

Healthy Landscapes Project, Sri Lanka

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Date: 11/11/2024

Cite as: Koliba, C. & Esham, M. (2024). Healthy Landscapes Project, Sri Lanka (GOGREEN Case Report Series No. 18), Roskilde: Roskilde University. ISBN: 978-87-7349-308-3

Is the project a case of...:

- State-initiated co-creation
- Entrepreneur-driven co-creation
- Grassroots-based co-creation*

**For an elaboration of the typology, please consult the GOGREEN theoretical framework p. 25.*

Integrated case analysis

Before proceeding to the scoring of the GFs, please provide a *3–5 page case analysis* in which you describe the background, history, and national, regional, and local contexts of the case, the problems and goals addressed by the local collaboration, the participating actors and their relationships, the unfolding of the co-creation process, the most important governance factors (this may include factors other than those in focus in this project), and the generated outputs and outcomes. The conclusion may specify a few lessons learned from the case study.

1) Background, history, and national, regional, and local contexts of the case

Sri Lanka's ancient village tank cascade systems (VTCS) are widely appreciated for their abilities to harness and manage water resources in times of water scarcity and abundance. And while there is a complex network of government agencies operating in collaboration with local farmers organizations to manage tank cascade resources, these arrangements are best suited to the maintenance of existing infrastructure, and less prepared to undertake tank restoration projects of minor tank cascade systems. In recent years external funding from international donor agencies such as the Global Environmental Facility (GEF) and UNDP have infused VTCSs with resources to undertake integrated tank restoration initiatives. These projects have relied on the existing intergovernmental-community networks to execute these projects. They have also leveraged additional supports and services that look to align restoration activities with other land management, economic development, educational, and public health and nutrition programming, drawing in additional programs and services that extend beyond water resource management.

Ancient Sri Lankans served as early engineers, pioneering techniques for tank development, ecosystem integration and innovation, and other feats of hydrological innovation. And much like other instances of the management of water resources such as those found in other South Asian and Southeast Asian countries, VTCSs were often governed collectively, as a collaboration of some combination of official appointees of Kings, democratically elected leaders, and local associations of villagers for millennia.

VTCSs are composed of “a mosaic of small-scale social-ecological land use systems, including smallholder farming systems and ecologically sensitive areas” existing in the Dry and Intermediate Zones of Sri Lanka (Ratnayake *et al.*, 2022, 2). They are comprised of a series of connected tanks comprising a meso-catchment for storage and utilization of surface waters for irrigation, human consumption, and related uses (Bandara *et al.*, 1985). VTCSs include certain landscapes- uplands and lowlands that are used for vegetable and fruit cultivation and rice paddy production respectively. Approximately 14,000 small village tanks are in use in the Dry and Intermediate Zones of Sri Lanka (Ratnayake *et al.*, 2021, 2).

Since 1992 the formal policy of “Participatory Irrigation Management” (PIM) has been in place guided by principles reinforcing the notion that ultimate control of local tank cascade systems lies with local farmer organizations. A series of large scale large and medium tank restoration projects funded by the World Bank and USAID have been undertaken since the early 1970’s, including the Minipe Water Management Project in 1978, the Kimbulwana-Oya Water Management Project in 1979, the Gal Oya Water Management project in 1979, and the Mahaweli Reconstruction and Rehabilitation Project in 1998 (Aheeyar, Padmajani, and Bandara, 2012). These projects have tended to be led by the Ministry of Irrigation or the Mahaweli Authority of Sri Lanka and focused on the restoration of large tank systems. And while these systems extend across wide swaths of villages, direct engagement with local farmer organizations through local committee structures has become normalized.

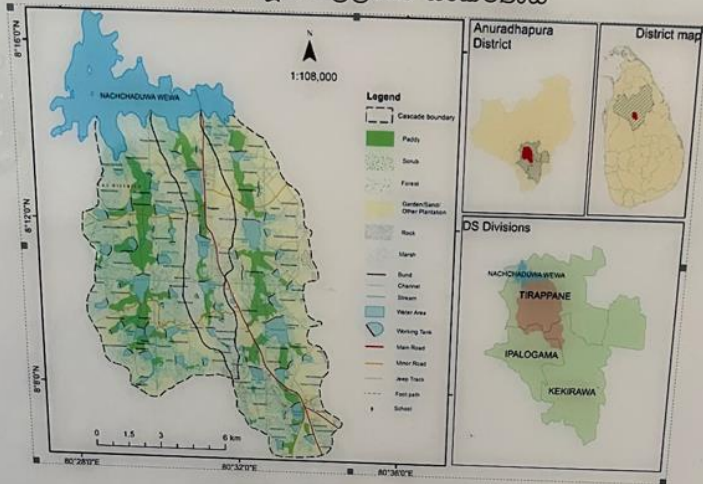
The combined factors of population growth and outmigration, the loss of traditional knowledge for the governance of VTCSs, and climate change have elevated the need to develop practices and evidence of successes for minor VTCS restoration. The outmigration patterns impacting the area stabilized several decades ago as villagers resettled the area at the encouragement of government officials. The Health Landscape Project (HLP), initiated in 2019, and co-financed through the Global Environment Facility (GEF) and the Sri Lankan government, was designed to create a model demonstration for minor VTCS restoration that emphasizes the diverse set of ecosystem services (ESs) that healthy and high functioning VTCSs can provide.

The region’s ancient tank cascade systems have been allowed to degrade. Certain tank bunds have collapsed, reducing capacity for rice paddy production. Once productive rice paddy lands have been lost. While the extensive use of pesticides and overuse of fertilizers have polluted tanks and ground water supplies with heavy metals and other toxins, leading to an ‘eco-health’ crisis of chronic kidney disease. Land encroachment and population growth have increased the frequency of elephant-human conflicts, resulting in death and injury of both humans and elephants. The biodiversity of the flora, fauna and animal species have been compromised.

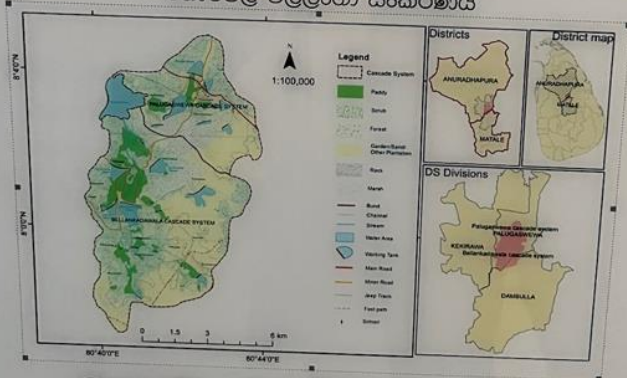
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The Healthy Landscapes Project (HLP)

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Project Areas



(Figure 1: GIS Maps of the HLP Location as Represented in Posters at the HLP Headquarters)

The Mahakanumulla cascade (see figure 1) was selected because of its location in the Anuradhapura district. The city of Anuradhapura was the seat of the ancient Sinhala Kingdoms that first established the tank cascades. Centrally located in the country's dry zone, the Mahakanumulla cascade's close proximity to the amenities of the ancient capital city, as well as the existence of the number of tanks that were amendable to restoration drove the selection of this region for the HLP.



(Figure 2: Villagers Participating in HLP Tree planting Project)

The project period ran from 2019-2024, and officially ended in March of 2024. During this time the Covid-19 pandemic struck, severely compromising the early planning and implementation phases of the HLP as country-wide lockdowns hampered in-person meetings and staff hiring schedules. As the worst of Covid-19 passed, Sri Lanka experienced a prolonged economic crisis that was amplified by central government mismanagement of monetary supply and a country-wide ban on non-organic fertilizer, which impacted rice paddy cultivation. The resulting crisis led to hyper inflation conditions for a period of 18 months, during which time food shortages, cuts to wages of federal workers, and fuel shortages made life very difficult. In order to protect the \$2million USD that GEF was supplying for the HLP, the money was funneled to SACEP, the South Asian Council for Environmental Program, to ensure that the economic crisis did not impact the allocation of resources for the project. Despite these challenges, and with the leadership of SACEP, a national project manager was hired, as was HLP staff. The scope of the project was reduced somewhat, with the bulk of the project activity unfolding between 2021 and 2023.

