EVALUABILITY ASSESSMENT FINAL REPORT

AMAZON ALIVE ACTIVITY

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Contractor: Panagora Group, Inc.

COR: Omar Lopez

Authors: Kelly Jones (Team Leader), Camilo Andrade (Development Programs Expert), Paula Rodriguez (Community Development Expert), Marco Velasquez (Legal Expert), Eduardo Molina (Geographic Information Systems Specialist), Jose David Panqueva (Survey and Data Specialist), Orlando Gracia, Luisa Fernanda Cardona, Juan Guillermo Bedoya, Javier Rodriguez.

Panagora Group Contacts:
Ana María Rivera
Chief of Party
Carrera 7 No. 74B-36, Piso 6, Bogotá, Colombia
Email: arivera@panagoracolombia.net

Orlando Gracia
Lead Evaluation Expert
Carrera 7 No. 74B-36, Piso 6, Bogotá, Colombia
Email: ogracia@panagoracolombia.net

Francis Okello
Program Director
8601 Georgia Avenue, 8th floor, Silver Spring, MD, USA
Email: francisokello@panagoragroup.net

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ACRONYMS

AA	Amazon Alive
CCC	Combating Conservation Crime
CONALDEF	Consejo Nacional de Lucha contra la Deforestación
CONPES	Consejo Nacional de Política Económica y Social
EA	Evaluability assessment
GOC	Government of Colombia
IE	Impact evaluation
IP	Implementing partner
KI	Key informant
KII	Key informant interview
LAC	Latin America and the Caribbean
LQ	Learning question
MDE	Minimum detectable effect
NGO	Non-governmental organization
NRM	Natural resources management
PE	Performance evaluation
PES	Payment for ecosystem services
RCT	Randomized control trial
REDD+	Reducing emissions from deforestation and forest degradation
QED	Quasi-experimental design
SINCHI	Instituto Amazónico de Investigaciones Científicas
SOO	Statement of Objectives
TOC	Theory of Change
UNDP	United Nations Development Program

EXECUTIVE SUMMARY

This Evaluability Assessment (EA) of USAID/Colombia's Amazon Forests and Biodiversity Activity (also known as Amazon Alive, or AA) reviews the intervention logic, suggests modifications to it and identifies assumptions about the planned intervention and evidence gaps, to provide recommendations on appropriate evaluation designs and their estimated costs. In response to Colombia's recent surge in deforestation and biodiversity loss, the AA Activity has two main objectives: (1) improve the effectiveness of environmental crime prevention and prosecution; and (2) improve the effectiveness of forest conservation and management. The long-term intended impacts of AA are to reduce deforestation and biodiversity loss in the arc of deforestation in the Colombian Amazon. The key sources of information for this EA included a desk review of USAID reports, Government of Colombia (GOC) documents, academic literature, and qualitative data collection from 21 USAID Key Informants (KIs).

The desk review and KIs point to four suggested strategies for Objective 1 of AA. The strategies include: (1) strengthen policies, regulations, and rules; (2) strengthen law enforcement capacity; (3) strengthen reporting by indigenous/local communities; and (4) improve forest traceability systems. Similarly, The EA team identified four suggested strategies for Objective 2. These strategies are: (1) stakeholder engagement and coordination; (2) strengthen formal tenure rights and security; (3) land-use planning and zoning; and (4) livelihood-focused approaches. Collectively these eight strategies are expected to lead to several short, medium, and long-term outcomes, and ultimately the long-term expected impacts of reducing deforestation and biodiversity loss. To evaluate these strategies, the EA team suggests using indicators along the full theory of change (TOC) for each objective and a combination of primary and secondary data.

Key learning interests for AA were identified by KIs. For Objective 1, 11 KIs discussed learning interests related to the strategy "strengthen policies, regulations, and rules", with the majority of KIs describing interests that centered around understanding the conditions that lead to effective coordination efforts. Five KIs each discussed learning interests around "strengthen law enforcement capacity" and "strengthen reporting by indigenous/local communities". For Objective 2, 13 KIs mentioned learning interests related to "livelihood-focused approaches" and seven KIs talked about learning interests around "strengthen formal tenure rights and security". Additional themes across multiple KIs included learning interests related to metrics for measuring deforestation and biodiversity loss and engagement of and impacts on indigenous peoples.

Based on the desk review, KIs, and the TOC outlined for each Objective, the EA team recommends the following evaluation designs: (1) an outcome performance evaluation (PE) for Objective 1 strategies; (2) an outcome PE for Objective 2 strategies focused on "land tenure" and "land-use planning"; (3) a process PE for Objective 2 strategy "stakeholder engagement and coordination"; and (4) an impact evaluation (IE) for Objective 2 "livelihood-focused approaches". Whether desk-based, or field-based, IE designs could be possible for the Objective 2 strategies "strengthen land tenure" or "land-use planning and zoning", but more information on specific sub-strategies and geographies is needed before feasibility can be determined. For an IE of livelihood-focused approaches, the evaluation design options include using an experimental or quasi-experimental design with the assignment of treatment and control groups at either a clustered geographical unit (e.g., community) or individual unit (e.g., household). Considering the strengths and weaknesses of these design options, the most rigorous option would be to use an

experimental or quasi-experimental cluster design to assign treatment and control units. This design option would minimize selection bias and allow spillovers to be tested.

The three key recommendations from the EA team are as follows:

1. The EA team recommends that USAID consider proceeding with an IE design of "livelihood-focused strategies" in the AA Activity. The suggested approach can be an experimental or quasi-experimental cluster design. There were significant learning interests expressed by USAID KIs around this strategy, and the unit of analysis (community, administrative unit, or households) makes it feasible to conduct a rigorous IE.

2. The EA team recommends that an outcome PE be conducted for two of the Objective 1 strategies, specifically, "strengthen policies, regulations, and rules" and "strengthen law enforcement capacity", to inform USAID learning interests and because this is a newer strategic area for USAID/Colombia. While this leaves out "community monitoring", it may be feasible to add questions related to community monitoring in the IE above if the strategies occur in the same geographies.

3. The EA team suggests that a desk-based or field-based IE for the Objective 2 strategies "land-use planning and zoning" and "strengthen formal tenure rights and security" be assessed for feasibility when more information becomes available for these strategies.

For any of these evaluation design options to move forward the following is needed:

1. The evaluation team and implementing partner (IP) need to work closely together to clarify strategies, update the TOC for all strategies, and clarify the unit of assignment of all strategies.

2. The evaluation team and IP need to work closely to identify potential geographies and decide on the best assignment strategy for treatment and control groups for any IE designs.

3. The evaluation team and IP need to communicate closely throughout the implementation of the project to clarify the timeline, ensure progress is being made, and decide when midline and or endline data collection occurs.

Given the above, and because it is too soon to make a final determination on the most feasible and cost-effective evaluation design at this stage until additional AA implementation details are known, the EA team recommends that an evaluation design team move forward with preliminary planning in collaboration with the IP for the PE and IE design options. Specific next steps include: (1) revising the TOC for specific sub-strategies that the IP has identified; (2) discussing the envisioned timing and structure for rolling out all strategies across the identified geographic areas; (3) discussing the best allocation of treatment and control units for the IE design based on the identified potential geographies; (4) selection of an appropriate and feasible unit of assignment for the IE; and (5) once the potential units of the assignment are known for an IE, to confirm that a sufficient number of strong potential candidates for the treatment and control groups exist for either an experimental or quasi-experimental IE design[1]

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[1] The unit of assignment is the lowest (usually geographic) unit at which an intervention decision is made, which will typically be a municipality, district, subdistrict, agency, community, group, or firm.

1. INTRODUCTION

This evaluability assessment (EA) final report for USAID/Colombia's Amazon Alive (AA) Activity, presents an illustrative high-level Theory of Change (TOC), key learning interests, and a set of rigorous evaluation design options. The report is structured in seven main sections. This first section provides a general introduction to the purpose of the EA and the context of the AA Activity. Section Two reviews the methodology used in this desk-based EA. Sections Three through Six represent the core findings. Section Three outlines the TOC based on the qualitative data collected and desk review and presents illustrative results chains for the suggested strategies for the two objectives in the AA Activity. Section Four identifies the key learning interests for AA identified in qualitative data collection from USAID staff. Section Five presents the set of indicators identified by the EA and sources of data available for an evaluation. Section Six provides the illustrative evaluation design options for AA, with details on the strengths and weaknesses of the approaches, timeline, and estimated costs of the designs. Finally, section Seven provides the core EA recommendations for moving forward with a rigorous evaluation of the AA Activity.

EVALUABILITY ASSESSMENT PURPOSE

EA is the first step in the design of rigorous and cost-effective evaluations. The purpose of this EA of the AA Activity was to review the intervention logic, suggest modifications to it, and identify assumptions about the planned intervention and evidence gaps to provide recommendations on appropriate evaluation designs and their costs. The main purpose of this EA was to identify at least three design options for a rigorous evaluation that could include both impact evaluations (IE) for part or all the AA Activity, or performance evaluation (PE) if the EA concluded that an IE design was not feasible.

AMAZON ALIVE ACTIVITY BACKGROUND

In response to Colombia's recent surge in deforestation and biodiversity loss, the AA Activity has two main objectives: (1) improve the effectiveness of environmental crime prevention and prosecution; and (2) improve the effectiveness of forest conservation and management. AA is an integrated Activity designed to contribute to Colombian development by strengthening social cohesion, responsive governance, and environmentally sustainable economic development.

The AA Activity contributes to national targets on deforestation reduction stated in the Government of Colombia's (GOC) National Development Plan for 2018-2022, supports the implementation of the Integral Strategy for Deforestation Control and Forest Management from the Ministry of Environment and Sustainable Development, and promotes the National Security and Defense Policy. The Activity also contributes to USAID/Colombia's Country Development Cooperation Strategy goal of "A more stable, peaceful, and prosperous Colombia through inclusive governance and equitable growth" by supporting Development Objective 2, "Strengthen governance to meet citizen needs and increase citizen confidence in the state", and Development Objective 3 "Promote equitable and environmentally sustainable economic growth".

The overarching hypothesis of the AA Activity is that if the GOC, civil society, and the private sector are effective in controlling environmental crimes and conserving and sustainably managing forests, then deforestation and biodiversity loss in the Amazon region will be reduced. The Activity will focus on areas

inside the Amazon's deforestation arc that were highlighted by the GOC's Ministry of Environment and Sustainable Development in their Visión Amazonía Initiative[2] (Exhibit 1).
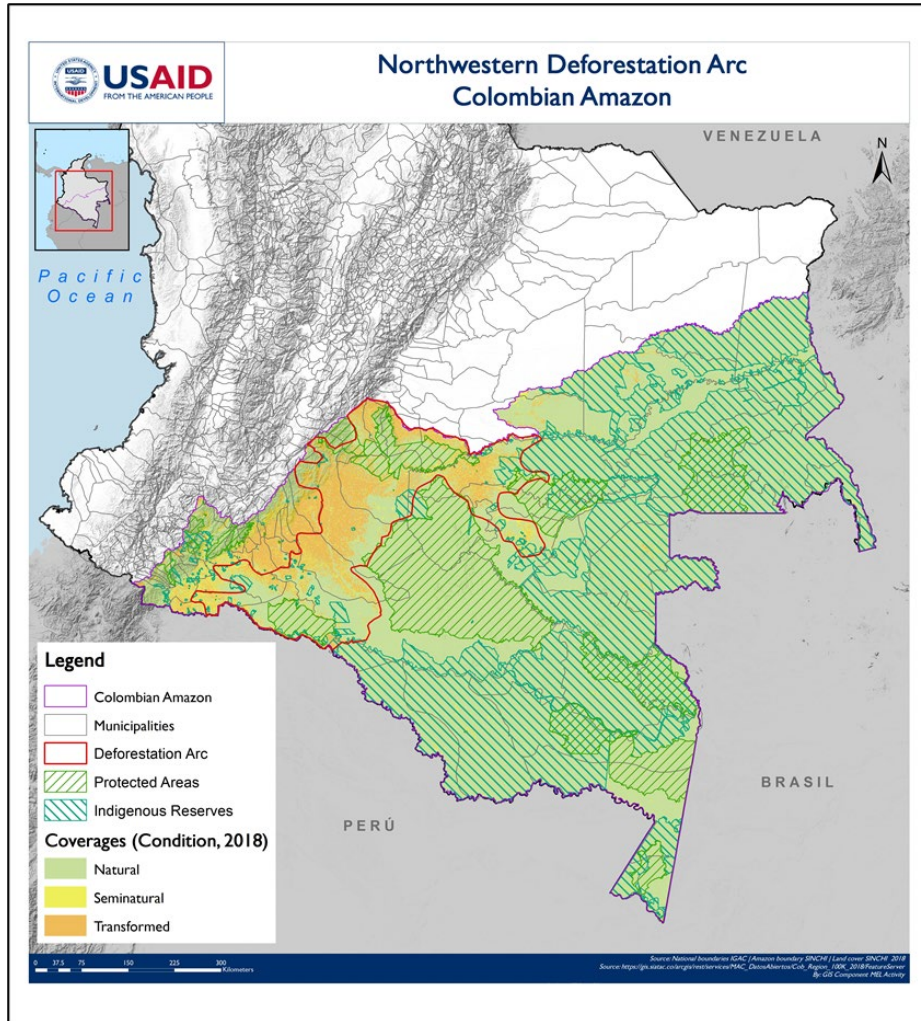

Exhibit 1. Arc of deforestation in the Colombian Amazon

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[2] https://visionamazonia.minambiente.gov.co/en/departments-where-vision-amazonia-works/

2. EA APPROACH AND METHODS

APPROACH

This EA comprised three stages to achieve its goals. The first stage included designing and planning; it involved reviewing and collecting available documents for desk review, compiling the list of Key Informants (KIs), developing the qualitative data instrument, and the EA design matrix, and presenting the methodology for approval. The second stage was the data collection and analysis; this included document analysis, qualitative data collection, and production of an Early Report. In this stage, the EA team reviewed the secondary literature, carried out the KI interviews (KIIs), and transcribed, coded, and analyzed the collected data. The third and final stage included the final presentation that communicated the results, conclusions, and recommendations; this phase includes the completion of this Final EA Report.

EVALUABILITY ASSESSMENT THEMES AND SUB-TASKS

The EA focused on the six themes and sub-tasks laid out in Table 1. The guiding questions laid out in the Scope of Work (SOW) and the specific questions that were addressed in this EA are listed in Annex I.

TABLE 1. OVERARCHING THEMES AND SUB-TASKS FOR THE EVALUABILITY ASSESSMENT		
THEMES		**SUB-TASKS**
I.	AA Intervention Theory of Change	Clarify the intervention, its key objectives, and associated results chains.
II.	Evaluation Questions	Confirm key learning interests, prioritized evaluation questions and issues of strategic interest for USAID and prioritize them.
III.	Capacity for Usefulness of Evaluation	Identify stakeholders that would benefit from an evaluation and the purpose of an evaluation.
IV.	Timing, Logistics, and Cost	Identify methodological challenges and constraints and determine logistics and costs of evaluation designs.
V.	Data Collection Availability and Quality of Information	Assess data needs and availability.
VI.	IE Design Criteria	Propose useful evaluation design methods, and their strengths and weaknesses.

DATA COLLECTION AND ANALYSIS

A desk review of the available literature and qualitative data collection served as the key sources of information in this desk-based EA. The desk review of documents particularly focused on relevant USAID reports and learning agendas and GOC policy documents. In addition to these documents, an assessment of the evidence base from the academic and grey literature was conducted around specific strategies relevant to the AA Activity. Systematic reviews, meta-analyses, and IE studies were prioritized when available for the literature review. Additionally, GOC and remote sensing secondary databases

were identified and reviewed to determine whether secondary data were available for the proposed evaluation designs.

Qualitative data were collected from USAID staff to gain a more detailed understanding of the Activity design, intended impacts, and key evaluation learning interests; interviews were only conducted with USAID personnel due to the procurement stage of the Activity. The EA team contacted 30 USAID personnel identified by USAID/Colombia to request interviews. After two rounds of follow-up requests, a total of 21 interviews were conducted (70 percent response rate). The KIs were based in the Colombian (12 KIs) and Washington, DC (9 KIs) offices. Interviews were conducted in English or Spanish, depending on the preference of the KI. A structured qualitative instrument was used to collect information on 12 questions related to the EA themes (Annex 2). Each interview was conducted by two EA team members, recorded, transcribed, and iteratively coded using a detailed codebook with the support of the MEL Activity. On average, interviews took 60 minutes to complete.

3. THEORY OF CHANGE

SITUATION MODEL

The EA team developed a situation model of the AA Activity as an initial step in the TOC development, to ensure that AA addressed key direct drivers related to the deforestation arc (Annex 3). This situation analysis was based on AA documentation, desk review, and expertise of the EA team, and followed the terminology and definitions suggested by the *Open Standards for the Practice of Conservation.*[3] In addition to identifying indirect and direct drivers of deforestation and biodiversity loss, the situation model includes key targets, including conservation targets and their link to ecosystem services and human well-being.

Using the situation model and the results chains presented below, the EA team concluded that as designed, the AA Activity is focusing most explicitly on the direct drivers (i.e., threats) of (1) land grabbing and (2) unsustainable agriculture, ranching, and forestry through addressing issues of weak governance and lack of sustainable livelihoods. The Activity focuses less explicitly on addressing the direct drivers (i.e., threats) of (3) energy and mining and (4) infrastructure.

RESULTS CHAINS

The EA team used the Statement of Objectives (SOO) from the AA solicitation, desk review documents, and KIIs to develop a high-level TOC for each of the objectives in AA. The TOC for each objective is depicted using a results chain, which is a visual diagram of a TOC. Development of the results chains at this stage provides clarity on the intervention logic and key assumptions, intended outcomes, and long-term expected impacts of the AA Activity. The TOC and results chains are illustrative and will need to be reviewed and updated with the implementing partner (IP) once specific strategies, sub-strategies, and geographies for the activity are determined.

OBJECTIVE 1

The SOO laid out three broad categories of strategies and approaches to be used by AA. Based on the desk review and KIIs, we mapped these three broad categories and strategies into four suggested strategies for AA (Annex 4). We used the terminology for strategies proposed by the Latin American and the Caribbean (LAC) Environment Combating Conservation Crime (CCC) Learning Program and Agenda.[4] We also linked the strategies to USAID's cross-mission learning agenda on Combating Wildlife Trafficking[5] and the results of the Security and Justice Sector Reform Project conducted in the Maya Biosphere region in Guatemala.[6] However, it should be noted that the AA Activity will focus on deforestation, and not on other environmental crimes included in the CCC Learning Program and

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[3] Conservation Measures Partnership, (2020). Conservation Standards. Retrieved from: https://conservationstandards.org/wp-content/uploads/sites/3/2020/10/CMP-Open-Standards-for-the-Practice-of-Conservation-v4.0.pdf
[4] USAID. (2020). Combating Conservation Crime Learning Agenda, Latin America and the Caribbean Environment.
[5] USAID. (2017). Combating wildlife trafficking cross-mission learning agenda.
[6] USAID. (2017). Results Of Specialized Environmental Justice Department of Petén, Guatemala. Report prepared under the Security and Justice Sector Reform Project (Contract No. AID-520-C-12-00004), implemented by Checchi and Company Consulting, Inc.

Agenda. These four strategies represent four of the five strategies proposed by the LAC CCC Learning Program and Agenda; the one not mentioned by KIs was "reduce demand for illegal products".

The specific sub-strategies under each strategy will need to be decided by the IP following a comprehensive scoping assessment to identify the important environmental crime activities in the implementation region and the relevant scope of actors. The KIs emphasized the need for holistic implementation of the four strategies to be effective. For example, one KI stated: "It is really important to come up with a holistic approach that addresses the priorities across what would be the environmental crimes law enforcement continuum so, it would be starting from prevention all the way through to adjudication." Additionally, KIs emphasized that if these four strategies are to be effective, then two pre-conditions are required: (1) territorial control of the Amazon Region by the state, and (2) coordination of USAID with similar initiatives or efforts to combat conservation crimes in the Amazon.

For the four strategies, the EA team assessed the available evidence that included USAID documents and a search of the academic literature. A summary of the evidence on these strategies can be found in Annex 5.

STRATEGY 1.1. STRENGTHEN POLICIES, REGULATIONS, AND RULES. Nearly all KIs (18 KIs) mentioned the importance of this strategy for AA. There were several suggested institutional arrangements for coordinating efforts to strengthen policies, regulations, and rules, including through CONALDEF (eight KIs); alternative existing GOC institutions (Fiscalía, Alta Consejería de Seguridad) (four KIs); and creation of a new body to coordinate institutional actors (15 KIs). Some specific actions suggested by KIs included: (1) clarifying the mandate and roles of institutions; (2) hold working sessions to develop a work plan around coordination of efforts; and (3) develop information systems to support and share efforts around crime prevention and prosecution. One KI stated: "One of the main areas of work should be inter-institutional coordination. It is necessary to define key actors, focal points of each institution, and working teams that gather permanently, addressing particular issues."

STRATEGY 1.2. STRENGTHEN LAW ENFORCEMENT CAPACITY. Sixteen KIs mentioned the importance of this strategy for AA, mainly in terms of capacity building within law enforcement. KIs emphasized that capacity building for law enforcement should focus on all stakeholders, including government, civil society, and private actors. They also suggested building the capacity of monitoring institutions such as Fiscalía General de la Nación, Procuraduría General de la Nación, Contraloría General de la República, and Defensoría del Pueblo, as well as the management of lands and natural resources (e.g., National Lands Agency, cadastral instances, notaries, etc.). Specific actions that were mentioned under this strategy included: (1) technical training of law enforcement on accountability procedures for environmental crimes (eight KIs); (2) development of communication skills to engage with citizens to gain their support in crimes prevention and prosecution (two KIs); and (3) development and use of appropriate technology (e.g., real-time deforestation alerts, drones, photos, etc.) around environmental crimes prevention and prosecution (three KIs). Related to law enforcement, one KI stated: "I would say capacity building with those key groups, with the Fiscalía, with the prosecutors, and with the judiciary and then probably with the investigators to make sure that they know what the environmental crimes are, what kind of reporting comes in, how they can use it to build and prosecute cases and things like that. And I think there's a lot of different ways to do that capacity building."

