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The Legal Practice of Ecosystem Services Protection in China

DING Jie
Inner Mongolia University, Hohhot, China
ZHAO Wenjing
Sun Yat-Sen University, Guangzhou, China
Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai), Zhuhai, China
LI Peilin
Inner Mongolia University, Hohhot, China

Environmental law has gradually expanded its regulatory focus from traditional environmental elements to ecosystem services. Comparative legal studies indicate that the environmental legal frameworks of several countries have integrated ecosystem services into their protection scope. Influenced by U.S. Citizen Suits and the EU Green Paper on environmental responsibility, China's environmental laws have also started to address ecosystem services, establishing a liability mechanism for loss of ecosystem services within the framework of civil liability and public interest litigation. This approach underscores China's commitment to the benefits derived from ecosystem services. However, by treating such losses as abstract and non-individualized, it neglects the individual losses involved, potentially leading to duplicate claims and increased burdens on defendants. Additionally, under the current remedial framework, compensation funds have not been effectively allocated for the restoration of ecosystem services, undermining their practical impact. While the legal practice of protecting ecosystem services in China is significant, adjustments are needed to the existing liability mechanism for loss of ecosystem services, including more reasonable allocation of compensation funds and the expansion of remedial methods, in order to ensure the comprehensive protection of ecosystem services.

Keywords: ecosystem services, loss of ecosystem services, liability, public interest litigation

Introduction

Ecosystem services emphasize the beneficial contributions that ecosystems provide for human survival and development. Specifically, they refer to the conditions and processes by which natural ecosystems and their species sustain and support human life (Daily, 1997). In the 1970 report *Man's Impact on the Global Environment by the Study of Critical Environmental Problems* (SCEP), the term "Environmental Service" was used to describe services provided by ecosystems to humans, such as climate regulation and pest control (SCEP, 1970).

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DING Jie, Master's student, Law School, Inner Mongolia University, Hohhot, China.
ZHAO Wenjing, Ph.D. candidate, School of Law, Sun Yat-Sen University, Guangzhou; Southern Marine Science and Engineering Guangdong Laboratory (Zhuhai), Zhuhai, China
LI Peilin (corresponding author), Ph.D., lecturer, Law School, Inner Mongolia University, Hohhot, China.

Subsequently, issues related to ecosystem services gradually entered the mainstream and have been the focus of significant attention. Some scholars, from the perspective of specific functions, have categorized ecosystem services into four types: provisioning services, regulating services, cultural services, and supporting services (Kempf da Silva & de Carvalho, 2018). Currently, the concept of ecosystem services is used in various contexts within environmental law. In Australia, the concept of ecosystem services has been frequently applied in the governance of coastal wetlands. First, it has been incorporated into administrative approval laws and policies, with the establishment of an ecosystem services assessment framework to ensure that the potential impacts on wetland ecological functions are thoroughly considered prior to project approval. Second, in the context of resource conservation laws, ecosystem services are used to require decision-makers to comprehensively assess wetland protection needs in non-development decisions, strengthening the overall management of wetland resources. Third, in laws and policies related to protected areas, the concept provides a scientific basis for delineating protected area categories, thereby placing clear restrictions on development and use in specific regions. Fourth, some emerging systems reflect the importance of ecosystem services, such as offering economic incentives related to natural restoration through ecosystem services payment mechanisms, which further promote wetland protection and sustainable management (Bell-James, 2020; Bell-James, Boardman, & Foster, 2020). Additionally, scholars have summarized five legal areas most influenced by the ecosystem services paradigm: government payment schemes, government regulation schemes, public land schemes, impact assessment schemes, and related judicial theories (Ruhl, 2015). It is evident that the diverse contexts in which the concept of ecosystem services exists have enriched the array of governance tools available in environmental law.

In China, the concept of ecosystem services has been actively promoted within the field of environmental legal responsibility. The earliest appearance of the concept in Chinese environmental law can be traced to Article 21 of the Interpretation of the Supreme People's Court on Several Issues Concerning the Application of Law in the Trial of Environmental Civil Public Interest Litigation Cases (hereinafter referred to as the Public Interest Litigation Judicial Interpretation), which came into effect in 2015.[1] Subsequently, in 2019, the Civil Code of the People's Republic of China (hereinafter referred to as the Civil Code) further incorporated this concept in Article 1235, making it a part of the environmental legal responsibility framework. However, when China introduced the concept of ecosystem services into the legal responsibility field, it was misunderstood as a loss that exists solely in the public domain. Moreover, it was exclusively framed as a civil liability type for public interest litigation, which has led to issues such as duplicate claims and ineffective utilization of compensation funds. These challenges warrant further study and attention.