2) The aims of the project and the sustainability problems that it seeks to address

Climate change is producing major fluctuations between severe drought and severe flooding conditions in Sri Lanka's Dry and Intermediate Zones (Ratnayake et al. 2023). During the dry season, lower water tables in wells have increased the hardness of the water supply, exposing villagers to heavy metals, and contributing to increased levels of chronic kidney disease (CKD). Greater sedimentation of tanks and canals are resulting from depleted water availability. While local forest service officers report that more bush fires are occurring during dry seasons.

Flood events are also seen to be more frequent during the monsoon seasons. Tank cascades have traditionally provided flood mitigation services (Hewawasam and Matsui 2022). In terms of the production of rice paddy and vegetables, the once reliable monsoon seasons (Maha and Yala) are now less reliable, making water management and irrigation decisions increasingly difficult. According to one farmer cultivating in a VTCS in the Mahakanumulla cascade (the focal area of the HLP), “Rainfall patterns have changed within the last five years, and it has been difficult to determine planting and harvesting times. We are getting impacted by unpredictability.”

The Healthy Landscape Project was intended to employ ecological approaches to restore ancient village tank cascade systems (VTCS) with the goals of advancing agroecological land management, strengthening ecological health of humans and ecosystems. Extensive background research was conducted on the Mahakanumulla cascade, the area chosen as the site of the HLP.

The HLP was divided into the following components:

- Component 1: Implementation of biodiversity-based options that improve sustainable landscape management that included funding for the restoration of several minor tanks;
- Component 2: Strengthened institutions, policies and integrated landscape planning of village tank cascade systems in socio-ecological sensitive areas;
- Component 3: Partnerships, awareness raising and capacity building for better integrated landscape management in support of improved ecosystem services and ecohealth outcomes;
- Component 4. Knowledge, information management, and monitoring and evaluation.

3) The participants and their interaction and communication in and between meetings

The HLP drew heavily on the existing governance apparatuses for governing VTCSs. The current state of management of minor VTCSs remains complex, as there is no single agency of government that has stewardship over water management resources for Sri Lanka (Wijekoon, Gunawardena, and Aheeyar 2016).

The District Secretary’s Office convenes and facilitates local Agriculture Committees that meet seasonally to resolve water management issues, plan for the upcoming seasons, and consider tank maintenance needs. These committees are led by the District Secretary and include representatives from the Department of Agrarian Development, Department of Agriculture, members of local farmer associations, and other government officials as needed. These committees are consensus-driven, meaning that farmers are authentic participants and actively listened to. If farmers disagree with the sentiments of government officials, further deliberation is undertaken. If repairs to tank cascade infrastructure are needed, it is most often that Irrigation or Agrarian Development engineers and their staff will conduct those repairs. Forest Conservation Department and Wildlife Conservation Departments are involved in VTCSs when matters of conserved lands and wildlife preservation or conflicts are evident. The Provincial Department of Agriculture provides services directly to farmers, farmer organizations and women’s societies on matters relating to agricultural production and entrepreneurial activities (such as the culinary arts, eco and agro-tourism, etc.).

Table 1: Policy Actors and Their Roles in the HLP

ACTOR	ROLE IN HLP
Ministry of Environment**	Provided ministry-level support for the project
Ministry of Agriculture*	Supported Provincial programming
Department of Agrarian Development*	Chiefly responsible for restoration of tanks; worked closely with farmer organizations in doing so
Department of Forest Conservation*	Provided trees for planting; provided technical assistance; regulates conserved lands
Department of Agriculture*	Provided seeds crop diversity; land management; culinary training; etc.
Department of Wildlife Conservation*	Provided technical assistance for managing human-elephant conflict
Department of Education*	Recruited and supported teacher training programs; curriculum development
Department of Ayurveda*	Collaborated with HLP staff to offer nutrition training, additional screening services
Department of Archeology	Reviewed elephant fence placement in sensitive areas
District Secretary's Office*	Troubleshooted challenges; facilitates community level meetings
Agriculture Committees	Served as spaces for the joint coordination of HLP tank restoration, programs and trainings
Farmer Organizations	Consented to support for tank restoration; provided logistical support; communicated needs
Women's Societies	Participated in culinary training; nutrition programs; communicated needs
Global Environment Facility (GEF)	Funded HLP; prioritizes ecohealth, biodiversity; capacity-building
United Nations Environmental Program (UNEP)*	Supported strategic planning
Bioversity International*	Provided some communication support
South Asia Council for Environment Program (SACEP)*	Hired and supervised HLP staff

RaJarata University of Sri Lanka**	Supported development of knowledge products
Wayamba University of Sri Lanka**	Supported technical aspects of the project; advocated for resources; conducted research
University of Peradeniya**	Supported technical aspects of the project; hosted planning meetings; conducted research * = representative member of Project Steering Committee + = Representative member of Technical Advisory Committee

The participation of local residents is channeled through two types of formal organization: farmer organizations and women’s societies. Individual villagers may be members of more than one organization, particularly in relation to farming. Farmer organizations may be formed around specific geographic regions or around types of crops grown. Every tank in a cascade system is associated with a local farmer organization. Women’s societies are almost always geographically defined. These groups are at least initiated by the Department of Agriculture and have proliferated across Sri Lanka in the last few decades. Both types of community-based organizations are democratically governed, with leadership elected. Most often these groups collect dues from members. Some state funds can be drawn on for specific projects and programs.

The governance network of policy actors involved in the HLP is provided in table 1. The HLP was implemented through a collaboration between the United Nations Environmental Program (UNEP), Bioversity International, the South Asia Council for the Environment (SACEP), and the Sri Lankan Ministry of Environment (MOE). Given the COVID-19 pandemic and ensuing economic crisis in Sri Lanka, SACEP served as the fiscal agent, hired, and supported the HLP staff, and was chiefly responsible for monitoring and reporting. A Project Steering Committee (PSC) and Technical Advisory Committee (TAC) were in place to advise the project. A series of interim reports and evaluations were undertaken and used to track progress and adjust objectives.

4) How often do they meet, and do they communicate between meetings?

The PSC for this project met regularly and was comprised of leadership from all of the government departments and ministries found in table 1, as well a representative from Wayamba University, the Executive Director of SACEP, and representatives from UNDP and Bioversity international. These meetings reviewed project progress, aligned coordination needs, and served to troubleshoot challenges. The TAC was comprised of researchers from Wayamba, Rajarata, and Peradeniya Universities. They met quarterly and reviewed the major technical features concerning tank restoration. In addition, local farmer organizations and women societies provided input through quarterly committee meetings that were facilitated by the District Secretary’s Office. These standing meetings are designed to coordinate water resource management issues for the tank cascade region. The HLP project was a regular agenda item for these committee meetings. In addition, HLP outreach staff met regularly with village leadership to discuss project progress and coordination.

5) The role and forms of knowledge sharing, coordination and joint problem-solving

Knowledge sharing was a major feature of HLP (see component 4 above). The university partners facilitated the convening of an international symposium on VTCSs in December of 2023 and are in the process of developing a network of tank saccade researchers; constructing a national database for VTCSs; developing resource guides and short courses for local villagers and practitioners; and editing a scholarly book on the topic of VTCSs. The persistent framing of “biodiversity” as key to the health and well-being of all living entities within the tank cascade system was echoed across all policy actors interviewed for this study. In addition, there was a sincere interest in rediscovering and promoting of traditional knowledge systems for VTCSs. The emphasis that the university researchers affiliated with HLP have placed on using science to rediscover ancient ways of knowing is compelling. The vision being pursued through the slate of knowledge products and the teacher training initiatives of HLP are designed to create the foundation for a knowledge base that can serve as the basis for scaling up tank restoration efforts across Sri Lanka’s Dry and Intermediate Zones.