STRATEGY 1.3. STRENGTHEN REPORTING BY INDIGENOUS/LOCAL COMMUNITIES. Ten KIs mentioned the importance of this strategy for AA. The KIs felt that communities should play an active

role in environmental crimes prevention and prosecution and that community networks were an important structure for reporting crimes. As one KI stated: "We require first an effective monitoring system in place that would involve levels of state and non-state actors. So, I would see a vote for community-based monitoring to report illegal activity when it is identified, because the territories we are working in under Amazon Alive are significant and some of them are indigenous reserves and under the territorial control and management of indigenous communities." This strategy follows the suggestion of a USAID study that suggests community engagement in anti-poaching and anti-trafficking efforts is not only feasible but desirable because it can reduce crime and improve citizen security.[7] It should be noted, however, that the Colombian deforestation and forest management policy, CONPES 4021, does not mention community monitoring as a strategy to combat environmental crimes, but instead emphasizes the role of the state in combatting crimes.

A caveat to this strategy is that the safety of community leaders and monitors must be ensured. This was emphasized by the ten KIs, for example: "I believe that in this specific case we should work on communication issues and issues of self-protection, because if we do nothing to protect the lives of communities and leaders, that is, think that we are going to strengthen organizations, so they continue to defend the region and continue to generate collective action without any guarantee for the lives of the leaders, that is inadmissible." Safety is more of a concern for community monitoring programs when the perpetrators have no social ties to the community, which is likely the case in the AA geographies. There is clear documentation that murders of social leaders and environmental defenders have increased drastically in Colombia following the failed implementation of the 2016 Peace Accords, and more concerning, Colombia's crop substitution program has been linked to increases in social leader killings by more than 500 percent.[8] These unintended consequences underscore the extreme caution that must be taken when engaging communities in environmental crimes prevention and prosecution.

STRATEGY 1.4. IMPROVE FOREST TRACEABILITY SYSTEM. We included the LAC CCC strategy "improve forest traceability system" based on KI statements about the need to reduce illicit economies to address environmental crimes. Seven KIs talked about the need to control illicit economies, such as illegal mining, illicit crops, and wildlife trafficking, that lead to deforestation under strategies for Objective 1. This was also mentioned in the CONPES 4021 policy document for addressing environmental crimes. The EA team chose to include the major livelihood strategies to reduce illicit economies under Objective 2. However, two KIs specifically mentioned forest traceability under this theme, and this strategy is part of the LAC CCC Learning Program and Agenda. However, the current AA does not emphasize this strategy and we do not include this strategy in our evaluation designs below.

Using these four strategies, AA is expected to lead to several short-term, medium-term, and long-term outcomes that, if achieved, should result in the anticipated long-term impacts (Exhibit 2). Short-term outcomes include: (1) improved coordination mechanisms; (2) clarification and enforcement of rules and policies; (3) improved technical capacity for law enforcement; (4) safe community monitoring systems established; and (5) development of traceability systems for forest products. If these short-term

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[7] USAID. (2016). Rewards and Risks Associated with Community Engagement in Anti-Poaching And Anti-Trafficking. BiodiversityTechnical Brief.
[8] Llanes, L. (2020). Unintended consequences of alternative development programs: evidence from Colombia's illegal crop substitution. Bogotá: Universidad de los Andes, CEDE.

outcomes are achieved, then the Activity would lead to (1) improvement in preventive detection of environmental crimes; (2) improvement in willingness and ability of law enforcement to apprehend, prosecute, and convict environmental crimes linked to deforestation; (3) local communities' monitoring and reporting of deforestation related crimes; and (4) appropriate data systems in place to provide information for deforestation related environmental crimes prevention and prosecution. If these medium-term outcomes are achieved, then the long-term outcomes can be realized; specifically, (1) an increased number of convictions against environmental crime linked to deforestation offenders and (2) a reduced number of environmental crimes linked to deforestation. If these long-term outcomes are achieved, then the threats of illicit activities (e.g., illicit coca, mining) and land grabbing are likely to reduce. This reduction in threats should lead to the long-term impacts of reducing deforestation, biodiversity loss, and improved human well-being. Direct human well-being impacts from these strategies would include improved governance (transparency and accountability) and improved social outcomes (security and safety). Several assumptions underpin this TOC (Annex 6).
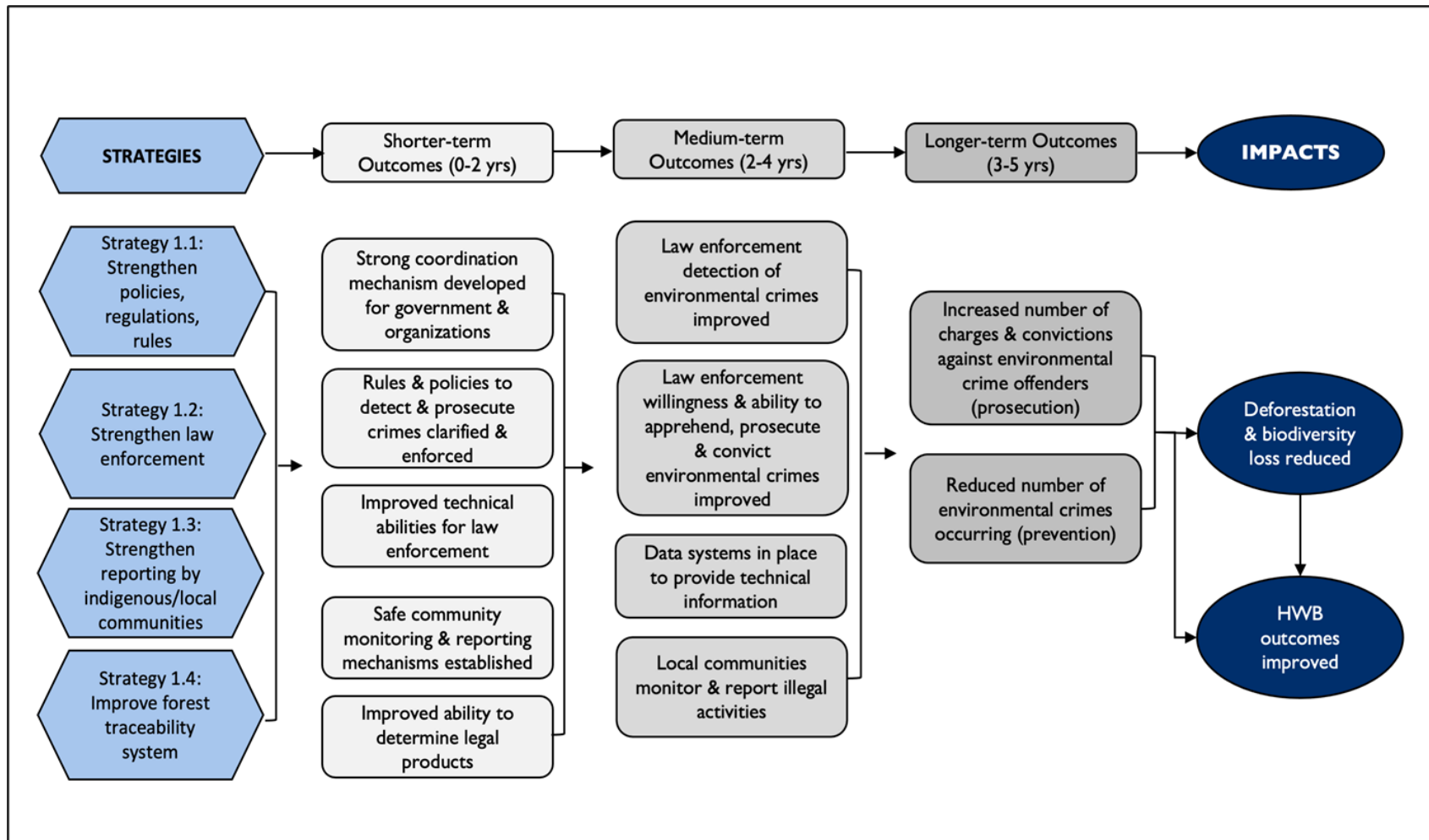
Exhibit 2. High-level theory of change for Objective 1

The SOO laid out four broad categories of strategies and approaches to be used within AA. Based on the desk review and KIIs the EA team recommends maintaining three of the four broad strategies, shifting the name of "market-based approaches" to "livelihood-focused approaches" and moving "adoption of strategic natural resources management (NRM)" into the livelihood-focused strategy. Additionally, participants suggested that "land-use planning and zoning" be added as a fourth strategy. These four strategies and the number of KIs referring to them can be found in Annex 7. One strategy that was not mentioned by KIs but was identified from the desk review was "strengthen national park governance". While there are fewer natural national parks (Exhibit 1) in the arc of deforestation, these parks are highly vulnerable to deforestation and have the risk of negative spillovers into the protected areas if communities and illegal actors shift deforestation behaviors to the national parks due to the implementation of AA strategies. Strengthening the national protected areas system was identified as a key strategy for USAID/Colombia and other stakeholders to address tropical deforestation in the Amazon.[9]

The specific sub-strategies and actions used by AA under each strategy will need to be decided following a comprehensive scoping assessment by the IP. The scoping assessment will identify important livelihood activities that are harmful to forest conservation and assess viable market opportunities, which vary across the region. A clear understanding of how communities and organizations value and manage the available resources before specific AA actions are implemented will lead to more opportunities for positive impact. Additionally, a thorough review of existing enabling conditions must be done to identify which specific strategies and sub-strategies are needed. Like Objective 1, for these four proposed strategies to be effective, KIs discussed the need for USAID to coordinate with similar initiatives to address deforestation drivers in the Amazon. Capacity building was also an over-arching requirement mentioned by KIs for the success of these four strategies.

For these four strategies, the EA team assessed the available evidence that included USAID documents and a search of the scientific literature. A summary of the evidence on these strategies can be found in Annex 8.

STRATEGY 2.1. STAKEHOLDER ENGAGEMENT AND COORDINATION. KIs talked broadly of needing to engage with relevant stakeholders as part of AA, from the local level (indigenous leaders, community leaders), to the GOC, to the private sector. Since the discussion about stakeholder engagement came up across several different questions in the qualitative instrument, we did not try to quantify the frequency of this response. One KI stated that AA could have an important role in helping these stakeholders coordinate their efforts: "I think it is important that government institutions do not compete with each other for results, but rather complement each other and that there is clarity in this regard. In this case, let's say, I think it is very important to act from the local and regional level and I think we can contribute a lot in that sense, that is, more than at the national level. It is very important to support these processes from the local and regional level to ensure that they are actually done and that the installed capacity remains in each institution." Stakeholder engagement and coordination were found to be an important enabling condition for the effectiveness of the previous Amazon initiatives[10] and

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[9] USAID. (2019). Colombia Tropical Forest and Biodiversity Analysis.
[10] USAID. (2020). USAID/Colombia Amazon Activities Performance Evaluation. Final report.

were key for success in the Guatemalan conservation enterprise's efforts.[11] Private sector engagement is also a critical part of this strategy.[12]

STRATEGY 2.2. STRENGTHEN FORMAL TENURE RIGHTS & SECURITY. Strengthening land tenure was mentioned as a key strategy for addressing deforestation by 11 KIs. This was discussed as an important enabling condition for the adoption of livelihood-focused interventions (e.g., tree planting) but land tenure can also have a direct influence on conservation behaviors.[13] It is important to emphasize that granting and clarifying land rights through formalization, while important, must also be linked to strengthening legal institutions to ensure any violations or disputes can be addressed; thus, formalization should be part of a broader package of strengthening tenure security. One KI stated: "Let's see, I think that opportunity in the second objective is the issue of applying the Decree [sig. Agreement 118 of 2020] 118 on land-use rights because those lands are vacant lands [untitled lands/public lands], I think that the government's commitment is very important, it is an opportunity that exists for the region, but also for the country in terms of piloting in this region. This is one of the most rugged regions in that sense."

STRATEGY 2.3. LAND-USE PLANNING AND ZONING. Eight KIs mentioned land-use planning and zoning as a key strategy; these discussions also identified improved monitoring as a critical component of this strategy. A KI summarized the need to engage at all levels on land-use planning as follows:

"What I do see is key at this time, let's say, for Amazon Alive, and that we considered during the design, was not to start creating new protected areas, but rather, to consolidate those that already exist, through conservation corridors that strengthen the connectivity, diversity, and conservation of existing forests. So, that's when the articulation between conservation and production also comes into play. Conservation, per se, is very complicated because it is not sustainable, that is, people will end up, at some point, cutting down that forest to have economic resources. But, if we really achieve, through the schemes that we were doing of property planning, where it is defined, within the framework of a connectivity corridor, that is, with which various scales are measured at the farm level and at the landscape level, how we can contribute to this corridor, define which are the areas that we must free to rehabilitate, which are the sources of water that we must conserve and which are the areas in which we should have a productive project, be it an agroforestry system or a silvopastoral system, or a non-timber use of the forest or tourism, or whatever, it is already easier to be able to define it with a vision, let's say, as more comprehensive."

USAID/Colombia identified harmonizing land-use planning and zoning instruments in its tropical forest analysis as a key strategic area.[14] The AA Activity could engage with national-level efforts on corridor development and capacity building to achieve biodiversity-friendly and climate-smart landscapes.

STRATEGY 2.4. LIVELIHOOD-FOCUSED APPROACHES. Eleven KIs mentioned the importance of livelihood approaches for AA. This is the main approach emphasized by AA to reduce deforestation

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[11] USAID. (2018). Lessons from Conservation Enterprises in the Maya Biosphere Reserve of Peten, Guatemala.
[12] USAID. (2020). Private Sector Engagement Learning Agenda, Latin America and the Caribbean Environment.
[13] Tseng, T., Robinson, B., Bellemare, M., BenYishay, A., Blackman, A., Boucher, T., Childress, M., Holland, M., Kroeger, T., Linkow, B., Diop, M., Naughton, L., Rudel, T., Sanjak, J., Shyamsundar, P., Veit, P., Sunderlin, W., Zhang, W., Masuda, Y. (2020). Influence of Land Tenure Interventions on Human Well-being and Environmental Outcomes. Nature Sustainability, 4, 242-251.
[14] USAID. (2019). Colombia Tropical Forest and Biodiversity Analysis.

under Objective 2, as indicated in its SOO. Specific sub-strategies mentioned under livelihood-focused approaches included conservation enterprises (9 KIs), payments for ecosystem services (PES) or reducing emissions from deforestation and forest degradation (REDD+) (3 KIs), and adoption of sustainable livelihood practices like silvopastoral or agroforestry (3 KIs). These sub-strategies are not necessarily mutually exclusive and can be mixed. Based on our evidence review, we suggest combining short-term asset-building PES with the promotion of agroforestry and silvopastoral systems versus using technical assistance only to promote the adoption of these livelihoods or using forest conservation (asset-restricting) PES. This is because funding for technical assistance is harder to sustain and does not lead to permanent changes in behaviors[15] . Private sector engagement is critical to the success of livelihood-based approaches over the long term. The interest in engaging the private sector in market-based approaches for livelihoods was emphasized by this KI: "At a second level is the whole issue of market-based approaches, to be able to connect what is done at the farm level, what is done from the improvements in the management of natural resources with an economic support to open markets for different products that have potential in the region, it can be the Asaí, the chontaduro, that will depend on the area that is selected for work, but they are Amazonian products, handicrafts, among others."

Based on the implementation of the four proposed strategies, the Activity is expected to lead to several short-term, medium-term, and long-term outcomes, and eventually the intended long-term impacts (Exhibit 3). Short-term outcomes include (1) engagement of relevant actors; (2) clarification and formalization of land rights; (3) coordination of land-use planning and zoning activities; (4) improved governance capacity; and (5) improved capacity to implement NRM actions. If these short-term outcomes are achieved, then the Activity should lead to (1) improved tenure security and land governance; (2) improved land management; (3) improved access to economic market opportunities; and (4) adoption of promoted livelihood strategies. If these medium-term outcomes are achieved, then the following long-term outcomes can be expected; specifically, (1) an increase in positive conservation behaviors; (2) a decrease in negative conservation behaviors; and (3) sustained private sector engagement. If these long-term outcomes are achieved, then the threats of unsustainable agriculture, livestock, and forestry should be reduced. This reduction in threats should lead to the long-term impacts of reduced deforestation and biodiversity loss as well as improved human well-being. Direct human well-being impacts from these strategies would include improved governance (rights and access), social outcomes (social capacity, adaptive capacity, education, and knowledge), economic well-being (financial wealth, material wealth, livelihoods), and health (food security). Achieving the long-term impact of reduced deforestation would also have indirect human well-being impacts through ecosystem services.[16] Several assumptions must hold for this TOC to be met (Annex 9).

[15] USAID (2018). Lessons from Conservation Enterprises in the Maya Biosphere Reserve of Peten, Guatemala.
[16] Diaz, S., Stenseke, M., Martín-López, B., Watson, R., Molnár, Z., Hill, R., Chan, K., Baste, I., Brauman, K., Polasky, S., Church, A., Lonsdale, M., Larigauderie, A., Leadley, P., Van Oudenhoven, A., Van der Plaat, F., Schröter, M., Lavorel, S., Aumeeruddy-Thomas, Y., Bukvareva, E., Davies, K., Demissew, S., Erpul, G., Failler, P., Guerra, C., Hewitt, C., Keune, H., Lindley, S., Shirayama, Y. (2018). Assessing nature's contributions to people. Science, 359, 270-272.
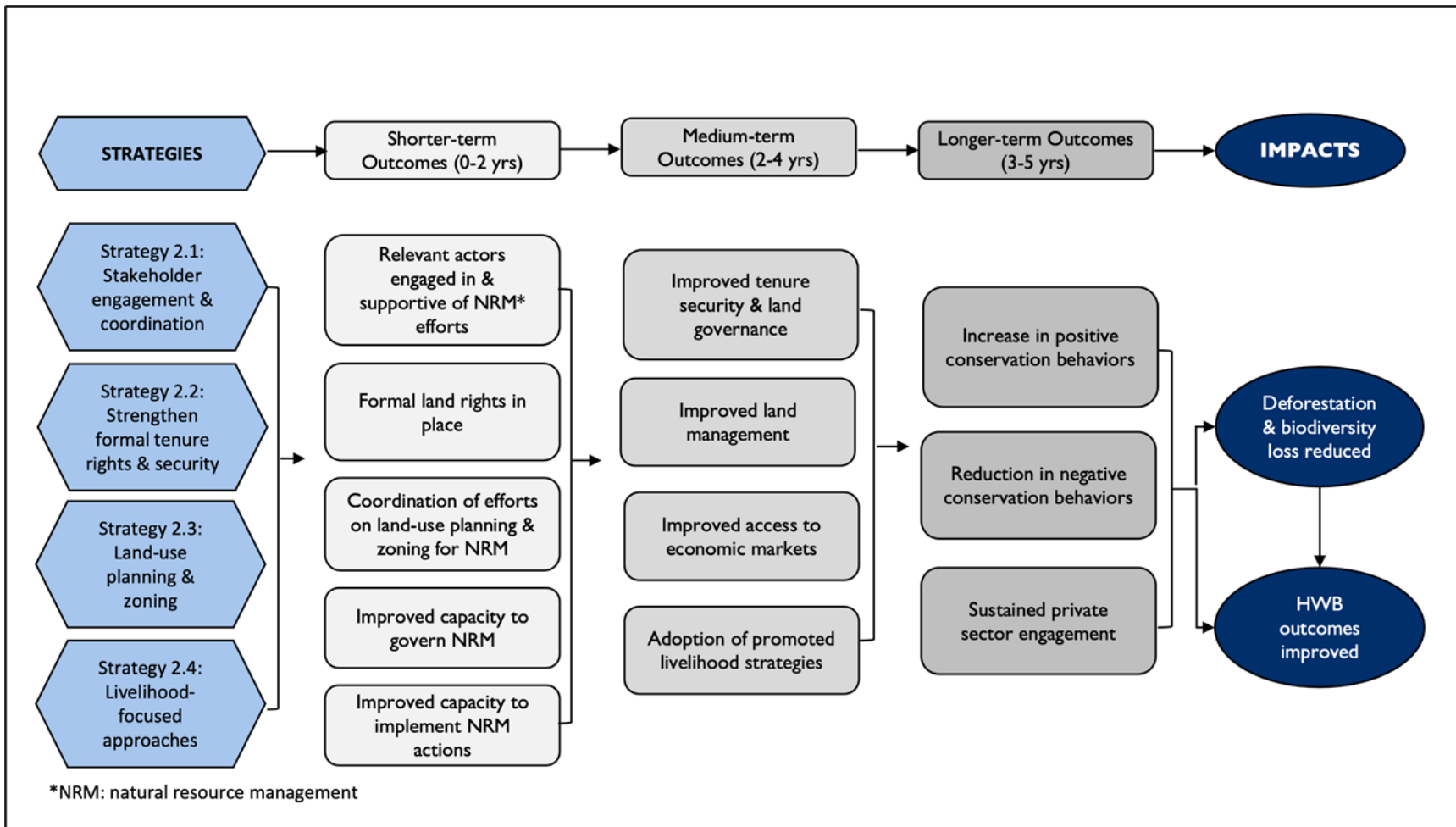
Exhibit 3. High-level theory of change for Objective 2

4. LEARNING AND EVALUATION INTERESTS

LEARNING INTERESTS

Table 2 presents the key learning interests expressed by the 21 KIs. The learning interests identified by KIs for Objective 1 focused on three of the four Activity strategies mentioned above, and we linked these learning interests to the broad learning questions from the LAC CCC Learning Agenda. Eleven KIs discussed learning interests related to Strategy 1.1 "strengthen policies, regulations, and rules", with most of these describing interests that centered around the effectiveness of coordination efforts. Five KIs each discussed learning interests around "strengthening law enforcement capacity" and "monitoring and reporting on environmental crimes by indigenous or local communities".

