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The Economics of Ecosystem Restoration (TEER) initiative

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Abstract

The lack of consistent information on costs and benefits of ecosystem restoration hinders further investments, weakening our collective capacity to achieve the global restoration goals. To fill this gap the Food and Agriculture Organization of the United Nations (FAO) initiated The Economics of Ecosystem Restoration (TEER) initiative, together with the CGIAR Research program on Forests, Trees and Agroforestry (FTA) led by CIFOR, the World Resource Institute (WRI), and other member organizations of the Global Partnership on Forest and Landscape Restoration (GPFLR).

The initiative has developed a common protocol to collect standardized data on costs and benefits of land-based restoration projects across countries and biomes. The ultimate objective of the TEER initiative is to constitute a global database that could serve as a reference point for governments, international donors, private investors, project managers, scientists and other stakeholders, for the ex-ante estimation of costs and benefits of future restoration projects in all major biomes and across a wide range of contexts worldwide, based on information from comparable projects on which data has been collected through a standardized framework. Such a reference database could offer decision-makers and restoration practitioners a wide range of restoration options and help them better understand their costs and expected benefits in different contexts, thus helping them prioritize their restoration investments in a world of constrained resources.

Keywords: knowledge management; landscape management; monitoring and data collection.

Introduction, scope and objective

Ecosystem restoration, including Forest and landscape restoration (FLR), is gaining traction on the global political agenda, as highlighted by the recent launch of the United Nations Decade on Ecosystem Restoration 2021-2030 which aims to prevent, halt and reverse the degradation of ecosystems on every continent and in every ocean.

Overall, the social, economic and environmental benefits of restoration are generally perceived as largely outweighing restoration costs (Bullock *et al.* 2011; GCEC, 2014; Ding *et al.* 2017; United Nations, 2020). It is estimated that every dollar invested in FLR can generate USD 7 to 30 in economic benefits (Verdone and Seidl 2017; Ding *et al.* 2017). Because of their multiple benefits, restoration projects have the potential to attract a broad range of public or private investors (Ding *et*

al. 2017). However, part of these benefits are non-marketable environmental or social benefits, sometimes difficult to observe directly and quantify precisely. In addition, the different benefits of restoration can accrue to different categories of actors, in different timescales. In some situations, the marketable benefits may outweigh the restoration costs but may be realized with a considerable time lag compared with initial investments. In other cases, the costs may outweigh the marketable benefits and restoration projects are viable only if non-marketable benefits are properly accounted for (Ding *et al.* 2017; Gitz *et al.* 2020a). This might explain why FLR still fails to attract the needed investments. Based on a conservative hypothesis of USD 2,390 per hectare (TEEB, 2009), achieving the global target set by the Bonn Challenge (150 million ha restored by 2020) would cost annually USD 36 billion, meeting the target of the New York Declaration on Forests (350 million ha by 2030) would require USD 49 billion annually (FAO and Global Mechanism of the UNCCD 2015). Needs exceed by far currently available public funding, hence private investments are essential for FLR (FAO and Global Mechanism of the UNCCD 2015; Sethi *et al.* 2017).

Global estimates of costs and benefits are important for advocacy, political momentum and commitments. They are insufficient, however, to prompt investors to support specific projects. Cost-benefit analysis (CBA) is a powerful tool to assess the costs and benefits associated with various restoration projects in different contexts, identify winners and losers, mobilize public and private resources, prioritize restoration efforts and fill the investment gap. Attempts have been made to estimate the costs of restoration interventions and to assess the benefits they generate at different scales using various methodologies (e.g., Thomas and Quill rou 2012; ELD Initiative 2015; Ding *et al.* 2017). But existing studies are generally limited in terms of scope (i.e. categories of biomes, restoration interventions or costs and benefits covered) and geographical coverage. In addition, such studies generally do not follow standardized methods and protocols (Wainaina *et al.* 2020; Bodin *et al.* 2021) and no common tool or standardized framework to collect and report such information has been developed to date. Hence, it is very difficult, if not impossible, to compare these results across studies and projects or to extrapolate them to other situations. Finally, detailed information on context and baseline at project inception is often lacking, making it difficult to assess the effectiveness of the restoration intervention as compared to both the initial situation and the project's objectives and to compare the performance of projects operating in similar contexts.

