



FORM 1: PROPOSAL FOR A NEW FIELD OF TECHNICAL ACTIVITY

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Proposer Standardization Administration of China	ISO/TS/P 293

A proposal for a new field of technical activity shall be submitted to the ISO Central Secretariat, which will assign it a reference number and process the proposal in accordance with the [ISO/IEC Directives Part 1, Clause 1.5](#). The proposer may be a member body of ISO, a technical committee, subcommittee or project committee, the Technical Management Board or a General Assembly committee, the Secretary-General, a body responsible for managing a certification system operating under the auspices of ISO, or another international organization with national body membership. Guidelines for proposing and justifying a new field of technical activity are given in the [ISO/IEC Directives Part 1, Annex C](#).

Proposal (to be completed by the proposer)

Title of the proposed new committee (The title shall indicate clearly yet concisely the new field of technical activity which the proposal is intended to cover). Ecological restoration
Scope statement of the proposed new committee (The scope shall precisely define the limits of the field of activity. Scopes shall not repeat general aims and principles governing the work of the organization but shall indicate the specific area concerned). Standardization of all types and all sizes of ecological restoration projects, including their management, planning, implementation, monitoring, evaluation, and reporting. Excluded: <ul style="list-style-type: none">• ISO/TC 82/SC7 (Mine closure and reclamation management)
<input checked="" type="checkbox"/> The proposer has checked whether the proposed scope of the new committee overlaps with the scope of any existing ISO committee <input type="checkbox"/> If an overlap or the potential for overlap is identified, the affected committee has been informed and consultation has taken place between proposer and committee on <ol style="list-style-type: none">modification/restriction of the scope of the proposal to eliminate the overlap,potential modification/restriction of the scope of the existing committee to eliminate the overlap. <input type="checkbox"/> If agreement with the existing committee has not been reached, arguments are presented in this proposal (under question 7) as to why it should be approved.

Proposed initial programme of work. (The proposed programme of work shall correspond to and clearly reflect the aims of the standardization activities and shall, therefore, show the relationship between the subject proposed. Each item on the programme of work shall be defined by both the subject aspect(s) to be standardized (for products, for example, the items would be the types of products, characteristics, other requirements, data to be supplied, test methods, etc.). Supplementary justification may be combined with particular items in the programme of work. The proposed programme of work shall also suggest priorities and target dates.)

1. Definition and terminology

The new ISO/TC will initiate work by preparing an overview that characterizes the discipline of ecological restoration and defines relevant technical terminology. The characterization will describe what ecological restoration is, how it is accomplished, why it is needed, and how it is distinguished from related disciplines. It will contribute to build a common understanding of concepts to support standardization work.

2. Principles, key assumptions, and phases of restoration work

The future standard will identify principles and key assumptions, as well as will describe the phases of restoration work from conceptual planning to final reporting. Particular emphasis will be given to the preparation of the reference model, which portrays the desired ecological attributes of an ecosystem to be restored. The ISO/TC will recommend the ideal way for ecological restoration projects to be structured administratively and managed.

3. Standards on specific freshwater aquatic ecosystem

Once this general characterization of the discipline is finalized, the ISO/TC will develop and prepare specific standards that pertain to the ecological restoration of freshwater aquatic ecosystems. These include rivers, lakes, and wetlands. Catchment (or watershed) management will be discussed in terms of how aquatic ecosystems can be effectively recharged.

4. Standards on large-scale ecological restoration

There is a need for developing standards for establishing ecological restoration programs, whereby the restoration tasks in multiple projects are coordinated into landscape-scale or regional-scale restoration programs. The ISO/TC will offer recommendations on how such programs can be managed.

Indication(s) of the preferred type or types of deliverable(s) to be produced under the proposal (This may be combined with the "Proposed initial programme of work" if more convenient).

Deliverables for the initial work shall consist of ISO International Standards (ISs) and documents that provide the principles, needs, history, and other background and qualifications for a complete understanding of the standards. The deliverables for the initial tasks shall be:

1. Definition and terminology (one standard);
 - ISO/TC standard for characterization of ecological restoration and rehabilitation and glossary of technical terms
2. Principles, key assumptions, and phases of restoration work (six standards);
 - ISO/TC standard for determining ecological baselines for degraded ecosystems
 - ISO/TC standard for the development of reference models
 - ISO/TC standard for conceptual planning of ecological restoration projects
 - ISO/TC standard for technical planning of ecological restoration projects
 - ISO/TC standard for onsite implementation of ecological restoration projects
 - ISO/TC standard for monitoring, evaluation, and ecological restoration project report preparation
3. Standards on specific freshwater aquatic ecosystem (two standards);
 - ISO/TC standard for restoring rivers, lakes, and wetlands
 - ISO standard for groundwater and catchment management relative to ecological restoration
4. Standards on large-scale ecological restoration (one standard)
 - ISO/TC standard for large-scale ecological restoration

A listing of relevant existing documents at the international, regional and national levels. (Any known relevant document (such as standards and regulations) shall be listed, regardless of their source and should be accompanied by an indication of their significance.)

