GUIDANCE NOTE

Lessons learned in planning and implementing corridors and connectivity conservation

ASL
Amazon Sustainable Landscapes Program

GLOBAL WILDLIFE PROGRAM

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Acknowledgements

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The Global Wildlife Program (GWP) is funded by the Global Environment Facility (GEF) and led by the World Bank. It is a global partnership to combat illegal wildlife trade and promote wildlife-based economies. Through an investment of $230 million in GEF financing and $1.4 billion in co-financing, the GWP brings together efforts in over 30 countries. GWP national projects across Africa, Asia, and Latin America and the Caribbean, along with a global coordination project, create a collaborative program that facilitates action on the ground, connections across borders, and the sharing of experiences, lessons, and best practices.

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About the Amazon Sustainable Landscapes Program

The GEF-funded, World Bank-led Amazon Sustainable Landscapes (ASL) Program is one of the largest regional programs under implementation in the Amazon with a total of $222 million in GEF grant funding and $1.2 billion in co-financing. Under an integrated regional approach, the ASL includes national projects in Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, and Suriname, and a regional project that promotes coordination and knowledge management. Together, the projects aim to improve integrated landscape management and ecosystem conservation in priority areas of the Amazon region.

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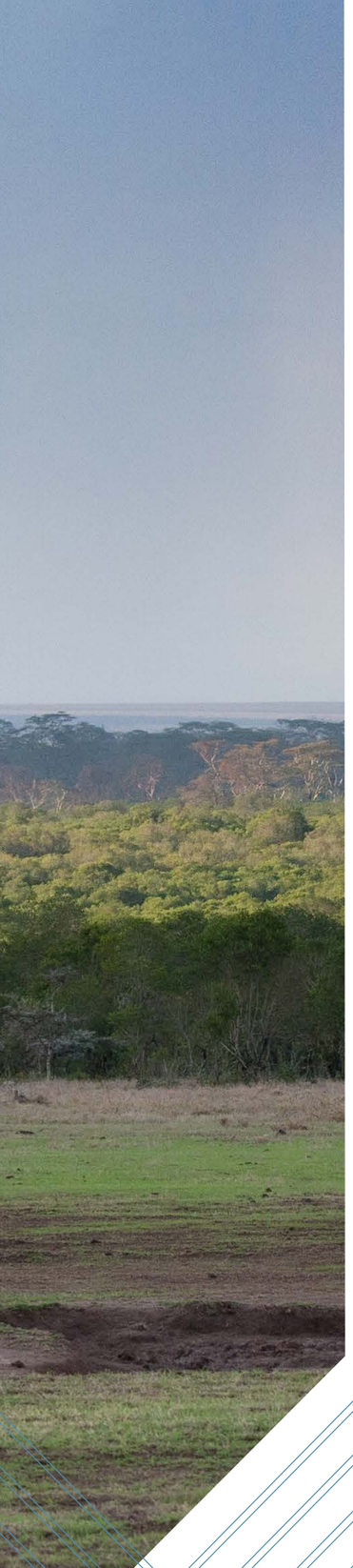


1. INTRODUCTION

Ecological connectivity is the unimpeded movement of species and the flow of natural processes that sustain life on Earth[1]. Ecological connectivity is critical to conserve biodiversity and maintain ecosystem health which in turn provides numerous benefits to humans. Among the key threats to biodiversity and ecosystem services are habitat loss, degradation, and fragmentation. As a direct countermeasure to fragmentation, connectivity conservation provides the "glue" to enable the natural system to function and maintain resilience over time.

Ecological corridors are "a clearly defined geographical space that is governed and managed over the long term to maintain or restore effective ecological connectivity".[2] These corridors are increasingly recognized as important to help achieve both conservation and sustainable development at a landscape level. Many national projects in both the Global Environment Facility (GEF) funded Amazon Sustainable Landscapes (ASL) Program and Global Wildlife Program (GWP) include local activities in creating, managing, and monitoring ecological corridors.

However, ecological connectivity is a complex issue. It refers to both the movement of species and the flow of natural processes – areas that require understanding of ecological concepts and sound technical data. If implemented incorrectly, it can inadvertently promote the movement of invasive species or fail to deliver the desired connectivity for target species. While the need for ecological connectivity is acknowledged in many projects, there is often a lack of specificity in how to implement connectivity conservation, impeding implementation and success. Reflecting this complexity, ecological connectivity was identified by ASL and GWP projects as a priority area for technical support and sharing of knowledge and lessons.

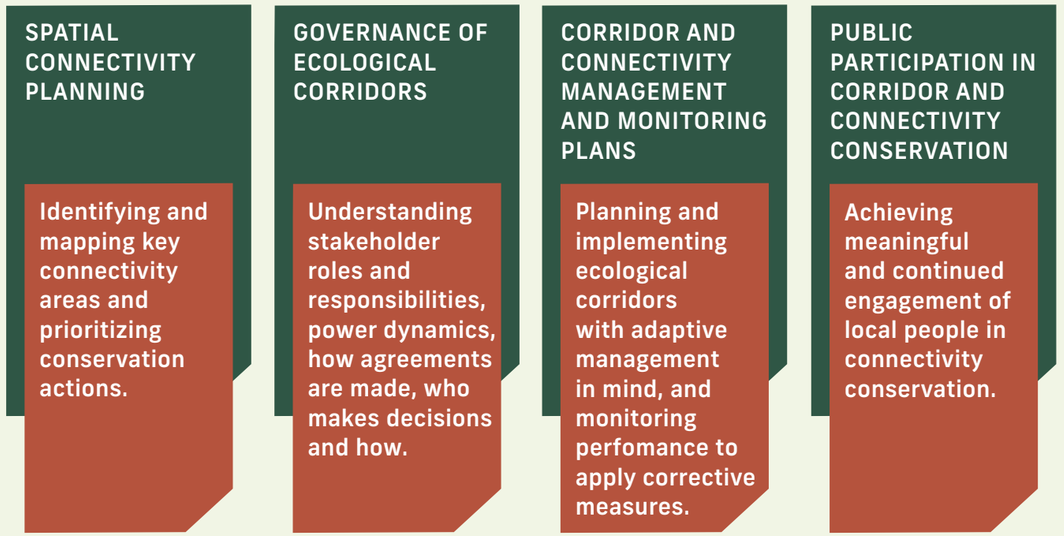
1 A definition for ecological connectivity was developed in 2019, in the context of a series of meetings convened by the CMS Secretariat to identify CMS priorities for the post-2020 Global Biodiversity Framework.
2 Hilty, Jodi, et al. "Guidelines for conserving connectivity through ecological networks and corridors." Best practice protected area Guidelines Series 30 (2020): p-122.