According to the Division Additional Secretary, the “project is making the villagers as well as the other government officers from the Agrarian Development Department, Irrigation Department, Division Economic Development officers, and even schoolteachers more aware about the importance of the tanks. I think this project has made the villagers aware of tank systems as a concept and they see how they can benefit from healthy landscapes... Farmers are aware of the importance of the tank cascades. They have actively participated in HLP activities and can clearly see the benefits of maintaining tank systems effectively in terms of the environment and forest systems. They are seeing the value of new land management activities and how these activities benefit their village and their families... Government officers involved in HLP have now a common experiences of coordinating activities that should have a lasting impact and benefits for the region.”



(Figure 3: Food Festival Vendors from Village)

In addition, there was strong evidence of coordination between the local farmer organizations and the government agencies responsible for tank restoration. Local farmers supported the restoration projects by providing security and lodging for construction workers. According to one farmer, “We know how to get know-how, we just don’t have access to the officers directly. The HLP has intervened in this process to help us get access to that assistance. Otherwise, it would have been very hard to access the help we need. There is no other party who can help us in this role.”

Also, there is strong evidence of joint problem-solving. One example is that the original HLP did not include the installation of elephant fencing for the village, which emerged as a critical need that was communicated by the villagers. The installation of the fencing did impinge on sensitive archeological sites. These issues were collaboratively resolved through the active consultation among local leaders, HLP staff, the Department of Agrarian Development, and the Department of Archeology. Archeologists visited the impacted site and compromises were made regarding the placement of the fencing.

6) The relation between consensus and conflict and the handling of the latter

There appeared to be little evidence of conflict except in two areas. A healthy and high functioning VTCS still persists within and across bureaucratically derived systems of governance. The restored tank was designated as an “animal” tank by the Forest Conservation Department. The villagers in the region were quick to note that the lands downstream from the restored tank were once paddy fields that had grown over into forest land that was now designated as conserved. The local farmer association had estimated that if these paddy fields were restored to use, some 347 new farmers currently without land could cultivate those fields. The extent to which these lands will eventually be released back into production remains to be seen. But this example provides a case that trade-offs persist in the governance of these VTCSs.

The initial plans for upland tank restoration were blocked by villagers in the lowland, fearing that the restoration of the upland tank would deplete their ground water supply. They reluctantly consented. Once the upland tank was restored, lowland villagers found that their ground water supplies recharged more effectively than before. The benefits of tank restoration became inherently obvious to lowland residents. There is now universal support for the HLP project in the villages of the region.

7) The role and form of leadership: lead actor, steering group and/or collective leadership

The HLP was operationally led by a full-time staff of 5 people, including the National Project Manager. SACEP provides project implementation oversight, and oversees project manager and staff, who are contracted with SACEP. The project manager was a retired senior official from the Ministry of Environment. He was very knowledgeable of VTCSs and was known to be an effective listener. There were several instances over the course of the project where he re-directed funds to activities that were being called for by the local villagers. These adjustments include the building of elephant fencing, the provision of culinary arts training and support, and the support for local eco-tourism efforts. According to the District Secretary, “There are people in this community who are leaders, who we can go to and work with you address problems and needs in the community.” Outreach to the villagers by the HLP staff was challenged by the COVID-19 pandemic because of delays in hiring staff and then restrictions in the ability of staff, once hired to be physically present in the community due to periodic lock downs. Remote meetings with villagers was

generally not an option. Although many villagers have cell phones, online meetings with them are still a rare occurrence.

The Project Steering Committee (PSC) was comprised of representatives of all of the major governmental agencies and NGOs. PSC membership is represented with * in table 1. The PSC receives periodic updates from HLP leadership and program evaluators. The PSC approves updated strategic plans and troubleshoots challenges as they arise. The Technical Advisory Committee (TAC) is a smaller group of actors with content expertise (science and engineering). TAC membership is represented with + in table 1. The TAC provides technical input into the tank restoration and related hydrological and ecological impacts of the project. The TAC has experienced some minor conflicts regarding the characterization of tank functions.

8) The temporal unfolding of the co-creation process: major shifts and ups and downs

Covid-19 and an ensuing economic crisis struck Sri Lanka during the early years of HLP. The project ran from September 2019 to March 2024. COVID-19 and the ensuing economic crisis to hit Sri Lanka could have led to failure for the HLP. It did not because government leaders and funders had the desire to seek out creative solutions, scale back activities in certain areas, and invest in emergent opportunities that aligned with the HLP goals and objectives. Equally, local villagers saw in the HLP opportunities for investment in their own successes. Local farmer associations and women societies saw opportunities that the HLP could bring and seized on those opportunities to build their own capacities. These opportunities for women included developing new business ventures associated with cooking and eco-tourism. These opportunities in turn led to the cultivation of new capacities around small business development, professional presentation of food, customer relations and the like. For the mostly male farmers, next type of crop production were introduced, including technical assistance relating to seed production. In both cases of men and women, a heightened awareness of the value of the tanks for water recharge, pollination, and wildlife management was expressed.



(Figure 4: Elephant Fencing and Restored Tank)

The economic crisis in particular stunted the MOE efforts to directly facilitate the project. They worked with the regional NGO, SACEP, who took over the operations of the project. This protected the project from government instability during the economic crisis. The original scale of the project needed to be downsized- leading to fewer tanks restarted. However, with input from villagers, the HLP expanded the offering of land management, culinary arts and nutrition training as well as investment in elephant fencing to reduce human-elephant conflicts.

9) The most important governance factors (may include factors other than those in focus in this project)

Since 1992 the formal policy of “Participatory Irrigation Management” (PIM) has been in place guided by principles reinforcing the notion that ultimate control of local tank cascade systems lies with local farmer organizations.

In more recent years, minor tank restoration projects have been initiated, often supported through NGO funding. For instance, the United Nations Development Program (UNDP) offered a series of small grants to local communities throughout Sri Lanka, including the Dry and Intermediate Zones, focusing on small project designed to promote resilience to climate change, several of which include small tank restoration projects. These small tank restoration projects have aimed at increasing water availability through the rehabilitation of tank bunds and repairing water distribution networks (Sakthivadivel, Fernando, and Brewer 1997, 6). Best practices in small tank restoration projects include the need for hydrological assessments to ensure surface and ground water surpluses. Failures to do so have resulted in a number of failed minor tank restoration projects in recent years.

The HLP was conceived after officials from the Sri Lanka Ministry of Environment (MOE) approached the Global Environment Facility (GEF) to consider funding a demonstration project linking minor tank restoration, biodiversity, and eco-health outcomes. Pursuant to the GEF project funding cycle 6 at the time, these project champions submitted an expanded “project note” in 2017. Subsequently, a Project Preparation Grant (PPG), a small planning grant, was awarded in 2018, which provided some resources for developing partnerships and a stakeholder engagement plan. In 2019 an implementation grant of medium size (\$2 million USD) was awarded by GEF, with expectation for co-financing arrangements from participating governmental entities.

Regarding what is perceived to be the most important governance factors shaping the successes of this project we site the combination of GF 1: the importance of biosphere conditions; GF 2: national, international programs and formal goals; and GF 9: the provision of blended financing as the most directly related GFs to the HLP’s initiation and implementation. Relative to GF1, climate change and historical land management has created a lot of uncertainty in food production in the region. Extensive droughts and floods are a more frequent occurrence. The impact of these changing conditions was recognized by GEF and more importantly the Sri Lankan government was a central region for supporting this project. The key to local resilience in the face of climate change exists in the form of restoring the VTCs. Relative to GF2, an early champion of the project was a senior staff member of the MOE who was also undertaking a Ph.D. study of the impacted region. The solutions relating to tank restoration aligned with both national and local priorities as well as the GEF’s funding priorities. National goals associated with improving local resilience to climate change and the ecohealth impacts of depleted and polluted water supplies aligned

with the GEF goals around cultivating greater biodiversity as a means of improving wildlife and well-being of local residents. Relative to GF9, the requirement that all major parties to this project are to provide tangible resources to the project ensured buy-in and also allowed for some creative innovations that dovetailed with existing government programs (e.g. new venture trainings, public health programming). While GF 4, formal institutional channels for citizen participation was also evident, although the HLP itself was not responsible for building such capacity. It merely drew on pre-existing channels.