There are no ISO standards for ecological restoration, although some presented by ISO/TC 82/SC7 for mine closure and reclamation management could be considered as exercises in ecological rehabilitation. Other nations and institutions have issued technical standards and guidelines for the management of impacted ecosystems in order to return them to a useful condition, which were listed as below.

Country	Type of ecosystem	Document title	Reference	Purpose
Australia	All ecosystems	National standards for the practice of ecological restoration in Australia	McDonald et al. (2018)	Provide a blueprint of principles and standards for the restoration projects in all land and water ecosystems of Australia.
Canada	Protected natural area	Principles and guidelines for ecological restoration	Canadian Parks Council (2007)	Describe an approach to restoration that will ensure that parks and protected areas continue to safeguard ecological integrity.
China	River	River restoration: a strategic approach to planning and management	Speed et al. (2016)	Identify the principles, procedures, and approaches of river restoration and distil the lessons from international experiences.
China	Grassland	Technical specifications for the restoration of degraded grassland	Wang et al. (2018)	Provide standards and methods for the restoration of degraded grassland
China	Marine ecosystems	Technical specifications for marine ecological restoration	Ministry of Natural Resources of the People's Republic of China	Describe a framework for the sustainable utilization and assessment of marine resource, protection of marine biodiversity, as well as the marine ecosystem health assessment and ecosystem management.
Queensland	All ecosystems	South East Queensland ecological restoration framework: code of practice, guideline and manual	Chenoweth EPLa and Bushland Restoration Services (2012)	Ensure consistent ecological restoration delivery.
UK	River	Manual of River Restoration Techniques	River restoration centre (2013)	Aim to help river managers identify potential restoration techniques for use in river restoration and sustainable river management.
US	Wetland	Principles of wetland restoration	USEPA (2000)	Help build on the lessons of restoration projects and promote effective restoration

US	Lake and reservoir	The lake and reservoir restoration guidance manual	USEPA (1990)	Help users identify, describe, and define the lake issues and describe the process of developing a site-specific lake or reservoir management plan
Vietnam	River	Guideline framework for river restoration in Viet Nam	Hao et al. (2011)	Provide understanding of the genetic requirements for river restoration programs for the decision makers.

One standard drafted by the Society for Ecological Restoration (SER) deserves particular mention. SER is the only international professional organization dedicated exclusively to the science and practice of that discipline. SER issued aspirational guidelines for ecological restoration and designated them as “standards.” Although scientifically sound, thorough, and well-conceived, these “standards” were presented as explanations and recommendations.

A statement from the proposer as to how the proposed work may relate to or impact on existing work, especially existing ISO and IEC deliverables. (The proposer should explain how the work differs from apparently similar work, or explain how duplication and conflict will be minimized. If seemingly similar or related work is already in the scope of other committees of the organization or in other organizations, the proposed scope shall distinguish between the proposed work and the other work. The proposer shall indicate whether his or her proposal could be dealt with by widening the scope of an existing committee or by establishing a new committee.)

Once the proposed ISO/TC has prepared the first seven deliverables which pertain to the performance of all kinds of ecological restoration projects, the mission of the TC will be to prepare specific standards for the ecological restoration of freshwater aquatic ecosystems and wetlands. These standards will instruct project personnel in the planning, implementation, and monitoring of ecological restoration. In addition, these ecological standards will support the role of ecological restoration in the realization of social, community, and sustainability goals and ecosystem services. The standards will describe how stakeholders can become engaged in restoration activities.