2. ABOUT THIS GUIDANCE NOTE

The objective of this guidance note is to illustrate experiences, lessons, and recurring challenges across ASL and GWP projects in connectivity conservation. The document compiles and summarizes information presented during a series of virtual knowledge exchange events on ecological connectivity and conservation held during 2022, and follow-up interviews with ASL and GWP project teams. The virtual events brought together ASL and GWP participating governments and partners from over 35 countries across Africa, Asia and Latin America and the Caribbean. Annex 1 provides a list of all presenters from ASL and GWP projects.

The knowledge exchanges on corridors and connectivity were based around four broad technical themes identified by project teams as most important to their work. The themes addressed three major steps in the process of connectivity conservation: (i) creating a vision for a connected landscape, (ii) agreeing upon a governance framework, and (iii) developing a management and monitoring plan. The fourth theme that emerged as a cross-cutting issue is public participation which is crucial in the entire ecological connectivity process. These four themes (Figure 1) are used to structure this guidance note, and present challenges faced, lessons learned and recommendations for improving connectivity conservation planning and implementation. The best practices mentioned in this note and these four themes are applicable to any project manager or team member working on connectivity conservation and designing or implementing corridors.

Figure 1: **Key technical themes identified by ASL and GWP teams as highest priority**



3. KEY THEMES IN PLANNING AND IMPLEMENTING CORRIDORS AND CONNECTIVITY CONSERVATION

3.1. Spatial connectivity planning

Spatial planning uses maps to make decisions about the use of land, for example for infrastructure development, housing, resource extraction, or biodiversity conservation. Spatial connectivity planning focuses on identifying and prioritizing areas important for maintaining or re-establishing connectivity between core habitat areas, populations, or protected and conserved areas. Data that inform connectivity maps include maps of species habitat suitability, land cover, linear infrastructure, and human population density. The steps of a typical workflow to develop connectivity maps are shown in Figure 2. Numerous tools are available for spatial connectivity planning, see here.

Figure 2: **Key steps of a typical approach to spatial connectivity and corridor planning.**

The final decision on where to focus for implementing corridors depends on a wide variety of issues, some of which can be analyzed *a priori*. Important components of corridor prioritization are the importance for species conservation, the feasibility of succeeding in protecting a corridor, economic costs of the conservation action needed, the probability that existing connectivity areas will be lost if no action is taken, and the benefit for climate resilient landscapes.

Spatial connectivity planning is crucial for allocating limited resources to areas most important for maintaining or re-establishing connectivity, thereby increasing the resilience of ecosystems that may be stressed by land degradation, isolation, and climate change. Yet it is a complex task impeded by a range of challenges. When ASL and GWP projects were asked to present case studies on spatial connectivity planning, only a few had developed spatial connectivity plans.

Challenges

- Deciding on the appropriate approach to connectivity planning is challenging because the process is complex and depends on clearly defining the connectivity conservation goals for a project and then choosing the most appropriate tool and approach to meet these goals.
- Spatial connectivity planning requires specialist expertise, such as knowledge of GIS, to compile, manage, and edit spatial data, and experience with using decision support tools and frameworks to identify the most important places for connectivity.
- Data may not be available on aspects relevant to modeling connectivity (e.g., species data, geographic data, socio-economic data). Further, a single corridor map based on current land cover and land use data does not take into account future land use changes, requiring additional consideration or modelling of potential change over time.
- Connectivity models based on habitat suitability may not accurately reflect how animals move through the landscape during dispersal or migration.
- Defining the boundaries of ecological corridors can be challenging because it needs to take both social and ecological factors into account to facilitate local community support for the implementation and management of the ecological corridor. Stakeholders and interest holders may not trust the process of producing the connectivity or corridor map because it can appear like a black box, and they may not agree with the boundaries shown on the map.