For Objective 2, 13 KIs mentioned learning interests related to livelihood-focused approaches and 7 KIs talked about learning interests around strengthening land tenure rights and security (Table 2). Additional themes that came up across multiple KIs included metrics for measuring deforestation and biodiversity loss (3 KIs) and engagement of and impacts to indigenous peoples (3 KIs). Specific learning interests related to livelihood-focused approaches were organized by USAID's Conservation Enterprises Learning Agenda questions, and KI's often mentioned more than one learning interest.[17] The majority of the 13 KIs that mentioned this learning interest discussed the need to understand stakeholder benefits from livelihood strategies. Six KIs discussed the need to understand how livelihood approaches influenced environmental outcomes, which we attributed to both reducing threats and deforestation. Fewer KIs identified learning interests around enabling conditions or behavior changes in livelihood-focused approaches.

TABLE 2. LEARNING INTERESTS FOR AMAZON ALIVE ACTIVITY KEY INFORMANT INTERVIEWS		
STRATEGY	NUMBER OF KII	LINK TO USAID LEARNING AGENDA
Strategy 1.1 Strengthen policies, regulations, & rules	9	LQ2.2: Under what conditions does national coordination improve the effectiveness of combating conservation crime and reducing deforestation?[18]
	2	LQ3: What are the factors related to corruption that impact the effectiveness of combating conservation crime and reducing deforestation?
Strategy 1.2. Strengthen law enforcement capacity	5	LQ2.1: Under what conditions are law enforcement effective at deterring conservation crime and reducing deforestation?
Strategy 1.3. Strengthen reporting by indigenous/local communities	5	LQ1: Under what conditions are community reporting effective at deterring conservation crime and reducing deforestation?
Strategy 2.4: Livelihood-focused approaches	4	Are enabling conditions in place to support a sustainable enterprise?
	9	Does the enterprise lead to benefits for stakeholders?

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[17] USAID. (2016). Measuring Impact: Cross-mission learning agenda for Conservation Enterprises.
[18] USAID. (2020). Combating Conservation Crime Learning Agenda, Latin America and the Caribbean Environment.

TABLE 2. LEARNING INTERESTS FOR AMAZON ALIVE ACTIVITY KEY INFORMANT INTERVIEWS

STRATEGY	NUMBER OF KII	LINK TO USAID LEARNING AGENDA
	2	Do the benefits realized by stakeholders lead to positive changes in attitudes and behaviors?
	6	Do positive changes in stakeholders' behaviors lead to a reduction in threats to biodiversity (or deforestation)?
		Does a reduction in threats lead to conservation (reduced deforestation)?
Strategy 2.2: Strengthen land tenure rights and security	7	How does clarifying and formalizing land rights lead to changes in conservation behaviors and reduced deforestation?
Metrics	3	What cost-effective metrics can be used to go beyond forest/non-forest cover to measure biodiversity loss or forest fragmentation?
Indigenous peoples	3	How can indigenous peoples be effectively engaged in the Activity? Are there differential impacts on indigenous peoples versus non-indigenous peoples?

USEFULNESS OF AN EVALUATION

KIs identified several stakeholders that would benefit from an evaluation of the AA Activity (Table 3). USAID was identified most frequently as the evaluation beneficiary. Participants discussed that the evaluation would improve the evidence-base for strategies across the Agency, USAID/Colombia, and the LAC region. Other donors, civil society, and the private sector were also identified as benefiting from any rigorous evidence collected by the Activity. The GOC was identified as a key beneficiary since results would inform national targets and policies. The IP would benefit from an evaluation through the ability to monitor and adapt the project. Several KIs mentioned the importance of sharing lessons learned in AA with the local community. Finally, an evaluation would help build alliances and future partnerships with non-governmental organizations (NGOs) and the private sector.

TABLE 3. STAKEHOLDERS BENEFITING FROM AN EVALUATION

STAKEHOLDER	EVALUATION USE
USAID	• Improves evidence-informed learning across the Agency • Contributes to LAC region and capacity
GOC	• Informs national targets and policies
IP	• Provides feedback on the progress of intervention for adaptive management
Other donors	• Provides lessons learned • Strengthens bilateral objectives
Community	• Raises awareness of AA Activity and impacts

EVALUATION PREFERENCES

Twelve KI's were asked about their evaluation design preferences for AA, and seven mentioned that a hybrid evaluation design—a combination of IE and PE designs for the Activity strategies—was preferred. These respondents felt strongly that a PE was needed for the full Activity so that both objectives could be adaptively managed. KIs also felt that Objective 1 might be best suited for a PE. Respondents expressed more interest in an IE for Objective 2, especially livelihood-focused approaches, given USAID's global investment in these approaches and the weak evidence base.[19]

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[19] USAID. (2019). The Nature of Conservation Enterprises: A 20-year retrospective evaluation of the theory of change behind this widely used approach to biodiversity conservation. USAID Office of Forestry and Biodiversity.

5. DATA AVAILABILITY AND EVALUATION METRICS

MEASURING OUTCOMES ALONG THE THEORY OF CHANGE

It is important to measure indicators along the full TOC (Exhibits 2 and 3), including short, medium, and long-term outcomes, as well as long-term impacts, in any evaluation design. The EA team developed a preliminary set of indicators that correspond to the illustrative high-level TOC for each objective (summarized in Annex 10 with a full list of indicators and data sources found in Google Drive[20]). The list of indicators is not meant to be exhaustive and will need to be updated after discussions with the IP on final strategies and sub-strategies. Data for these indicators would come from primary data collection (e.g., surveys, interviews) and secondary databases (e.g., GOC databases, remote sensing data).

MEASURING LONG-TERM IMPACTS

DEFORESTATION AND BIODIVERSITY

To measure long-term impacts to reduced deforestation several freely available remote sensing products exist that could be used (Table 4 and Annex 11). Based on the strengths and weaknesses of these approaches, the EA team recommends that an evaluation team focus on using processed information on forest[21]/non-forest cover.

TABLE 4. REMOTE SENSING APPROACHES

REMOTE SENSING APPROACH	STRENGTHS	WEAKNESSES
Processed information to measure forest cover change	• Little time is required to obtain the information • Low cost • High temporal resolution for fires and deforestation alerts	• Small range or single offered spatial resolution • Annual temporal resolution • Only Forest/non-Forest cover
Processed information to assess land cover change	• Little time is required to obtain the information • Low cost • Different types of land cover classification • Forest • Agriculture • Pasture	• Small range or single offered spatial resolution • Medium range of offered temporal resolution for land cover data (Multiannual)
Processing raw satellite imagery*	• Large range of available spatial resolutions • Large range of available temporal resolutions • Freedom to customize the type of land cover classification	• More time is required for data processing • Technical knowledge required for data processing • Need of field verification

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[20] Full sets of indicators were developed for Objective 1 (Excel table); Objective 2 (Excel table); and long-term impacts for both objectives (Excel table).

[21] A forest is defined as land mostly occupied by trees, this could include palms, bamboo, herbs, and lianas, where the tree cover is >30%, the minimum canopy height is 5 m, and the minimum area is 1 ha (Ramírez-Delgado et al., 2018).

*For primary classification work, it would be recommended to use the Corine Land Cover methodology, which is the official one used by Colombian official institutions to produce land cover cartography (IDEAM, IGAC, CORMAGDALENA, 2007).[22]

Biodiversity loss is not directly captured by measuring forest cover or deforestation, although forest cover often is used as a proxy for habitat and ecosystem services. For strategies that are expected to have landscape-scale impacts, additional remote sensing analyses of structural or functional connectivity and fragmentation could be included in an evaluation. These metrics provide information on habitat patch size and corridors for species movement and are often used as measures of forest degradation.[23] There is existing open-source software that can be used for these analyses, such as Marxan, Polyfrag, or Conefor. Field work could also be conducted to measure forest richness and diversity or wildlife richness and diversity. These methods would be better suited for strategies implemented at a household or community level. Finally, real-time forest or fire early warning and alert systems can indicate forest degradation and are often associated with illegal activities.

HUMAN WELL-BEING

Conservation interventions are increasingly expected to measure their impact on social outcomes through human well-being metrics and or social equity indicators, in addition to their environmental impacts. This is for both ethical and instrumental reasons. Ethically, people living amongst conservation areas bear a disproportionate burden of the costs of conservation. Instrumentally, empowering, and incentivizing people affected by conservation programs and interventions is expected to enhance biodiversity conservation effectiveness and sustainability.

AA would directly impact human well-being by achieving the outcomes laid out in the high-level TOC (Exhibits 2 and 3). Human well-being is a multi-faceted concept and can be broken into domains. One conceptualization of domains is: economic (financial wealth, material wealth, employment); health (physical, mental, food security); social (social capital and cohesion, safety and security, knowledge); cultural (cultural identity, traditional knowledge); and governance (transparency, participation, agency, rights, and access).[24]

AA would also have indirect impacts on human well-being through forest protection and the ecosystem services that flow from the forest as illustrated in the Situation Model (Annex 2). There are two frameworks to catalog the indirect effects on human well-being through ecosystem services: (1) the Millennium Ecosystem Assessment's four categories of provisioning, regulating, cultural, and supporting ecosystem services and (2) the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services' nature contributions to people framework that includes material, non-material, and regulating contributions with culture an overarching consideration.

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[22] http://www.ideam.gov.co/web/ecosistemas/metodologia-corine-land-cover
[23] Forest degradation corresponds to a persistent reduction of the forest carbon stocks, which could be associated with a sustained and measurable decrease in forest canopy and or the number of trees per hectare (Ramírez-Delgado et al., 2018).
[24] Kaplan-Hallam, M., Bennett, N.J. (2017). Adaptive Social Impact Management for Conservation and Environmental Management. Conservation Biology, 32, 304- 314.

6. ILLUSTRATIVE EVALUATION DESIGN OPTIONS

OVERVIEW OF EVALUATION DESIGN OPTIONS

PEs are intended for adaptive management of a strategy or intervention and are used to monitor processes, activities, outputs, or outcomes.[25,26] In process PE the focus is on how the program is delivered, including what activities were carried out, what outputs were delivered, and how processes were managed. Process PE needs to occur during the project life cycle. Outcome PE focus on whether planned results and outcomes were achieved, including any unintended consequences. Outcome PE focus on measuring the results of a project that go beyond the responsibility of the project managers, or what stakeholders do on their own following the delivery of outputs by the project. Because outcome PE does not use a control group, there are limitations in causally attributing outcomes and impacts to the program. However, when best practices are followed, including using a TOC to inform indicator development and collecting before and after data, outcome PE can provide valuable information to the IP, funders, and the public about program performance.

IE designs, on the other hand, are intended to provide causal evidence about whether a strategy or intervention led to changes in expected outcomes. This attribution comes from a carefully designed control group that allows the evaluator to assess what would have happened without the program (the counterfactual).[27] Having a valid control group addresses the issue of selection bias, a bias that arises when the units receiving the strategy or intervention are different from those that do not receive it. IE uses experimental or quasi-experimental research designs to assign a control group. Best practices and rigorous IE designs also utilize baseline data and endline data. This before-after data controls for contemporaneous biases, which is when other social, policy, or market changes are occurring alongside the project that could influence outcomes. IEs are intended for well-specified strategies and if multiple strategies are being used, it can be difficult to disentangle the effects of one strategy from the other. By their very nature, the results of an IE are only available later in the program life cycle. Most IE designs require large sample sizes to have the statistical power to detect an impact.

ILLUSTRATIVE EVALUATION DESIGN OPTIONS AND QUESTIONS BY STRATEGY

Based on the desk review, KIIs, and the illustrative high-level TOC developed for each objective, the EA team's recommended evaluation design option and illustrative evaluation question for each strategy are listed in Table 5. Additionally, the primary data collection instruments that are suggested for that strategy are listed in the table.

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[25] USAID. (2021). ADS Chapter 201 Operational Policy for the Program Cycle. Retrieved from: https://www.usaid.gov/sites/default/files/documents/201.pdf
[26] UNDP. (2011). Outcome level evaluation. A companion Guide. Obtenido de UNDP: http://web.undp.org/evaluation/documents/guidance/UNDP_Guidance_on_Outcome-Level%20_Evaluation_2011.pdf
[27] White, H., Raitzer, D.A. (2017). Impact Evaluation of development Interventions: A Practical Guide. Asia Development Bank.

TABLE 5. ILLUSTRATIVE EVALUATION QUESTIONS AND DESIGN OPTIONS BY STRATEGY

STRATEGY	ILLUSTRATIVE EVALUATION QUESTION	SUGGESTED EVALUATION DESIGN	PRIMARY DATA COLLECTION INSTRUMENTS
Strategy 1.1. Strengthen policies, regulations, & rules	Under what conditions does national coordination on crimes improve the effectiveness of combating environmental crime and reducing deforestation?	Outcome PE	Key informant interviews
Strategy 1.2. Strengthen law enforcement capacity	Under what conditions are strengthening law enforcement effective at deterring environmental crime and reducing deforestation?	Outcome PE	Key informant interviews
Strategy 1.3. Strengthen reporting by indigenous/local communities	Under what conditions are community reporting effective at deterring environmental crime and reducing deforestation?	Outcome PE	Key informant interviews & focus groups
Strategy 2.1: Stakeholder engagement & coordination	What types of engagement strategies lead to stakeholder support and participation in natural resource management and sustainable livelihood approaches?	Process PE	IP Activity M&E
Strategy 2.2: Strengthen land tenure rights & security	What is the effect of strengthening land tenure rights and security on reducing deforestation?	Outcome PE or possibly an IE*	Interviews & surveys
Strategy 2.3: Land-use planning & zoning	What is the effect of land-use planning and zoning on reducing deforestation?	Outcome PE or possibly an IE*	Interviews & surveys
Strategy 2.4: Livelihood-focused approaches	What is the impact of livelihood-focused approaches on benefits to stakeholders and reducing deforestation?	IE	Interviews & surveys

*More information is needed before the feasibility of this evaluation design can be determined for this strategy

Strategy 1.1. and **Strategy 1.2.** involve similar units of assignment, treatment, and analysis (Annex 12). Given the unit of treatment, the EA team determined it would be difficult to construct a large sample size and it would be difficult to develop a valid control group for IE. However, an outcome PE for these two strategies would provide important information for USAID's LAC CCC Learning Agenda and would address some of the key learning interests identified by KIs (Table 2).

Strategy 1.3 involves community-level interventions and monitoring teams and would mostly rely on primary data collection. Given the uncertainty on whether community monitoring teams exist in the Amazon, or can be created safely, the EA team recommends an outcome PE for this strategy. While IE has been conducted on specific community monitoring processes and technologies and reporting levels in the Amazon regions of Ecuador and Peru[28], in these IE the community monitoring teams were already established, and the evaluation focused on the use of specific technologies.

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[28] Pellegrini, L. (2019). Impacts of community monitoring of socioenvironmental liabilities in the Ecuadorian and Peruvian Amazon. Impact Evaluation Report 99. New Delhi: International Initiative for Impact Evaluation.

Strategy 2.1 involves multiple levels of stakeholders (Annex 12), and in many cases will involve only a small number of stakeholders per group, making it difficult to construct a control group for IE. This strategy is an important enabling condition for other strategies but on its own may not directly link to longer-term outcomes or impacts in the TOC. For these reasons, we suggest a process PE be used by the IP for the data collection on activities and outputs related to this strategy. It will be important that progress on this strategy be shared with the evaluation team since this strategy's success will influence the outcomes of other strategies.

Strategy 2.2 would likely be targeted to small administrative units (i.e., veredas) or statistical units (i.e., rural sectors or sections) (Annex 12). Land tenure interventions, whether granting land titles, conflict resolution, or capacity building, are often amenable to IE designs and many KIs expressed learning interests around land tenure (Table 2). In the case of AA, strengthening tenure rights and security is presented as an enabling condition for the development of conservation livelihoods. If the two strategies are always implemented in similar geographic areas, it will be difficult to tease out the direct impact of strengthening land tenure on conservation behaviors and deforestation. Thus, an outcome PE is recommended to gather information about the specific outcomes of the strategy, without trying to establish causal linkages between the strategy and long-term impacts. More clarification from the IP is needed to decide if an IE strategy would be feasible.

Strategy 2.3 could be implemented at multiple scales, including household, community, administrative unit, or corridors (Annex 12). Based on the currently available information on this strategy, the EA Team recommends an outcome PE because it is not clear if a valid control group could be established with the available information. However, a desk-based or field-based IE could be possible if regional or community-level sub-strategies (e.g., Conservation Agreements) are used by the IP, and valid control areas that do not receive the project can be identified.

Strategy 2.4 would ideally be assigned at a small unit of analysis, such as a community[29] or administrative unit (i.e., rural section), but uptake of the treatment would occur at the household level (Annex 12). This makes this strategy amenable to an IE because many treatment units should be available, and it is possible to construct a control group from households that are not exposed to the strategy. This strategy was also mentioned by the largest number of KIs as a learning interest (Table 2). If USAID/Colombia decides to conduct an IE around this strategy, it would enhance the limited evidence base on livelihood strategies, and to the best of our knowledge, be the first IE around livelihoods and forests in the Colombian Amazon.

OVERVIEW OF PROPOSED EVALUATION APPROACHES

Based on Table 5, the EA team assessed the strengths and weaknesses, costs[30], and logistics for three stand-alone evaluation options and two hybrid evaluation options for the AA Activity to consider:

- Option 1: Outcome PE (Strategies 1.1, 1.2, 1.3, 2.2, 2.3, 2.4)

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[29] We use the term community to refer to a group of people that share infrastructure (e.g., church, football field, community center, community school), make rules together (i.e., governance), and or have a name (e.g., Tres de Mayo) that they use to identify themselves. If this unit were used to assign treatment and control areas, the concept would have to be discussed with people in the field in terms of how to operationalize it.
[30] All costs in this report are in US dollars.

- Option 1I: IE for Strategy 2.4
- Option III: Desk-based IE for Strategy 2.2 or 2.3
- Hybrid Evaluation Options
  - Full PE + IE
  - Reduced PE + IE

OPTION 1. OUTCOME PE

Table 6 shows the estimated costs for a mixed-methods outcome PE with two or three data collection rounds for Strategies 1.1, 1.2, 1.3, 2.2, 2.3, and 2.4. The costs included per round in these calculations are a team of six persons, 14 field trips, 1500 quantitative surveys, and 120 qualitative interviews.

TABLE 6. ILLUSTRATIVE ESTIMATED COSTS FOR OUTCOME PE	
DATA COLLECTION	COST
2 rounds (Baseline-Endline)	$628,070
3 rounds (Baseline-Midline-Endline)	$929,402

The suggested timeline for this approach is shown in Table 7.

TABLE 7. ILLUSTRATIVE TIMELINE FOR OUTCOME PE					
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
2 rounds	Baseline				Endline
3 rounds	Baseline		Midline		Endline

The strengths of an outcome PE approach would be:

- Following best practices, such as using a TOC and collecting baseline data, PE designs provide valuable information about whether a program achieves its stated goals and objectives.

- There is no need to collect data in control areas that are not receiving the treatment.

The weaknesses of an outcome PE approach would be:

- Not able to causally link any of the strategies to long-term outcomes or impacts.

- Doesn't respond to learning interests expressed by USAID to conduct an IE.

OPTION 2. IE FOR STRATEGY 2.4

The key challenge in designing an IE for Strategy 2.4 "livelihood-based approaches" is how to create a control group that eliminates selection bias. Livelihood strategies are particularly prone to selection bias because the household (or individual) must decide they want to participate in the intervention. The

households (or individuals) that choose to participate in these programs are often different in both their ability to participate (e.g., human capital or financial capital) and their willingness to participate (e.g., financial versus non-financial motivations) from the households that choose not to participate. IE methods vary in how they assign treatment and control units to reduce selection bias, and thus their strengths and weaknesses. For this strategy, the EA team identified three possible IE approaches to minimize selection bias:

1) Experimental (Randomized Control Trial (RCT)) or Quasi-Experimental (QED) **Cluster Design** to Assign Treatment & Control Units

2) RCT **Individual Design** to Assign Treatment & Control Units

3) QED **Individual Design** to Assign Treatment & Control Units

Given the low reliability of the third approach, we only present details on the first and second approaches below. We do not recommend the third approach and explain at the end of the second approach why option three is not considered in this EA report.

APPROACH #1: EXPERIMENTAL (RCT) OR QUASI-EXPERIMENTAL (QED) CLUSTER DESIGN
The first design option is a cluster IE design—a cluster is any geographical unit where we apply the treatment, it can be a community, an administrative unit like a vereda, or a statistical unit like a rural sector or section.[31] Clusters would either be randomly assigned into two groups (RCT) or assigned using statistical methods (QED). The intervention group will be offered the livelihood approaches during the project period and the control group will not have access to the livelihood strategies. To operationalize this design, the following steps are required:

- First, the evaluation team must work with the mission and the IP to determine the full list of geographies eligible for strategy implementation.

- Second, the evaluation team would group the communities on characteristics that would influence deforestation and livelihood strategies, such as past deforestation rates; forest cover; distance to roads, rivers, and towns; population density; land tenure; security and violence; illicit crop cultivation; and presence of other USAID/development programming. Most of these data should be available from secondary data sources, but many projects also conduct a rapid rural appraisal of the target geographies to provide additional social information to aid in selection, such as local institutions, livelihood strategies, and experience with past rural development or conservation projects.

- Third, the evaluation team would randomly assign clusters to either the treatment or control group in an RCT design (so the evaluation team and not the IP team would decide on treatment units in this design) or use statistical matching in a QED design to select a control group for the treatment units that are selected by the IP. By grouping similar units before assigning clusters, the probability of finding balance in covariates (and thus reducing selection bias) between the treatment and control

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[31] We use the term community to refer to a group of people that share infrastructure (e.g., church, football field, community center, community school), make rules together (i.e., governance), and or have a name (e.g., Tres de Mayo) that they use to identify themselves. If this unit were used to assign treatment and control areas, the concept would have to be discussed with people in the field in terms of how to operationalize it.

clusters is increased. It would also be important to consider the distance between treatment and control units to try and minimize spillovers (or leakage), while at the same time ensuring distances are not too far apart to reduce logistical costs.