To address these issues, FAO, the CGIAR Research program on Forests, Trees and Agroforestry (FTA) led by CIFOR, and the World Resource Institute (WRI) have launched The Economics of Ecosystem Restoration (TEER) initiative¹, under the aegis of the UN Decade on Ecosystem Restoration, in collaboration with other member organizations of the Global Partnership on Forest and Landscape Restoration (GPFLR), including the Secretariat of the Convention on Biological Diversity (SCBD)/ Forest Ecosystem Restoration Initiative (FERI), Bioversity International, the International Union for the Conservation of Nature (IUCN), Tropenbos International, and WeForest. Other organizations have expressed interest in joining the network and replicating the TEER framework.

The main objective of the TEER initiative is to collect detailed information on the costs and benefits of a wide range of restoration interventions across diverse biophysical, socio-economic and institutional contexts, following a standardized framework. However, ex-post collection or expert reconstruction of detailed information on past restoration projects on the ground can be very difficult, time-consuming and costly. Systematic data collection would be easier to conduct, less costly and likely more accurate if implemented consistently right from project inception, throughout the whole period of project implementation and even after it to capture the benefits realized only in the long-term. Hence, it was decided that, for the TEER framework, information will be collected directly by local project managers, under the responsibility of their organization (FAO 2019a).

¹ See: <http://www.fao.org/in-action/forest-landscape-restoration-mechanism/our-work/gl/teer/en/>

This information will feed a global TEER database that could serve as a reference point for governments, international donors, private investors, project managers, scientists and other stakeholders, for ex-ante estimation of costs and benefits of future restoration projects based on information from comparable projects for which data is available in the TEER database. This database will offer decision-makers, investors and restoration practitioners a wide range of restoration options and a better understanding of their costs and expected benefits in different contexts, thus helping them prioritize their restoration investments in a world of constrained resources (FAO 2019a; FAO 2019b).

Methodology / approach

As a first step, a common protocol to collect standardized data on costs and benefits of restoration projects has been developed and tested. The challenges faced and the methodology followed are described below.

Trade-off between exhaustivity and feasibility:

Having data collected directly under the responsibility of local project managers implies to find the right balance in the protocol between exhaustivity and feasibility. The protocol must be as user-friendly as possible and adapted to the information available to local project managers, as well as to their resources and time constraints.

Hence, firstly, the time needed to go through this protocol should remain reasonably limited. The protocol must contain a small number of questions, selected to cover the main aspects of the restoration project, its costs and benefits, context and baseline. Were selected in priority questions considered as the most practical and immediately relevant for cost-benefit analysis and comparison across projects at different scales.

Secondly, as project managers cannot be experts in all the domains covered in the protocol, the questions need to be carefully formulated, so as to be easy to understand and to answer, even for a non-specialist, based on information immediately available to the respondents. This careful formulation aims at: (i) reducing the time spent filling-in the protocol; (ii) increasing the reliability of the answers as well as (iii) their comparability across projects. This is why the protocol privileges, wherever possible, guided questions with a closed list of possible answers.

To facilitate its adoption in different contexts, as well as cross-projects comparisons, the elaboration of the protocol relied on well-known concepts and classification systems, already extensively discussed in the scientific literature and/or widely used by international organizations, as illustrated in Table 1 (not an exhaustive list).