Lessons learned and recommendations

Planning and decision-making

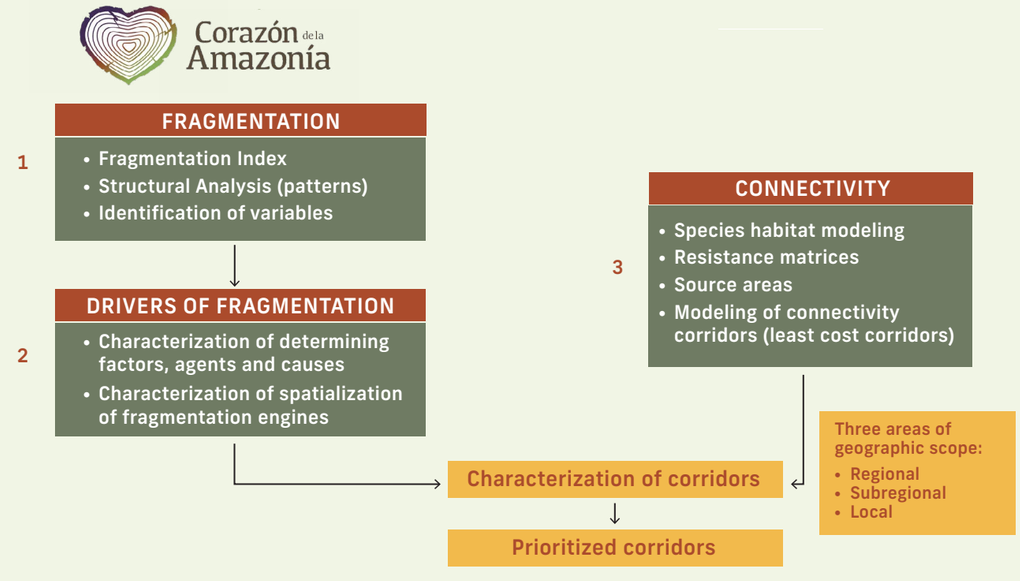
- In addition to, development of stand-alone connectivity/corridor plans, information on corridor locations should be included in broader land use plans and in protected and conserved area plans to help assign budget to corridor management and maximize synergies across activities and avoid potential conflict. Including connectivity in protected or conserved area plans will help ensure that individual protected areas will not become isolated as land use changes, or help restore connectivity if already lost.

  In **Botswana**, the GWP project conducted a connectivity analysis as a core part of an integrated land use management plan which is being crafted to harmonize and align land uses in the landscape between two protected areas.

- Suitable habitat for focal species and connectivity between habitats can be modeled for different projected future scenarios (e.g., new roads, modified fences, restored areas). Projected habitat and connectivity loss or gain in the landscape can then inform management decisions.

  In **Colombia**, the ASL Heart of the Amazon project team used this conceptual framework (Figure 3) to prioritize corridors after studying the drivers of fragmentation in the landscape.

Figure 3: **A conceptual representation of the methodologies used for studying fragmentation and drivers of fragmentation in the Colombian Amazon.**



Source: Heart of the Amazon project

Data and analysis

- Availability of data (particularly species data) needs to be considered when deciding how to model connectivity. Compiling available data and software options can help with determining the best-suited methodologies for modeling connectivity.
- Focal species' movement data are excellent for corridor modeling because they contain information about how the animals are responding to different landscape elements such as roads and agricultural fields.
- When only limited species data are available, corridors can be modeled based on the degree of human impact such that corridors are routed through more natural areas. Increasingly, user-friendly tools are available to conduct connectivity analyses. Alternatively, connectivity experts can be brought into the project team to conduct connectivity analyses.

Community and stakeholder engagement

- Engaging communities in the entire connectivity planning process is important for sustainability and management of the connectivity plan (participatory planning, see section 3.4). Involving key players early on in the planning process increases the likelihood that the plans will be implemented and result in well-connected landscapes.

  In **Botswana**, communities, tribal administration authorities, government, landlords, civil society organizations, and academics were engaged to collaboratively develop Integrated Land Use Management plans that address connectivity.

- Defining the boundaries of ecological corridors in a participatory planning process provides clarity for local communities and stakeholders and can decrease conflict over land uses. Parameters should preferably be agreed upon by stakeholders and interest holders.
- Transparency is key to building trust in connectivity maps among stakeholders and interest holders. Translating the science of connectivity modeling in an easy-to-understand way requires the will to do so and good communication skills.

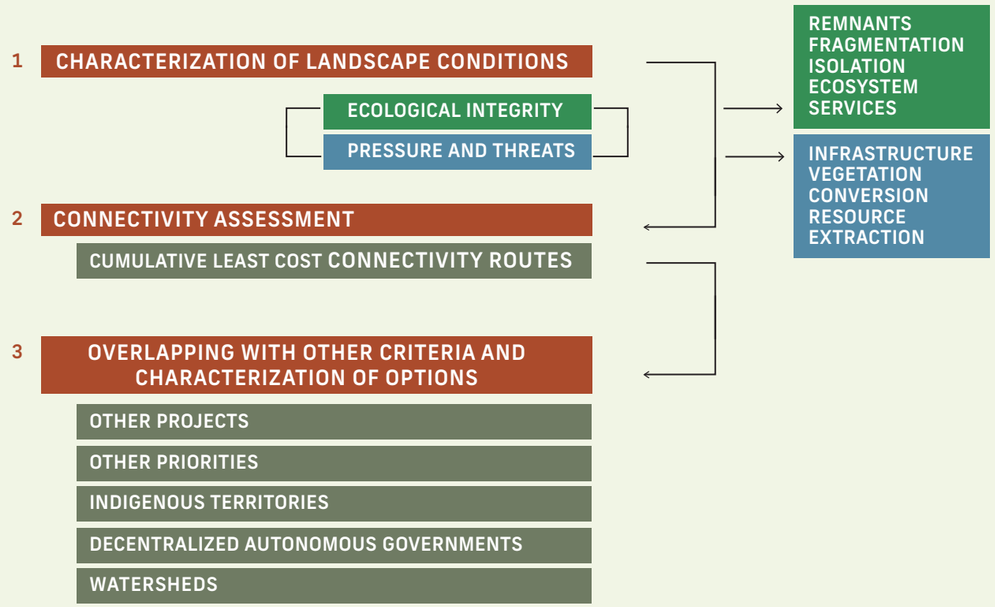
Consideration of both ecological and socio-ecological factors

Including analysis of both ecological and social parameters when determining corridor boundaries is important because it helps identify areas that are essential for maintaining ecological processes and promoting species movement, while consideration of social parameters ensure acceptance and support from local stakeholders.

