Benefits from providing wetland ecosystem services for use; 2. Benefits from using high-quality ecosystem services.
ENTERPRISE LEVEL	1. Inclusion of wetland ecosystem services in value chains of products and goods; 2. Incorporation of data on all major external impacts on ecosystem services into annual reports and enterprise accounting systems (indicators such as "no net loss" and "positive overall impact"); 3. Investments in the development, maintenance, and conservation of wetland ecosystem services; 4. Implementation of compensation mechanisms for using and providing wetland ecosystem services in enterprise economic policies.	1. Cost savings on compensating for damage to wetland ecosystem services; 2. New revenue streams from participating in payment mechanisms for wetland ecosystem services; 3. Benefits from a simplified licensing system; 4. Improved business reputation as an environmentally responsible enterprise.

Source: [8]

However, according to the existing classification of ecosystem services, for the effective implementation of mechanisms and tools for managing wetland ecosystem services, there is a need for greater detailing in distinguishing hierarchical levels: global level; territorial level; state level; regional level; local and municipal level; enterprise level; wetland group level; and the level of an individual wetland.

The complexity of identifying ecosystem benefits at these hierarchical levels is determined by the difficulty in identifying beneficiaries and stakeholders. The beneficiaries and stakeholders of climate regulation ecosystem services provided by wetlands include almost the entire global population. However, the mechanism for appropriating the benefits of these ecosystem services is limited within the framework of international climate programs, such as the provisions of the Kyoto

Protocol. The beneficiaries of flood prevention ecosystem services of wetlands are typically local populations whose settlements are located downstream, while the beneficiaries of indirect agroecosystem services of wetlands, such as increased crop yields and the preservation of agrobiodiversity, are the agricultural sector.

These types of services are defined as latent, meaning implicit or hidden ecosystem services of wetlands, the real value of which is undetermined and not integrated into the economy of relevant industries. Moreover, there are challenges in developing the necessary organizational and economic instruments and markets for these services. [3]

Existing institutions, organizational, and economic management tools for wetlands do not ensure the necessary level of conservation and restoration. Therefore, the development and implementation of market-based organizational and economic instruments, which operate on the basis of market institutions to direct economic entities toward wetland ecosystem conservation, are becoming increasingly urgent.

However, even market-based instruments for managing ecosystem services may function under flawed economic incentives, imperfect governance structures, and processes. At the same time, market-oriented ecosystem service management mechanisms have the potential to lead to social losses. According to UNDP, an imperfect carbon market mechanism under the Paris Climate Agreement has resulted in the inefficacy of its regulatory components due to the lack of real market incentives for individual states to reduce greenhouse gas emissions, thereby stabilizing their excessively high overall volume. Another example of ineffective market-based organizational and economic instruments identified by UNDP includes inefficient tax incentives and subsidies, which can lead to situations where the market contributes to the depletion of ecosystem services and natural capital of wetlands, even in economic sectors where such services would otherwise ensure long-term economic efficiency and societal stability.

Under such conditions, an institutional trap arises in the fisheries sector, where many maritime countries provide substantial state subsidies that encourage excessive and predatory fishing, leading to the degradation of aquatic ecosystem biodiversity. [7] In such a scenario, institutional destruction and institutional conflicts emerge, reducing the effectiveness of wetland ecosystem service management and disrupting economic and social stability and balance. [5] In economic interactions, different economic entities rely on existing institutions within an institutional architecture. Institutions provide economic entities with essential information, forming the basis for developing their functional mechanisms, as well as regulating their economic activities, interactions, and behaviors.

The ongoing war in Ukraine severely worsens the challenges of sustainable use of wetland ecosystem services - adding more anthropogenic impacts and upsetting existing management frameworks. In regions affected by conflict, military operations as well as the destruction of infrastructure, shelling, and contamination of water bodies with heavy metals and chemicals further accelerate the destruction of wetland ecosystems. Such as the Ramsar wetland Desna Floodplain in Sumy Oblast's Shostka district (located near the border), which suffered direct physical damage and pollution, reducing its ability to deliver critical ecosystem services - including water purification, flood regulation, and biodiversity support. This wartime degradation not only undermines the ecological integrity of these systems but also jeopardizes the livelihoods of local communities dependent on wetland resources, amplifying the urgency for adaptive and resilient management strategies.