Current ISO standards for activities related to ecological restoration will not be duplicated or confounded by standards to be prepared by the proposed ISO/TC. Instead, complimentary standards will fully respect standards that were previously issued by other ISO/TCs concerned with mine closure (ISO/TC 82/SC7) and the management of forests, grasslands, and marine ecosystems. For example, complimentary standards can be prepared for the restoration of groundwater and catchment areas which, in turn, are required as elements of mine closure. Moreover, in the process of developing the standards of ecological restoration, proposers will follow the standardization stated in ISO/TC 146 (Air quality), ISO/TC147 (Water quality) and ISO/TC 190 (Soil quality). Ecological restoration needs knowledge of inter-disciplines. The new standards will extend the applications of the above standards in the field of ecological restoration.

A listing of relevant countries where the subject of the proposal is important to their national commercial interests.

Ecological restoration can contribute in substantial ways to protecting nature and improving human well-being all over the world. Many well-intended projects and programs in recent years, which were designated as ecological restoration, have underperformed. The standards established by the proposed ISO/TC will present a robust framework for future restoration projects to achieve intended goals.

Therefore, the outputs of the proposed ISO/TC should be of interest to all nations of the world.

This framework could benefit the attainment of UN sustainable development goals (SDG) and realize a large array of ecological, socioeconomic, and cultural values. For example, the special UN SDG 15 would facilitate restoration of degraded land and soil in order to achieve a degradation-neutral world by 2030. This goal specifically targets the restoration of freshwater ecosystems.

Region-specific issues will be considered and the subgroups of restoration experts in different countries will be established in the new ISO/TC, for example Australia, Brazil, China, UK, and US.

A listing of relevant external international organizations or internal parties (other ISO and/or IEC committees) to be engaged as liaisons in the development of the deliverable(s). (In order to avoid conflict with, or duplication of efforts of, other bodies, it is important to indicate all points of possible conflict or overlap. The result of any communication with other interested bodies shall also be included.)

Internal organizations which could be engaged as liaisons for the development of the standards of the proposed new TC:

1. ISO/TC 82/SC 7 Mine closure and reclamation management
2. ISO/TC 146 Air quality
3. ISO/TC 147 Water quality including SC 2 physical, chemical and biochemical methods
4. ISO/TC 190 Soil quality including SC 7 impact assessment
5. ISO/TC 207 Environmental management including SC 5 life cycle assessment and SC 7 greenhouse gas management and related activities
6. ISO/TC 296 Bamboo and rattan
7. ISO/TC 331 Biodiversity

Internal organizations which could be informed as sector-specific primary beneficiaries of the tools to be developed by the proposed new TC:

1. ISO/TC 224 Service activities related to drinking water supply, wastewater and stormwater systems
2. ISO/TC 234 Fisheries and aquacultures
3. ISO/TC 287 Sustainable processes for wood and wood-based products
4. ISO/TC 92 Fire safety

External organizations:

1. Society for Ecological Restoration (SER)

In 2016, SER published International Standards for the Practice of Ecological Restoration including Principles and Key Concepts. SER issued a revised 2nd edition in 2019. These SER "standards" offered comprehensive guidance and made wise recommendations. However, SER imposed no sanctions on projects that do not comply, even though such projects are called ecological restoration by organizations that sponsor them. In that regard, these are not standards in a strict sense of that term. The proposed ISO/TC will rely heavily on the expertise of SER in the process of developing its standards. Two of the persons who prepared this application are respected members of SER who served on the committee that developed the SER "standards." We intend to recruit more SER members to serve on the new ISO/TC. SER maintains local chapters on most continents. We will form liaisons with chapters if any of them express interest in participation.

2. Society for Ecological Restoration of Beijing (SERB)

SERB is the only ecological restoration society recognized by the national government in China. SERB operates at both a provincial and national level. A liaison with SERB shall be created.

3. International Institute for Applied Systems Analysis (IIASA)

IIASA maintains a Center for Landscape Resilience & Management that is involved in many restoration projects in different countries. A liaison with IIASA shall be created.

4. Australian Association of Bush Regenerators (AABR)

AABR specifies restoration protocols in Australia. A liaison will be established with that organization.

A simple and concise statement identifying and describing relevant affected stakeholder categories (including small and medium sized enterprises) and how they will each benefit from or be impacted by the proposed deliverable(s).

The standards developed by the proposed ISO/TC will improve ecological outcomes. Organizations that perform restoration according to ISO/TC standards will be assured of attaining full ecological recovery rather than partial measures, which we recognize as rehabilitation. Government bodies that authorize or mandate ecological restoration will be ensured that projects conducted in accordance with the ISO/TC standards will have a highly likely chance of full recovery from a degraded condition. Stakeholders consisting of individuals and communities that are located in or near restored ecosystems will likewise benefit from the broad array of values that will be satisfied by well-executed ecological restoration.