The Origin of the Concept of Ecosystem Services in China's Legal Responsibility Framework

The concept of ecosystem services in the field of legal responsibility in China is essentially an extension of the liability for environmental damage. Its core lies in incorporating the value of the loss of ecosystem services due to damage into the overall assessment of environmental harm. The introduction of this concept largely draws

[1] Article 21: (In public interest litigation) If the plaintiff requests compensation for the loss of ecosystem service functions during the period from environmental damage to restoration to its original state, the people's court may support such a claim in accordance with the law.

on the experiences of the United States and the European Union, both of which have integrated the loss of ecosystem services into the assessment of environmental damage consequences. On this basis, China, considering its own environmental protection needs, has strengthened the comprehensive quantification and evaluation of environmental damage consequences by incorporating the loss of ecosystem services into its legal responsibility framework.

Loss of Natural Resource Services in the United States

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) authorizes the government to hold responsible parties liable for the release of hazardous substances into the environment. It requires these parties to bear the costs of restoration and compensation for the release of hazardous substances into the environment. This liability includes not only the costs of removing hazardous waste but also the damages for injury, destruction, or loss of natural resources, as well as reasonable costs for assessing such injuries, destruction, or losses resulting from such releases.

CERCLA provides only general provisions regarding liability for natural resource damages and further authorizes the President to promulgate related regulations. The President subsequently delegated this task to the U.S. Department of the Interior, which then developed and issued the Department of the Interior Natural Resource Damage Assessment Regulations (DOI Regulations). Section 11.14(ll) of the DOI Regulations defines restoration or rehabilitation as "actions taken to return injured resources to baseline condition, as measured by the physical, chemical, or biological characteristics of the resources or the services they previously provided". This definition introduces the concept of "services", and Section 11.14(nn) further clarifies that services "mean the physical and biological functions performed by resources, including their use by humans. These services are the result of the physical, chemical, or biological qualities of the resources". In conjunction with Section 11.36 of the DOI Regulations, the loss of such services may include, among other things, the loss of the ability of water bodies and sediments to assimilate, economic rental losses from commercial harvests due to any closures and/or population losses as determined by the authorized officials, and recreational harvest losses caused by any closures and/or population losses as specified by the authorized officials. Under this framework, the concept of "services" emphasizes that the level of recovery of injured resources should be measured by the capacity of the resources to provide services, rather than by their physical or biological characteristics. This means that the goal of ecological restoration is no longer simply to restore the physical composition of resources, but to return the ecosystem to its original functionality, including compensating for the loss of services during the restoration period. Guided by this, the loss of natural resource services becomes a critical component of natural resource damage liability under CERCLA.

Loss of Natural Resource Services Under the European Union

Article 2 of Directive 2004/35/CE of the European Parliament and of the Council (hereinafter referred to as Directive 2004/35/CE) defines "damage" as "a measurable adverse change in a natural resource or measurable impairment of a natural resource service which may occur directly or indirectly". This definition incorporates the concept of "services" into the scope of environmental damage, thus expanding the scope of compensation for environmental liability through the damage to natural resource services. In addition, Directive 2004/35/CE outlines specific remedial measures for environmental damage as "primary" remediation, "complementary"

remediation, and "compensatory" remediation.[2] Among them, "compensatory" remediation includes "interim losses", and the definition of "interim losses"[3] is essentially consistent with the definition of ecosystem service loss in China. It is evident that the European Union has long incorporated remedies for ecosystem services into its environmental liability framework.