- Finally, once a unit is assigned to the treatment group, all eligible households within that unit would be eligible to participate in the livelihood strategies if they chose to participate (i.e., no coercion).

To determine a reasonable sample size required for the evaluation to produce meaningful results under this design, we estimated the minimum detectable effect (MDE) size. The MDE is the smallest true effect that the IE can detect given the IE design.[32] As the MDE size gets smaller, the power of the design and the utility of the results increase. MDEs of less than 0.2 are characterized as desirable, meaning that the experiment is well powered to detect even small effects. MDEs between 0.2 and 0.6 are characterized as medium effect sizes, meaning that an experiment is well powered to detect only relatively larger effects. Many IE studies are underpowered, meaning that the study incorrectly concludes that the intervention has no impact (Type II error). A recent systematic review of the impacts of forest conservation policies and programs concluded that most conservation policies exhibit an average effect size in the lower range of 0.2.[33]

For cluster designs, the larger share of statistical power comes from the total number of clusters, rather than the unit of analysis (households). Using the 0.2 MDE as the suggested threshold, we can assess the total number of clusters and households that would be required for this type of design in Table 8 under different assumptions. We show MDE size for both (1) a more conservative set of assumptions, which includes a confidence level of the hypothesis test of 95 percent, the level of power at 80 percent, an intra-cluster correlation (ICC) of 0.3, and the amount of variation in the outcome explained by the covariates included in the regression analysis as 30 percent; and (2) a less conservative set of assumptions, which includes a confidence level of the hypothesis test of 90 percent, the level of power at 80 percent, an intra-cluster correlation (ICC) of 0.2, and the amount of variation in the outcome explained by the covariates included in the regression analysis as 30 percent. Using the more conservative parameters, the 0.2 MDE is achieved when there is a total of 3,900 household surveys across 260 clusters. Using the less conservative set of assumptions, a sample size of 2,100 households and 140 clusters could achieve an MDE of 0.21. This number of clusters should be achievable using the GOC's statistical units of rural sectors or sections (see Annex 13 for details). The estimated costs for this type of approach would include the following items per round: a team of six consultants, ten field trips, and 100 qualitative interviews.

TABLE 8. MDE AND ESTIMATED COSTS FOR DIFFERENT SAMPLE SIZES IN CLUSTER IE DESIGN						
	(1)	(2)	(3)	(4)	(5)	(6)
Intervention clusters	60	70	100	110	120	130
Control clusters	60	70	100	110	120	130

[32] Djimeu, E., Houndolo, D.G. (2016). Power calculation for causal inference in social science: sample size and minimum detectable effect determination, impact evaluation manual, Working Paper 26. International Initiative for Impact Evaluation.
[33] Borner, J. S. (2020). The effectiveness of forest conservation policies and programs. Annual Review of Resource Economics, 12-19.

TABLE 8. MDE AND ESTIMATED COSTS FOR DIFFERENT SAMPLE SIZES IN CLUSTER IE DESIGN

	(1)	(2)	(3)	(4)	(5)	(6)
Total clusters*	120	140	200	220	240	260
Number of households (HH) per cluster	15	15	15	15	15	15
Total HH sample size	1,800	2,100	3,000	3,300	3,600	3,900
MDE with more conservative parameters	0.301	0.278	0.233	0.222	0.213	0.204
MDE with less conservative parameters	0.228	0.211	0.177	0.168	0.161	0.155
Costs (2 survey rounds)	$710,832	$777,753	$978,515	$1,045,435	$1,112,356	$1,179,276
Costs (3 survey rounds)	$1,053,677	$1,154,058	$1,454,936	$1,555,317	$1,655,698	$1,756,078

*Community or small statistical unit (e.g., rural sections or rural sectors)

An illustrative timeline for a cluster IE design is presented in Table 9. If the Mission decided, the endline data could be collected after the activity ends, but for illustration, we have used the end of project activities as the endline.

TABLE 9. ILLUSTRATIVE TIMELINE FOR CLUSTER IE DESIGN

	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
IP activities:					
Intervention group	Begin AA Activities				End AA Activities
Control group			No AA Activities		
Timeline:					
2 rounds	Baseline				Endline
3 rounds	Baseline		Midline		Endline

Strengths of cluster IE approach:

- This is statistically the most rigorous design option in terms of concluding causal relationships by eliminating selection bias concerns. This is particularly the case for RCT assignment of clusters since RCT designs can typically eliminate all selection bias. QED assignment could reduce observable selection bias but may not eliminate all unobservable selection bias.

- By having a set of control units where the intervention is not offered, larger spatial impacts of the intervention can be tested. Specifically, cluster-level deforestation outcomes can be tested to understand the influence of the strategy on spillovers within the cluster to other properties outside of the households that adopt the livelihood strategies.

Weaknesses of cluster IE approach:

- This method requires many clusters to achieve sufficient power. Within the treatment clusters, households would need to adopt (or take up) the strategy in sufficient numbers to achieve the targeted sample size.

- It may not be desirable to have a set of control units that do not receive the intervention. The evaluation team will need to be in contact with these clusters and households throughout the evaluation period.

APPROACH #2: EXPERIMENTAL (RCT) INDIVIDUAL DESIGN

If USAID or the IP determines that it is not feasible or preferable to have treatment and control clusters to utilize a cluster IE design, a second possible approach would be an RCT design where randomization occurs at the individual level versus the cluster level. In this design, treatment communities (or some other assignment unit) are selected by the IP, and within these communities, households are randomly allocated to treatment and control groups. To eliminate self-selection bias in this approach, the control units need to be households that express interest in the livelihood program. This can be determined by requiring some type of application process to participate in the program. These types of applications are common in PE approaches, which require a formal contract but may be harder to design for other livelihood approaches such as enterprises.

There are a few options for assigning households to treatment and control groups within the same cluster. In each design, the IP would select the treatment clusters, but it is the households themselves that self-select into the treatment (as is always the case with voluntary livelihood approaches). It is important to keep in mind that for any of the designs described below, community leaders and households need to have a clear understanding that not all interested households will get to take part in the treatment, and why. The design methods below are listed in order of recommendation based on causal identification of treatment effects:

a) *Oversubscription design:* Households that express interest in the livelihood strategies are randomly selected to be in the intervention or control group throughout the project, either based on pre-defined application criteria or a lottery system that is transparent for the applicants. This can be justified based on limited resources of the Activity or that the program is a pilot and will be eventually rolled out if impacts are detected. In PES programs, households that apply are often excluded from receiving the payment because of limited program funding (stronger design) or because applicants do not meet some minor program criteria (weaker design). These 'rejected' applicants are then used as the control group (often with matching to further ensure similarity).

b) *Within-group design:* This assignment provides some level of intervention to all households that apply for the livelihood strategies, but the type of treatment received varies. For example, some households would receive the full livelihood approach including any financial incentives or in-kind resources, while others might only receive the enabling conditions (e.g., technical training, capacity

building) that allow them to pursue more sustainable livelihood strategies. Households would be randomly assigned to be in the treatment or control group throughout the project.

c) *Phased design:* Households that express interest in livelihood strategies are randomly assigned to phase I and phase II households. Phase I households receive the treatment at the start of the program and phase II households would receive the same treatment later in the program cycle. These phase II households would serve as the control group for phase I households. Because all households would be treated by the end line, this type of strategy prevents the evaluation of long-term impacts.

Because randomization is at the individual level, the required household and cluster sample sizes to achieve the targeted 0.2 MDE are much lower than in the cluster RCT design (Table 10). However, there are more significant drawbacks and weaknesses of this design compared to the cluster assignment (see below).

TABLE 10. MDE AND ESTIMATED COSTS FOR DIFFERENT SAMPLE SIZES FOR INDIVIDUAL RCT DESIGN				
	(1)	(2)	(3)	(4)
Intervention HH	750	1,000	1,500	2,000
Control HH	750	1,000	1,500	2,000
Total HH sample size	1,500	2,000	3,000	4,000
Total clusters*	50	66	100	133
Number of HH per cluster	30	30	30	30
MDE with more conservative parameters	0.144	0.126	0.102	0.088
Costs (2 survey rounds)	$643,912	$755,446	$978,515	$1,201,583
Costs (3 survey rounds) **	$953,032	$1,120,333	$1,454,936	$1,789,539

*Community or small statistical unit (e.g., rural sections or rural sectors)

**3 rounds would be required for Phased design

An illustrative timeline for an individual RCT is presented in Table 11 for the different design options.

TABLE 11. ILLUSTRATIVE TIMELINE FOR INDIVIDUAL RCT DESIGN					
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
IP activities:					
Intervention group	Begin AA Activities (for Phase I*)		Begin AA Activities for Phase II*		End AA Activities

Control group		No AA Activities		
Timeline:				
2 rounds	Baseline			Endline
3 rounds	Baseline	Midline		Endline

*If the design phase was implemented

Strengths of individually assigned RCT approach:

- This is a statistically rigorous design option in terms of concluding causal relationships because self-selection bias is eliminated.

- Using control households within the same cluster as treatment households eliminates the need to contact other communities or units and to survey households in areas that are not receiving the intervention.

- Because randomization is at the household/individual level rather than the cluster level, a smaller sample size can achieve a smaller MDE.

Weaknesses of individually assigned RCT approach:

- Because there are no clusters without the program, the larger spatial impacts of the intervention cannot be tested. Specifically, cluster-level spillovers (or leakages) cannot be measured or ruled out by the IE.

- It may not be desirable to randomly assign some households that apply to not get the intervention. This is minimized in the phased assignment compared to the other options, but the phased assignment cannot assess long-term impacts.

- The take-up rate of the strategy would need to be high enough (enough households would have to express interest in each cluster) to assign treatment and control groups. Because of the voluntary nature of livelihood approaches, the take-up rate in each cluster could be small.

A QED individual design would contain the weaknesses outlined above for an RCT individual design, but in addition, would not be a statistically rigorous approach to reducing self-selection bias. This is because the control group of households would be households that chose not to participate in the programs and thus are inherently different from those households that participate. While matching can be used to reduce this bias, matching can only control for observable characteristics, and harder to measure factors, like motivations, cannot be considered equal across treatment and control groups.

ADD-ONS FOR IE DESIGNS Below we provide some costs for potential add-on components for any of the IE design approaches for Strategy 2.4.

- **Measure farm-level boundaries.** For all IE designs described above, it is assumed that the evaluation team would have to measure reduced deforestation at the household level by using a buffer around the household location because of a lack of cadastral information. This is not a precise measure, and the accuracy will be determined during field research in terms of the typical location of

farm plots to the households. AA should assess whether there is any cadastral boundary information for the targeted geographies (e.g., from the *Instituto Geográfico Agustín Codazzi* or through SINCHI). If there are, these areas could be targeted for IE to test the validity of the buffer approach that would be used in the larger sample. If there are no boundaries available, a practical method to test the validity of the buffer approach would be to use remote sensing images and social cartography or participatory mapping, where the household identifies their plots on the imagery. This requires more time during the survey process. To do this for a subset of 100 households (50 treatment and 50 control) would cost $13,232. The goal would not be statistical power but to provide confidence in the overall deforestation results.

- **Longer-term (~7-year) deforestation analysis.** Since livelihood approaches can take longer than 3-5 years to see benefits, detecting the impacts of this strategy on deforestation may require a longer time frame. Additionally, it is often of interest to understand whether there is some level of 'permanence' in behavior changes or reductions to deforestation after a strategy has ended. This type of long-term deforestation analysis would require a desk-based analysis of changes to deforestation after the program ends at approximately the 7-year mark (so no additional survey work). Assuming a team of 3 consultants and 3 months to complete the desk-based IE analysis, the cost would be $34,519.

- **Measuring reductions in biodiversity loss.** Deforestation does not necessarily tell us about impacts on biodiversity. Two field-based measurements could be added to determine biodiversity loss, however, given their costs, it is suggested for only a sub-sample of households. The two measurements are:

  1. **Plot-level Forest inventory.** A standardized plot size would be established, and a forest inventory would be conducted at baseline, midline, and endline. This inventory would include tree species diversity, tree age, and crown height and diameter. The costs for this assume 30 plots are inventoried at 4 hours/plot by a team of 2 persons (for 3 data collection rounds): $45,484.

  2. **Wildlife measurements.** Camera traps are considered the most reliable and powerful way to measure wildlife species and diversity. To install camera traps on 100 plots (50 treatment and 50 control) we assume that 2 cameras are needed per plot, that 2 people would oversee monitoring the camera trap data, and 10 field visits would be needed to install and collect data from the cameras (over three time periods). The total cost would be $107,239.

CHALLENGES AND CONSIDERATIONS FOR IE DESIGNS. Below we provide some additional considerations for any IE design approach adopted for Strategy 2.4.

- **Overlap of strategies**. The disadvantage of delivering multiple strategies together as a package is that the IE will not be able to disentangle the relative effects of the different strategies on outcomes (Figure 3). However, given that AA envisions strong linkages between the enabling conditions and livelihood strategies, it is less policy relevant to try to understand the separate effects of the individual strategies as opposed to their combined effects.

- **Endline data collection timing.** The implementation timeline of the strategy needs to be carefully documented to ensure progress is made before endline data collection. If it is found that the strategy has lagged in implementation, it might be necessary to delay endline data collection.

- **Take-up rate/Compliance.** Compliance or take-up rate refers to the probability that a unit in the treatment group receives the treatment. It affects the power of an IE design. Since livelihood approaches are voluntary, a household must choose to participate and low take-up rates could influence the ability to meet the estimated sample sizes in an individual or cluster IE design.

- **Attrition.** Attrition, or the loss of some participants throughout the IE, reduces a study's statistical power at best and can bias impact estimates if attrition is correlated with the treatment. Attrition can occur due to migration, death, or inability to find a household in later periods. Detailed contact information must be collected on households (including cell phone numbers of multiple household members) to find participants even if they move or drop out of the program. Returning to the field at midline could help reduce attrition by establishing more constant contact with households.

- **Spillovers.** Spillovers occur when the untreated units are affected by the treatment, either positively or negatively. Spillovers can lead to biased estimates. The main concern of spillovers for Strategy 2.4 is deforestation spillovers to other neighboring households or less likely, spillovers to neighboring communities. By adopting a cluster design, intra-community spillovers can be tested. By considering the distance between treatment and control communities in the design, cross-community spillovers should be minimal.

- **Heterogeneity impacts/Subgroups.** The evaluation team should be able to test for different impacts of Strategy 2.4 by sub-groups (e.g., indigenous households). If sample sizes are sufficient across these groups, then estimating the impacts of the treatment on sub-groups often does not reduce the power of the analysis. These sub-group analyses should be defined *a priori* to avoid data mining.

- **External Validity.** IE designs are intended to maximize internal validity, so clear conclusions about the impact of an intervention can be drawn. External validity, or the generalizability and replicability of the IE, is difficult to ascertain and is influenced by the implementation process and the similarity of the population that adopts the intervention to other target populations.

OPTION 3. DESK-BASED IE FOR STRATEGY 2.2 OR 2.3

It is possible that a QED IE using matching and difference-in-difference methods could be developed to test the impact of Strategy 2.2 "strengthen land tenure rights and security" or 2.3 "land-use planning and zoning" on deforestation. Many forest conservation policies are evaluated using remote sensing data and similar QED methods because the availability of temporally rich remote sensing data now allows for convincing causal estimates. While this method cannot rule out all sources of bias, it can produce a level of confidence above an outcome PE because of the inclusion of a control group and would be more cost-effective than conducting additional field work. However, the biggest uncertainty is whether a valid control group could be identified that has not received a similar strategy (from AA or a similar program) or that was not potentially affected by spillovers. Thus, discussions between the evaluation team and IP are needed before this option can be considered feasible. The EA team also suggests that any IE of these strategies focus on community-level sub-strategies (e.g., Conservation Agreements) or corridor-level

sub-strategies (e.g., capacity building) versus household-level approaches which would be harder to identify valid control groups without additional field work. If additional field work was of interest, the evaluation team would need to assess the overlap with household-level livelihood strategies and whether an additional treatment type (e.g., Conservation Agreements) could be incorporated into the IE designs presented above. If not, and field work was still desired, an additional set of estimated costs would need to be calculated.

The estimated cost of adding a desk-based IE after the end of the project based on a team of 3 consultants and an additional three months of desk work is $34,519.

HYBRID EVALUATION OPTIONS

In Table 12 we show the estimated costs of the stand-alone PE of most strategies (referred to as "Full PE") and the stand-alone costs for an IE of Strategy 2.4 for comparison. Additionally, we present estimated costs for two hybrid evaluation design options with two to three rounds of data collection and scenarios where the PE is done over three rounds, but the IE is done over only two rounds. The two hybrid designs include the IE of Strategy 2.4 plus some type of outcome PE. The first hybrid option considers IE of 2.4 and a Full PE like what was outlined in option 1 above (minus strategy 2.4). The assumption for this hybrid design is that strategies evaluated by the PE are in different geographies than the IE strategy and so additional quantitative household surveys are needed. These per round costs include labor (six persons); 16 field trips; 1,000 PE surveys; IE surveys; and 140 qualitative interviews.

A second hybrid design option includes the IE of Strategy 2.4 and an outcome PE for only the Objective 1 Strategies 1.1 "strengthen policies, regulations, and rules" and 1.2 "strengthen law enforcement capacity". We suggest prioritizing the PE of Strategies 1.1 and 1.2 over other strategies because these represent key learning interests of USAID (Table 2), and this is a new strategic area for USAID/Colombia. In this "Reduced PE", PE data collection could focus only on qualitative instruments and secondary databases. Even though strategy 1.3 is also part of Objective 1, it was not included in this Reduced PE option because the unit of analysis (Annex 12) and data collection instruments (Table 5) are different from the first two strategies. Included in the costs of this Reduced PE are labor (6 persons); 16 field trips; IE surveys; and 140 qualitative interviews. It should be noted that if strategy 1.3 is implemented in similar geographies as the IE, it could be possible to collect household data on these strategies through the mixed methods IE instruments.

DATA ROUNDS	OPTION1: PE (FULL)	OPTION 2: IE STRATEGY 2.4 (3,000HH)	HYBRID OPTION 1: IE (3,000HH) +FULL PE*	HYBRID OPTION 2: IE (3,000 HH) +REDUCED PE**
TABLE 12. COMPARISON OF ILLUSTRATIVE ESTIMATED COSTS FOR EVALUATION DESIGNS				
2 Rounds	$628,070	$ 978,515	$ 1,224,533	$ 1,001,464
3 Rounds	$929,402	$ 1,454,936	$ 1,824,095	$ 1,489,493
2 Rounds IE & 3 Rounds PE***			$ 1,478,150	$ 1,143,547
Add-ons:				

TABLE 12. COMPARISON OF ILLUSTRATIVE ESTIMATED COSTS FOR EVALUATION DESIGNS

DATA ROUNDS	OPTION1: PE (FULL)	OPTION 2: IE STRATEGY 2.4 (3,000HH)	HYBRID OPTION 1: IE (3,000HH) +FULL PE*	HYBRID OPTION 2: IE (3,000 HH) +REDUCED PE**
Desk-based IE Strategy 1.3	$34,519	$34,519	$34,519	$34,519
Measure farm-level boundaries (100 HH)		$13,232	$13,232	$13,232
Longer-term (~7-year) deforestation analysis		$34,519	$34,519	$34,519
Measure impacts to forest diversity (30 HH)		$45,484	$45,484	$45,484
Measure impacts to wildlife diversity (100 HH)			$107,239	$107,239

*Includes PE costs for strategies 1.1, 1.2, 1.3, 2.2, and 2.3
**Includes PE costs for strategies 1.1 and 12
***For the option of collecting two rounds of data for the IE but three rounds of data for a PE, the costs for the baseline and endline are as specified in the Hybrid Option 1 and 2 descriptions, but the midline costs only include: labor (6 persons); 16 field trips; 1,000 (Full PE) or 0 (Reduced PE) PE surveys; and 100 qualitative interviews.

If the ballpark cost estimates provided above exceed available resources, USAID will need to revisit learning priorities and determine which learning interests are most important to obtain credible and rigorous evidence on AA implementation. It is also important to note that all costs will need to be adjusted once final information on the strategies and geographies is determined with the IP.

OTHER EVALUATION CONSIDERATIONS

For any evaluation design option, a consideration for the AA Activity is the political election in 2022. The presidential election could delay implementation by requiring engagement with new stakeholders (Strategy 2.1) and coordination with different stakeholders (Strategy 1.1 and 1.2). Additionally, the political process could lead to changes in security conditions that affect where strategies are implemented. The evaluation team and IP will need to work closely together to monitor any of these changes or delays in implementation as it would influence the collection timing of midline and endline data, and if implementation is not progressing as scheduled, these data collection efforts may need to be delayed.

7. RECOMMENDATIONS

This section provides the EA team's overall recommendations for proceeding with an evaluation design for the AA Activity. This includes a discussion of key considerations for implementation planning for AA, to confirm the feasibility of the proposed evaluation options and enable a more detailed IE design to proceed for Strategy 2.4 if USAID/Colombia decides to pursue one.

Based on the data collected, the EA team concludes that the AA Activity has the potential to conduct a rigorous IE for Strategy 2.4 on livelihood approaches that would respond to key USAID learning interests. However, for an IE to move forward the following is needed:

- The evaluation team and IP need to work closely together to clarify sub-strategies, ensure TOC for sub-strategies are updated, and clarify if sub-strategies are expected to lead to impacts in five years.

- The evaluation team and IP need to work closely together to define geographies and decide on the best assignment strategy for treatment and control communities.

- The evaluation team and IP need to communicate closely throughout implementation to clarify the timeline, ensure progress is being made, and decide when endline data collection occurs.