An expression of commitment from the proposer to provide the committee secretariat if the proposal succeeds.

China is willing to undertake the work of secretariat of the new TC and will provide all necessary resources including financial and human resources as well as facility supports.

Purpose and justification for the proposal. (The purpose and justification for the creation of a new technical committee shall be made clear and the need for standardization in this field shall be justified. Clause C.4.13.3 of [Annex C](#) of the ISO/IEC Directives, Part 1 contains a menu of suggestions or ideas for possible documentation to support and purpose and justification of proposals. Proposers should consider these suggestions, but they are not limited to them, nor are they required to comply strictly with them. What is most important is that proposers develop and provide purpose and justification information that is most relevant to their proposals and that makes a substantial business case for the market relevance and the need for their proposals. Thorough, well-developed and robust purpose and justification documentation will lead to more informed consideration of proposals and ultimately their possible success in the ISO IEC system.)

Global goals. The United Nations General Assembly declared 2021–2030 as the “Decade on Ecosystem Restoration,” which positions “the restoration of ecosystems as a major nature-based solution towards meeting a wide range of global development goals and national priorities.” In practice, UN programs and publications use the term ecological restoration inconsistently. Attempts to define ecological restoration have not generated a universal consensus of meaning, and no standards exist for guiding and evaluating what is to be this “work of the decade.” The proposed ISO/TC will provide these standards.

In addition to this UN priority, other exemplary targets for ecological restoration have been established. The *New York Declaration*, for example, was signed in 2014 by 32 countries, 19 regions, 56 companies, 16 indigenous people organizations, and 58 NGOs to restore 200 million ha of degraded lands by 2030; the *EU Biodiversity Strategy* was agreed by 28 European Union member states to restore at least 15% of degraded ecosystems; *AFR100* aims to bring 100 million ha of land in Africa into restoration by 2030; *Initiative 20x20* is a country-led effort to bring 20 million hectares of land in Latin America and the Caribbean into restoration. Since 1996, US Army Corps of Engineers has progressively implemented a series of ecological restoration programmes and regarded the ecological restoration as one of primary missions of the *Civil Works Program*. In 2014, Vietnam issued the *National Biodiversity Strategy to Vision 2020 with Vision to 2030*. In 2016, Brazil joined Initiative 20x20 with a pledge to restore 22 million ha of degraded land by 2030. In 2019, Australia released *Australia’s Strategy for Nature 2019-2030* to implement the Convention’s Strategic Plan and Aichi Targets. In 2020, China approved the *Master Plan for Major Conservation and Restoration Projects of National Important Ecosystems (2021-2035)*. ISO/TC standards will ensure that ecological restoration projects adequately satisfy ecological, socioeconomic, and cultural values.

Ecological restoration, when implemented effectively and sustainably, contributes to protecting biodiversity; improves human health and well-being; increases food and water security; delivers goods, services, and economic prosperity; and supports climate change mitigation, resilience, and adaptation. It is a solution-based approach that engages communities, scientists, policymakers, and land managers to repair ecological damage and rebuild a healthier relationship between people and the rest of nature. When combined with conservation and sustainable use, ecological restoration is the link needed to move local, regional, and global environmental conditions from a state of continued degradation, to one of net positive improvements.

Humanity relies substantially on its resource base of natural goods and services, which are recognized by economists as natural capital. Stated another way, nature sustains us, and we serve our own interests when we reciprocate and sustain nature by restoring degraded ecosystems. The global human population and our ecological footprint have expanded to the limits of sustainability, threatening our way of life and possibly our survival. Ecological recovery is no longer optional. We must repair our planet. Ecological restoration is the best way to recover lost natural capital and thereby strengthen our communities and institutions and to benefit our welfare.

Aquatic ecosystems. The development of standards for restoring freshwater ecosystems will be an initial priority of the new ISO/TC. Freshwater ecosystems provide multiple benefits and services to society and are essential for reaching the United Nation Sustainable Development Goals (SDGs). Freshwater ecosystems, such as rivers, lakes, and vegetated wetlands, are among the world’s most

biologically diverse environments and provide numerous products and services on which human well-being depends. Given that humans and almost every living being require water, freshwater ecosystems have significant economic, cultural, aesthetic, recreational and educational value. They help to sustain the global hydrological cycle, carbon cycle and nutrient cycles. They support water security, provide potable water, regulate flows and extreme conditions, purify water, and replenish groundwater. Services also depend on these ecosystems, which provide water for drinking, agriculture, employment, energy generation, navigation, recreation and tourism. The UN SDG target 6.6 aims to protect and restore water-related ecosystems so that they can continue to benefit society, through halting their degradation and destruction and helping to recover those that are already degraded. However, restoring the degraded water-related ecosystems is a complex task requiring significant time, resources, and knowledge. The new ISO/TC aims to establish criteria for technical implementation across different water-related ecosystems and further to increase the effectiveness of ecological restoration efforts.