10) The generated outputs and outcomes

A logic model outlining the inputs, activities, outputs, and outcomes of the HLP was created out of the research study and is provided in table 2 below.

Table 2: Inputs, Activities, Outputs and Outcomes of the Healthy Landscapes Project

INPUTS	ACTIVITIES	OUTPUTS	OUTCOMES
GEF and Government Funding (2MM USD+) ⁺	Restoration of village tanks and its components ^{**} Upstream development with tree planting ⁺ [*] Downstream development with Sluice and canal repair ^{**} Installation of elephant fencing ^{**}	Restored upland tank ⁺⁺ Rehabilitated lowland tank ⁺⁺ Trees planted to improve water filtration ⁺⁺ Fewer human-elephant conflicts [*]	Improved ground water recharge (P) [*] Increased bee honey production (P) ⁺⁺ Increased migratory birds (P) ⁺⁺ Expansion of dairy herds (buffalo) (S) [*] Capacity for multiple paddy harvests (S) ⁺⁺ Safer villages and farm fields (S) [*] Increased biodiversity (P) ⁺⁺
GEF and Government Funding (2MM USD+) ⁺ HLP and in-kind staff time [*]	Teacher training ⁺⁺ Nutrition training ⁺⁺ Venture creation / livelihood development ⁺⁺ Culinary arts training ⁺⁺ Ecotourism technical assistance [*]	Teachers trained in VTCSs ⁺⁺ Parents and pregnant mothers awareness raised [*] Food festival undertaken [*] Farmers supported in seed production ⁺⁺	Diffusion of knowledge of VTCSs (C) [*] Improved health of villagers (S) [*] Improved well-being and income of villagers (S) ⁺⁺

	Seed production resources*	Water quality awareness raising**	
	Land management technical assistance*	Increased quality and number of eco-tourism programs*	
GEF and Government Funding (2MM USD+)* Scientific expertise**	Development of knowledge products*	Edited scholarly volume** Short courses delivered* Resource guides produced* VTCS network convened* VTCS database developed* Peer viewed journal articles on cascade management and restoration* Training manuals*	Development of knowledge systems for restoring and maintaining VTCSs (C)*
R=Regulating Ecosystem Services respondents P=Provisioning Ecosystem Services. documents C=Cultural Ecosystem Services S=Supporting Ecosystem Services		*= Observed evidence provided by +=Reported in program evaluation	
<p>11) Lessons learned about the conditions for co-creating green solutions</p> <p>In the cases of low and emerging middle-class countries, the ability of poorer or working-class villagers to initiate tangible green transition projects is likely very difficult. The HLP project is a good example of how international NGO funding can serve to instigate green transition projects in these types of settings. The conception of the HLP was driven by a former government official in the Ministry of Environment (MOE) who was undertaking a Ph.D. to study how to restore village tank cascade systems. The MOE and other government ministries of Sri Lanka are very familiar with drawing in international resources to fund innovation projects.</p>			

The co-creation element for the HLP has a long and strong basis in participatory irrigation / water systems management in the country dating back several millennia. In a sense, the co-creation of the tank cascade system resulted from long standing coordination between kings (in the past) or more recently government agencies and NGOs and local communities. The traditional knowledge that villagers possessed for creating and maintaining these cascade systems that were, essentially, prototypical sustainable development initiatives is of critical importance. With the loss of this traditional knowledge the HLP's attention to the creation of knowledge products drawn from rigorous scientific analysis is an attempt to rediscover these ancient ways of knowing how to live sustainably. We should be cautious to think that the co-creation of green transitions needs to rely on novel approaches and governance configurations. The HLP case highlights that in some instances, co-created green transitions can manifest by rediscovery of ancient ways of doing and being in harmony with nature.

Scoring and analysis of governance factors

1. Perceived importance of biosphere conditions

QCA score:

0

0.33

0.66

1

Scoring confidence:

Low confidence

Medium confidence

High confidence

Data sources:

Interviews

Documents

Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

Across all types of stakeholders in the HLP, from the international funders (GEF, UNDEP, Bioversity international) to the lead organizations (SACEP and MOE), to supporting government agencies and community leaders and project beneficiaries, the impact of climate change (increased floods, droughts and shifts in monsoon seasons) were cited as main drivers of project inception and implementation. In addition, the importance of biodiversity in relation to the health and well being of the region's people and ecosystems was repeatedly articulated during interviews, chance observations and source documents and observed in the emphasis of the project on wildlife and forest conservation, improvements to water quality (in relation to chronic kidney disease), and sustainable agricultural development.

The actual evidence of climate change impacts on the region within which the HLP unfolded is very well documented, most precisely in Ratnayake et al., 2023. Specifically, the biosphere conditions that helped to shape this project include:

- a) Shifting monsoon patterns resulting in extreme fluctuations in flooding and drought conditions. These changed patterns makes land management decisions difficult, as well as poses immediate threats to life and property (in terms of flooding and landslides) and crop production, particularly in relation to extended drought conditions impacting crop yields. Restored VTCSs are viewed as a means for water storage in times of drought and storing water overflows during flood events, therefore improving the resiliency of these communities.

- b) The region’s farmers are particularly hard hit with Chronic Kidney Disease, the causes of which are very likely environmental. The persistent use of fertilizers is noted as the cause, as ground water supplies are found polluted. Restored VTCSs are leading to better ground water recharge, reducing the levels of heavy metals and nutrients in the drinking water supplies.
- c) Increased conflicts between humans and elephants have been noted as land encroachment and dried up tanks are forcing elephants into populated areas for water and food. These conflicts are resulting in deaths of both species. Restored VTCSs are providing outlets for elephants to resource water and food outside of village and rice paddy fields.
- d) Persistent droughts and land encroachment has led to a decrease in biodiversity in the region. Restored VTCSs are providing increased habitats for wildlives, including migratory birds. In addition, recharged ground water supplies are improving the health of flowering trees and shrubs, providing for better habitat for pollinators.

2. Legislation, programs, and formal goals

QCA score:

- 0
- 0.33
- 0.66
- 1

Scoring confidence:

- Low confidence
- Medium confidence
- High confidence

Data sources:

- Interviews
- Documents
- Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

The HLP was designed to closely align with several existing policy goals pertaining to participatory and conservation practices advanced by the Sri Lankan governments across all levels of jurisdiction. By executive order, all government-backed activities that couple environmental and population health and well-being need to align with specific sustainable development goals (SDGs). The protocols for participatory irrigation management (PIM) that have been long a standard for tank cascade management and that were codified into formal policies in 1992 served as the foundation for the co-creation of tank cascade restoration efforts of the HLP. PIM calls for the negotiated settlement of water resource, wildlife, and forest conservation conflicts that involve farmer organizations, District level administrators, and the relevant governmental departments (e.g. Agrarian Development, Agriculture, Irrigation, Wildlife Conservation, and Forest Conservation). In addition, the HLP was funded by the Global Environment Facility (GEF) that prioritizes funding projects that promote biodiversity, climate change adaptation, the circular economy, and sustainable land management—policy goals that appear in the various cycles of funding offered through GEF.

The evidence for scoring this GF as a 1.0 is in part provided in table 1 that outlines the extensive list of government agencies and NGOs involved in the governance of this project. The Sri Lankan government agencies involved drew on the HLP to offer existing and new programs to the HLP area, which includes the coupling of tank restoration projects and land management programming priorities in the areas of trainings in new ventures, land management programs in seed and paddy cultivation, and awareness raising relative to tank vitality. In addition, the teacher training program and knowledge products are

designed to elevate the awareness of VTSCs as a vital source of resiliency for Sri Lanka’s Dry and Intermediate Zones. To this degree, the restoration of VTSCs is viewed as a national goal and potential priority. This message was conveyed via several interviews with the Ministry of Environment, Department of Agriculture, Department of Education, and the Department of Ayurveda; that the HLP was viewed as a model project with national implications that align with government priorities. In addition, the international agenda of GEF, UNEP, Bioersivity International, and SACEP around advancing coordinated responses and investments for integrating biodiversity, climate change, and intergovernmental, cross sector, and community co-creation activities was an important driver of HLP success.