Thus, the EA team recommends that USAID consider proceeding with an IE design of Strategy 2.4 in the AA Activity, with the suggested approach being an RCT or QED cluster design. However, it is important to recognize that an evaluation team would need to conduct further work to fully develop and refine the IE design. This should be done in close collaboration with the IP.

If an RCT or QED cluster design IE is implemented, the plausibility of being able to measure any impacts on deforestation or human well-being due to Strategy 2.4 is considered medium-high. The IE design is statistically powered to detect impacts and test for potential spillovers. However, there remain three key concerns. First is the type of livelihood approach and the timeframe that is realistic to see measurable results. It will be important that the IP and evaluation team discuss the suite of livelihood sub-strategies and select sub-strategies that are expected to have results within five years to increase the success of an IE. Previous USAID evaluations found that it took longer than three to five years to establish adequate enabling conditions for many enterprise projects and that once enterprises were established it took longer than three to five years to observe benefits. A suggestion is to use asset-building PES as part of the livelihoods approaches since these can achieve outcomes within two to three years, while the IP is building sustainable enterprises that take more time to develop and more time for outcomes to be realized. Asset-building PES has proven effective at enhancing tree cover and livelihood outcomes in similar contexts.[34]

A second concern is a scale at which the IP will work and the uptake of the livelihood strategies by enough households to achieve the power of the IE designs presented in this report. If the IP will work in a smaller subset of clusters or uptake of sustainable livelihoods by households is limited, then the MDE achievable by the IE will increase. The third concern is the context of the targeted geographic area and the many complexities of developing market access and sustainable livelihood opportunities given

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[34] Calle, A. (2020). Can short-term payments for ecosystem services deliver long-term tree cover change? Ecosystem Services, 42, 84-101.

ongoing security concerns, illicit activities, and a lack of enabling conditions. Related to these concerns, it should be noted that reporting on failures of conservation programs is an important part of evidence generation; however, the hope would be to report a failure because the TOC logic does not hold, not because the results have not materialized (but might at a later timeframe) or because the intervention was not able to be implemented as planned (due to security concerns or other external factors). Doing a rapid assessment before endline data collection to ensure the strategy has been implemented as planned, and benefits are being realized (anecdotally), would be critical before proceeding with the endline study.

It is important to note again that the focus on livelihood strategies in our proposed IE is because strategies 2.1 (stakeholder engagement) and 2.2 (land tenure) are enabling conditions of livelihoods and are assumed to be applied in the same geographies. An impact evaluation cannot tease out the different impacts of these layered strategies, and it makes the most theoretical sense to assume livelihoods would be the catalyst for behavior changes and changes to deforestation rates. However, ultimately, the impact evaluation is capturing the total effect of all these strategies.

While an IE was not considered feasible for other AA strategies, the second recommendation of the EA team is that an outcome PE is conducted for Objective 1 Strategies 1.1. and 1.2 to inform USAID learning interests and because this is a newer strategic area for USAID/Colombia. By only focusing on these two strategies, the PE could focus on collecting rich qualitative data and complement this with secondary government databases, reducing the overall costs of this hybrid evaluation approach (Table 12). This would focus the environmental crimes evaluation on national and local-scale government strategies, and not on community monitoring strategies. For this design to move forward, the following is needed:

• The evaluation team and IP need to work closely together to clarify sub-strategies, ensure TOC for sub-strategies are updated, and clarify the unit of assignment of sub-strategies.

The EA team recommends this hybrid approach versus conducting a Full PE in addition to an IE because the scope and scale in this latter approach would likely be too great for an evaluation team. This is because of the complexity of the AA Activity and the fact that different strategies have different treatment units and would require different primary data collection instruments, including additional quantitative data collection and analysis (Table 5 and Annex 12). Instead, an evaluation team should consider whether evaluation questions can be included in the mixed methods IE instruments related to Strategies 1.3, 2.2, or 2.3. This would be feasible if the strategies are implemented in the same geographies, which is the assumption for Strategies 2.1 and 2.2, but it is not known at this time if this is the case for Strategies 1.3 or 2.3.

Regarding the possibility of conducting a hybrid evaluation approach using two rounds of data collection versus three rounds, **the EA team suggests that the Activity try to include three rounds of data collection**. Three rounds of data collection would help reduce attrition rates in an IE because of more regular contact with households and help with adaptive learning around livelihood strategies. For Objective 1, having a midline data collection effort would help determine if strategies are leading to their short-term outcomes which will be critical for achieving later-stage outcomes. Having mid-project data would allow for any modifications and adaptations that are needed to the strategies to be made early in the project life cycle.

The third recommendation by the EA team is that a desk-based or field-based IE for Strategy 2.2 and or Strategy 2.3 be assessed for feasibility when more information is available. A QED IE for Strategy 2.2 or 2.3 would provide additional evidence on forest conservation and management strategies for AA, and a desk-based IE could be cost-effective. However, to determine whether this option is feasible, the following is needed:

- The evaluation team and IP need to work closely together to clarify sub-strategies, ensure TOC for sub-strategies are updated, and clarify the unit of assignment of sub-strategies.

- The evaluation team and IP need to work closely together to discuss targeted treatment geographies and scales and decide if viable control geographies would exist for this evaluation design.

Given the above, and because it is too soon to make a final determination on the most feasible and cost-effective evaluation design at this stage until additional AA implementation details are known, the EA team recommends that an evaluation design team move forward with preliminary planning in collaboration with the IP for the PE and IE design options. Specific next steps include: (1) revising the TOC for specific sub-strategies that the IP has identified; (2) discussing the envisioned timing and structure for rolling out all strategies across the identified geographic areas; (3) discussing the best allocation of treatment and control units for the IE design based on the identified potential geographies; (4) selection of an appropriate and feasible unit of assignment for the IE; and (5) once the potential units of the assignment are known for an IE, to confirm that a sufficient number of strong potential candidates for the treatment and control groups exist for either an experimental or quasi-experimental cluster IE design.

ANNEX 1. SPECIFIC QUESTIONS ADDRESSED IN THE EVALUABILITY ASSESSMENT FROM THE SCOPE OF WORK

The original scope of work (SOW) for this desk-based evaluability assessment (EA) laid out the following sub-tasks:

a) Clarify the intervention, its key objectives, and associated results-logic framework (see Table 1 for more information)
b) Confirm key learning interests and issues of strategic interest for USAID (see Table 1 for more details)
c) Identify and prioritize illustrative key evaluation questions among USAID stakeholders (see Table 1 for more information)
d) Identify methodological challenges and constraints (see Table 1 for more details)
e) Assess data needs and availability, and key program risks and assumptions (see Table 1 for more information)
f) Identify useful data collection and analysis methods (See Table 1 for more details)

These sub-tasks were guided by a set of overarching illustrative questions as presented in Table 1, Column 1. However, due to restrictions on who the EA team could speak with—USAID staff only—and the early stages of the procurement of this Activity with an implementing partner (IP), some of the SOW questions were not able to be addressed in this EA. The specific set of questions addressed in this EA are shown in Table 1, Column 2.

Specifically, under Theme I, the EA team was not able to assess the specific geographies and beneficiaries for AA since there were no discussions with the IP during the EA; under Theme II, the IP's and other key stakeholders' learning interests were not assessed because the EA could only interview USAID staff; under Theme III, USAID/Colombia directed the EA team that resources were available to conduct an impact evaluation and so this topic was not specifically assessed; under Theme IV, an in-depth benefit-cost assessment was not able to be conducted for the Activity; finally, illustrative questions for both Themes V and VI were able to be fully assessed in this EA.

TABLE 13. OVERARCHING QUESTIONS FOR THE EA LAID OUT IN THE SCOPE OF WORK AND WHAT IS ADDRESSED IN THE FINAL REPORT	
SOW OVERARCHING THEMES AND QUESTIONS	SPECIFIC QUESTIONS ADDRESSED IN THIS REPORT
I. AA Intervention Theory of Change	I. AA Intervention Theory of Change
• Is it plausible to achieve the activities' expected outcomes through the proposed interventions and within the proposed time frame?	• Is it plausible to achieve the activities' expected outcomes through the proposed interventions and within the proposed time frame?
• Are the key objectives, expected outcomes, and assumptions clearly specified in the activity's Theory of Change (TOC)?	• Are the key objectives, expected outcomes, and assumptions clearly specified in the activity's Theory of Change (TOC)?
• Are there adjusted alternative TOC, expected outcomes, and assumptions that could be developed to address potential weaknesses in those presently proposed?	• Are there adjusted alternative TOC, expected outcomes, and assumptions that could be developed to address potential weaknesses in those presently proposed?

TABLE 13. OVERARCHING QUESTIONS FOR THE EA LAID OUT IN THE SCOPE OF WORK AND WHAT IS ADDRESSED IN THE FINAL REPORT

SOW OVERARCHING THEMES AND QUESTIONS	SPECIFIC QUESTIONS ADDRESSED IN THIS REPORT
• What expected activity interventions might be evaluable (impact if possible), through what methods, and at what stages during and/or after the project timeframe? • What specific components of the activity and intended results are of the most significant learning interest? • Will it be possible for the evaluation to examine the entire activity geography or a subset of geographic regions or sites? • Who are the intended beneficiaries, and how are they targeted/selected?	• What expected activity interventions might be evaluable (impact if possible), through what methods, and at what stages during and/or after the project timeframe? • What specific components of the activity and intended results are of the most significant learning interest?
II. Evaluation Questions • What are the key evaluation learning interests and questions at this stage? How are these prioritized? • Will it be possible to answer the proposed evaluation questions of the highest interest in a rigorous way through this evaluation? • What are the underlying assumptions associated with these learning interests and questions? • Who are the key stakeholders and/or audience (e.g., USG, USAID, Colombia mission, USAID's implementing partners, partner country governments, and other donors) that need to be involved during the design of the IE? • What are IP's and other stakeholder's key evaluation questions and learning priorities? • Are there specific knowledge gaps or learning interests that the evaluation should address, and can the evaluation be designed to meet those needs? • Are there any information gaps that need to be addressed to comply with custom indicators?	II. Evaluation Questions • What are the key evaluation learning interests and questions at this stage? How are these prioritized? • Will it be possible to answer the proposed evaluation questions of the highest interest in a rigorous way through this evaluation? • What are the underlying assumptions associated with these learning interests and questions? • Who are the key stakeholders and/or audience (e.g., USG, USAID, Colombia mission, USAID's implementing partners, partner country governments, and other donors) that need to be involved during the design of the IE? • Are there specific knowledge gaps or learning interests that the evaluation should address, and can the evaluation be designed to meet those needs?
III. Capacity for and Usefulness of Evaluation • Does AA have the necessary capacities to support an impact evaluation and utilize the evaluation results to guide its interventions? • Is the activity context conducive to supporting an appropriate impact evaluation (e.g., partner commitment to evaluation, political events, resources, etc.)? • How are evaluation results intended to be used for decision-making? • What specific program interventions would an impact evaluation be most useful for guiding the AA program management decision?	III. Capacity for and Usefulness of Evaluation • How are evaluation results intended to be used for decision-making? • What specific program interventions would an impact evaluation be most useful for guiding the AA program management decision? • Will an impact evaluation be useful for informing USAID's priority learning and decision-making needs for this programming type?

TABLE 13. OVERARCHING QUESTIONS FOR THE EA LAID OUT IN THE SCOPE OF WORK AND WHAT IS ADDRESSED IN THE FINAL REPORT

SOW OVERARCHING THEMES AND QUESTIONS	SPECIFIC QUESTIONS ADDRESSED IN THIS REPORT
• Will an impact evaluation be useful for informing USAID's priority learning and decision-making needs for this programming type?	
IV. Timing, Logistics, and Cost	IV. Timing, Logistics, and Cost
• Is there adequate time to plan, design, and conduct an impact evaluation in the context of the AA implementation schedule?	• Is there adequate time to plan, design, and conduct an impact evaluation in the context of the AA implementation schedule?
• What would be the logistics required for the evaluation, and how would it affect the AA's activities implementation?	• What would be the logistics required for the evaluation, and how would it affect the AA's activities implementation?
• What is the potential to generate credible evidence through the proposed designs?	• What is the potential to generate credible evidence through the proposed designs?
• What are the estimated costs of conducting a robust and reliable impact evaluation (baseline, midterm, and end-line) in the AA interventions' geographic areas?	• What are the estimated costs of conducting a robust and reliable impact evaluation (baseline, midterm, and end-line) in the AA interventions' geographic areas?
• Will the evaluation's benefits exceed the evaluation costs (including monetary costs and burden on staff, implementers, beneficiaries, and stakeholders)?	
V. Data Collection Availability and Quality of Information	V. Data Collection Availability and Quality of Information
• Can data and information be collected (through primary and secondary sources) to answer key evaluation questions and measure the activity's impact?	• Can data and information be collected (through primary and secondary sources) to answer key evaluation questions and measure the activity's impact?
• What are key sources of threats to causal attribution under potential IE design options?	• What are key sources of threats to causal attribution under potential IE design options?
• Will it be possible to answer the proposed evaluation questions based on evidence and data and support the findings with quantitative and qualitative information that is reliable, valid, and generalizable?	• Will it be possible to answer the proposed evaluation questions based on evidence and data and support the findings with quantitative and qualitative information that is reliable, valid, and generalizable?
VI. IE Design Criteria	VI. IE Design Criteria
• Given the activity's TOC, priority interventions, and key evaluation questions, what is an appropriate impact evaluation design approach?	• Given the activity's TOC, priority interventions, and key evaluation questions, what is an appropriate impact evaluation design approach?
• What would be the unit(s) of analysis of the evaluation?	• What would be the unit(s) of analysis of the evaluation?
• What should be the sampling approach and sample size?	• What should be the sampling approach and sample size?
• Is it possible to identify and access a control group?	• Is it possible to identify and access a control group?
• If an impact evaluation is not feasible, could a performance evaluation provide the information needed for the activity decision-making and answer key evaluation learning interests and questions?	• If an impact evaluation is not feasible, could a performance evaluation provide the information needed for the activity decision-making and answer key evaluation learning interests and questions?

ANNEX 2. QUALITATIVE DATA COLLECTION INSTRUMENT

Theme 1: Amazon Alive Intervention Theory of Change

1. What specific strategies or interventions do you think should be used to meet Objective 1 "improve the effectiveness of environmental crime prevention and prosecution" to achieve the minimum expected results in the AA Statement of Objectives (within the broad categories of: improve GOC's response to environmental crime prevention & reduction; generate and/or share tools and data to prosecute and convict environmental crimes; and build capacity to confront environmental crimes & deforestation)?

    a. Why do you suggest these strategies or interventions?

    b. At what unit (e.g., community, municipality, national government) would the strategies or interventions need to be implemented?

2. What specific strategies or interventions do you think should be used to meet Objective 2 "improve the effectiveness of forest conservation & management" to achieve the minimum expected results in the AA Statement of Objectives (within the broad categories of: land use rights/land tenure; market-based approaches; natural resource management practices; and engaging stakeholders)?

    a. Why do you suggest these strategies or interventions?

    b. At what unit (e.g., community, municipality, national government) would the strategies or interventions need to be implemented?

3. What do you identify as the challenges and opportunities of the AA Activity in terms of achieving the long-term impact of avoided deforestation in the Colombian Amazon?

Theme II: Evaluation Learning Questions

4. Considering the AA Activity, what learning interests or learning agendas would you consider relevant to be addressed under Objective 1 "improve the effectiveness of environmental crime prevention and prosecution"?

5. Considering the AA Activity, what learning interests or learning agendas would you consider relevant to be addressed under Objective 2 "improve the effectiveness of forest conservation & management"?

Theme III: Capacity and Usefulness of Evaluation

6. In your opinion, which stakeholders would benefit from an evaluation of the AA Activity and how could these stakeholders use the information generated by an evaluation?

Theme IV: Timing, Logistics, and Costs

7. Under what timeframe would an evaluation of the AA Activity need to be completed to be useful to the stakeholders you described above and for the purposes you suggested?

Theme V: Data Collection Availability and Quality of Information

8. Related to Obj 1 "improve the effectiveness of environmental crime prevention and prosecution", are there specific indicators or types of information/data that you would suggest to monitor the outcomes in an evaluation of the AA Activity?

9. Related to Obj 2 "improve the effectiveness of forest conservation & management", are there specific indicators or types of information/data that you would suggest to monitor the outcomes in an evaluation of the AA Activity?

10. In the past, USAID has conducted activities similar to the AA Activity. Do you know whether these previous activities were able to conduct a rigorous evaluation? What lessons could be learned from these past evaluation efforts to inform the evaluation of the AA Activity?

Theme VI: Evaluation Design Criteria

11. Given the AA Activity and the learning interests/agenda you identified earlier, do you think stakeholders would benefit more from an impact evaluation or a performance evaluation? Why do you think so?

    a. Does your opinion on the preferred evaluation design differ for Objective 1 versus Objective 2?

ANNEX 3. SITUATION MODEL

Land speculation, land grabbing and praderization
Illegitimately occupying or settling rural land in order to demonstrate tenure, acquire title, or secure other rights or benefits

Environmental restrictions (Weather, poor solis)

National and international markets/supply chains

Advance/ expansion of the agricultural frontier

Lack of sustainable livelihoods

Unplanned productive alternatives

Agriculture, Livestock and Forestry

Selective Illegal logging
Selective extraction of trees, including protected or endangered species, in prohibited areas and/or without proper permits

Cattle ranching
Cutting and burning of native vegetation for livestock farming beyond legal limits or within prohibited areas and/or lacking proper tenure

Illicit crops
Cultivation of plants like coca with illicit purposes, marijuana, and other intoxicants or hallucinogens often classified as controlled substances

Industrial agriculture
Large-scale, intensive production of crops on areas beyond legal limits and/or using improper methods

Small-scale agriculture
Small-scale cutting and burning of native vegetation for cultivation beyond legal limits or within prohibited areas and/or lacking proper tenure

Subsistence Hunting
Overhunting, or hunting of protected or endangered species, in undesignated areas or above established limits

Lack of Political Will / Weak Governance
Corruption

Lack of coordination/presence among government agencies (Military, Police, District Attorney and Environmental Authorities-Entities)

Lack of incentives to develop and implement politics for sustainable natural resources

Lack of financial and human

Post conflict - Inmature Peace Accord implementation

Weak implementation of Indigenous jurisdiction

Weak Territorial control

Weak local/community governance

Violence and Security

Low prosecution and law enforcement

Covid 19 context

Conservation Targets

Scope: Amazon Arc of deforestation

Natural Forest

Biodiversity

Ecosystem Services
Climate regulation (Carbon storage & sequestration)

Regulation of freshwater quality

Regulation of water quantity, timing and flows

Habitat maintenance

Food, forage and energy sources

Local materials and medicinal resources

Supporting local identities and culture

Physical and psychological experiences

Human Well-Being
Security from natural disasters

Planetary well-being from reduced emissions

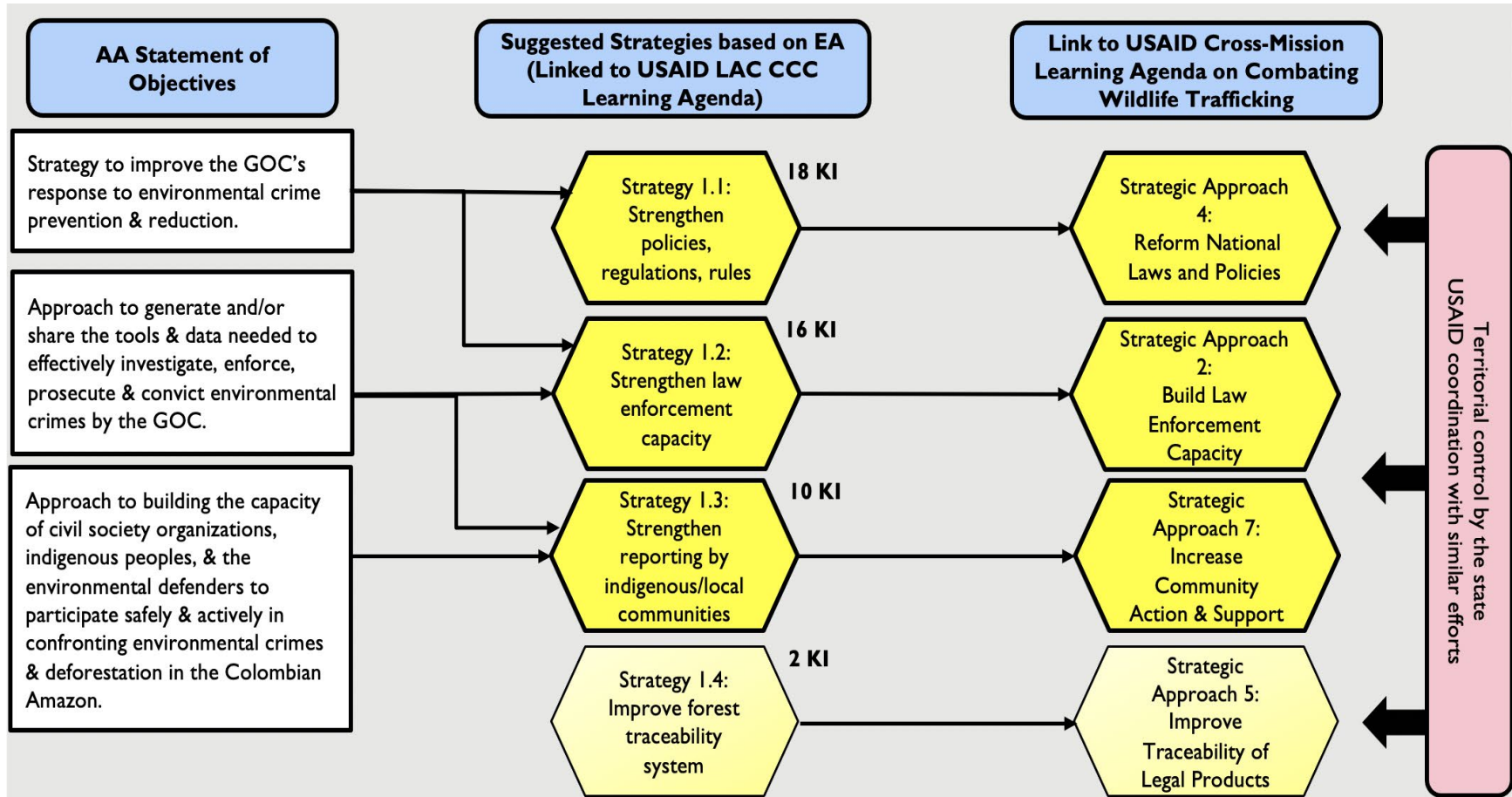Local physical health/well-being

Local material well-being and income

Local food security

Maintain traditional ways of life

Spiritual health

Tourism livelihoods

Inadequate Technical Information / Environmental Education (GOC & Local)
Not enough knowledge about biodiversity, biology and conservation

Lack of dissemination of forest

Not enough knowledge about land use

Energy and Mining
Small-scale mining
Small-scale extraction, processing and trading of minerals without appropriate permissions and/or mitigation measures

Oil & Gas
Extraction, processing, and trade of oil and natural gas without appropriate permissions and/or mitigation

Infrastructure
Transportation infrastructure
Construction and maintenance of installations to facilitate the movement of people and goods throughout a territory (licit or not)

Housing and urban growth
Unauthorized and/ or unmitigated urban and rural construction to provide shelter and services to local or temporary populations

Commercial and industrial development
Unauthorized and/or unmitigated real estate development to provide products or services for commerce or business

Weak Accountability, Surveillance and Monitoring
Lack of accountability system

Lack of surveillance and legal sanctions

Lack of incentives (economic costs and rewards) for local people and government

Changes in popultation

miro

ANNEX 4. SUGGESTED STRATEGIES SUGGESTED FOR OBJECTIVE 1 MAPPED FROM STATEMENT OF OBJECTIVES WITH NUMBER OF KI'S THAT MENTION IT INDICATED

ANNEX 5. DESK REVIEW – OBJECTIVE 1

DOCUMENTS RELEVANT FOR ALL THE STRATEGIES

USAID (2017) COMBATING WILDLIFE TRAFFICKING CROSS-MISSION LEARNING AGENDA

Through this learning agenda, USAID highlights a series of common strategic approaches used to combat wildlife crime in its Measuring Efforts to Combat Wildlife Crime toolkit. Two are relevant for Amazon Alive:

- Strategic Approach 2. Build Capacity for Effective Enforcement and Prosecution. The provision of financial or technical assistance to improve the capacity of governments and agencies to enforce wildlife laws and prosecute wildlife criminals. Enforcement actions are expected to both increase the risks for wildlife criminals and contribute to reduced purchases of target illegal wildlife products by consumers.