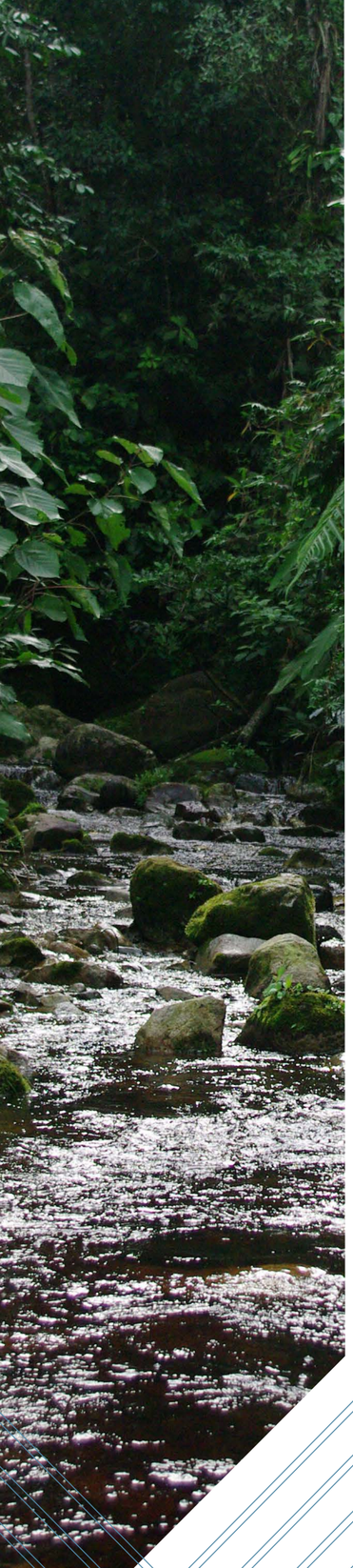
In **Bhutan**, corridor boundaries of the 2012 national ecological corridor plan have recently been adjusted following a scientific and transparent process that included a set of ecological and social parameters appropriate for the socio-ecological landscape. For example, ecological parameters included the level of disturbance, minimum corridor width at narrow constrictions (bottlenecks), presence of rare species, and topographic diversity (which facilitates animal movement in changing climatic and environmental conditions).

In **Ecuador**, the ASL project team included social parameters when delineating corridors including the locations of Indigenous territories, of local autonomous governments, of properties of landowners with previous participation in conservation programs, and of communities with a commitment to conservation (Figure 4).

Figure 4: **Process of identifying (steps 1 and 2) and delineating (step 3) corridors between protected areas taken by ASL project in Ecuador.**



Source: Presentation on connectivity corridors in two priority landscapes in the Ecuadorian Amazon Region



3.2. Governance of ecological corridors

Clear governance[3] arrangements are needed to address drivers of fragmentation such as deforestation, farming, and human-wildlife conflict in a systematic and impactful way. Governance in the context of ecological corridors refers to the process of making decisions towards the common goal of restoring and maintaining connectivity via corridors. Building an effective governance structure is particularly important in geographies with diverse landownership and land uses, because it offers a mechanism for participation of different stakeholders (landowners, local communities, and other stakeholders and interest holders) across sectors. Involving a diverse range of stakeholders in early stages of project development (e.g., the spatial planning phase - see section 3.1) to develop a shared vision of a connected landscape can increase the willingness of potential partners to participate in corridor governance.

An effective governance structure can ensure information exchange and ongoing dialogue, thereby giving partners and communities a sense of ownership and responsibility. Understanding stakeholder roles and responsibilities, power dynamics, how agreements are made, and who makes decisions and how, is important for setting up effective governance structures. Inter-institutional and inter-sectoral committees (i.e. platforms or alliances) created for an ecological corridor, or for multiple corridors in the same landscape, can be effective corridor governance structures.

3 Governance is the process of making and implementing decisions within an institution or society. It can also be described as the process of choosing the right course among the stakeholders involved in a collective problem that leads to the creation, implementation, or reinforcement of acceptable conduct or a common vision.

Challenges

- A lack of political support for ecological corridors can make creating durable governance structures challenging.
- Ensuring meaningful participation in governance structures by different types of stakeholders in the landscape, and at different levels (national, regional, and local) can be difficult. Impeding factors include uneven power dynamics in different cultures and societies, lack of capacity of some stakeholders to attend and understand stakeholder consultations, and lack of will by some stakeholders to involve minorities.
- Different stakeholders often have diverging mandates and objectives which are not aligned and there is no compromise to achieve effective governance.
- Inconsistent leadership and funding threaten the long-term sustainability and effectiveness of governance structures.

Lessons learned and recommendations

Political and institutional support

- Political support can be increased by working with national governments to draft laws or policies that support meeting international obligations towards advancing connectivity (e.g., the Kunming-Montreal Global Biodiversity Framework adopted by the 15th Conference of the Parties (CoP-15) to the Convention on Biological Diversity).

In **Ecuador**, Ministerial Agreement 019 (2020) spells out guidelines and technical criteria for the design, establishment, and management of connectivity corridors. This provides the impetus for building strong governance structures.

- Working with governments at different levels ensures their buy-in and commitment to the process as well as facilitating the integration of land use plans into local management instruments.