3. Relative openness of public governance paradigms

<u>QCA score:</u>	<u>Scoring confidence:</u>	<u>Data sources:</u>
<input type="checkbox"/> 0	<input type="checkbox"/> Low confidence	<input checked="" type="checkbox"/> Interviews
<input type="checkbox"/> 0.33	<input type="checkbox"/> Medium confidence	<input type="checkbox"/> Documents
<input checked="" type="checkbox"/> 0.66	<input checked="" type="checkbox"/> High confidence	<input checked="" type="checkbox"/> Observations
<input type="checkbox"/> 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Because the HLP relies on the existing structures of PIM to guide community engagement, the extent to which grassroots, community-level input is used to initiate project activities is limited. The HLP was initiated by MOE staff and tank cascade researchers and not by or through local farmer organizations. The menu of supporting services and trainings (e.g. seed production technical assistance, nutrition training, health screening, new venture training, culinary arts training, etc.) existed prior to HLP and were offered by governmental service providers in other areas. The HLP helped to recruit participants and focus resources into the impacted villages. Grassroots input was used to prioritize the installation of elephant fencing and in advocating for the installation of solar pumps. The evidence of conflict between local farmers who want overgrown rice paddy fields to be restored to use and the Forest Conservation Department who want that land to remain conserved, underscores the real limitations to a fully realized public governance framework guiding this project. Given the structural nature of the GF, we score this as a 0.66. The success of the HLP would not have been possible without the structural public governance paradigm of the PIM.

4. Formalized institutional channels for citizen participation and community mobilization

<u>QCA score:</u>	<u>Scoring confidence:</u>	<u>Data sources:</u>
<input type="checkbox"/> 0	<input type="checkbox"/> Low confidence	<input checked="" type="checkbox"/> Interviews
<input type="checkbox"/> 0.33	<input type="checkbox"/> Medium confidence	<input type="checkbox"/> Documents
<input checked="" type="checkbox"/> 0.66	<input checked="" type="checkbox"/> High confidence	<input checked="" type="checkbox"/> Observations
<input type="checkbox"/> 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The PIM approach to engaging local farmer organizations and women's societies through government facilitated agricultural, irrigation and environmental committees has been in place since at least independence from Great Britain in 1948. The negotiated arrangements that arise from these committee meetings are binding and usually grounded in consensus. The HLP was first introduced to local communities via these mechanisms. The HLP staff routinely engages in direct outreach with community leaders and organizations. However, the HLP needs to rely on these formal channels to obtain official community consent and input. Because these channels exist independently of the HLP and are limited in scope to matters relating to water resource management, the ability for novel proposals emanating from communities is limited. This lack of novel formal channels for citizen engagement emanating from the HLP itself is reason for scoring this a .66 and not a 1.0.

5. Mechanism for ensuring top-down government and bottom-up social accountability

QCA score:

0

0.33

0.66

1

Scoring confidence:

Low confidence

Medium confidence

High confidence

Data sources:

Interviews

Documents

Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

As a project that is funded by an international NGO (GEF) and supported by a variety of partnering NGOs, routine reporting and evaluation of the project and its outcomes are required and well documented. This feedback has led to adjustments to the scope of work and the timelines for the project. The Project Steering Committee is informed of these results and affirms the revised plans. These norms suggest a strong, professionally advanced top-down form of social accountability for the project. The extent to which there is strong evidence for bottom-up accountability is more challenging to find. However, our interviews with key stakeholders did provide instances in which problems that surfaced were resolved with active communication and engagement across stakeholders. HLP staff played an active role, in close partnership with the District Secretary's Office to resolve these conflicts. We found only a few examples of bottom-up requests emanating from the local community that resulted in tangible results in their favor (elephant fencing installation being the most obvious). The case of the overgrown rice paddy fields and forest conservation designation remains unresolved. If it is resolved in favor of the local farmer priorities, we may be more inclined to feel more confident about the mutuality of top down and bottom up accountabilities.

6. Strategic agenda-setting by means of translation

QCA score:

0

0.33

0.66

1

Scoring confidence:

Low confidence

Medium confidence

High confidence

Data sources:

Interviews

Documents

Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

In source documents and interviews with funders and leading sponsors of the HLP the adherence to the SDGs was evident. Specific references to SDGs 2 (zero hunger), 5 (gender equality), 6 (clean water and sanitation), and 13 (climate action) were made by officials from the Sri Lankan Ministry of Environment and Provincial Department of Agriculture. These SDGs have been translated into the project goals of the HLP. The pursuit of the SDGs and integration of SDG goals is a priority of the Sri Lankan President's Secretary's Office. SDG goals are embedded in the strategic planning goals of all relevant ministries and appear in the many of the source documents of the HLP. At the grassroots level, we found some evidence that some farmers were aware of sustainability as a concept and made explicit references to the coupling of concepts such as water quality and zero hunger, and climate action and gender equality. The lead funding organization, GEF, adopts the SDG framework in evaluating their funding priorities and funding proposals. However, we found no evidence that the SDGs themselves "attracted local actors to participate."

7. Construction of narratives about successful multi-actor collaboration

QCA score:

0

0.33

0.66

1

Scoring confidence:

Low confidence

Medium confidence

High confidence

Data sources:

Interviews

Documents

Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

To accurately assess this factor with any confidence would require greater immersion and more frequent observations. We did find many examples of positive experiences had between collaborators in the HLP. Some specific instances include: the role of local villagers providing security and logistical support for the workers doing the tank restoration work; the role that Provincial Department of Agriculture outreach and technical support staff played in empowering women and their women's societies to advance career opportunities and ventures. We saw evidence of husbands supporting their wives in pursuing these new ventures. We saw evidence of collaboration of the HLP staff and governmental officials from the Ministry of the Environment, and Provincial Departments of Education, Public Health and Agriculture. And we saw a common appreciation for the successes of the HLP from the supporting international NGOs that have resulted from the professionalism and collaborative activities of HLP stakeholders. We did not, however, find evidence of stories of collaboration becoming convened through a shared narrative. The project did produce some extremely well researched peer reviewed publications relative to the village tank cascade systems, particularly relating to the ecosystem services and land use characteristics of the region. In a sense, these articles advance a narrative of the Mahakanumulla cascade as a social ecological system. GoGreen will be adding to these narratives and perhaps shed light on the more collaborative narratives. Lastly, there are many communications pieces (blogs, articles for popular consumption) on the HLP. These narratives do often speak of collaborative successes. The extent to which these communication devices are known to local stakeholders was not found. This GF is scored a .33 because we found little evidence of

the conscious sharing of narratives among project stakeholders. Internal story-telling of common narratives was not an explicit strategy.

8. Building or harnessing institutional platforms and arenas

QCA score:

- 0
- 0.33
- 0.66
- 1

Scoring confidence:

- Low confidence
- Medium confidence
- High confidence

Data sources:

- Interviews
- Documents
- Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

Our assessment of this governance factor centers on the existence and roles of physical and virtual (digital) meeting spaces in the project. These spaces are being interpreted as commons spaces through which project goals, priorities, and bottom-up accountability are discussed and used to inform decision-making. We found evidence that the project has a digital platform that is used to convey the project outcomes through blog posts and articles advanced by one of the NGO partners (Bioversity International). These platforms do not, however, have any inward focus. Some local farmers organizations and women’s societies are using Whats App to share information through networks. These networks have been intentionally supported by the Provincial Department of Agriculture. This platform predated the HLP. We could find no evidence of HLP staff or core partners contributing to Whats App knowledge production. The HLP is supporting the development of a wide range of knowledge products including: an international symposium; a scholarly volume; short courses; resource guides; a VTCS network; a VTCS database, all of which are oriented outward, to develop a “community of practice” around village tank cascade restoration. The pursuit of a network, a shared database, and an international symposium have the potential to lead to the development of new institutional platforms to support VTCS.