- Strategic Approach 7. Increase Community Conservation Action and Support to Combat Poaching and Trafficking: Efforts to build community support and action to decrease poaching and illegal activity. Put in place community incentive structures (related to economics, governance, security, or other factors) that will, in combination with the removal of enforcement barriers, lead communities and enforcement agencies to establish effective cooperation.

STRATEGY 1.1. STRENGTHEN POLICIES, REGULATIONS, RULES

Himmelhoch, Sarah. "Environmental Crimes: Recent Efforts to Develop a Role for Traditional Criminal Law in the Environmental Protection Effort" Environmental Law Vol. 22 (1992), 1469-1507.

This article shows how environmental crimes emerged as an institutional intent to address environmental problems through the implementation of civil and criminal penalties to protect the environment. The author demonstrates that the initial interest in the use of traditional criminal law was premature and that the most promising route to consolidate this scheme is to adopt and enforce criminal statutes specifically directed at environmentally damaging behavior.

Blomquist, Robert. "The Logic and Limits of Environmental Criminal Law in the Global Setting: Brazil and the United States--Comparisons, Contrasts, and Questions in Search of a Robust Theory." Tulane Environmental Law Journal Vol. 23 (2011), 83-98.

This article presents the cases of the United States and Brazil to argue the need to reform the national systems of criminal environmental law and enforcement to overcome the challenges around the proper integration of environmental rules and criminal sanctions into a balanced mosaic of clear enactment, evenhanded enforcement, and fair construction. This is, consider the nature, aims, and limits of criminal law and how they relate to the underlying substantive offenses defined in the environmental statutes.

Faure, Michael. "The Development of Environmental Criminal Law in the EU and its Member States." 2 Review of European Community & International Environmental Law Vol. 26 (2017), 139-146.

Through the analysis of the case of the European Union -the interplay between national legal systems and community law-, this article suggests that environmental criminal regulation must be supplemented by a "toolbox approach", according to which alternative remedies to criminal legal must be introduced to allow the latter scheme to play its role as ultimum remedium.

STRATEGY 1.2. STRENGTHEN LAW ENFORCEMENT CAPACITY

United Nations Office on Drugs and Crime – UNODC. Wildlife and Forest Crime Analytic Toolkit. New York: United Nations, 2012.

The toolkit included in this publication provides a comprehensive overview for understanding the nature and extent of environmental offenses and for analyzing preventive and criminal justice responses to wildlife and forest offenses. Underdeveloped legal frameworks, weak law enforcement, and poor prosecutorial and judicial practices, as well as a lack of understanding of the different factors that drive wildlife and forest offenses, have resulted in valuable wildlife and plant resources becoming threatened by, inter alia, illegal logging, illegal trade in timber products, poaching and trafficking in animal parts, derivatives, and plant material. Law enforcement is pointed out to be one of the main tools to reduce wildlife and forest crime. Enforcement involves any government action or intervention taken to determine or respond to non-compliance. It is the most immediate and often the most visible way to suppress wildlife and forest crime. The toolkit identifies the following as aspects subject of direct intervention: enforcement agencies; intelligence; enforcement powers; investigation procedures and techniques; border control and Customs; international cooperation in criminal matters; technical assistance and aid; and accountability and integrity.

United Nations Environmental Program - UNEP. Enforcement of Environmental Law: Good Practices from Africa, Central Asia, ASEAN Countries, and China.

For any environmental legislation or regulation to be effective it requires to be adequately enforced. Environmental Laws do provide enforcement mechanisms and expect the responsible authorities to enforce the law. Developing countries have however been experiencing weak enforcement that is rendering the national environmental laws and regulations sometimes ineffective in deterring violations. The law enforcement process must be conducted considering three complementary perspectives: administrative enforcement, civil enforcement, and criminal enforcement. Also, it is asserted that both networking and Institutional coordination provide a good opportunity to strengthening the enforcement of environmental law.

STRATEGY 1.3. STRENGTHEN REPORTING BY INDIGENOUS/LOCAL COMMUNITIES

Tomkins, Kevin. Police, "Law Enforcement and the Environment." 3 Current issues in criminal Justice Vol. 16 (2007) 294-306.

Community policing has emerged in recent years as an effective and productive strategy for enforcing the law at the local level. Especially in the wildlife and forestry sectors, some government agencies deploy local rangers, guards, and other officers to patrol game reserves, monitor logging activities, and ensure compliance with the relevant laws and regulations. Some countries have instituted "bush watch" schemes, like Neighborhood Watch programs designed to prevent wildlife theft and to protect native fauna and flora.

Anagnostou, Michelle et. al. "Ranger perceptions of the role of local communities in providing actionable information on wildlife crime" Conservation Science and Practice (2020).

Wildlife crime in protected areas remains a major conservation challenge. However, little is known about the role of local communities in providing information on illegal activities to help improve law enforcement efforts in protected areas. This article aims to understand the perceptions of law enforcement authorities working directly with local communities on the conditions under which local people provide information to park rangers, using the Murchison Falls Protected Area in Uganda as a case study. There was consensus among participants that people who provide information are those who have trusted relationships with rangers; interact regularly with community outreach rangers (either formally through community programs or informal socializing); and believe that the protected area benefits them and their community. All respondents believed that information provided by local people can enable the success of wildlife crime investigations, but that associated ethical issues must be addressed. This study indicates that engaging communities in protected area conservation are crucial for law enforcement efforts to be effective in addressing wildlife crime.

USAID (2016) Rewards and Risks Associated with Community Engagement In Anti-Poaching And Anti-Trafficking

As demand for wildlife products drives an increase in prices, poaching and trafficking are becoming more militarized and connected to organized criminal gangs. Although communities have long been effective in regulating the behavior of their members, should they help detect and prevent crimes associated with the illegal wildlife trade? Results of this study strongly suggest that community engagement in anti-poaching and anti-trafficking efforts are not only feasible but desirable because they can reduce crime and improve citizen security. Many factors influence when communities might or might not be motivated to engage in efforts that reduce or halt wildlife poaching and trafficking. In some situations, community engagement in anti-poaching and antitrafficking efforts creates an unacceptable risk. This summary includes a set of the most important factors that conservation practitioners need to consider when assessing the risks and rewards of engaging communities in anti-poaching and anti-trafficking efforts.

STRATEGY 1.4. IMPROVE FOREST TRACEABILITY SYSTEM

USAID (2020) Combating Conservation Crime Learning Agenda Latin America and the Caribbean Environment

The LAC Environment Combating Conservation Crime (CCC) Learning Program and Agenda address the need to understand the drivers, actors, and patterns of conservation crimes particular to the LAC region, and the conditions under which the prioritized CCC strategic approaches best function to achieve environmental outcomes. The learning agenda indicates that strengthening reporting by indigenous/local communities and strengthening law enforcement are the two strategic approaches with the most pressing knowledge gaps. The learning agenda also indicates that improving traceability for legal products (the ability to determine with precision and timeliness if a product is legal) is a key strategic approach to combating conservation crimes.

ANNEX 6. KEY ASSUMPTIONS FOR OBJECTIVE I TOC

OBJECTIVE I: IMPROVE THE EFFECTIVENESS OF ENVIRONMENTAL CRIME PREVENTION AND PROSECUTION.

INTERVENTIONS

- Strategy 1.1: Strengthen policies, regulations, rules.
- Strategy 1.2: Strengthen law enforcement capacity.
- Strategy 1.3: Strengthen reporting by indigenous/local communities.
- Strategy 1.4: Improve the Forest traceability system.

KEY ASSUMPTIONS (IF, THEN):

GENERAL

1. There is sufficient political will at the national level to engage in and implement Objective 1.
2. There is sufficient political will on the part of local governments to engage in and implement Objective 1.
3. There is sufficient political will on civil society to engage in Objective 1.
4. Environmental crimes are considered by Colombian criminal legislation and justice policies.
5. Environmental crimes are instrumentalized through security and defense policies.
6. The GOC has an effective presence in the Amazon region and exerts control of the deforestation core areas.
7. The GOC provides security to the population located in the region, particularly the peasantry and the indigenous communities.
8. Corruption within the GOC is contained and legal processes are conducted transparently.
9. International demand for illegal products will not undermine efforts to address Objective 1.

STRATEGY 1.1

10. The design of both an information management tool and a set of indicators to follow up programs, plans, and strategies around deforestation will facilitate the coordination tasks conducted by CONALDEF.
11. The conduction of working sessions on environmental criminal, sanctionatory, policy, and disciplinary procedures among the institutions involved in the management of deforestation will generate articulation capacities around the prevention and prosecution of environmental crimes.
12. The creation of a special force of environmental protection contributed to the consolidation of a defense and security scheme in the Amazon that will facilitate the implementation of environmental crimes prevention and prosecution activities.

STRATEGY 1.2

13. As a result of the training of public servants from the judiciary, public servants from the Office of the Attorney General (attorneys and investigators), and members of the army and the police, the

institutions involved in environmental crimes prevention and prosecution will count on technical capacities to comply with their legal corresponding mandate.

14. The development of coordination capacities within the institutions involved in the management of deforestation will lead to the effective operation of the national scheme on the matter (CONALDEF).

15. The development of coordination capacities within the institutions involved in the management of deforestation will lead to the effective functioning of the continuum of activities ranging from preventive measures to criminal-related actions imposed by apprehension, prosecution, and conviction.

16. If actions are exerted to control the dynamics of certain illegal economic activities that take place in the Amazon (money laundering, traffic of plant species-based products, illegal transportation infrastructure associated with deforestation), the incidence of environmental crimes will be reduced.

STRATEGY 1.3

17. If community-based forest and wildlife crime monitoring networks are established, environmental crime prevention and prosecution will be strengthened. [35]

18. A human security-oriented safe denounce mechanism for community involvement on environmental crimes control is developed.

STRATEGY 1.4

19. The update of the forestry traceability system will impact the effective control of certain deforestation dynamics associated with illegal economies.
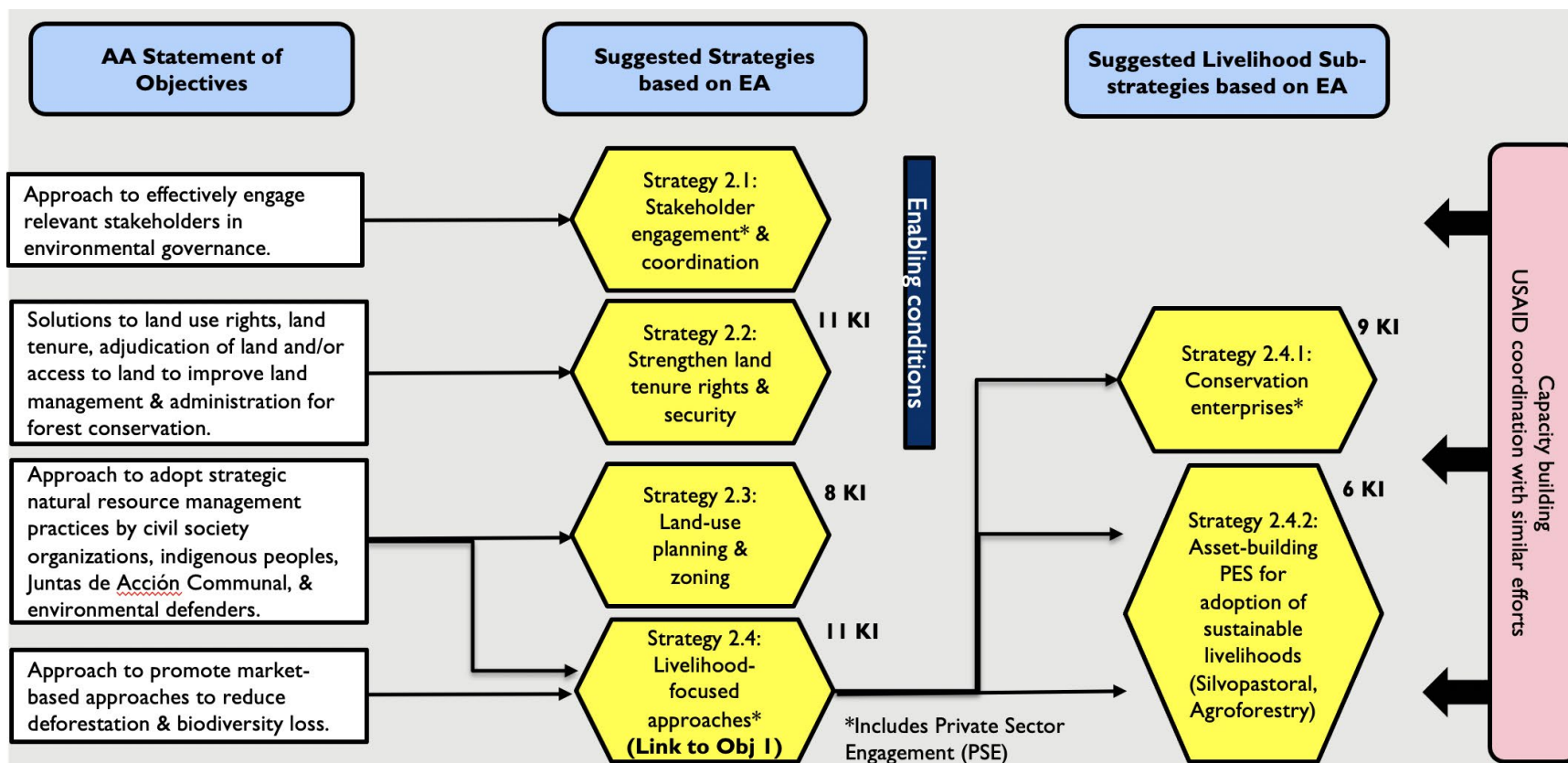
SOURCES USED TO INFORM KEY ASSUMPTIONS:

- The Republic of Colombia. 1996. CONPES Document 4021.

  - Objective 3: strengthening institutional prevention, investigation, and judicialization capacities to control the illegal economic activities that drive deforestation.

- Republic of Colombia, Ministry of the Environment. 2017. "Estrategia Integral de Control a la Deforestación y Gestión de los Bosques."

  - The strategy of environmental inspection.

- Republic of Colombia. 2018. "Plan de Acción para reducir la deforestación y hacer frente a los efectos del cambio climático en la Amazonía colombiana STC 4360 de 2018."

  - Effective territorial control to the deforestation core areas.

- Republic of Colombia, Ministry of Defense. 2019. Security and Defense Policy.

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[35] The public policy documents produced by the GOC on deforestation management do not consider this strategy directly.

- Deforestation as a matter of national security- need to have an associated defense and security scheme.

- USAID. 2017. Combating Wildlife Trafficking Cross-Mission Learning Agenda.

  - Inclusion and development of the "Increase community conservation action and support" and "build capacity for effective enforcement and prosecution" strategies.

- USAID. 2017. Results of Specialized Environmental Justice Department of Petén, Guatemala.

- Provision of indicators associated with Strategy 1.2 (apprehension, criminal prosecution, and adjudication and conviction).

- USAID. 2020. Combating Conservation Crime Learning Agenda. Latin America and the Caribbean Environment.

  - Learning agenda used to structure and categorize Objective 1 strategies.

ANNEX 7. SUGGESTED STRATEGIES FOR OBJECTIVE 2 MAPPED FROM STATEMENT OF OBJECTIVES WITH NUMBER OF KI'S THAT MENTIONED IT INDICATED

ANNEX 8. DESK REVIEW – OBJECTIVE 2

STRATEGY 2.1: STAKEHOLDER ENGAGEMENT & COORDINATION

Furumo, P. R. (2020). Scaling up zero-deforestation initiatives through public-private partnerships: A look inside post-conflict Colombia. Global Environmental Change Journal, 62, 102055.

In this paper, the authors explore public-private policy interactions in the context of zero-deforestation international commitments subscribed by the Colombian government and consider the opportunities created by the peace deal with the FARC guerrilla. Authors identify zero-deforestation initiatives in three overlapping governance domains (i.e., domestic public policy, REDD+, sustainable supply chain in-initiatives), and highlight multi-stakeholder pledges that have catalyzed supporting initiatives at multiple scales. The identified lessons show that the government provides important directionality among the proliferation of zero-deforestation initiatives. Public pledges and the orchestration of actors through public-private partnerships allow to scale up efforts by aligning transnational activities with national priorities. The case of Colombia serves as a potential zero-deforestation model for other nations. However, the authors saw challenges around equitable land tenure, illegality, and enforcement, all related to the AA intervention, that must be overcome to produce long-term change.

Kainer, K., DiGiano, M., Duchelle, A., Wadt, L., Bruna, E. & Dain, J. (2009). Partnering for Greater Success: Local Stakeholders and Research in Tropical Biology and Conservation. Biotropica 41 (5), 555-562.

Local communities are important stakeholders in resource management and conservation efforts, particularly in the developing world. Although evidence is mixed in suggesting that these resident stakeholders are optimal forest stewards, it is highly unlikely that large tracts of tropical forests will be conserved without engaging local people who depend on them daily for their livelihoods. Stakeholders, who reside in biodiverse ecosystems like tropical forests, are the largest direct users and ultimate decision-makers of forest fate, can be important investors in conservation, harbor local ecological knowledge that complements Western science, and frequently have long-term legitimate claims on lands where they reside. Research partnerships with local stakeholders can increase research relevance, enhance knowledge exchange, and result in greater conservation success. Different phases of the research cycle present distinct opportunities for partnership, with flexibility in timing, approaches, and strategies depending on researcher and local stakeholder needs and interests. Despite being the last step in the research process, dissemination of results can be the best starting point for researchers interested in experimenting with local stakeholder engagement. Still, tropical biologists might not choose to partner with local people because of lack of institutional rewards, insufficient training in stakeholder engagement, insecure research infrastructure in community settings, and time and funding limitations. Although not appropriate in all cases and despite significant challenges, some biological scientists and research institutions have successfully engaged local stakeholders in the research process, proving mutually beneficial for investigators and local people alike and resulting in important innovations in tropical biology and conservation.

Reed, J., Barlow, J., Carmenta, R., Van Vianen, J. and Sunderland, T. (2019). Engaging multiple stakeholders to reconcile climate, conservation and development objectives in tropical landscapes,

Biological Conservation, Volume 238, 108229, ISSN 0006-3207, https://doi.org/10.1016/j.biocon.2019.108229.

Achieving equitable and sustainable development that supports climate change mitigation targets and avoids biodiversity loss remains a leading, and intractable challenge in many tropical countries. Sectorial thinking – focusing on just one aspect of the problem or system – is increasingly understood to be inadequate to address linked social-ecological challenges. Holistic approaches that incorporate diverse stakeholders across scales, sectors, and knowledge systems are gaining prominence for addressing complex problems. Such 'integrated landscape approaches' have received renewed momentum and interest from the research, donor, and practitioner communities, and have been subsumed in international conventions related to climate, biodiversity, and sustainable development. However, implementation efforts and tangible evaluation of progress continue to lag behind conceptual development. Failure of landscape approaches to adequately engage diverse stakeholders—in design, implementation, and evaluation—is a contributing factor to their poor performance. Here we draw on consultation workshops, advances in the literature, and our collective experience to identify key constraints and opportunities to better engage stakeholders in tropical landscape decision-making processes. Specifically, we ask: (1) what are the key challenges related to effectively engaging multiple stakeholders in integrated landscape approaches and (2) what lessons can be learned from practitioners, and how can these lessons serve as opportunities to avoid duplicating future research efforts or repeating past perceptions of underperformance. We present our findings within three broad categories: (i) navigating complexity, (ii) overcoming siloed thinking, and (iii) incentivizing behavioral change; thus, providing a useful starting point for overcoming inherent challenges associated with engaging stakeholders in landscape approaches.