Meaningful engagement of stakeholders

- Promoting inclusive development of a common vision for a connected landscape can increase participation of diverse groups in governance of ecological corridors by making sure that the benefits of corridors are known and accessible by all stakeholders. Clearly communicating that people are part of a corridor improves support and engagement in governance structures.

In **Ecuador**, landowners ensure ecological connectivity is maintained by practicing sustainable agriculture approaches in corridors linking protected areas.

- Applying public participation tools (e.g., scenario planning, participatory systems mapping, stakeholder analysis, see section 3.4) can help governance bodies agree on goals and best strategies to achieve a common vision.
- Developing a participatory management plan that includes a roadmap with agreed roles and responsibilities and prioritizes actions to be addressed in the short (~0-4 years), medium (~5-10 years) and long term (~>10 years) can be a powerful mechanism to manage diverging objectives of different stakeholders.
- Promotion and development of financial and non-financial incentives can help motivate landowners and local communities to participate in corridor governance.

In **Bhutan**, communities located in corridors benefit from wildlife-based tourism and thus are more likely to be involved and engaged in the process.

Sustained funding and relevance of governance structures

- Exploring and agreeing upon the financial mechanisms for managing corridors in early stages of a project, ideally at the conception stage, can ensure the financial sustainability of interventions over the long term. Developing cost-sharing mechanisms when different conservation projects overlap is another approach to securing financial resources for corridor governance.
- Providing continued capacity building for relevant stakeholders involved in committees using a gender-inclusive and intercultural approach helps ensure the effectiveness and longevity of committees.
- Fostering participatory, science-based mechanisms for monitoring and evaluation of goals, strategies, and investments can be a motivation for continuing stakeholder engagement in governance structures.

3.3 Corridor and connectivity management and monitoring plans

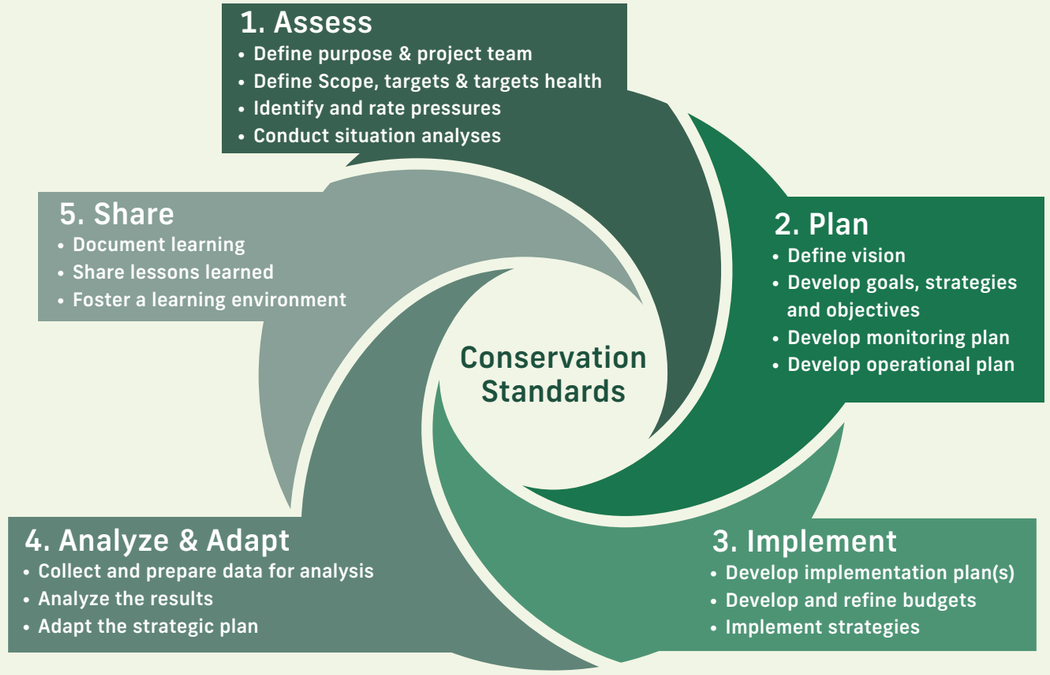
Designing management and monitoring plans is an important part of corridor and connectivity conservation efforts. These plans should contain the goals and objectives for a given corridor and details about how they will be achieved. They need to specify the *who* and *how* of implementing actions and monitoring progress over time.

An adaptive management approach – which is the integration of design, management, and monitoring to systematically test assumptions in order to adapt and learn – is vital to good decision-making[4]. The fundamental questions answered in an adaptive management process are: Are we doing the right things? Are we doing them well? Are we achieving our desired impact? Thus, monitoring and assessment are key to adjusting management actions to achieve desired outcomes.

A useful tool is the adaptive management cycle as described by the Conservation Standards for the Practice of Conservation (Figure 5). The cycle consists of five phases (Assess, Plan, Implement, Analyze & Adapt, and Share); being a cycle means that the phases are informing each other. Developing a management (or operational) and monitoring plan is part of the planning phase. The Standards contain a set of clearly described steps for assessing threats, targets, goals, and objectives of conservation projects and can be applied to connectivity conservation projects. The Standards also give guidance to developing action and management strategies including implementation and monitoring plans.

4 Salafsky, Nick, Richard Margoluis, and Kent Redford. 2001. Adaptive Management: A Tool for Conservation Practitioners. Washington, D.C.: Biodiversity Support Program Adaptive Management.