As a member state of the European Union, France has gone a step further by extending the protection of ecosystem services to the civil law domain, a move very similar to that of China. During the 2013 revision of the French Civil Code, then-Minister of Justice Christiane Taubira commissioned a research report on ecological damage, prepared by a team led by Professor Yves Jégouzo. The report recommended the inclusion of a separate provision for the compensation of ecological damage in the Civil Code and defined ecological damage as "Atteinte anormale aux éléments et aux fonctions des écosystèmes ainsi qu'aux bénéfices collectifs tirés par l'homme de l'environnement".[4] This recommendation was later adopted in the French Civil Code. Although the French Civil Code does not explicitly establish liability for the loss of ecosystem services, its definition of ecological damage has already included the impairment of ecosystem services within the scope of damage, thus making it possible to claim compensation for the loss of ecosystem services.

Liability for Loss of Ecosystem Services in China

The earliest regulatory text in China addressing the liability for the loss of ecosystem services appeared in Article 21 of the Judicial Interpretation on Public Interest Litigation, which came into effect in 2015. The origin of this provision remains unclear. However, in the context of ecological environmental damage assessment practices, the Guidelines for Ecological Environmental Damage Assessment (Version II), issued in 2014 (hereinafter referred to as the Assessment Guidelines), had already incorporated the loss of ecosystem services within the scope of ecological environmental damage. Article 8.3.2 of the Assessment Guidelines explicitly outlines three types of restoration: basic restoration, compensatory restoration, and supplementary restoration.[5] A comparison with the three remediation measures in the Directive 2004/35/CE reveals that basic restoration aligns with the "Primary" remediation, compensatory restoration corresponds to "Compensatory" remediation, and supplementary restoration matches "Complementary" remediation. It is clear that China's approach to the loss of ecosystem services is heavily influenced by Directive 2004/35/CE and CERCLA, both of which introduce the concept of ecosystem services to comprehensively quantify ecological environmental damage.

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[2] "Primary" remediation is any remedial measure which returns the damaged natural resources and/or impaired services to, or towards, baseline condition; "Complementary" remediation is any remedial measure taken in relation to natural resources and/or services to compensate for the fact that primary remediation does not result in fully restoring the damaged natural resources and/or services; "Compensatory" remediation is any action taken to compensate for interim losses of natural resources and/or services that occur from the date of damage occurring until primary remediation has achieved its full effect.

[3] "Interim losses" means losses which result from the fact that the damaged natural resources and/or services are not able to perform their ecological functions or provide services to other natural resources or to the public until the primary or complementary measures have taken effect. It does not consist of financial compensation to members of the public.

[4] The translation of into English is "Abnormal impairment of the elements and functions of ecosystems, as well as the collective benefits derived by humans from the environment".

[5] Basic restoration aims to restore the damaged environment and its ecosystem services to baseline levels; compensatory restoration seeks to compensate for the ecosystem services or resources that should have been provided during the period between the damage and the recovery to baseline levels; and supplementary restoration is required when basic and compensatory restorations fail to achieve the expected recovery, ensuring that the environment returns to baseline levels and providing equivalent compensation for interim damage.

However, a closer analysis reveals that while China has adopted ecosystem services as a key indicator for assessing ecological environmental damage, aligning with the concepts and methodologies of both the European Union and the United States, there remain notable differences in the specific remedial pathways. Liability for the loss of ecosystem services is established in Article 1235(1) of the Civil Code, which inherits the provisions of Article 21 of the Judicial Interpretation on Public Interest Litigation (Wang & Li, 2024). This means that liability for the loss of ecosystem services falls under civil liability, while remediation is pursued through public interest litigation. In other words, China adopts a remedial model that combines "civil liability" with "public interest litigation" for addressing the loss of ecosystem services.

Misapplication of the Concept of Ecosystem Services Under China's Unique Model of Civil Liability and Public Interest Litigation

Both CERCLA and Directive 2004/35/CE have incorporated the remediation of ecological environmental damage within the scope of administrative regulation, establishing the government as the primary entity responsible for addressing ecological damage, with the authority to further require the perpetrators to pay related costs. In contrast, China supports the basic objective of holding ecological environmental damage perpetrators accountable for related costs, but the path to achieving this goal is not through administrative procedures. Instead, it is pursued via civil litigation, known in China as public interest litigation. According to the Judicial Interpretation on Public Interest Litigation issued in China, public interest litigation and general civil litigation are two independent and non-conflicting legal pathways, which may be pursued simultaneously. However, when addressing liability for the loss of ecosystem services, this breaks the coordination within the existing legal framework, leading to duplicate claims and inefficient use of compensation funds.