Ribeiro, S. C., Selaya, N. G., Perz, S. G., Brown, F., Schmidt, F. A., Silva, R. C. & Lima, F. (2020). Aligning conservation and development goals with rural community priorities: capacity building for forest health monitoring in an extractive reserve in Brazil. Ecology and Society 25(3):5. https://doi.org/10.5751/ES-11665-250305dfsdfds

We reflect on our experience in seeking to align the goals of a conservation and development project with community priorities in the Chico Mendes Extractive Reserve in Acre, Brazil. Our project featured capacity building for monitoring forest health to foster participation in payments for ecosystem services programs. Although we pursued prior consultations and designed participatory activities, and although we combined knowledge transmission with skills training, participation declined. That prompted our team to consult with community members, which generated important insights about expectations of immediate economic remuneration, community political cultures, communicative practices, and differences among local constituencies.

Sterling, E., Betley, E., Sigouin, A., Gomez, A. Toomey, A., Cullman, G., Malone, C., Pekor, A., Arengo, F., Blair, M., Filardi, C., Landrigan, K. & Porzecanski, A.L. (2017). Assessing the evidence for stakeholder engagement in biodiversity conservation, Biological Conservation, Volume 209, Pages 159-171, ISSN 0006-3207, https://doi.org/10.1016/j.biocon.2017.02.008.

Engaging local stakeholders is a central feature of many biodiversity conservation and natural resource management projects globally. Current literature on engagement predominantly focuses on individual case studies or specific geographical contexts, making general conclusions regarding the effect of these efforts on conservation outcomes difficult. We reviewed evidence from the peer-reviewed and grey

literatures related to the role of stakeholder engagement (both externally driven and self-organized engagement) in biodiversity conservation at the local scale using both quantitative and qualitative approaches. We critically appraised and extracted data using mixed methods for case studies (n = 82) and meta-analyses (n = 31) published from 2011 to 2015. We conducted an inductive thematic analysis on background literature references published from 2000 to 2016 (n = 283). The quantitative analysis assessed multiple variables, and yielded no significant results, but suggested a possible relationship between success in producing attitudinal change towards conservation and four engagement factors. Our qualitative analysis identified six dimensions of engagement processes that are critical for successful outcomes when a project is externally driven and suggests that understanding of governance and social-cultural context plays an important role in all types of stakeholder engagement efforts. Finally, we reflect on the effectiveness of relying primarily on the evidence available from published literature to understand links between conservation and stakeholder engagement, in particular with regard to self-organized engagement.

Torres-Rojo. J.M, Moreno-Sánchez, R. &Amador-Callejas, J. (2019). Effect of capacity building in alleviating poverty and improving forest conservation in the communal forests of Mexico, World Development, Volume 121, Pages 108-122, ISSN 0305-750X, https://doi.org/10.1016/j.worlddev.2019.04.016.

This research contributes to the literature exploring the effects of local capacity building in forest communities by analyzing the Community Forestry Program (CFP) in Mexico. This program provides grants to enhance four types of local capacities: human, social, economic, and environmental.

Vogler, D., Macey, S. & Sigouin, A. (2017). Stakeholder Analysis in Environmental and Conservation Planning. Lessons in Conservation, Vol. 7, pp. 5–16. Network of Conservation Educators and Practitioners, Center for Biodiversity and Conservation, American Museum of Natural History.

Stakeholders are defined as the people and organizations who are involved in or affected by an action or policy and can be directly or indirectly included in the decision-making process. In environmental and conservation planning, stakeholders typically include government representatives, businesses, scientists, landowners, and local users of natural resources. These groups of stakeholders often have very different positions and values that may be difficult to reconcile with each other and the planned project. This synthesis provides a brief overview of why it is important to incorporate different stakeholders, including underrepresented groups and "hidden" stakeholders, in the planning process and discusses the potential benefits of inclusion. Before involving stakeholders, conducting a stakeholder analysis can help to identify relevant stakeholders and to assess their views and interests on a proposed project. The synthesis describes specific techniques for conducting a formal stakeholder analysis, such as the use of stakeholder tables and a stakeholder influence/interest grid. Finally, the synthesis also highlights some approaches and strategies that can help to facilitate a fair and productive participatory process.

STRATEGY 2.2: STRENGTHEN LAND TENURE RIGHTS & SECURITY

Blackman, A., Corral, L., Santos Lima, E. & Asner, G. (2017). Titling indigenous communities protect forests in the Peruvian Amazon. Proceedings of the National Academy of Sciences of the United States of America 114:4123–4128.

The document results indicate that titling reduces clearing by more than three quarters and forest disturbance by roughly two-thirds in a 2-y window spanning the year title is awarded and the year afterward. These results suggest that awarding formal land titles to local communities can advance forest conservation.

Communications, Evidence and Learning (CEL) Project. (2019). Impact Evaluation Feasibility Assessment of the Land for Prosperity (LfP) Activity: Final Report

The Communications, Evidence, and Learning (CEL) project is conducting a desk-based Impact Evaluation (IE) feasibility assessment to help inform on design options for a possible impact evaluation of the Land for Prosperity (LfP) activity. The objective of the IE feasibility assessment is to identify and develop a set of illustrative IE design options that meet USAID learning interests and are considered feasible for a credible assessment of LfP impacts, should USAID decide to conduct an IE of the activity.

Gullison, R.E., & Hardner, J. (2018). Progress and challenges in consolidating the management of Amazonian protected areas and indigenous territories. Conservation Biology, 32, 1020-1030.

This paper proposes that Effective management refers to the ability of a protected area or indigenous territory to meet its objectives, particularly as they relate to the protection of biodiversity and forest cover. Effective management is achieved through a process of consolidation, which among other things requires legally protecting sites, integrating sites into land-use planning, developing, and implementing management and resource-use plans, and securing long-term funding to pay for recurrent costs. Effectively managing all protected areas and indigenous territories in the Amazon may be needed to avoid a deforestation tipping point beyond which regional climatic feedbacks and global climate change interact to catalyze irreversible drying and savannization of large areas.

Holland, M., Jones, K., Naughton-Treves, L., Freire, J-L., Morales, M. & Suárez L. (2017). Titling land to conserve forests: The case of Cuyabeno Reserve in Ecuador, Global Environmental Change, Volume 44, 2017, Pages 27-38, ISSN 0959-3780, https://doi.org/10.1016/j.gloenvcha.2017.02.004.

We used a mixed-methods approach to assess the impact of a 'forest-friendly' titling program on previously untitled lands surrounding the Cuyabeno Reserve in Ecuador. Such programs are part of an increasing trend in tenure formalization intended to simultaneously strengthen tenure security, reduce deforestation, and open the door for more incentive-based conservation programs. We use quasi-experimental methods to estimate and compare the impact of titling on forest outcomes for lands that are titled with certain limitations on the ownership bundle of rights, alongside lands titled but without these restrictions. This quantitative analysis is paired with results from a series of focus group interviews with landowners to understand their experiences with the titling effort, particularly tied to the restrictions. Our results point to a statistically significant impact of titling with restrictions on reducing deforestation by 34 percent, whereas titling without such restrictions resulted in no significant effect. When we explore impacts according to annual deforestation rates, the results suggest that titled lands are buffered from the surges in deforestation that otherwise occurred on untitled lands and more broadly across the region. While 'forest-friendly' restrictions had more of an effect on forest outcomes than titled lands without, the insights shared by landowners suggest important concerns about equity and unjust burdens on current households that could risk livelihood options for future generations.

Jones, K., Holland, M., Naughton-Treves, L., Morales, M., Suarez, L., & Keenan, K. (2017). Forest conservation incentives and deforestation in the Ecuadorian Amazon. Environmental Conservation, 44(1). Pp. 56-65.

Through focus group interviews, eligible control units, and Landsat for covers, this paper used a mixed evaluation scheme to understand the impacts of forest conservation incentives on annual deforestation. It also shows that conservation incentives would be considered competitive for participants when the agricultural capacity of their land was limited (and the incentives provide an alternative livelihood strategy) p. 61. Trust (in the community, in the implementing agency p. 63), liquidity (steady payments, local scarcity of productive land, local access to off-farm employment, opportunity costs), environmental protection, and relationships between neighbors (p. 62) were also key to the enrollment rates (p. 56. P. 61). This paper also shows that a "hybrid public-private governance approach can lead to larger conservation outcomes than restrictions alone." (p. 56) and that "…the relationship between land tenure and deforestation is mixed" (p. 57). The evaluation showed that "…the relative reduction in deforestation that can be attributed to the FCI program ranges between 56 and 76 percent" (p. 60).

Peña, X., Vélez, M.A., Cárdenas, J.C., Perdomo, N. & Matajira, C. (2017). Collective Property Leads to Household Investments: Lessons From Land Titling in Afro-Colombian Communities, World Development, Volume 97, Pages 27-48, ISSN 0305-750X, https://doi.org/10.1016/j.worlddev.2017.03.025.

In this paper, we attempt to estimate the impact of collective land titling in territories inhabited by Afro-descendent communities in Colombia. We compare rural districts in titled areas with rural districts in untitled areas that are similar in all the relevant observable characteristics. We find that the collective titling process in the Choco´ region has caused an increase in average household per capita income, a decrease in extreme poverty, larger investments in housing, higher attendance rates among children in primary education, and a decrease in housing overcrowding. Our results suggest that collective land titling creates a more secure natural resource base and a longer time horizon for households in collective territories, which leads to investment in their private physical and human capital.

Rodríguez-de-Francisco, J. C., Ortiz-gallego, D., Velez-Triana, J. S., & Hein, J. (2021). Post-conflict transition and REDD+ in Colombia: Challenges to reducing deforestation in the Amazon. Forest Policy and Economics, 127 (February).

This article demonstrates the challenges to implement REDD+ in the Colombian post-conflict context related to the power vacuum left by the FARC retreat, land grabbing for speculation and cattle ranching, power asymmetries, and corrupted regional elites. Based on the hypothesis that deforestation rates tend to increase in the aftermath of conflict-peace transitions due to the creation of windows of opportunity for resource appropriation (Nepal, Sri Lanka, the Ivory Coast, and Peru), the authors identify narratives associated with deforestation drivers and propose a multidimensional understanding of this phenomena that controverts the -usual- double caused interpretation of deforestation as the result of poverty and (more or less precise) knowledge about the environment. After revising the 5 pillars that sustain REDDD+ (forest governance, intersectoral coordination, agro-environmental development, and enabling policies), the authors identify the drivers of deforestation associated with historical, sociopolitical issues and shaped the economy and landscape of Guaviare (p. 4, p. 7) such as praderization (associated to cattle, land speculation practices and political regional elites); infrastructure; illicit crops; changing development paradigms in the Amazon and social differentiation

The article concludes that the current scope of REM (Redd early movers) does not sufficiently address the main drivers of deforestation and that REM's focus on campesinos and indigenous communities will not significantly reduce the substantial deforestation rates in the present post-conflict context. A complete understanding of the conflicts associated with natural resources and local actors such as political elites, government programs (infrastructure and colonization), agribusiness, guide precise interventions associated with the concrete drivers of deforestation in a specific context.

Vélez, M.A., Robalino, J., Cárdenas, J.C., Paz, A. & Pacay, E.. (2020) Is collective titling enough to protect forests? Evidence from afro-descendant communities in the Colombian Pacific region. World Development 128, 128, 104837.

Based on the experience of afro-descendant communities, the authors conclude that under adequate conditions, collective titling can lead to forest conservation. Collective titling significantly reduces deforestation rates, but the effect varies substantially by sub-region. The authors observe that the larger effects are in Nariño and Valle del Cauca. Their qualitative analysis suggests that this might be the result of the local community-based organization defining the rules for community use of natural resources and the expulsion of private companies dedicated to timber exploitation and oil palm plantations.

Based on the analysis of communities without a title, the authors provide a multi-leveled theory of change of incentives and institutions. Their theory of change is based on three layers or scales (micro, meso, macro) at which these mechanisms interact, and draws directly from the Institutional Analysis and Development (IAD) framework and the multi-layer framework developed by Cardenas and Ostrom. At the micro-behavioral level, group members make decisions about using the shared resources from the forested land to pursue their well-being, based on the incentives to exploit or preserve the forested land. At the meso level, several formal and informal community arrangements will affect those incentives for the group members. at the macro level, certain legal structures (IAD Constitutional Rules) will constrain the meso and micro-level decision-making depending on the capacity of the state to enforce such rules.

They conclude that collective titling to Afro-Colombian Communities has reduced deforestation in the Pacific by more than a one per- centage point. These effects represent more than 27 percent reductions of what would have been the deforestation rates without titling.

Tseng, Tzu-Wei, J., Robinson, B., Bellemare, M., BenYishay, A., Blackman, A., Boucher, T., Childress, M., Holland, M., Kroeger, T., Linkow, B., Diop, M., Naughton, L., Rudel, T., Sanjak, J., Shyamsundar, P., Veit, P., Sunderlin, W., Zhang, W. & Masuda, Yuta. (2020). Nature Sustainability Influence of land tenure interventions on human well-being and environmental outcomes. Nature Sustainability (December). Pp. 242- 251.

The authors question the direct causality between land tenure security and desired climate goals and environmental outcomes in general. Based on the analysis of 117quantitatve studies that isolate the usual association between land tenure security and human wellbeing or environmental outcomes, they find that i) land formalization, land use planning, and policy reforms had a strong relationship with economic outcomes on agricultural lands ii) there´s positive but weaker support that strengthening land tenure security improves environmental outcomes, particularly, in short-term land investments and management outcomes, and mostly over forest conditions and iii) land tenure security may improve land management, improved soil quality, food security and farm income, but can also increase nutrient runoff

from intensification. The question about the long-term effects of the impacts of land tenure security on environmental outcomes remains unsolved due to the lack of data and evaluations that provide information on this issue.

STRATEGY 2.3: LAND-USE PLANNING & ZONING

Bonilla-Mejía, L. &Higuera-Mendieta, I. (2019). Protected areas under weak institutions: evidence from Colombia. World Development 122. Pp. 585–596

This paper examines the mechanisms through which local institutions shape the effectiveness of Protected Areas while collective lands (protected areas, indigenous reserves, and afro Colombian lands) protect forests and reduce deforestation even when state presence is weak (their collective and inalienable land rights may also contribute to reducing external pressure). Results indicate that natural Protected Areas are only effective in densely populated areas while collective lands work better in remote areas. Based on these findings and in the Brazilian experience, the authors conclude that i) additional efforts are therefore required to enforce the law in remote areas (particularly in the Amazon and Pacific regions, where local institutions are weak and illicit activities have rapidly expanded over the last decades) and ii) that the combination of collective lands, community organizations and decision processes can also contribute to preserving forests.

Broberg, L. (2003). Conserving Ecosystems Locally: A Role for Ecologists in Land-Use Planning, BioScience, Volume 53, Issue 7, July, Pages 670–673, https://doi.org/10.1641/0006-3568(2003)053[0670:CELARF]2.0.CO;2

Integration of ecological principles into private land-use planning is critical to the preservation of biodiversity and functional ecosystems in the United States. Ecologists need to play an active role in shaping land-use decisions to meet those goals. Four areas of action for ecologists are (1) educating members of the staff, planning board, and governing body involved in land-use decisions; (2) serving on a planning commission or governing body; (3) commenting at public hearings; and (4) participating in citizen review panels for land-use laws and policies. The most effective measures will be those that integrate ecological principles into arguments based on the existing standards for comprehensive planning and subdivision review.

Brody, S.D. (2003) Implementing the Principles of Ecosystem Management Through Local Land Use Planning. Population and Environment 24, 511–540. https://doi.org/10.1023/A:1025078715216

While ecosystem approaches to management focus on broad spatial scales, decision-makers increasingly recognize that implementation must occur at the local level with local land-use decisions. This article examines the ability of local comprehensive plans in Florida to incorporate the principles of ecosystem management. It seeks to understand how comprehensive plans can effectively contribute to the management of ecological systems by systematically evaluating local plans against a conceptual model of what makes for a high-quality ecosystem plan. Results measure the relative strengths and weaknesses of local plans to achieve the objectives of ecosystem management and provide direction on how communities can improve their environmental frameworks.

Brown, G., Sanders, S. & Reed, P. (2018). Using public participatory mapping to inform general land use planning and zoning, Landscape and Urban Planning, Volume 177, Pages 64-74

Zoning is a ubiquitous land use planning and regulatory mechanism whose purpose is to provide for orderly community growth and development by segregating land uses that are deemed incompatible. The delineation of zones and related land use ordinances are traditional components of an expert-driven, local government process that produces a general or comprehensive land-use plan as required by law. Public participation in the development of general land use plans has rarely used participatory mapping methods that engage the public to explicitly inform zoning decisions. In this study, we demonstrate how participatory mapping methods can assess the consistency, compatibility, and potential conflict of zoning with public values and preferences in a general plan revision process using a coastal community in California as a case study. We describe the participatory mapping design, data collection, and data analyses in a workflow to illustrate the methods and present the strengths and limitations of the approach for use in a general land use planning process. Future research should expand these methods to assess the potential effects of resident domicile and "NIMBYism" on the results, and importantly, assess the impact of public participatory mapping in land-use decisions if implemented by local government authorities.

Burby, R. J., Deyle, R. E., Godschalk, D. R., & Olshansky, R. B. (2000). Creating Hazard Resilient Communities through Land-Use Planning. Natural Hazards Review, 1(2), 99–106. https://doi.org/10.1061/(ASCE)1527-6988(2000)1:2(99).

The Second National Assessment on Natural and Related Technological Hazards calls land use planning the single most promising approach for bringing about sustainable hazard mitigation. This article describes the essential elements of land-use planning for hazard mitigation. It highlights important choices involved in formulating planning processes, undertaking hazard assessments, and crafting programs to manage urban development so that it is more resilient to natural hazards. Research conducted over the past two decades suggests that if local governments make the right choices in crafting land-use-planning programs, communities will be less likely to suffer severe losses of lives and property in natural disasters.

Clerici, N., Salazar, C., Pardo-Díaz, C., Jiggins, C. D., Richardson, J. E., & Linares, M. (2019). Peace in Colombia is a critical moment for Neotropical connectivity and conservation: Save the northern Andes-Amazon biodiversity bridge. Conservation Letters, 12(1), e12594. https://doi.org/10.1111/conl.12594

The paper describes how corridors between the Colombian Andes and Amazon regions have been affected by deforestation. It helps us give updated information about forest loss and erosion in the AA action area, especially in association with certain protected areas (i.e., Picachos, Tinigua, Sierra de la Macarena, and Chiribiquete). The paper also identifies the main drivers (i.e., large-scale agricultural expansion) and ecological consequences of deforestation current dynamics (i.e., endangering the maintenance and connection of gene flow and biodiversity exchange.

Oldekap, J., Sims, K., Karna, B., Whittingham, M., & Agrawal, A. (2019). Reductions in deforestation and poverty from decentralized forest management in Nepal. Nature Sustainability. Vol 2. May. Pp. 421–428.

Since the 1980s, decentralized forest management has been promoted to enhance sustainable forest use and reduce rural poverty. Rural communities manage increasing amounts of the world's forests, yet rigorous evidence using large-N data on whether community-based forest management (CFM) can jointly reduce both deforestation and poverty remains scarce. We estimate the impacts of CFM using a large longitudinal dataset that integrates national census-based poverty measures with high-resolution

forest cover change data, and near-complete information on Nepal's >18,000 community forests. We compare changes in forest cover and poverty from 2000–2012 for subdistricts with or without CFM arrangements, but that are otherwise similar in terms of socioeconomic and biophysical baseline measures. Our results indicate that CFM has, on average, contributed to significant net reductions in both poverty and deforestation across Nepal and that CFM increases the likelihood of win-win outcomes. We also find that the estimated reduced deforestation impacts of community forests are lower where baseline poverty levels are high, and greater where community forests are larger and have existed longer. These results indicate that greater benefits may result from longer-term investments and larger areas committed to CFM, but that community forests established in poorer areas may require additional support to minimize trade-offs between socio-economic and environmental outcomes.

STRATEGY 2.4: LIVELIHOOD-FOCUSED APPROACHES

Aguilar-Støen, M. (2017). Better Safe than Sorry? Indigenous Peoples, Carbon Cowboys and the Governance of REDD in the Amazon. Forum for Development Studies, 44(1), 91–108.

This paper focuses on one type of actor, so-called carbon cowboys – a term coined by journalists to signify actors who are willing to push the limits of established negotiation mechanisms to gain control over forest areas. I will focus on carbon cowboys' practices and the responses from indigenous peoples in Colombia to highlight a common claim across the region, namely better state presence and regulation. The response from indigenous peoples' organizations indicates that although territorial control is an important achievement, some form of state intervention is required to protect their rights in an uncertain REDD terrain.

Andersen, L., Busch, J., Curran, E., Ledezma, J-C., Mayorga, J. & Bellier, M. (2012). Environmental and socio-economic consequences of forest carbon payments in Bolivia: Results of the OSIRIS-Bolivia model. Instituto de Estudios Avanzados en Desarrollo (INESAD). http://www.jstor.com/stable/resrep00654

We introduce the OSIRIS-Bolivia model to provide a quantitative basis for decision-making. OSIRIS-Bolivia is an Excel-based tool for analyzing the potential effects of incentive payments to reduce emissions from deforestation (REDD) in Bolivia. It is based on a spatial econometric model of deforestation in Bolivia during the period 2001-2005, and uses information on forest cover, deforestation rates, geographical conditions, and drivers of deforestation, including agricultural opportunity costs, for more than 120,000 pixels covering the whole country. OSIRIS-Bolivia is based on a partial equilibrium model in which reductions in deforestation in one region reduce the supply of agricultural products to the domestic market, which in turn causes an increase in the price of agricultural products, making conversion of land to agriculture more attractive and thus stimulating an increase in deforestation in other regions (leakage).