Furthermore, the war has disrupted institutional frameworks and economic mechanisms essential for wetland conservation, diverting national resources and attention away from environmental priorities toward immediate humanitarian and military needs. The capacity of state and regional authorities to monitor, regulate, and restore wetland ecosystem services has been severely diminished, while the destruction of scientific and administrative infrastructure has hampered data collection and the implementation of sustainable management practices. At the same time, the displacement of populations and the breakdown of local governance structures have weakened stakeholder engagement, complicating efforts to involve beneficiaries in decision-making

processes. In this context, the development of a proactive and flexible organizational-economic mechanism becomes even more critical, one that can account for the unique challenges posed by armed conflict and prioritize the restoration of wetland ecosystem services as part of post-war recovery and resilience-building efforts.

Based on the fundamental principles of the theory of economic mechanisms, the structural organizational and economic mechanism for managing wetland ecosystem services can be identified as part of the synergistic mechanism of ecosystem and economic functioning. The essence of the organizational and economic mechanism for managing wetland ecosystem services can be defined as the dynamic interaction and coordination of organizational structures and management processes based on a set of strategies, incentives, resources, and tools that influence and determine the changes in wetland ecosystem services. The key principles of organizational and economic management of wetland ecosystem services include the following [4, 7, 9]:

1. The principle of integrating ecosystem services into the activities of economic entities at various hierarchical levels of economic management.
2. The goal-setting principle, which ensures a clear target orientation in the functioning of the organizational and economic mechanism for managing wetland ecosystem services.
3. The principle of adaptability of the wetland ecosystem service management mechanism to continuously changing conditions of wetland ecosystem functioning.
4. The principle of stakeholder and beneficiary involvement in managing wetland ecosystem services, with a mandatory assessment of its impact on local well-being and poverty levels.
5. The principle of hierarchy in wetland ecosystem service management, requiring clear interactions, coordination, and integration of ecosystem functions, components, and processes.
6. The principle of continuous development and ongoing improvement in wetland ecosystem service management quality.
7. The principle of responsiveness and potential anticipation of wetland ecosystem service degradation and decline.
8. The principle of regulation and resource provision.
9. The principle of ethics and social responsibility in the organizational and economic mechanism for managing wetland ecosystem services.
10. The principle of scientific validity and substantiation of wetland ecosystem service management mechanisms.
11. The principle of control and feedback, defining the signaling channels for adjusting and refining wetland ecosystem service management goals and objectives.

The development and implementation of strategies for managing wetland ecosystem services constitute a critical component of their comprehensive management mechanism. According to predictive studies presented in the "Millennium Ecosystem Assessment" report [8], the prospects for wetland use can be realized under two main scenarios: 1) Reactive Scenario: The loss of ecosystem services in most wetlands will continue until 2050, with a reduction in their area due to population growth and the further expansion of agricultural land and settlements along wetlands. 2) Proactive Scenario: The state of ecosystem services in most wetlands will remain largely unchanged. However, due to the emergence of new technologies, scientific and technological advancements, and the development of management tools and skills, some wetlands may be restored and preserved for future generations.

Thus, wetland ecosystem service management strategies and concepts should align with these forecasted trends and adopt two approaches: 1) Reactive strategies, where management issues related to wetland ecosystem services are addressed as they arise. 2) Proactive strategies, which are developed with a long-term perspective.

Based on the ecosystem approach to wetland management proposed by the Ramsar Committee, three key directions for forming wetland ecosystem service management strategies have been suggested [2]:

1. Strategies for preventing negative anthropogenic impacts on wetland ecosystem services.

2. Strategies for mitigating unavoidable anthropogenic impacts on wetland ecosystem services (e.g., minimizing impacts during project implementation and restoring wetlands afterward).

3. Strategies for compensating or offsetting residual impacts on wetland ecosystem services (e.g., restoring wetland ecosystem functions and services).

However, in our view, wetland ecosystem service management strategies should be systematized based on a broader range of criteria (Table 2).