Figure 5: **The Conservation Standards for the Practice of Conservation is a standardized, globally agreed upon adaptive management approach developed over decades by leading conservation organizations (Open standards for the practice of conservation 4.0, 2020, https://conservationstandards.org).**



Challenges

- While the need for management and monitoring plans is well known, and the importance of monitoring for adaptive management acknowledged, there is a paucity of these plans for connectivity-focused projects, including in GWP and ASL projects participating in the knowledge exchange series. This may be due to the lack of funds, resources, capacity, or time in developing management and monitoring plans.
- Defining specific, relevant indicators and deciding which data to collect and how to collect them can be difficult.
- Developing protocols for data storage, management, and access is an important step to build a sound monitoring system but requires special expertise and long-term financial resources to maintain such systems.
- Securing long-term, sustained funding for monitoring activities can be a big challenge because most project funding is time-bound, and connectivity monitoring is meaningful when done over a long period of time.

Lessons learned and recommendations

Developing plans

- For connectivity-focused projects, management and monitoring plans are critical to ensure that the actions taken, and the money spent, are a good investment and that goals and objectives are met.
- Having clarity about the threats to connectivity and the connectivity targets, goals, and objectives helps to identify appropriate monitoring activities and timeframes.
- Collaboratively developing management and monitoring plans helps ensure buy-in and support for connectivity and facilitates the process of deciding who is responsible for which action in the management and monitoring plan.

In **Colombia**, diverse stakeholders - indigenous groups, local communities including the youth, protected area representatives, and conservation organizations - came together to sign an International Agreement on Jaguar Conservation, whose focus is on connectivity conservation in the region.

In **Botswana**, a similar process engaged communities, tribal administration authorities, government, landlords, civil society organizations, and academics to collaboratively develop Integrated Land Use Management plans that address connectivity.

- An adaptive management table (see example in Figure 6) is a useful tool when developing a management and monitoring plan. It can help consider the goals, objectives, and strategies, expected outputs and outcomes, the indicators, trigger levels, and potential management responses needed when the desired outputs or outcomes are not achieved. Adaptive management tables can also consider baseline conditions, monitoring methods, monitoring timelines, and who is doing the monitoring.

Figure 6: **The adaptive management table used in an interactive group activity in the knowledge exchange series. A comprehensive adaptive management table may need to include columns for the baseline, monitoring methods, monitoring timelines, who is doing the monitoring. Source:** Delta Stewardship Council 2020**. Guidance on how to develop monitoring plans is also available in the Open Standards for the practice of conservation 4.0 webpage at** https://conservationstandards.org/resources

ADAPTIVE MANAGEMENT TABLE

Goals	Objectives	Expected Outputs and Outcomes	Monitoring Category	Indicators	Trigger level (related to indicators)	Potential Management Response
Broad statements that propose general solutions	*Quantitative specific narrative statements of desired outcomes that allow for evaluation*	*Output: On- the-ground implementation and management actions Outcome: Ecosystem responses to management actions*	*Administrative physical, ecological, social, other*	*How are you measuring progress towards your objectives?*	*Level or threshold at which a change in management is needed*	*Specific management action you will put in place if trigger levels are not met or if you are not achieving your objectives*
Maintain or improve structural connectivity between the protected areas	Protected small, remaining natural areas	Output: Formally protect administrative remaining natural areas in corridor where feasible Outcome: Maintaining one aspect of structural connectivity		# of patches protected OR # of ha protected	10% increase in # ha protected by (year) OR 2 additional patches protected by (year)	Increase outreach to private landowners, increase effort to work with local administration or zoning

Indicators and data collection

- Good indicators relate to a project's goals, objectives, and strategies, and are specific, measurable, achievable, relevant and time-bound (SMART). Indicators can be administrative, social, or ecological – as illustrated in Table 1 – and a mix of all types might be needed to measure the achievement of connectivity goals.
- Methods of data collection should be accurate, reliable, cost-effective, feasible, and appropriate. Standard operating procedures for data collection and monitoring should be developed and followed to ensure long-term viability and data quality.
- A data management plan detailing where data are stored and who manages them is helpful. Data may be stored and managed by, for example, agencies, universities, or NGOs. International databases are available to store, manage, and regulate access to certain types of data (e.g., camera trap data, movement data, roadkill data).
- Incorporating connectivity considerations into existing monitoring schemes can be an effective way of ensuring long-term funding for connectivity monitoring.

In **Colombia**, modelling of potential future land use change trends and monitoring deforestation to identify drivers and hotspots has also helped establish early warning systems for loss of connectivity.

Table 1: **Range of indicators to measure progress**

TYPE OF INDICATOR	DEFINITION	EXAMPLES
Administrative (Monitoring administrative measures helps with project assessment).	Measure performance over time for a specific objective[5]	• Number of workshops conducted that share lessons and inform about connectivity • Number of peer exchanges with local communities, agencies, and organizations • Number of agreements signed with local actors • Fraction of high-priority hectares that are newly protected or conserved
Social	Indicators that quantitatively measure social phenomena	Monitoring ecosystem services and other co-benefits of ecological corridors provides information about this aspect of corridor conservation., examples: • Decreased human-wildlife conflict incidences • Improved water quality • Improved livelihoods Because social capital is critical for community involvement in connectivity conservation, monitoring change in underlying social factors can inform the social process (governance, communication, etc.).
Ecological	Indicators that communicate information about ecosystems and the impact human activity has on ecosystems[6]	Monitoring of structural connectivity involves measuring changes in landscape composition and configuration over time. Remotely sensed data collected by satellites at frequent intervals are useful for identifying changes in land cover. Field monitoring is more resource intensive but can provide additional, detailed information The ultimate objective of connectivity conservation is to preserve and restore functional connectivity – movements of individuals, species, genes, and propagules that sustain healthy natural systems. Because structural indicators cannot directly measure these outcomes of connectivity indicators of functional connectivity are useful. Examples: • Changes in land cover • Presence of species in a corridor • Indication of gene flow