The Framework of Civil Liability and Public Interest Litigation for Addressing Ecological Environmental Damage in China

In the early practices of various countries, the responsibility for compensating ecological environmental damage was typically borne by the state. In 1972, the Recommendation of the Council on the Principles of Environmental Policy at the International Level, issued by the Organisation for Economic Co-operation and Development (OECD), introduced the "Polluter Pays Principle" for the first time at the economic level. This principle aimed to alleviate the financial burden on member states resulting from the use of public funds for pollution control (Ke, 2010). Following the establishment of this principle, the responsibility for compensating ecological environmental damage gradually shifted from the state to the polluters. In contrast, China's demand for transferring the costs of ecological environmental remediation emerged later, primarily due to the limited significance of distinguishing responsibility subjects under the public ownership system. Within this institutional context, the polluter's responsibility mainly manifested as halting pollution and paying fines. For example, in the *1972 Report on the Pollution Situation of Guanting Reservoir and Proposed Solutions*, submitted by the State Planning Commission and the State Construction Commission, the only requirement was for polluters to take measures to stop further pollution (Qu & Peng, 2010). If ecological restoration was required, the state typically directly assumed responsibility for the remediation work, rather than the polluters. After the reform and opening-up, with the growth of the private economy, the model in which the state bears the responsibility for compensating

pollution by private entities became theoretically less suitable. Subsequently, scholars began to delve into the issue of allocating environmental damage responsibility (Zhang, 1983). However, the responsibility for compensating ecological environmental damage has not yet been fully shifted to private polluters.

The turning point occurred in 2002, when the Maltese tanker Tasman Sea caused an oil spill in the eastern waters of the Dagu Anchorage in Tianjin, resulting in extensive marine pollution and the first clear indication that the polluter should bear responsibility for compensating ecological environmental damage. This incident sparked an urgent need for a remedial system for ecological environmental damage and became the foundational case for addressing similar issues. Two major factors drove the handling of this issue at the time. The first factor was that within the existing legal framework, Article 90 of the revised Marine Environmental Protection Law of 1999 most closely addressed the need for ecological environmental damage remediation. This article was derived from Article 42 of the 1982 Marine Environmental Protection Law, which explicitly stipulated that marine pollution compensation liability should be handled through civil litigation (Wang, 1990). Therefore, China generally regarded such damage liability as civil liability, making it necessary to explore the procedures for realizing this civil responsibility.

The second major factor was the concurrent rise of discussions surrounding the public interest litigation system. Following the reform and opening-up, private entities increasingly engaged in actions that infringed upon public interests, while administrative measures proved relatively inadequate. This prompted calls to reinstate the prosecutorial authority to initiate lawsuits for major civil cases involving national and public interests, as granted under the 1954 Procuratorate Organization Law. Building on research into Roman public interest litigation and U.S. citizen suits, scholar Han Zhihong proposed the establishment of a public interest litigation system in China (Han, 1999). Subsequently, numerous academic articles advocated for a public interest litigation system aimed at safeguarding national and social public interests (Ma, 2001). This issue also drew attention from China's environmental law scholars. During the 2002 seminar on Research on Environmental Legal Systems Adapted to Market Mechanisms, scholars Huang Minghe and Wang Zongting, using U.S. citizen suits as a model, proposed establishing an environmental public interest litigation system in China (Huang, 2002; Wang, 2003). Scholars argued for breaking through the existing limitations of standing to allow social public interest organizations or procuratorates to represent the public in initiating administrative or civil public interest litigation (Luo & Li, 2003). This discourse laid the groundwork for establishing civil remedies for ecological environmental damage liability.

Subsequent developments in procedural law have established public interest litigation within China's Civil Procedure Law, Environmental Protection Law, and related legal frameworks. Simultaneously, substantive law evolved, with the enactment of Articles 1234 and 1235 of the Civil Code marking the comprehensive formation of a private law model for ecological environmental damage remediation. Under this framework, Articles 1234 and 1235 of the Civil Code provide the basis for claims, while designated state agencies and legally authorized organizations act as plaintiffs, with remedies pursued through civil litigation procedures. At this point, the civil liability system for ecological environmental damage and the framework for public interest litigation were formally established. As a component of ecological environmental damage, the loss of ecosystem services naturally falls under the civil liability and public interest litigation model.