In our opinion, the main dominant strategies are the following: the strategy of ignoring the need to manage the ecosystem services of wetlands, the strategy of neutralizing and mitigating the negative impact on the ecosystem services of wetlands; the strategy of maintaining the functioning of wetland ecosystems and preventing their degradation; strategy for compensating for damage to wetland ecosystems and their services; strategy for rational use of and impact on wetland ecosystem services; strategies for restoring and creating preconditions for the formation of new wetland ecosystem services.

Table 2. *Decomposition of Wetland Ecosystem Service Management Strategies*

	CHARACTERISTICS OF STRATEGIES	*TYPES OF STRATEGIES*													
	CONSTRUCTIVENESS / *DETAILING*	**REGRESSIVITY**													**PROGRESSIVENESS**
GENERAL	*GENERAL STRATEGIES*	**Survival strategy**		**Stabilization Strategies**		**Strategies for rational use and impact**		**Growth and development strategies**							
	DOMINANT STRATEGIES	**The strategy of ignoring**	**Neutralization strategy**	**Mitigation strategy**	**Support and prevention strategy**	**Compensation strategy**	**Adaptation management strategy**	**Recovery strategy**						**Strategy for creating new ecosystem services for wetlands**	
	THE NATURE OF THE BEHAVIOR OF MANAGEMENT ENTITIES	Coercive and neutral strategies			Passive strategies			Active strategies							
	A WAY TO ACHIEVE THE MANAGEMENT GOAL	Strategies to reduce anthropogenic pressure	Strategies for restructuring and reorganizing wetland ecosystems		Protection and preservation strategies	Conservation strategies	Promotion strategies	Intensification strategies			Diversification strategies		Integration strategies		
								Reintroduction strategies	Breeding strategies	Reproduction strategies	Related	Unrelated	Vertical	horizontal (wetland basin)	
SPECIAL	*COMPREHENSIVENESS OF WETLAND ECOSYSTEM SERVICES*	**POLYCENTRIC**		**PARTIALLY SPECIALIZED**				**SEGMENTALLY SPECIALIZED**							
		◄													►
	TARGETED STRATEGIES FOR THE CONTAINMENT OF WETLANDS ECOSYSTEM SERVICES	Polycentric management strategy, considering the high capacity of all types of wetland ecosystem services	Polycentric management strategy, considering the low capacity of all types of wetland ecosystem services	A strategy to focus on the benefits of the provisioning and socio-cultural ecosystem services of wetlands	Strategy for focusing on the benefits of wetland ecosystem services of regulation and maintenance and socio-cultural wetland ecosystem services		A strategy to focus on the benefits of wetland ecosystem services of regulating and maintaining and enabling wetland ecosystem services	Management strategy, considering the single-segment specialization on the advantages of wetlands providing ecosystem services			Management strategy, considering the single-segment specialization on the benefits of wetland ecosystem services in terms of regulation and support		Management strategy considering one-segment specialization on the benefits of socio-cultural ecosystem services of wetlands	

Source: Compiled by the author based on [2,5].

In addition, the decomposition of strategies for managing wetland ecosystem services can be detailed according to the following features: the vector of influence of strategies; the nature of the behavior of the subjects of management of wetland ecosystem services, as well as the types of such services. The essence and characteristics of our proposed strategies for managing wetland ecosystem services are disclosed in Table 3.

Table 3. *Characteristics of management strategies for ecosystem services of wetlands*