9. Provision of access to blended financing

QCA score:

- 0
- 0.33
- 0.66
- 1

Scoring confidence:

- Low confidence
- Medium confidence
- High confidence

Data sources:

- Interviews
- Documents
- Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

The nature of the GEF funding (2MM USD) required a co-financing arrangement at a 3:1 ratio. The responsibility for tracking the co-financing arrangements fell to SACEP, which served as the fiscal agent for the HLP. The history of this arrangement has been shaped by COVID-19 and the ensuing economic crisis to strike Sri Lanka. To keep GEF funds outside of the national budgeting apparatus, SACEP was asked to serve as the lead fiscal and operating agent for the HLP. HLP staff were employed by SACEP. All accounting for the HLP ran through the national office of SACEP which is located in Colombo, Sri Lanka. Co-financing

partners included the UNEP, Biosersity International, and several ministries and departments of the Sri Lankan government including the policy domains of Environment, Argrarian Development, Agriculture, Public Health, Education, and Forest Conservation. The government partners offered substantial in-kind support of staff and expertise and other resources. We should note that we did not ask for specific access to budget details pertaining to the co-financing of the HLP budget. We did ask about co-financing arrangements in all relevant interviews and there were clear indications that a variety of government and NGO sources were drawn on for co-financing, and that this obligation had a bearing on the way that the project objectives were explicitly pursued.

10. The capacity to leverage support from authorities to enable local collaboration

- | | | |
|--|---|--|
| <u>QCA score:</u> | <u>Scoring confidence:</u> | <u>Data sources:</u> |
| <input type="checkbox"/> 0 | <input type="checkbox"/> Low confidence | <input checked="" type="checkbox"/> Interviews |
| <input type="checkbox"/> 0.33 | <input checked="" type="checkbox"/> Medium confidence | <input type="checkbox"/> Documents |
| <input checked="" type="checkbox"/> 0.66 | <input type="checkbox"/> High confidence | <input type="checkbox"/> Observations |
| <input type="checkbox"/> 1 | | |

Please elaborate on the reasoning behind your scoring for this governance factor:

The HLP is a highly visible and supported project of the Ministry of Environment (MOE). The program coordinator of the HLP is a retired senior official of the MOE. The MOE staff initially advocated for the HLP to GEF. Senior leaders of all of the key governmental actors from the policy domains of Environment, Argrarian Development, Agriculture, Public Health, Education, and Forest Conservation serve on the Project Steering Committee. This group meets periodically either in person or virtually. This group reviews evaluation documents, strategic plans, and troubleshoot specific problems. Such problems have included disputes of sighting of elephant fences in archeologically sensitive areas, the organization and support of knowledge products, and to a lesser extent, the restoration of rice paddy fields. That recognized, we did not find explicit evidence of government agencies cutting red tape requirements to support the project. Government authority interventions focused mainly on getting project staff access to the right government officials. The resulting decisions were metted out according to the context with little need to “pull strings” and with little need to sort out legal issues.

11. Inclusion and empowerment of relevant and affected actors

- | | | |
|--|---|--|
| <u>QCA score:</u> | <u>Scoring confidence:</u> | <u>Data sources:</u> |
| <input type="checkbox"/> 0 | <input type="checkbox"/> Low confidence | <input checked="" type="checkbox"/> Interviews |
| <input checked="" type="checkbox"/> 0.33 | <input checked="" type="checkbox"/> Medium confidence | <input type="checkbox"/> Documents |
| <input type="checkbox"/> 0.66 | <input type="checkbox"/> High confidence | <input checked="" type="checkbox"/> Observations |
| <input type="checkbox"/> 1 | | |

Please elaborate on the reasoning behind your scoring for this governance factor:

The HLP has provided significant levels of support to villagers of the Mahakanumulla cascade through a variety of pre-existing programs including: technical support seed production operations, technical assistance on crop diversification and modern cultivation approaches, support for new ventures for women (home gardens, culinary arts), supporting the development of new ecotourism ventures in the casades, helping to stock the restored tank with fish to support fisheries, tangible increases in ground water recharge resulting from the restored tank, and a variety of other reported outcomes, all of which are having impacts on villagers' quality of life. The extent to which the HLPs reach extends to the villages most vulnerable members is uncertain. Our data collection processes were not systemic in nature, and therefore we do not understand who has been excluded. We were impressed that we saw evidence for the empowerment of women, and a focus on pregnant women's health, early pre-school aged children through the HLP support of public health projects and screenings. That said, the empowerment of villagers stemmed less from the exercise of their own voices and authority, then it did from a government-led effort to distribute benefits to marginalized people of the region. Empowerment was still dictated on the terms of the government and not the terms of the people.

12. Clarification of interdependence vis-à-vis common problem and joint vision

QCA score:

0

0.33

0.66

1

Scoring confidence:

Low confidence

Medium confidence

High confidence

Data sources:

Interviews

Documents

Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

The main focus for our interpretation of this factor centers on the key phrasing: "measures in place to show all project participants they there is value in their collaborations." We were unable to adequately answer this question, as it is likely best answered through a systemic implementation of a survey tool. It was hard to judge beliefs given the limited number of key informants that we touched. This project lacked a forum through which all of the relevant stakeholders could interact. Although there were a number of events and joint activities undertaken (we witnessed two of these in the form of a HLP sponsored tree planting and a food festival highlighting the talents of village chefs), there were no physical or digital platforms for mutual engagement. We give this a .33 in part because there was certainly a consistent expression of appreciation for collaboration among the partners. There was, by and large, mutually reinforcing respect for the stakeholders of the project: officials respected the needs of villagers and villagers expressed appreciation for the support of officials. This was particularly evident in the interviews with villagers and with the District officials. There appeared to be a strong reinforcing respect for each other.

13. Trust-building and conflict mediation

QCA score:

- 0
- 0.33
- 0.66
- 1

Scoring confidence:

- Low confidence
- Medium confidence
- High confidence

Data sources:

- Interviews
- Documents
- Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

We did not find “systemic measures” to ensure that mutual trust was evident and consistently secured. As noted earlier, this project has overcome some conflicts, all of which, save the rice paddy restoration matter, were of a minor nature. Conflicts that surfaced usually concerned matters of intergovernmental jurisdiction and ruling (e.g. archeological and wildlife conservation; agriculture and forest conservation). There appears to be no formal processes in place to measure and ensure trust between partners. That said, there appears to be a high level of trust among them, as noted in response to factor 12.

14. Use of experimental tools for innovation

QCA score:

- 0
- 0.33
- 0.66
- 1

Scoring confidence:

- Low confidence
- Medium confidence
- High confidence

Data sources:

- Interviews
- Documents
- Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

We found no evidence of the intentional use of experimental design concepts in the planning or implementation of the HLP. The idea for the HLP emanated from the MOE, but the concept of tank cascade restoration is not a novel idea. As noted, funding for such projects has been provided through international NGOs for several decades. The novelty or innovation of the HLP as a project type is that it helps to fill a gap in the service delivery mechanisms of the Sri Lankan government at the watershed scale. And by doing so, the HLP serves as a space for the integration of physical restoration projects with social services and technical assistance programs aimed at improving the health and well-being of local villagers. The design thinking concept for VTCS interestingly lies in the ancient blueprints of tank cascade systems designed and implemented some 2000 years ago. While an additional take on design thinking in relation to the HLP may be found in the project’s aligned with concepts of “ecosystem services.” To this end, we situate the design thinking and experiential prototyping as a feature of the project proposal. A review of the peer reviewed papers that were in part funded by the GEF grant understores the value of tank cascades as a design product of the ancient Kingdoms of Ceylon. However, given the explicit nature of this GF- e.g. explicit evidence of modern views of design thinking, we found no such evidence.