Errors Arising From China's Civil Liability and Public Interest Litigation Framework for Addressing Ecological Environmental Damage

Unlike the United States and the European Union, which tend to address ecosystem services damage through administrative remedies, China has developed a unique public interest litigation model, defining it as a civil remedy approach. This has led to two key issues: First, it overlooks the potential individual interest losses included in the loss of ecosystem services, where simultaneous public interest and private interest litigation may result in duplicate claims; second, the compensation for the loss of ecosystem services may not be effectively utilized.

Duplicate claims for ecosystem service function loss. Considering that ecosystem services include provisioning services, regulating services, cultural services, and supporting services, it is important to note that the beneficiaries of provisioning and cultural services are specific individuals. For instance, land-based provisioning services benefit the landowner or user of the land. If the cultivated land managed by a tenant is polluted, the primary loss would be the inability of that land to provide crops, which constitutes a loss to the tenant. Furthermore, while regulating and supporting services may not directly affect specific individuals, their impairment ultimately results in harm to particular people. For example, if climate regulation is disrupted, extreme weather events could damage the health of certain individuals. Therefore, the beneficiaries of these ecosystem services ultimately refer to specific private entities within the reach of the ecosystem (Boyd, King, & Wainger, 2001).[6] Since beneficiaries of ecosystem services may, in some cases, be specific individuals, the loss of these services may constitute personal losses.

However, China currently treats the loss of ecosystem services as a public interest, with remedies limited to public interest litigation, which is a civil remedy path. Specifically, Article 1235, Section 1 of China's Civil Code stipulates that the infringer must compensate for the "loss of services due to ecological damage until restoration is completed". The Civil Code is a law that safeguards private rights, and to align with the structure of private rights, Articles 1234 and 1235 of the Civil Code essentially abstract the ecological environment as a public "object" (Cai, 2012).[7] Since the ecological environment is abstracted as a public "object", it is conceptually linked to the legal theory of property. As a result, based on this abstraction, the loss of the use value of this public "object" can be further derived, which is precisely the loss of ecosystem services (Supreme People's Court Environmental and Resource Tribunal, 2015). In other words, the loss of ecosystem services is essentially a loss of the use value of the ecological environment, which has been abstracted as an "object" and, by analogy with the legal theory of property, results in a loss of the ecological environment's use benefits (Wang & Li, 2023). Therefore, since the ecological environment belongs to the realm of public interest, the loss of ecosystem services, as a loss of the use benefits of the ecological environment, constitutes a loss of public interest.

Clearly, this abstract conceptualization overlooks individual losses within the scope of the loss of ecosystem services. Furthermore, China's civil litigation system treats public interest litigation and private interest litigation

[6] Ecosystem functions and ecosystem services are fundamentally different; ecosystem services are the beneficial outcomes of ecosystem functions, not the functions themselves. For example, the ability to absorb floodwaters is a biophysical function. If the damage caused by the absorbed floodwaters to buildings, roads, and agriculture is minimal, it creates a service. Ecosystem functions can only be referred to as ecosystem services when they serve the public.

[7] Here, this refers to something understood as having the attributes of property, which is conceptually linked to the legal principles of property. Some scholars have attempted to define it as a type of property, such as Professor Cai Shouqiu's theory of public common goods, which holds that the ecological environment is a public common good.

as two independent forms of litigation that can be initiated simultaneously, allowing for concurrent claims. On one hand, this may lead to duplicate claims, resulting in judicial unfairness. On the other hand, since public interest litigation adopts an abstract approach, while private interest litigation addresses specific and pressing damages to particular individuals, priority should logically be given to private interests in compensation. However, if the same subject matter is claimed twice, defendants may find it difficult to bear the burden, ultimately hindering the realization of compensation for private entities. Before the establishment of liability for the loss of ecosystem services, a similar issue arose in the Tasman Sea case, where the defendant raised objections to duplicate claims regarding the loss of fishery resources and fishermen's income. The court rejected these objections solely on the grounds that the claims were described differently, without addressing whether their substance overlapped.[8] However, fishery resources are inherently a type of provisioning service within the ecosystem, and this provisioning service can be concretized as the income lost by local fishermen due to production halts. Thus, the fishermen's income loss from being unable to fish is substantively a part of the loss of fishery resources. Consequently, these claims were, in essence, duplicative. Nevertheless, the court's lack of clarity regarding the substantive implications behind the terms prevented it from distinguishing between public and private losses beyond the plaintiffs' identities, ultimately resulting in duplicate claims.