TYPES OF STRATEGIES	CHARACTERISTICS OF STRATEGIES
СТРАТЕГІЯ ІГНОРУВАННЯ	The strategy is focused on prioritizing the goals of economic activity of stakeholders and beneficiaries of wetland ecosystem services, promotes predatory and unsustainable use of these services, and leads to gradual degradation of wetlands and adjacent ecosystems.
NEUTRALIZATION STRATEGY	The strategy is aimed at eliminating the main anthropogenic and natural factors of negative impact on the ecosystem services of wetlands, which cause irreversible changes in the state of ecosystems and their destruction.
MITIGATION STRATEGY	The strategy is aimed at reducing the level of impact of the main anthropogenic and natural factors of negative impact on the ecosystem services of wetlands in order to slow down and (or) stop their degradation.
SUPPORT AND PREVENTION STRATEGY	The strategy is aimed at preventing the potential negative impact of the main anthropogenic and natural factors by supporting the functioning of wetland ecosystem structures and components in order to increase the value of their main services.
COMPENSATION STRATEGY	A strategy for actual and potential compensation for the negative impacts on wetland ecosystem services caused by various beneficiaries and stakeholders, to balance the functioning of these ecosystems and preserve their services for posterity.
STRATEGY OF RATIONAL USE AND IMPACT	The implementation of a strategy for the rational use of and impact on the ecosystem services of wetlands requires stakeholders to implement economic activities based on the ecosystem approach and providing for the maintenance and conservation of wetland ecosystem functions in the context of ensuring sustainable economic development and social well-being.
RECOVERY STRATEGIES	The strategy of restoration of wetland ecosystem services is applied in cases where the main economic activities of stakeholders involve the use of ecosystem services that are in crisis, or the unsatisfactory state of certain ecosystem functions of wetlands cause further degradation of wetlands and adjacent ecosystems and causes a sharp decline in the well-being of society. The aim of this strategy is to quickly identify existing problems, eliminate sources of economic, ecosystem and social stability by restoring the previously existing ecosystem services of wetlands.
STRATEGIES FOR CREATING NEW WETLAND ECOSYSTEM SERVICES	The creation strategy is to form preconditions for the emergence of new interconnections and interaction of ecosystem functions, components and processes that are inherent in wetlands and are a source of ecosystem services, due to ecosystem, social and economic feasibility and the need for their existence within local, regional national and global ecosystems.
SURVIVAL STRATEGIES	Restriction and survival strategies are used primarily in crisis situations, if the negative impact of natural and anthropogenic factors significantly changes the available volume of wetland ecosystem services and may eventually cause their disappearance. The purpose of this strategy is to change the vector of influence of economic activity of economic entities, which is the cause of current unfavorable changes in the state of wetland ecosystems.
STABILIZATION STRATEGIES	The stabilization strategy is focused on maintaining the functioning and partial revitalization of economic activities of stakeholders and beneficiaries of wetland ecosystem services, while promoting their conservation and sustainable use.
GROWTH AND DEVELOPMENT STRATEGIES	Growth strategies are selected as the basic ones for the management of wetland ecosystem services when the activities of stakeholders and beneficiaries of wetland ecosystem services are carried out in a sustainable manner, and when they have internal and external potential and need to increase the volume of wetland ecosystem services in order to increase economic efficiency and social welfare.
COERCIVE AND NEUTRAL STRATEGIES	Coercive and neutral strategies are used in conditions of pressure on beneficiaries and stakeholders of wetland ecosystem services to comply with the requirements to reduce the negative impact on wetland ecosystems, or to implement economic activities characterized by the sustainable use of wetland ecosystem services and not creating conditions for their further degradation.
PASSIVE STRATEGIES	Passive strategies for managing wetland ecosystem services are characterized by the concentration of economic actors' activities on certain types of activities with a limited amount of sustainable use and impact on wetland ecosystem services, which is not focused on the comprehensive improvement of the state of wetland ecosystem services.
ACTIVE STRATEGIES	Active strategies for managing wetland ecosystem services are characterized by expanding the economic activities of wetland stakeholders and beneficiaries through the use of new or newly created wetland ecosystem services.