Restoration norms. Ecological restoration attempts to recover degraded natural ecological processes to normal levels of function. Ecological restoration recovers ecological processes to the point where assistance from restoration practitioners is no longer needed in order for the ecosystem to mature naturally. In this respect, ecological restoration differs radically from typical engineering projects, because the endpoint of restoration is an on-going process and not a product or commodity. ISO/TC standards for ecological restoration will reflect this ecologically sensitive distinction.

The ISO/TC standards will specify that technical implementation will be predicated on a baseline ecological survey to determine the type and extent of degradation and on the preparation of an ecological reference model which describes the ecological state, physical conditions, and normal functional processes that are intended to be recovered. Restoration implementation procedures are site specific. They are selected on what will be needed to assist natural recovery from the baseline conditions to the reference state. The reference model is project site-specific and eliminates the need to categorize the ecosystem according to an ecological classification system. A report describing the ecological baseline inventory and the reference model are both prepared prior to initiation of implementation of onsite restoration activities.

Ecological attributes. Six ecological generic kinds of attributes are recovered in an ecological restoration project. They are physical site conditions, species composition, structural diversity, ecological functioning, absence of threats, and external exchanges. Physical site conditions refer mainly to the presence of appropriate substrates or soils and suitable moisture conditions (in terrestrial systems) or water quantity/quality (in aquatic systems). Species composition refers to the presence of an appropriate suite of native plants and animals and the absence or rarity of invasive or other inappropriate species, as determined from the reference model. Structural diversity refers to the biological community structure in terms of species abundance and the juxtaposition of species, as determined from the reference model. Ecological functioning refers to the development of normal level of biological function, such as growth, reproduction, nutrient recycling, energy flow in food chains, and the emigration and dispersal of organisms. Absence of threats refers to a lack of conditions which would initiate future degradation, such as the presence of invasive species next to the restoration project site. External exchange refers to normal functioning with the surrounding landscape, such as moisture inputs and outputs and the normal passage of wide-ranging fish, birds, and other animals.

Ecological restoration projects recover a degraded ecosystem to a level whereby recovery will continue without assistance from restoration practitioners. For example, an herbaceous wetland may essentially recover to an ecologically mature state in only a few years of practitioner assistance. In contrast, a forested wetland may require a decade of practitioner assistance to become established, followed by a century of continued development without practitioner assistance until the mature ecological state is reached. In other words, practitioner-assisted restoration does not necessarily continue until ecological maturity.

Conclusion. The reason we are presenting this much detail on ecosystems in the application is to emphasize to reviewers that ecological restoration must be evaluated largely in light of qualitative and sometimes unique, onsite conditions. Ecological restoration is not readily amenable to evaluation from

empirical data as is typical of most architectural, engineering, and agronomic projects. Empirical evaluation is important in ecological restoration primarily in relation to quantitative aspects of the reference model. Restoration success is determined when a site-specific level of organization has been attained. Success requires professional judgment based on experience. Judgment is needed, because natural ecosystems are extremely complex and no two are exactly alike. Furthermore, natural ecosystems are dynamic and ever-changing. In this regard, restoration and its evaluation have been compared to shooting at a moving target.

Those of us who prepared this application are thoroughly convinced that restoration can be fairly and uniformly evaluated by a system of well-conceived standards. We have demonstrated the efficacy of such standards in our own restoration project work. Furthermore, there is a great need for standards as guidance to ensure that restoration projects are properly implemented. Too many shoddy projects have been perpetrated in all parts of the world—sometimes with great fanfare—in the absence of standards. The discipline of ecological restoration is desperately needed to recover a badly degraded planet, but the work product of that discipline will never rise to an adequate professional level of attainment without standards that are enforced with sanctions. We stress that ISO/TC standards are urgently needed for that purpose.

Signature of the proposer

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Further information to assist with understanding the requirements for the items above can be found in the [Directives, Part 1, Annex C](#).