In contrast, the administrative approach effectively avoids the issue of duplicate claims. CERCLA does not directly provide compensation to individuals suffering pollution-related damages. Instead, it offers indirect assistance to affected individuals and communities through specific forms of support. The primary goal of CERCLA is to clean up contaminated environments and prevent further harm from hazardous substances to public health and the environment, rather than to compensate individuals for economic or health losses caused by pollution. Under this framework, individual economic claims are inherently excluded. Similarly, in Annex II-1(d) of Directive 2004/35/CE, when addressing compensation for interim losses, it is explicitly stated that interim losses do not include economic compensation for members of the public. This provision continues the logic of Recital (14), which emphasizes that the Directive does not apply to cases of personal injury, damage to private property, or any economic loss, nor does it affect any rights related to claims for such damages. By delineating the boundaries between administrative and civil remedies, the legal framework excludes individual economic losses from administrative compensation. Consequently, this design eliminates the risk of duplicate claims for the same subject matter.

Utilization of funds for the loss of ecosystem services. Under China's civil remedy framework, compensation funds obtained through public interest litigation are often allocated to government accounts and executed by the courts. Article 14 of the Interpretation of Several Issues Concerning the Application of Law in the Trial of Environmental Tort Liability Disputes, revised by the Supreme People's Court in 2020, stipulates that when the plaintiff requests ecological restoration, the court may rule that the infringer assumes the obligation of restoration and clarify the restoration costs payable in the event of noncompliance. If the infringer fails to complete the restoration within the time specified in the judgment, the court may entrust a third party to carry out the restoration, with costs borne by the infringer. Furthermore, Article 32 specifies that for judgments in environmental civil public interest litigation requiring enforcement measures, execution should be transferred to

[8] Tianjin Maritime Court, (2003) Jin Haifa Shi Chu Zi Nos. 184-187 Civil Judgment.

the court's enforcement department, thereby clarifying enforcement authority. In practice, however, ecological restoration funds often enter government accounts but remain largely inaccessible due to complex approval processes, resulting in long-term fund stagnation as "dormant funds" (Zhu & Meng, 2018). A 2020 audit report by China's National Audit Office on ecological and environmental protection funds revealed that in 17 out of 20 provinces sampled (85%), issues such as misappropriation, diversion, or misuse of ecological protection funds were identified. Of the 313.862 billion yuan of funds audited, 3.817 billion yuan were found to have been misused (Liu, 2021). Additionally, judicial institutions generally lack specialized technical personnel and standardized ecological restoration management mechanisms, which hinder effective supervision of fund usage. Due to the heavy caseload and limited resources, judges face significant workloads, making it challenging to continuously monitor the execution of ecological restoration funds. As a result, substantial amounts of funds remain idle and fail to achieve their intended purpose. This inefficiency in fund utilization undermines the effectiveness of the legal framework for ecosystem services.

In contrast, under the administrative approach, related funds are managed by designated personnel and specifically allocated to enhance ecosystem services or to seek alternatives. For example, CERCLA provides support to individuals and communities through fund utilization, including: (1) Emergency health protections: During cleanup actions, CERCLA may provide temporary solutions to communities threatened by contamination, such as supplying safe drinking water; (2) Temporary evacuation: Residents directly affected by hazards may be temporarily relocated to ensure their safety; (3) Community value enhancement after environmental restoration: Cleanup of contaminated sites often improves the living environment and public health in communities, and over the long term, may indirectly increase property values and overall quality of life.