Table 1: References used to elaborate the TEER protocol for data collection

Variables	Adapted from
Restoration objectives	FAO 2015; HLPE 2017; Jalonen <i>et al.</i> 2018; Coppus <i>et al.</i> 2019; Gitz <i>et al.</i> 2020b
Land cover	FAO, 2015; CORINE ² Land Cover
Restoration interventions	Strassburg <i>et al.</i> 2018; IPBES 2018 ; Coppus <i>et al.</i> 2019
Seed type, seed source, type of seed supplier and seed selection criteria	FAO 2015; Jalonen <i>et al.</i> 2018
Land tenure arrangement	FAO 2015b
Land tenure types	Coppus <i>et al.</i> 2019
Land degradation processes	FAO and ITPS 2015; FAO 2015; IPCC 2019
Level of land degradation	FAO 2015
Drivers of land degradation	Dewi <i>et al.</i> 2017; Coppus <i>et al.</i> 2019; Gitz <i>et al.</i> 2020b

Thirdly, out of the four levels initially considered for data collection (the intervention unit level; the project/programme level; the landscape level; and the national or global level), the TEER protocol focuses on the first two levels (intervention unit and project levels, see **Box 1**) for which the information is available to local project managers. Later on, if needed, field-data collected through the TEER protocol, can be easily linked to data collected at wider levels (landscape, national, global) already available in existing datasets.

Box 1: Main scales for data collection: project and intervention unit levels

For the purpose of the TEER protocol:

A **restoration project** consists of one or a set of time-bound restoration interventions, aiming at restoring the ecological integrity and/or rehabilitating one or several ecosystem functions on a given site or ensemble of sites. These interventions shall be planned and implemented within a common framework (objectives, budget, timeframe, partners), under the responsibility of the same entity/organization. A project can be implemented on one or several intervention units.

An **intervention unit** is a relatively homogeneous area of land, in terms of land cover, land use and degradation level, over which the same restoration intervention or combination of restoration interventions is homogeneously applied. The intervention unit constitutes the smallest identified unit in the TEER database.

Source: Bodin *et al.* (2021)

Trade-off between breadth and depth:

A balance was sought in the TEER protocol between simplicity and complexity, between depth and breadth.

The protocol contains standardized guided questions, designed to be applicable to a wide range of restoration projects, using diverse restoration interventions, across various contexts and ecosystems (from the Sahelian dry lands to tropical forests, wetlands and peatlands), subject to a variety of drivers of land degradation. Some flexibility has been introduced in the protocol to allow

² CORINE means: “Co-ORDinated INformation on the Environment”. See: <https://www.eea.europa.eu/publications/CORO-landcover>

respondents to provide more detailed data or additional free comments to describe more accurately their specific project and situation.

Multi-level categorizations have been used for some variables (e.g. restoration interventions) to help the respondents navigate quickly and find easily the answer reflecting their own situation. Such multi-level categorizations also aim at facilitating comparisons among projects and cross-analysis at different scales. They can provide a useful starting point to build comprehensive typologies of restoration projects in various contexts.

Results

Following the methodology exposed above, a draft template for data collection has been developed under Excel to facilitate offline work to collect information at project and intervention unit levels: (i) on restoration interventions and their costs; (ii) on context and baseline; as well as (iii) general indications on the expected benefits. The template covers the main economic, environmental, social and institutional dimensions that: (i) characterize the context and baseline of a restoration project; (ii) determine its feasibility; and (iii) impact directly its costs and potential benefits.

This draft template is structured as follows:

- A first Excel sheet collects general information on the respondent and on the project, including: identification of the respondent, project title, leading organization, project objectives, budget, area, as well as the list of its intervention units.
- There is one Excel sheet for each intervention unit with the name and localization of the intervention unit, information on land cover, land tenure, restoration intervention(s), seeds and planting material, land degradation processes, socio-economic baseline conditions, topography, access to water and biodiversity, and basic information on the various economic, social and environmental benefits expected from the restoration intervention(s).
- Additional Excel sheets collect cost-related information at project and intervention unit levels, including: paid and unpaid labor, project assets (investment and operating costs), consumables, meeting and travel costs, services, taxes and other financial costs, compensation for land not used or income foregone. These costs are collected either annually when the information is available (Tier 1) or globally, over the period covered by the project (Tier 2).