5 Fitz-Gibbon, C. (1990). Performance indicators, Bera Dialogues No 2. Multilingual Matters

6 Bertollo, P. (1998). "Assessing ecosystem health in governed landscapes: A framework for developing core indicators". Ecosystem Health. 4: 33–51. doi:10.1046/j.1526-0992.1998.00069.x

3.4. Public participation in corridors and connectivity

Public participation[7] in connectivity conservation and management is critical across all stages of planning and implementation. Public participation helps build trust, legitimacy, and credibility; builds a foundation to jointly set priorities at a landscape scale; and helps minimize trade-offs and maximize synergies, plan in a systematic way and think strategically about long-term investments. Without public participation, connectivity conservation projects will be difficult to implement because long-term collaboration and coordinated action with local communities and other stakeholders and interest holders is key to success. Due to the complexity of issues related to corridor boundaries, public participation in decisions regarding a corridor will ensure that projects do not inadvertently compromise existing legitimate rights (including collective rights, subsidiary rights and the rights of women) for those living in the area who will be impacted by a corridor project. Rules of thumb for effective public participation are to be open, inclusive, diverse, transparent, reflective, have shared visions, look long-term, and develop a shared culture.

Challenges

- Initiating and maintaining public participation takes time, effort, and resources. Engagement of local communities, including securing of Free, Prior and Informed Consent as required, is an ongoing process requiring targeted resources. If projects do not plan for public participation from the start, sufficient budget or time might not be set aside for the process to be meaningful or effective. Ultimately this can lead to delays or potential grievances and require restructuring of project activities.
- A lack of trust of stakeholders in the entity facilitating the public participation process, or in the process itself, can be a serious challenge. It may originate, for example, from a history of ignoring stakeholder interests, or stakeholders perceiving meetings as being highly biased towards one group of stakeholders. Historic conflicts can also influence trust and engagement, such as past conflicts over land use, experience with human-wildlife conflict, the perspective that conservation is an obstacle to development, or community perceptions of decision-making by governments in favor of conservation with disadvantages for landowners.
- A lack of interest among stakeholders to participate may cause, among other challenges, difficulties ensuring inclusion of diverse groups and incorporating a diversity of views and preferences.

Lessons learned and recommendations

- Planning for and articulating clear community engagement methods can ensure consistent interaction over time, which increases trust.
- Even before starting the planning phase, communicating the benefits of connectivity and co-benefits of ecological corridors to both ecosystems and people can help increase understanding by and interest of local communities.
- Direct community participation in projects that focus on wildlife can be an effective method for increasing stakeholder engagement.

  In **Colombia**, landowners participated in wildlife monitoring by allowing the installment of trail cameras on their lands and reporting sightings using the Wildlife Insights trail camera monitoring platform.
- Providing diverse opportunities to engage different parts of the community (including women, youth, elders, vulnerable groups) increases the likelihood of community engagement and participation in conservation and corridor projects.

  In **Bhutan**, standard questionnaires were developed to consult residents and inform corridor delineation.

  In **Colombia**, engagement opportunities included farmer-to-farmer education and knowledge sharing, a radio program about the project, and installing effective fencing to protect domestic animals from jaguars.
- Proactively involving stakeholders in planning corridors can overcome negative earlier experiences. There are a range of tools available to boost public participation (see box 1).

7 Public participation is the inclusion of the public in the activities of an organization or in a project. It generally seeks and facilitates the involvement of people potentially affected by or interested in a decision.

Box 1: **Potential tools to support public participation**

Stakeholder analysis is a useful tool for determining who to engage in the process of corridor planning and implementation. Questions to ask include: Which categories of stakeholders need to be included? Where are they based? What are the engagement transaction costs? How often will you engage them? In what way will you engage them? To categorize the different stakeholders, the following questions are helpful: Who is the organizing group (small core group building the plan) and the participating group (broader mix of key stakeholders)? Who will take ownership for implementing outcomes? Who will implement the strategy? Who are you trying to influence? Who will influence your process?

Participatory systems mapping refers to a group of stakeholders collaboratively developing a simple causal map (or conceptual model) of an issue during a workshop. The map shows underlying drivers, risks, and interconnected factors and their causal relationships. A causal map for a connectivity project may include factors that drive fragmentation, the factors that limit landholders in maintaining connectivity, and the factors related to the economics of development and conservation. The power of this tool is that different forms of knowledge can be combined to build an awareness of the nature of the issue at stake and broaden the participants' horizons to imagine new solutions. This approach helps visualize where local actors and interests lie, as well as gain a better understanding of how they may be engaged and benefit from a project.

Scenario planning is a strategic planning method to make, for example, long-term land use plans. Scenarios are plausible descriptions of how the future may look based on a set of assumptions. Scenarios can be narrative, or changes may be measured with numbers or indicators. In corridor projects, they can help make informed planning and management decisions with regard to where best to restore areas for connectivity or apply other land management actions.

Horizon scanning is the systematic examination of opportunities or risks at the margins of current thinking. It can, for example, be used to identify early signs of new development (e.g., a new road or railroad) threatening connectivity in an ecological corridor. In general, it can help detect key disrupters that will have a dramatic impact on focal landscape and its people.

4. CONCLUSION

Maintaining and restoring ecological connectivity is key for effective biodiversity conservation and landscape resilience to climate change which in turn benefit local communities and underpin sustainable development.