Evaluation and Prospects of China's Remedy System for the Loss of Ecosystem Services

China's system for protecting ecosystem services remains underdeveloped, with notable gaps between its current understanding and implementation and the ideal state. Relevant provisions in the Civil Code reflect China's growing emphasis on protecting ecosystem services by imposing stronger legal responsibilities on ecological environment infringers, thereby raising public awareness of the importance of ecosystem services. Looking ahead, efforts should focus on addressing misconceptions about the liability for the loss of ecosystem services under the civil remedy model, improving the design of related systems, and ensuring the effective utilization of compensation funds for ecosystem services damage. Additionally, the scope of ecosystem services should be expanded to broader legal fields beyond liability, further enhancing the effectiveness of ecological protection.

Improving the Remedy System for the Loss of Ecosystem Services

To prevent the frequent occurrence of duplicate claims, it is necessary to adjust the existing framework for the loss of ecosystem services. At the substantive rule level, it should be clarified that not all losses of ecosystem services constitute public interest losses. From the perspectives of literal interpretation and systematic interpretation, Article 1235 of the Civil Code is inherently a compensation mechanism for public interest losses, and its scope should be limited accordingly. However, the phrasing of the Civil Code may easily lead to the misunderstanding that all losses of ecosystem services fall under public interest. To avoid such interpretive ambiguity, specific clarification should be provided for the loss of ecosystem services under Article 1235(1) of

the Civil Code, making it clear that claims for the loss of ecosystem services in public interest litigation do not include losses that private entities are entitled to claim. Additionally, defendants should be advised that they may raise objections on this basis.

At the procedural level, defendants should actively raise objections to prevent duplicate claims. If private entities have not yet initiated private interest litigation for their compensable losses of ecosystem services, defendants in public interest litigation should, upon raising objections, be informed in accordance with Article 10(3) of the Judicial Interpretation on Public Interest Litigation that private claims must be pursued separately. The corresponding amount should then be deducted from the public interest claim for the loss of ecosystem services. If the defendant in public interest litigation does not raise objections, this should be deemed a voluntary waiver of the right to object. Subsequently, if private interest litigation is filed for the same act of damage, and private entities seek compensation for their share of the loss of ecosystem services that is deemed compensable, the defendant must provide compensation. Similarly, if private entities have already been compensated for their share of the loss of ecosystem services, defendants in public interest litigation may request a deduction of that amount. However, failure to raise objections will be treated as a waiver of this right.

At the technical level, improvements should be made to the existing methods for assessing losses of ecosystem services compensable to private entities. Specifically, in addition to the current methods for calculating such losses, specialized assessment methods should be developed to evaluate two categories of private entity losses: the loss of use caused by private usufructuary rights and purely economic losses compensable to private entities.

Ensuring the Effective Utilization of Compensation Funds for Ecosystem Services Damage

Regarding the effective utilization of compensation funds for ecosystem services damage, some scholars have proposed strengthening court enforcement as a solution. However, given the relatively limited number of environmental public interest litigation cases, establishing specialized departments within courts may be inefficient, and relying solely on court enforcement is not feasible. A more practical alternative suggested by scholars is to establish ecological restoration funds managed by public-interest organizations with independent legal status. Through public trusts, the courts or litigants could entrust these organizations with managing restoration funds to ensure that the funds are used efficiently and securely for ecological restoration (Hu, 2023). Jiangxi Province has already implemented this concept. In 2020, the Jiangxi Sihua Ecological Environmental Protection Foundation (hereinafter referred to as the "Sihua Foundation") was established and piloted a public trust management model in courts in Jiujiang, Jingdezhen, and other regions to specifically manage ecological restoration funds. In the first environmental public interest litigation case after the implementation of the Civil Code,[9] the Fuliang County People's Court ruled to entrust over 2.8 million yuan of restoration funds to the Sihua Foundation for the remediation of polluted water sources and soil. The restoration project was completed efficiently within six months and achieved remarkable results, demonstrating the feasibility and advantages of the public trust mechanism in ecological restoration.