15. Ongoing critical self-reflection and learning (i.e., process and/or developmental evaluation):

QCA score:

- 0
- 0.33
- 0.66
- 1

Scoring confidence:

- Low confidence
- Medium confidence
- High confidence

Data sources:

- Interviews
- Documents
- Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

There is strong evidence of use of these formal evaluations for assessing and reevaluating project goals and activities. The HLP has benefited extensively from two project evaluations that were undertaken during the four or so years of the project. We reviewed these reports and the subsequent revised strategic plans for the project. These documents provide for detailed milestones, timelines, and responsible parties. The evaluation reports were used by the HLP leadership and the Project Steering Committee (PSC) to adjust the scope of the project. This ability to adjust to changing conditions and use of evaluation data were critical features of this project that kept efforts focused and impactful. Recalling that the funding for the project began in 2019, right before COVID-19 and during the ensuing economic crisis, the project leadership was still deeply committed to see the project through to completion. Innovations in funding mechanisms, flexibility in project objectives, pivoting to new endeavors all resulted from critical self-reflection and learning.

16. Exercise of facilitative leadership:

QCA score:

- 0
- 0.33
- 0.66
- 1

Scoring confidence:

- Low confidence
- Medium confidence
- High confidence

Data sources:

- Interviews
- Documents
- Observations

Please elaborate on the reasoning behind your scoring for this governance factor:

The leader of the HLP is designated as the “national project manager.” According to those most familiar with this leader, he is a strong collaborator and knows a great deal about village tank cascade systems. They view him as a problem solver and an effective listener. He is credited with being flexible and innovative in the uses HLP funds, particularly in relation to emerging opportunities. For instance, the HLP put support behind a food festival to allow local chefs the chance to highlight their skills and seek potential new catering clientele. Some involved in the project expressed concern for his willingness to fund projects in some areas. However, our observations of him and his staff suggest that he possesses qualities of facilitative leadership. He has, as well, relied heavily on the support of specific MOE project coordinators. In that sense, there is a shared leadership element to the HLP leadership. The project leadership did drive the collaboration forward by engaging in self-reflection and advocacy when needed. This GF is scored a .66 however and not a 1.0 because of the lack of formal and direct engagement with citizens in the formal governance of the project. In addition, we picked up some instances from some informants who expressed

problems with National Project Manager’s decisions to fund projects that lie outside the scope of the original project. This was not a widely held view, but does reflect some evidence of tension.

Outcome variable: Successfully co-created green transitions

The outcome variable ‘co-created green transitions’ will be scored in two parts. First, ‘co-creation’ will be scored based on an assessment of whether the participants in the initiative, project or process engaged in collaborative problem-solving that fostered creative ideas and innovative solutions (data will consist of survey data combined with interviews and documents). Next, ‘green transitions’ will be scored based on an assessment of whether the initiative, project or process has fulfilled or is expected to fulfill its green goals, ambitions and aspirations (data will consist of survey data combined with interviews and internal and/or external evaluation reports, including scientific publications).

The scoring of this variable is done in two parts:

- 1. Is the developed solution based on collaborative problem-solving spurring creativity and innovative solutions?*
- 2. Does the developed solution engender a green transition?*

This scoring should be conducted based on both the survey and complementary green outcome evaluations. Please consult Sections 4.4 and 6.10 in the Research Protocol for more details.

1. Is the developed solution co-created?

QCA score:

0

0.33

0.66

1

Scoring confidence:

Low confidence

Medium confidence

High confidence

Data sources:

Survey

Interviews

Documents

Observations

Please elaborate on the reasoning behind your scoring for this part of the governance factor, including the data sources used for the scoring.

From the standpoint of interpreting co-creation as a feature of bottom up and top-down engagement, the lack of certain features of direct grassroots engagement in the HLP give us pause in scoring this dimension higher than .33. However, a review of the survey results (see below) of government officials and higher education partners involved in the HLP suggest indication that collaboration was a major factor in the success of the HLP, with all questions pertaining to collaboration expressing agreement that collaboration was key ot developing solutions and problem solving.

Regarding the collection of observable evidence, we found little evidence, but also little need for problem-solving to mobilize new ideas and knowledge. The problems faced by HLP were largely addressed during the early stages of the project’s inception. Problem-solving relative to COVID-19 and economic crisis led the MOE to request SACEP’s role as fiscal and operational lead. However, during the core implementation period of the HLP, there was very little need for innovation to occur in response to a need to solve problems. The nature of the solutions to emerge through the HLP were largely not novel. Tank cascade

systems are ancient in origin. While the range of services provided to local villagers were routinely offered. The innovations of HLP are found in the bundling of services and restoration project supporting the wider green transition of the region. The success of the project would not have succeeded without substantial collaboration between stakeholders. This suggests that the social innovations associated with HLP was a critical and valued component of the project.

By relying on the intergovernmental governance network for participatory irrigation management (PIM), the HLP supplemented this system with an integrated watershed-scale view. By scaling the project at the tank cascade system level, the HLP served as liaison between siloed government departments and programs and the villagers’ needs and aspirations. The vision of VTCSs restoration being advanced by the HLP was not merely a feat of environmental engineering, but a project of comprehensive community development. HLP staff were technically employees of an international NGO, SACEP, who served as idea boundary spanners. The additional resources of the HLP budget allowed governmental program partners to offer their programs and services in an integrated manner, thereby linking tank restoration efforts, land management reforms and practices, nutrition programs, entrepreneurship initiatives, etc. in the minds and imaginations of the villagers we interviewed. To this end, the HLP structure provided the means for this integration. And once the resources of HLP dry up, this need for integration will persist. It is interesting to note, however, that survey respondents thought the the HLP did not lead to innovations in “the status quo,” meaning the coordination of HLP relied strongly on pre-existing frameworks for collaboration.

In addition, in terms of the “technological” advances relating to collaboration, the HLP did not cut new ground in terms of design thinking applications. Nor did it generate new technical solutions. This could be somewhat misleading because the technical solutions being employed are rediscovering solutions to biospheric conditions emanating from 2000 years ago. This fact also feed into the survey responses that around the HLP drawing on the status quo more than transforming it.

If possible, please insert your survey responses in the table below (in % for each response), including the mean/average % for each survey item.

Note: Survey Results from Senior Government Officials and Higher Education Partners (n=8)

	Strong. dis. (1)	Dis. (2)	Slight. dis. (3)	Neither agr/dis (4)	Slight. Agree (5)	Agree (6)	Strong. Agree (7)	Mean
1. Problem-solving mobilized different experiences, and/or ideas and/or forms of knowledge to develop new perspectives (Q17)						7	1	2.125
2. Through the collaborative problem-solving process, different experiences and/or ideas and/or forms of knowledge have been mobilized to search for unconventional solutions (Q7)					1	6	1	2

3. The collaborative problem-solving process mobilized different experiences, and/or ideas and/or forms of knowledge to search for solutions that go beyond standard/text-book solutions (Q8)					2	5	1	1.875
4. The co-created solution breaks with established practices (Q9)		4	1	1		2		0.375
5. The co-created solution disrupts conventional wisdom (Q10)	1	5			1	1		-1.25
6. The co-created solution offers new ideas to address the green transition problem (Q11)					2	6		1.75
7. I'm supportive of the co-created solution (Q12)						3	5	2.625
8. I'm content with the overall collaborative process of the project (Q13)				1	1	4	2	1.875
9. I feel the multi-actor collaboration process was a prerequisite for the success of the project (Q6)					1	3	4	2.375
10. I'm satisfied by the results of the co-creation effort in terms of expected impact on the welfare of the community (Q15)					1	7		1.875
11. The collaborative interaction in the project has led to an innovative solution (Q16)					3	5		1.625
12. The actors involved in the project are engaged in collaborative interaction that stimulated creative problem-solving (Q14)						2	6	2.75
13. The co-created solution meets the proposed goals of the project (Q18)					2	5	1	1.875
14. The co-created solution will be durable and robust in the long run (Q19)					1	2	5	1.75
15. The co-created solution is expected to significantly improve sustainability for the whole community (Q20)					1	2	5	2.5

2. Does the developed solution engender a green transition¹?

QCA score:

- 0
 0.33
 0.66
 1

Scoring confidence:

- Low confidence
 Medium confidence
 High confidence

Data sources:

- Survey
 Interviews
 Documents
 Observations

Please elaborate on the reasoning behind your scoring for this part of the governance factor, including the data sources used for the scoring:

Having toured the restored tank and interviewed a half dozen farmers surrounding the tank, it is clear that the ecological and agricultural benefits of the tank restoration are tangible and outlined in table 2. The restored tank is providing for better ground water recharge, which in turn is feeding village wells and nourishing local forests. An increase in the dairy buffalo herds was evident. Larger bird migration has been seen. Wild bee honey collection is up substantially. We found evidence of new ventures for women chefs, seed producers of chilli, big onion, and rice. The HLP also supported a teacher training curriculum designed to advance knowledge of tank cascade ecology. The HLP knowledge products stand to advance the academic and scientific knowledge base for tank cascade restoration. It is our conclusion that the systemic restoration of village tank cascades can be a centerpiece for green transitions for livelihoods and ecosystems of the Dry and Intermediate Zones of Sri Lanka. The role of VTCSs to ecological and social resilience are well documented. And while the HLP resulted in just one tank restoration project (and several small tank rehabilitations), the HLP serves as a high profile and emanantly successful instance of green transitions of pilot in size.