This TEER template has been discussed, reviewed and validated by a panel of experts representing all TEER partner organizations. The template was translated in five languages (English, French, Spanish, Portuguese and Chinese), pilot-tested in 2020 in seven restoration projects (located in: Brazil, Lebanon, Mozambique, Niger, Peru and Zambia): 87 restoration interventions were described over 20 intervention units; overall, more than 3,000 data points were collected. The pilot-test helped identify and fix some technical issues in the template, and refine multi-level categorizations of costs and restoration interventions.

A specific module on benefits has been developed in 2021 under the leadership of the World Resources Institute (WRI). This module considers not only short-term tangible benefits, but also benefits expected in the long-term (over a 35-year period), including benefits that are fully realized only after the end of the project or those that might be more difficult to observe and quantify (FAO 2019a). This module collects basic empirical data on economic, social, and environmental benefits, based on the information immediately accessible to local project managers on the ground. Such information can then be used to fuel more elaborated models and expert analysis about the long-term benefits of ecosystem restoration in various contexts, and increase their accuracy. Such “real”

data, collected on the ground, help demonstrate the concrete returns on investment generated by restoration projects. They could convince and attract investors more efficiently than highly uncertain ex-ante modelled projections of expected benefits.

Discussion

The pilot-test showed that the TEER template is flexible enough to cover a wide diversity of projects and contexts and performs quite well in addressing the abovementioned trade-offs between exhaustivity and feasibility and between breadth and depth. However, filling the template requires a significant work for the project manager, estimated at about one day, depending on the complexity of the project and availability of detailed information (Bodin et al. 2021). As a consequence, the TEER template may be better suited to restoration projects of a certain scale and complexity; and the respondents need a strong motivation to fill the template. This is why a dashboard was included in the template, presenting a simple and visual summary of the information collected and providing to the respondent a user-friendly tool to facilitate costs and benefits' monitoring and reporting, as well as project's management and assessment.

The realization of the TEER template is an important milestone for the TEER initiative. Data collection has now started at large scale, using the template as revised after the pilot test. The data collected will feed a global database in order to address the information gap highlighted in introduction. Contributing organizations will be authorized to use this database as a reference tool for their work. TEER partner organizations will have to address the technical and legal issues related to the ownership, management of and shared access to the database itself and to the data and ensure that confidentiality of sensible financial information is protected. The value-added of the TEER global database will depend on the number and diversity of restoration projects included.

Conclusions / wider implications of findings

The expert consultations and pilot test conducted in 2020 confirmed the high interest of intergovernmental organizations, research and academic institutions and restoration actors on the ground, for a global database, fed by field data, that could offer decision-makers a common framework and a reference tool to define priorities for restoration in a context of constrained resources by helping them assess ongoing restoration projects and calibrate future projects based on information available for similar restoration interventions in comparable contexts.

The TEER database can also play a key role at larger scale in global programs. Restoration is a component of most projects under the 7th Global Environment Facility replenishment (GEF 7) Food Systems, Land Use and Restoration (FOLUR) Impact program (IP) and will be in the next GEF 8 replenishment a key intervention to bringing back the productivity of food systems and ensuring their long-term sustainability and integration with ecosystem services. Using the TEER database in GEF 7 FOLUR and future GEF 8 projects will increase its usefulness as a reference point for future GEF restoration-related IPs, for implementing agencies such as the World Bank and FAO, for countries planning to scale-up their restoration interventions and for the wider global restoration community via the UN Decade on Ecosystem Restoration channels.

The Multi-Partner Trust Fund for the UN Decade on Ecosystem Restoration is the financial engine behind the implementation of the strategy for this UN Decade. The Fund will be an important mechanism for achieving the Sustainable Development Goals and the objectives of the Rio Conventions. In this context, data generated through the TEER initiative will feed several country-

level needs, it will strengthen the case for restoration at national level by providing economic arguments about the cost of inaction, inform national- planning of ecosystem restoration and inform investors on its costs, expected benefits and returns on investment. As such, it will ensure that the economic dimension of ecosystem restoration is better understood and taken into account.

This reference tool will be all the more efficient that it is widely adopted and used. Hence, TEER partner organizations, invite all interested partners to join the initiative and use the template for their own projects.

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