Establishing an independent foundation as a juridical entity to oversee and manage the utilization of ecological environment damage compensation funds is an effective solution to address the challenges in

[9] Fuliang County People's Court, Jiangxi Province, (2020) Gan 0222 Minchu No. 796 Civil Judgment.

executing compensation for ecosystem service function damage. Specifically: First, such a foundation would be classified as a juridical foundation, an independent civil entity (Zhang & Yue, 2012). Article 87 of China's Civil Code defines non-profit legal persons as entities established for public or other non-profit purposes, which do not distribute their profits to contributors, founders, or members. This provides foundations with a high degree of independence and public interest orientation. Second, such foundations should ideally be established at the provincial level. This approach avoids inefficiencies caused by limited case numbers and funds at municipal or smaller administrative levels while mitigating the risk of national-level foundations failing to effectively fulfill their oversight and management roles. A unified provincial foundation is the most appropriate structure, and all ecological environment damage compensation funds generated from public interest litigation cases within a province should be managed by this foundation. For cross-provincial cases, the compensation funds should be supervised and managed by the foundation in the province where the ecological damage occurred. If the damage spans multiple provinces, the relevant provincial foundations should jointly oversee and manage the funds. Third, the sources of funding for ecological environment damage compensation foundations include compensation obtained through ecological damage consultations, the ecological damage compensation system, and all ecological damage compensation awarded in environmental public interest litigation. Additionally, such foundations can be supplemented with public donations and government financial appropriations to strengthen their operations. This framework would enhance the effective utilization of compensation funds for ecosystem services damage, ultimately achieving the goal of restoring ecosystem services.

Expanding the Legal Applications of Ecosystem Services Protection

Currently, China primarily relies on civil mechanisms to protect ecosystem services. However, experiences from other countries demonstrate that the protection of ecosystem services can be expanded across various legal domains.

On one hand, the government should take on the primary responsibility of safeguarding ecosystem services. At present, China has implemented a series of administrative systems to regulate ecological and environmental issues. Building on this foundation, the scope of these systems should be expanded to include the government's responsibility for protecting ecosystem services. For example, within the environmental impact assessment (EIA) system, when analyzing, forecasting, and evaluating the environmental pollution and ecological damage caused by planning and construction projects, ecosystem services should be incorporated as a key evaluation criterion. If the implementation of a plan or project is expected to adversely impact ecosystem services, this should be a valid basis for determining potential environmental pollution or ecological damage, thereby justifying the rejection of the plan or project through a failed EIA report. In addition, monitoring ecosystem services involves extensive biological and environmental sciences, making their maintenance highly dependent on a set of reliable technical standards. In China's environmental law, relevant technical standard systems already include environmental standards, environmental monitoring systems and data-sharing mechanisms, monitoring and early warning systems for environmental resource carrying capacity, investigation, monitoring, evaluation, and restoration systems for environmental factors, as well as environmental and health monitoring and risk assessment systems. It is essential to incorporate ecosystem services as one of the monitoring targets within these systems.

On the other hand, the government should impose penalties on administrative counterparts for actions that harm ecosystem services. For example, in the seizure and detention system, severe damage to ecosystem services should be considered a valid basis for applying these measures. Similarly, given the close connection between ecosystem services and the ecological environment, acts of pollution or destruction that impair ecosystem services should be categorized as environmental pollution or ecological destruction. Consequently, when ecosystem services are infringed, the environmental protection injunction system can also be invoked. Furthermore, existing mechanisms in China's environmental law, such as the system of daily penalties for continuous violations and the system of production restrictions and suspensions for rectification, could be incorporated as specific regulatory measures within the administrative framework for protecting ecosystem services.

Conclusions

China has made significant progress in incorporating ecosystem services protection into its legal framework, drawing on international experiences from countries like the United States and the European Union. However, several challenges remain. Unlike the administrative regulatory models employed by the U.S. and EU, China has adopted a civil liability and public interest litigation approach to addressing the loss of ecosystem services. While this model has its merits, it has also resulted in issues such as duplicate claims for the loss of ecosystem services and the inefficient utilization of compensation funds. To address these limitations, there is a pressing need to optimize China's ecosystem services protection system. China should first, improve the remedy system for the loss of ecosystem services liability; second, ensure the effective utilization of compensation funds for ecosystem services damage; and third, expand the legal scope of ecosystem services protection. By addressing these gaps, China can further align its legal framework with international best practices, ensuring both the preservation of its unique ecosystems and the sustainable development of its socio-economic systems. Additionally, these efforts will enhance China's role in global ecological governance, demonstrating how tailored legal approaches can effectively balance ecological protection with development goals.

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