TYPES OF STRATEGIES	CHARACTERISTICS OF STRATEGIES
STRATEGIES FOR REDUCING ANTHROPOGENIC PRESSURE	Strategies to reduce anthropogenic pressure on wetland ecosystem services involve reducing the quantity and/or quality of physical, chemical, mechanical, thermal, biological, radiation and other factors of impact on wetland ecosystems, which are caused by economic, scientific, technical, demographic, cultural and political reasons of economic activity of stakeholders and beneficiaries of wetland ecosystem services.
STRATEGIES FOR RESTRUCTURING AND REORGANIZATION OF THE WETLAND ECOSYSTEMS	Restructuring and reorganization strategies are aimed at overcoming the fragmentation of wetland ecosystems or reorganizing them to improve ecosystem properties, functions and components, as well as transforming the organizational, production and management structure of economic entities to increase the volume of ecosystem services.
PROTECTION AND PRESERVATION STRATEGIES	Strategies for the protection and conservation of wetland ecosystem services are aimed at implementing a set of measures to protect and control the change of wetland ecosystem services in order to maintain the existence of dependent ecosystems, preserve them for posterity, and increase the economic and social efficiency of their use.
CONSERVATION STRATEGIES (RESERVATIONS)	The strategy for the conservation (reservation) of wetland areas determines the temporary or permanent, full or partial withdrawal of wetlands from economic circulation due to the degradation of ecosystem services, the significant environmental value of ecosystem functions, the inviolability of territories, the conservation of biological and genetic diversity, as well as the need to restore their ecosystem, social efficiency, and the economic return on ecosystem services of wetlands.
ADAPTATION MANAGEMENT STRATEGIES	Adaptive management of wetland ecosystem services adjusts the functioning and structure of economic entities based on changes in wetlands' ecosystem functions, components, and properties. This approach considers the needs of beneficiaries and stakeholders. There are two types of strategies: parametric adaptation and signal adaptation, formed according to varied factors affecting wetland ecosystem services.
PROMOTION STRATEGIES	Strategies to stimulate the management of wetland ecosystem services involve the development and implementation of methods and measures formed under external motivational influences (organizational, financial, economic, socio-cultural) that allow changing the management and functioning of stakeholders and beneficiaries to improve the use of wetland ecosystem services.
INTENSIFICATION STRATEGIES	Strategies for intensification of management of ecosystem services of wetlands are characterized by the process of organization and management of activities of economic entities through the introduction of the most efficient and/or innovative production, management, scientific, technical, information and other technologies to improve the condition, use or impact on wetland ecosystem services. Such strategies may include strategies for the restoration of ecosystem properties, functions and components of wetland ecosystems that form ecosystem services; strategies for reintroduction to wetland ecosystems and breeding of species or processes characteristic of them based on the use of appropriate technologies to increase the economic return on ecosystem services and public welfare.
DIVERSIFICATION STRATEGIES	Diversification strategies for the management of wetland ecosystem services are used when there is a need to expand the list of wetland ecosystem services to meet economic and social needs and interests, expand the range and production of new products and reorient sales markets to increase economic and social efficiency. Types of diversification strategies can be related (expanding the list of ecosystem services of wetlands) and unrelated (expanding the list of ecosystem services of ecosystems adjacent to the wetland, for example, forests).
INTEGRATION STRATEGIES	The strategy of integrating the management of wetland ecosystem services is applied when it is necessary and appropriate to implement a set of measures that result in the formation of an association, one management structure for individual wetlands or their parts in order to increase the efficiency of use and impact on ecosystem services. Types of integration strategies may include the following: horizontal integration involves bringing together stakeholders and beneficiaries of wetlands that have the same lists of ecosystem services within the watershed in order to improve the use of and impact on wetland ecosystem services and, as a result, economic and social efficiency; Vertical integration leads to the formation of an association of the full chain of consumption of wetland ecosystem services in order to control the formation of their value and ensure ecosystem, economic and social efficiency.

Source: Compiled by the author based on [2,5,6].

The selection of alternative strategies will enable the formation of an effective organizational-economic mechanism for managing wetland ecosystem services and allow various economic entities to adapt to the specifics of their financial-economic condition, managerial potential, as well as their level of dependence on and impact on ecosystem services. The formation of strategies for managing wetland ecosystem services is a process that involves specific stages: the development of alternative strategies; strategic analysis; the final selection of a strategic set; and the development of a strategic

plan in accordance with the goals and objectives of managing wetland ecosystem services. The decomposition of strategies should continue until the strategic tasks are formulated at the lowest functional and operational levels.

The development of a viable organizational-economic mechanism for managing wetland ecosystem services will facilitate the systematic integration of these services into the activities of economic entities, ensure the sustainable use of ecosystem services, promote their conservation and protection, and involve all stakeholders in the process of regulating and managing wetland ecosystem services. At the same time, it should be noted that such a mechanism should contribute to the formation of ecosystem resilience in wetlands and adjacent ecosystems, as well as economic and societal resilience. In the context of modern development, this necessitates the use of market-based organizational tools for managing ecosystem services.

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