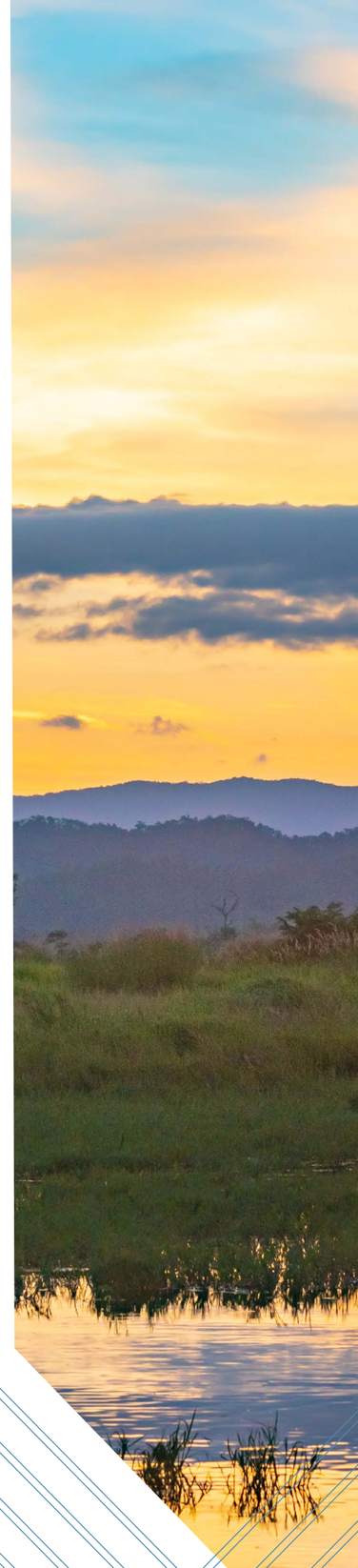
Three important steps in the process of connectivity conservation, emphasized across the knowledge series, are:

- Creating a vision for a connected landscape
- Agreeing upon a governance framework
- Developing a management and monitoring plan

These steps need to be supported throughout by a participatory approach involving stakeholders along the process.

Despite the myriad challenges identified in connectivity conservation practice, in many countries there has been significant progress made in establishing and strengthening methods to effectively plan, manage, and monitor ecological corridors. There has been a realization that connectivity conservation can serve as a tool to integrate several conservation and development agendas at a local, regional, and national level.

A common theme that emerged throughout the knowledge series was the fundamental importance of engaged and empowered communities for connectivity conservation. This involves making this engagement inclusive (e.g., in gender, indigenous and vulnerable people), transparent, and fair. This theme pervaded other technical topics including planning and mapping ecological corridors, governance, and management and monitoring plans. Furthermore, funding and political will to sustain partnerships, continued capacity building, and effective use of adaptive management frameworks can support success.



A clear outcome of the knowledge exchange series was highlighting the value of sharing experiences and lessons learned across projects with similar challenges. Project teams benefited from learning about not only spatially and topically diverse projects, but also from projects in diverse phases of planning and implementation, with South-South exchange amplified by the collaboration between the ASL and GWP programs.

Projects around the world have made good progress on connecting species and ecosystems, and continued knowledge exchange and sharing of lessons will help countries capitalize on best practices and improve the successful implementation of conservation efforts.

TOOLS AND RESOURCES

The ASL and GWP produced an online resource library of literature, tools, websites, and resources for ecological connectivity and corridors. The library includes resources relevant for species and habitat connectivity in focal ASL and GWP regions and globally, as well as relevant disciplines such as social science, equitable stakeholder engagement, and linear infrastructure planning. This resource can be accessed as an eBook at: https://spatialagent.org/ECCRL/.

A key document for connectivity conservation are the Guidelines for Conserving Connectivity through Ecological Networks and Corridors published by the International Union for the Conservation of Nature (IUCN). The guidelines have been translated into Spanish, French, Mongolian, Korean, and Chinese. The resource can be accessed at: https://portals.iucn.org/library/node/49061.

ANNEX 1. List of presenters

EVENT	COUNTRY / ORGANIZATION	PRESENTER
Kick off workshop	World Bank consultant to ASL and GWP	Annika Keeley*
	World Bank consultant to ASL and GWP	Diego Juffe Bignoli*
Workshop 1 "Planning for Connectivity Conservation"	GWP Botswana	Mbiganyi Frederick Dipotso
	GWP Botswana	Sam Cushman
	ASL Colombia	Uriel Murcia
	Amazonian Scientific Research Institute (SINCHI)	Luisa Castellanos
	Amazonian Scientific Research Institute (SINCHI)	Jorge Arias
	Global Conservation Solutions	Josh Noseworthy
	ASL Ecuador	Jose Luis Naula
	ASL Ecuador	Carolina Rosero
	GWP Bhutan	Jigme Dorji
	Center for Large Landscape Conservation	Amrita Neelakantan
	African Conservation Centre	Lucy Waruingi
Workshop 2 "Management Plans and Connectivity"	National Coordinator of Small Grants Program, Ecuador	Ana María Varea
	WWF India	Prachi Thatte
	ASL Colombia	Viviana Robayo
	ASL Colombia	Wilfredo Pachon
	ASL Colombia	Miguel Mejia
Public webinar "Public Participation in Corridors and Connectivity Conservation"	School of Geography and Sustainable Development at the University of St Andrews	Jessica Thorn
	ASL Colombia	Wilfredo Pachon

* Annika Keeley and Diego Juffe facilitated and presented in all events.

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