VTCSs have been documented to provide extensive ecosystem services (ESs) for the region.

Ecosystem service valuation schemes are increasingly being used to characterize the provisioning, regulating, cultural, and supporting services of social-ecological systems (SESs). In 2022 Ratnayake et al published an extensive report on the range of the ecosystem services provide by the VTCS in Mahakanumulla, located in the Anuradhapura district of Sri Lanka's north-central province. The study broke down the VTCS into agricultural, forest, water bodies, rocky areas, build-up area and various micro-land use areas. An extensive inventory of the range of ecosystem services was documented. *Provisioning* ESs of VTCSs included food production, water for domestic and irrigation, inland fisheries, support for livestock, medicinal plants and wild edibles. *Regulating* functions included flood controls, groundwater recharge, water purification, local climate regulation, pollination, soil nutrient and erosion regulation, pest and disease controls, and support of biodiversity. *Cultural* ESs included the aesthetic and recreational values, the convenance of traditional knowledge and values through VTCS practices, and the spiritual and religious values convened and supported through village tank cascades (Ratnayake et al. 2022, 9-10). Additional *supporting* ESs that are often accounted for in ecosystem services include the impacts of healthy VTCSs on villagers' health and well-being that result from the availability of clean water, increased

¹ By "green transitions", we mean objectives and aspirations that correspond to at least one of the Green SDGs (SDG 6, 7, 11, 12, 13, 14, 15). The project does not have to refer explicitly to the green SDGs, but the project's green objectives

biodiversity, and the prevalence of locally sourced food. This inventory of ESs underscores the value of tank cascade restoration to “green transitions.”

The score of .66 reflects the fact that the HLP is very small in scale. And while a phase 2 proposal to GEF is being actively considered, the long-lasting impacts of the HLP as a sustainable green transition remains to be seen.

If possible, please insert your survey responses in the table below (in % for each response).

1. The project:	Yes	No	Don't know
...did not produce any green transition solution	0	0	0
...is expected to produce/has produced a green transition solution aiming to avoid a worsening in the status quo	0	0	0
...is expected to produce/has produced a green transition solution aiming to maintain the status quo	3 (37.5%)	0	0
...is expected to produce/has produced a green transition solution aiming to improve the status quo	5 (62.5%)	0	0

Please list all the informants you have interviewed for the case study (list project role + interview date):

ORGANIZATION	ROLE	DATE
Biodiversity Alliance	Website, comms, oversight	10/30/23
United Nations Environment Program (UNTEP)	Oversight	10/30/23
South Asian Co-operative Environment Program (SACEP)	Project oversight; fiscal management and accounting	11/06/23
South Asian Co-operative Environment Program (SACEP)	SACEP Leadership	11/06/23
Ministry of Environment	Project sponsorship	11/06/23
Ministry of Environment	Project sponsorship	11/06/23
Ministry of Environment	Project sponsorship	11/06/23
Healthy Landscape Program	Leads program implementation	11/07/23

Healthy Landscape Program	Leads nutrition program	11/07/23
Healthy Landscape Program	Manages finances	11/07/23
Healthy Landscape Program	Manages special projects	11/07/23
Healthy Landscape Program	Liases with community	11/07/23
District Secretariat	Facilate committees	11/07/23
Provincial Department of Education	Point person for science curriculum	11/07/23
Eco-tourism Entrepreneur	Concieved eco-tourism program	11/07/23
Rajarata University of Sri Lanka	Leads university; contributes to short courses	11/08/23
Rajarata University of Sri Lanka	Leads knowledge products team	11/08/23
Rajarata University of Sri Lanka	Leads scholarly book project	11/08/23
Rajarata University of Sri Lanka	Leads network development	11/08/23
Rajarata University of Sri Lanka	Leads database development	11/08/23
Rajarata University of Sri Lanka	Leads source book development	11/08/23
Department of Agrarian Development	Leads office- minor tank infra	11/08/23
Department of Agrarian Development	Directs projects	11/08/23
Department of Agrarian Development	Engineer for restoration	11/08/23
District government	Coordinates regional planning	11/08/23
Farmer Association	Bee honey, farming	11/08/23
Carpenter		11/08/23
Farmer	Mango, Coconut, Cinn.	11/08/23
Farmer	Upland crops	11/08/23
Farmer	Seed producer; chilly; big onion	11/08/23
Farmer	Seed producer; chilly; big onion; carpenter	11/08/23
Farmer wife		11/08/23
Chef	Cook; entrepreneur	11/08/23
Department of Agriculture (Provincial)	Oversees service program operations	11/09/23
Public Health Office	Oversees programs and field outreach	11/09/23

Public Health Office	Outreach; instruction	11/09/23
Ministry of Environment	Supports progress reporting; liaisons with stakeholders	11/10/23
Wayamba University of Sri Lanka	Formal representing VC at PSC; TAC; consultant for some activities / informal role helping with progress reports; research	11/10/23
Forest Department (District)	Regulates conserved lands; provides trees for planting; monitors trees	11/10/23
Forest Department (District)	Regulates conserved lands; provides trees for planting; monitors trees	11/10/23
Provincial schools	Getting trained in cascade science	11/10/23
Rajarata University of Sri Lanka	Planting trees as club activities	11/10/23

Please list all the observations you have made (type of meeting/workshop/etc. + observation date):

<p>Food Festival 11/10/23 Tree Planting 11/10/23 Teacher Training 11/10/23</p>
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Please list all the documents you have analyzed (document name + source + year):

<p>GEF HLP Work Plan 2022-2024, obtained from HLP staff UNEP GEF PIR Fiscal Year 2020 report, obtained from HLP staff UNEP GEF PIR Fiscal Year 2021 report, obtained from HLP staff UNEP GEF PIR Fiscal Year 2022 report, obtained from HLP staff</p> <p>Healthy Landscapes – Mid-term Review – J. Gonsalves, obtained from HLP staff</p> <p>Ratnayake, S. S., Kumar, L., Dharmasena, P. B., Kadupitiya, H. K., Kariyawasam, C. S., & Hunter, D. (2021) Sustainability of village tank cascade systems of Sri Lanka: exploring cascade anatomy and socio-ecological nexus for ecological restoration planning. <i>Challenges</i>, 12(2), 24. Obtained from research collaborators</p> <p>Ratnayake, S. S., Khan, A., Reid, M., Dharmasena, P. B., Hunter, D., Kumar, L., ... & Kariyawasam, C. S. (2022) Land use-based participatory assessment of ecosystem services for ecological restoration in village tank cascade systems of Sri Lanka. <i>Sustainability</i>, 14(16), 10180. Obtained from research collaborators</p> <p>Ratnayake, S. S., Reid, M., Larder, N., Kadupitiya, H. K., Hunter, D., Dharmasena, P. B., ... & Kariyawasam, C. S. (2023) Impact of climate change on paddy farming in the village Tank Cascade Systems of Sri Lanka. <i>Sustainability</i>, 15(12), 9271. Obtained from research collaborators</p>
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Please note the response rate for the survey/measurement of outcome variable:

67 % (8 of 12 possible respondents participated in the survey)