Brancalion, P., Lamb, D., Ceccon, E., Boucher, D., Herbohn, J., Strassburg, B. & Edwards, D. (2017). Using markets to leverage investment in forest and landscape restoration in the tropics, Forest Policy and Economics, Volume 85, Part 1, pp. 103-113

The document reviews the challenges and opportunities of exploiting market forces for Forest and Landscape Restoration (FLR), which can be essential for kick-starting the implementation of programs globally. The authors identify four key opportunities for regulating markets to promote FLR: economic mechanisms; technological, educational, or infrastructural investment; legal and enforcement

mechanisms; and market-led standards and certification schemes. Finally, they present five pitfalls that may arise when relying on markets to promote FLR. Governments will need to play a critical role in establishing appropriate policy frameworks and institutional arrangements to leverage investments when market signals are not strong enough to initiate changes in traditional land use or farming practices or to regulate reforestation activities when market signals become so strong that they overwhelm all other land-use activities, leading to a transformed and homogenized landscape.

Castro Nunez, A., Charry, A., Castro-Llanos, F., Sylvester, J. & Bax, V.. (2020) Reducing deforestation through value chain interventions in countries emerging from conflict: The case of the Colombian cocoa sector. Applied Geography 123.

Based on the hypothesis that deforestation has been particularly severe in areas affected by the armed conflict and illicit crop production, this article shows that narratives around approaches to achieve zero deforestation from agricultural commodities should (1) be adjusted to local contexts, (2) incorporate location-specific development needs, (3) complement existing rural development efforts, (4) enhance collaboration among actors that operate both within and beyond the value chain, and (5) apply high-resolution data to assess deforestation-commodity relations and verify zero-deforestation commitments. These considerations are particularly relevant in contexts where commodity production is not evidently leading to deforestation, as in the case of cocoa production in Colombia.

Jayachandran, S., De Laat, J. Lambin, E., Santon, C., Audy, R. & Thomas, N. (2017). "Cash for carbon: A randomized trial of payments for ecosystem services to reduce deforestation." Science. (Method: Randomized Control Trials)

This paper evaluates the implementation of financial incentives for forest owners to keep their forests intact (p. 1). Some of the findings, using cover analysis in treatment and control villages, showed some forms of leakage (p. 4). One benefit that the study could not quantify was increased biodiversity.

Kremen, C. & Merenlender, M. (2018) Landscapes that work for biodiversity and people. Science 362, 304 19 October.

The authors defend one hypothesis: landscapes would be sustainable if they are taken care of by people whose economies are also sustainable. From this assumption they derive the term working landscapes, understood as socioeconomic systems that help maintain biodiversity and provide habitat connectivity, complementing protected areas and providing greater resilience to climate change. This scheme is based on a comprehension of the landscape as a stable productive organism rather than one that should be taken to its maximum productivity, in this sense a sustainable system is multifunctional and more resilient to change. In technical terms, this approach means that the mosaics designed would mix fibers, food, wood, and different types of services that could impact positively human well-being, local economies, and more resilient and biodiverse ecosystems.

Pagiola, S., Honey-Rosés, J. & Freire-González, J. (2016). Evaluation of the Permanence of Land Use Change Induced by Payments for Environmental Services in Quindío, Colombia. PLoS ONE 11(3): e0147829. doi:10.1371/journal.pone.0147829

The effectiveness of conservation interventions such as Payments for Environmental Services (PES) is often evaluated—if it is evaluated at all—only after the intervention. Since gains achieved by the

intervention may be lost after it ends, even apparently successful interventions may not result in long-term conservation benefits, a problem known as that of permanence. This paper uses a unique dataset to examine the permanence of land-use change induced by a short-term, asset-building PES program implemented in Quindío, Colombia, between 2003 and 2008.

Roe, D., Booker, F. & Day, M (2015). Are alternative livelihood projects effective at reducing local threats to specified elements of biodiversity and/or improving or maintaining the conservation status of those elements? Environmental Evidence. Pp. 4 -22.

This paper examines the impacts of alternative livelihood projects on biodiversity conservation, rather than livelihood outcomes in 106 projects from which only 22 had an assessment for conservation effectiveness. First, the authors identify two conceptions on livelihood projects as i) "… an approach to achieving biodiversity conservation by substituting a livelihood strategy that is causing harm to a biodiversity target—for example, through unsustainable use—for one that has a lesser, or negligible, impact on the same target.". A second approach would encourage "…an alternative method of exploiting a resource that has a lower impact than the original method". The findings showed that changes in behavior and increased reporting of violations due to increased awareness on conservation principles and other positive conservation impacts were not a consequence of an activity that had conservation assessments. The lack of evidence to reach conclusive findings in terms of effectiveness. The authors link this lack of evidence to the lack of i) data and evaluation and ii) a solid theory of change and a systematic review of the assumptions it is or was based on.

Tayleur, C., Balmford, A., Buchanan, G, Butchart, S., Ducharme, H., Green, R., Milder, J., Sanderson, F., Thomas, D., Vickery, J. &Phalan, B. (2017). Global coverage agricultural sustainability standards, and their role in conserving biodiversity. Conservation Letters. September- October. Pp. 610-618.

This paper points out that sustainability standards have considerable potential to contribute to conservation since they provide a structured system to achieve and document improvements through clearly defined indicators and auditing mechanisms. Even though certifications are not the only alternative to sustainable agriculture, it proves to decrease the use of chemical pesticides, fertilizers, and herbicides and increases adoption of shade trees and soil conservation practices. Also, to target the certification according to i) where a specific issue is of particular concern ii) where standards have criteria to address that issue (e.g., prohibition on habitat conversion), and where enabling conditions exist (government policies that complement certification), give it more opportunities to contribute to sustainability goals. A second strategy to scale up certification is to involve public and corporate organizations (coordinate) and to focus and prioritize high-risk crops and places (target).

USAID. (2015). Conservation Enterprises. Using a Theory of Change Approach to Synthesize Lessons from USAID Biodiversity Projects

This brief synthesizes lessons from past USAID-funded efforts to support conservation enterprises such as Biodiversity Conservation Network (BCN), the Sustainable Conservation Approaches in Priority Ecosystems Program (SCAPES), TransLinks, the Forests, Climate and Communities Alliance (FCCA), the Central Africa Regional Program for the Environment (CARPE). The theory of change for conservation enterprises is based on this assumption "if projects support conservation enterprises, then the enabling conditions for enterprises (such as market demand and participant capacity) are met; if enabling conditions are met, then benefits (such as more income or improved governance) are realized by

participants; if benefits are realized, then participants' behavior (such as hunting or illegal logging) is changed and pressures to biodiversity are reduced, and biodiversity will be ultimately conserved". After presenting a set of enabling conditions from two levels (business practices and community-based natural resource management) it concludes that i) To build a rigorous evaluation and key findings is crucial to monitor and evaluate the assumptions ii) there´s a need for more cross-site learning from activities under the same TOC iii) and adaptive management of conservation enterprise strategies

USAID. (2016). Measuring Impact. Cross-mission learning agenda for Conservation Enterprises.

This document states that as a strategy for continuous learning, the United States Agency for International Development (USAID)'s Bureau for Economic Growth, Education, and Environment/Office of Forestry and Biodiversity (E3/FAB) proposes the implementation of a Biodiversity Cross-Mission Learning Program to increase the effectiveness of strategic approaches that are commonly implemented in the Agency's biodiversity programs. This Learning Program is designed to improve understanding of the conditions under which a specific strategic approach is successful in achieving desired outcomes, and why, and to improve USAID's biodiversity programming. The agency states that a conservation enterprise approach has become a common component of many of its biodiversity activities. Conservation enterprises are frequently part of a larger sustainable livelihood or community-based natural resource management (CBNRM) approach, so they may be thought of as a sub-set of these broader approaches.

USAID. (2017). Conservation Enterprises. Technical Brief. Using a Theory of Change Approach to Synthesize Lessons from USAID Biodiversity Projects

The brief synthesizes lessons from past USAID-funded efforts to support conservation enterprises such as Biodiversity Conservation Network (BCN), the Sustainable Conservation Approaches in Priority Ecosystems Program (SCAPES), TransLinks, the Forests, Climate and Communities Alliance (FCCA), the Central Africa Regional Program for the Environment (CARPE), to increase the understanding of conservation enterprise approaches and outcomes and to improve the effectiveness of biodiversity programming. The document states that a series of enabling conditions influence the likelihood that supporting a conservation enterprise will result in the desired outcomes for participants and biodiversity. In that sense, enabling conditions are context specific; what may be important in one context may not be in another. The conditions identified overlap and interacted with each other; strengths in some areas may compensate for weaknesses in others; and not one condition is sufficient to enable conservation enterprise outcomes by itself.

USAID. (2018). The Nature of Conservation Enterprises. A 20-year retrospective evaluation of the theory of change behind this widely used approach to biodiversity conservation.

To examine the assumptions in the generalized theory of change, as well as probe deeper into the conditions required for long-term enterprise and conservation sustainability, USAID launched a retrospective evaluation (hereafter, "the Retrospective") of sites with longstanding enterprise approaches. It focused on six sites where the enterprise approach has remained active for approximately two decades through partnerships between local communities and one or more implementing organizations. USAID supported activities at all six sites at some point in time. The enterprises involve timber and non-timber forest products, and eco-tourism services – all focused on achieving conservation outcomes. By looking beyond the traditional funding and reporting period into the long-term outcomes

of supporting conservation enterprises, USAID and its partners generated valuable new insights to help practitioners improve the design and management of this strategic approach.

USAID. (2020a). A Framework for Monitoring, Evaluating, and Learning from Conservation Enterprises.

The purpose of this framework is to inform the full cycle adaptive management of USAID programs (for Mission staff and implementing partners) through monitoring, evaluating, and learning from outcomes along with the generalized theory of change (see Figure 1). The results of this framework will provide USAID programs the information needed to manage biodiversity programs and demonstrate desired outcomes more effectively. The use of the framework will also help USAID and their partners more systematically generate, document, and share lessons from different activities implementing this strategic approach.

USAID. (2020b). A Sourcebook for Community-Based Forestry Enterprise Programming.

This Sourcebook aims to inform the design and implementation of community forestry interventions that seek to deliver social, environmental, and economic outcomes in developing countries. Community forestry enterprises are potentially a key element in environmental management. Successfully implemented, they promote improved landscape-level ecosystem services, biodiversity conservation, and community income generation better than many alternative land uses. Hence, in many situations, these enterprises lead to better environmental outcomes than government or private-sector management.

USAID. (2020c). Private Sector Engagement Learning Agenda. Latin America and the Caribbean Environment.

The goal of the LAC Environment Learning Agenda for Private Sector Engagement is to generate and share evidence to inform USAID efforts to engage the private sector to achieve environmental outcomes, including biodiversity conservation and sustainable landscapes. It defines learning questions and then develops specific activities to address those questions.

GOVERNMENT OF COLOMBIA DOCUMENTS

Republic of Colombia. (2018). "Plan de Acción para reducir la deforestación y hacer frente a los efectos del cambio climático en la Amazonía colombiana STC 4360 de 2018."

- Strategic Guidelines

Republic of Colombia. (2020). CONPES Document 4021. "POLÍTICA NACIONAL PARA EL CONTROL DE LA DEFORESTACIÓN Y LA GESTIÓN SOSTENIBLE DE LOS BOSQUES".

- Action Plan Section

ANNEX 9. KEY ASSUMPTIONS FOR OBJECTIVE 2 THEORY OF CHANGE

OBJECTIVE 2: IMPROVE THE EFFECTIVENESS OF FOREST CONSERVATION & MANAGEMENT

INTERVENTIONS

- Strategy 2.1: Stakeholder engagement & coordination

- Strategy 2.2: Strengthen land tenure rights & security

- Strategy 2.3: Land-use planning & zoning

- Strategy 2.4: Livelihood-focused approaches

STRATEGY 2.1: STAKEHOLDER ENGAGEMENT & COORDINATION

- Governance, presence, and commitment from the Colombian State are at the basis of the implementation of the Program.

- There is sufficient public and private sector interest and commitment to engage in public-private partnerships, and sufficient capacity to engage farmer-based organizations.

- Farmer-based organizations will have sufficient interest and capacity to participate and benefit from these partnerships.

- The relationship and joint action with the private sector and the third sector will strengthen the sustainability actions developed in the territory.

- The effective coordination between land administration officials and other public entities (for example, local tax authorities and municipal service providers), facilitates the strengthening of conservation processes.

- Intersectoral coordination for the simultaneous containment of the agricultural frontier and deforestation is a concurrent strategy, both for the stabilization and ruralization of the population, and the control and prevention of deforestation on the large reserve forest areas of Law 2/1959, protected areas, strategic forest ecosystems, and wasteland nuclei containing forests.

- The identification of the needs for regulatory updating and bottlenecks, in conjunction with the environmental authorities and actors of the forest chain, allows the generation of instruments for the sustainable management of the forest resource in a simpler, more practical, and expeditious way for the communities and private forest owners.

- Training processes strengthen skills amongst organizations.

- Knowledge production defines what norms will be used to impose social order in peaceful and orderly ways.

- The environmental governance of local communities can be strengthened through the management of information and knowledge to consolidate a culture of co-responsibility for the care and sustainable use of forests.

- The articulation of traditional knowledge, the strengthening of community organizational structures, social cohesion, and community-institutional dialogue, within the framework of sustainable forest management, allow empowerment, democratic participation, forest governance, and social appropriation of knowledge, around the use, conservation, and protection of forests.

STRATEGY 2.2: STRENGTHEN LAND TENURE RIGHTS & SECURITY

- In the case of communal titling, the securing of communal property rights over the land brings more stable access to the territory, which would facilitate a longer time horizon for the household and therefore secure future benefits from investing in the present improvement of their home.

- Formalized land tenure is connected to deforestation and conservancy practices.

- Weak property rights can spur forest damage in a variety of ways: by enabling landless migrants to colonize frontier areas, by strengthening land managers' preferences for productive activities that provide quick but unsustainable returns, by creating incentives for squatters to clear forests to establish use rights or block competing claims, and by preventing land managers from participating in payments for environmental services and reducing emissions from deforestation and degradation initiatives.

- Formalization of land tenure and sustainable practices discourage/de-incentivize deforestation processes.

- The social land-use planning of property promotes progressive access to the property and other forms of tenure, equitable distribution of land, legal security of land tenure, planning, management, and financing of rural land, and a transparent land market.

- The granting of use rights over unaddressed vacant lots/wastelands, located in Forest Reserve Zones of Law 2 of 1959, in potential areas, mitigates the socio-environmental conflicts that arise in these reserved forest areas.

- Protected areas and indigenous territories are a good strategy for protecting forests in the Amazonian region.

- Green businesses should be defined based on the priorities of indigenous peoples to guarantee their territorial land rights.

- Strong and clear regulations (on carbon markets and green businesses) and state presence secure the livelihoods and rights of indigenous peoples and the titling and consolidation of indigenous territories.

- Land tenure, local autonomy, and collective action may contribute to effective and equitable community-based forest management.

- Collective land titling creates more secure property rights and a longer time horizon for households in collective territories, which leads to investment in their private physical and human capital.

CRITICAL ASSUMPTIONS
- In remote areas, natural PAs are particularly vulnerable to illicit activities that fuel deforestation.

- Impacts of conservation areas on preserving forests greatly depend on the institutional context, near human settlements, in municipalities that provide more public goods and are less violent.

STRATEGY 2.3: LAND-USE PLANNING & ZONING

- Strengthening the technical capacities of territorial entities and environmental authorities, aimed at adjusting and updating territorial planning and zoning instruments, serves to reduce land-use conflicts and increase institutional capacities for adequate planning of the territory with the inclusion of environmental criteria for reducing deforestation and mitigating climate change.

- It is important to manage the instruments of planning and territorial and environmental management, related to forests that constitute social well-being, productivity, and competitiveness of the sectors of the economy, under a differential management approach of landscapes, resilience to climate change, risk management, and service to sustainable rural development and reconciliation in post-conflict territories served, to ensure sustainable use of natural resources.

- The productive reconversion of agricultural activities in the areas identified with potential for productive use and that allow their incorporation into the agricultural frontier by applying environmental zoning promotes actions that contribute to economic growth in a sustainable way and with the capacity to reduce conflicts by land use, incorporating agroforestry and silvopastoral systems, among others, generators of environmental services.

- The social land-use planning of property promotes progressive access to property and other forms of tenure, equitable distribution of land, legal security of land tenure, planning, management, and financing of rural land, and a transparent land market.

- Holistic management plans secure the livelihoods and rights of indigenous peoples and local communities and the titling and consolidation of their territories.

- Deforestation has been particularly severe in areas affected by the armed conflict and illicit crop production.

- The reduction of deforestation in titled communities is explained mainly by local community-based organizations defining the rules for community use of natural resources.

STRATEGY 2.4: LIVELIHOOD-FOCUSED APPROACHES

SUB-STRATEGY CONSERVATION ENTERPRISES

- Decentralizing forest management and empowering communities could lead to greater autonomy in establishing local enterprises based on cash crops and timber extraction, producing much-needed monetary resources, especially if poverty is widespread among its members.

- Conservation per se is not sustainable.

- Competitive economical alternatives make conservancy practices sustainable in time.

- Strong commercial agreements are associated with the participation of the private sector in the process.

- Sustainable forest management must be done within the framework of a conservation enterprise, with economic benefits for local communities.

- Business partners can provide critical expertise, experience, investments, and a secure market for goods and services.

- NGOs can help form business alliances, reduce the barriers to markets and profits, and assure equitable partnerships.

- Supporting community enterprises may lead to biodiversity conservation by giving environment project staff an entry point into the community and improving community interest in managing natural resources. In some situations, raising awareness and building community engagement in conservation may be as effective as community enterprises in meeting conservation objectives.

- Community enforcement against both internal and external threats can help achieve enterprise success and conservation outcomes; lack of enforcement capacity and regulations can be a barrier.

- Local participant ownership and management of the enterprise can contribute to conservation outcomes, and enterprise success, given that locals are familiar with the concerns and priorities of communities.

- Women and disadvantaged groups should be included in the planning, decision-making, and implementation of the enterprise.

- Financial management and marketing skills are key to enterprise success.

- Long-term external investment may be required to build needed participant capacity.

- Most value chains for services or products do not inherently include conservation outcomes. The capacity of existing enterprises operating within the value chain may need to be strengthened, and/or new enterprises developed, to achieve conservation goals.

- Less cleared forest for subsistence farming means that demands for food might be met by more efficient agricultural producers and practices.

- Understanding the natural resource conflicts between local communities, organizations, elites, and government policies bring precise ideas about the real deforestation drivers and how to reduce them.

- Taking into account the natural and cultural potential of the country, which links a variety of well-preserved natural tourist attractions, nature tourism can be implemented as an economic alternative, achieving that conservation is promoted, the generation of jobs for the local population and that, in turn, minimize the negative environmental impact on natural resources including components of the bioeconomy, science, and technology.

CRITICAL ASSUMPTIONS
- Increased income is going to change someone's attitudes and behaviors because they are getting more income from nature.

- Poorer households may have greater financing constraints than better-off households.

- Deforestation rates tend to increase in the aftermath of conflict-peace transitions due to the creation of windows of opportunity for resource appropriation.

- The relationship between deforestation and agribusiness is becoming increasingly apparent in Guaviare.

SUB-STRATEGY SUSTAINABLE NRM
The results of some PES programs suggest that, at least in the case of productive land uses such as silvopastoral practices under certain conditions asset-building PES programs can be effective at encouraging landowners to adopt environmentally beneficial land management practices and that the benefits will persist after payments cease. Natural conservation contracts seek to create the conditions so that the land tenure and productive zoning enable peasant family agriculture and productive inclusion associated with forestry development.

The productive reconversion of agricultural activities in the areas identified with potential for productive use and that allow their incorporation into the agricultural frontier by applying environmental zoning will promote actions that contribute to economic growth in a sustainable way and with the capacity to reduce conflicts by land use, incorporating agroforestry and silvopastoral systems, among others, generators of environmental services.

- REDD payments would likely decrease biodiversity loss due to deforestation and potentially increase the income of the poor.

- Efforts to reduce deforestation face the problem of leakage, in which a reduction in deforestation in one location increases agricultural prices, increasing pressure to deforest in other locations.

- Concerns about food security or unfamiliarity with the REDD+ mechanism might imply that farmers prefer continuing agriculture over equal income from forest conservation.

- Some land uses may prove to be sustainably adopted thanks to asset-building PES programs while others are not.

- Silvopastoral practices have important biodiversity benefits.

CRITICAL ASSUMPTIONS

- Increased income is going to change someone᾽s attitudes and behaviors because they are getting more income from nature.

- PES may not induce the desired land-use changes (that is, that they may lack additionality).

- Any induced land-use changes, by PES, may not generate the desired services (for example, because the wrong land uses were induced, or total land-use change was insufficient).

- Changes induced by PES may not be sustainable or permanent because they are abandoned once the payments end.

- Short-term payments are sufficient to induce lasting land-use change, particularly, in situations of low trust.

- Conservation incentives would be considered competitive for participants when the agricultural capacity of their land was limited.

- Community-based forest management established in poorer areas requires additional support to minimize socioeconomic and environmental tradeoffs.

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ANNEX 10. SUGGESTED INDICATORS AND DATA SOURCES SUMMARIZED FROM MORE COMPLETE EXCEL TABLES OF INDICATORS AND SOURCES

Complete Excel tables found here:

Objective 1: Excel table

Objective 2: Excel table

Long-term impacts both objectives: Excel table

TABLE 14. STRATEGY 1.1 & STRATEGY 1.2 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME & IMPACTS FROM TOC	INDICATOR	DATA TYPE	DATA SOURCE
Strong coordination mechanism developed for government & organizations	Number of enforcement procedures (manuals, ID guides) at national or municipality level	Primary & Secondary	Interviews & government data
	Number of inter-agency or cross-border coordination networks	Primary & Secondary	Interviews & government data
	Number of persons reached by sensitization campaigns under the program	Primary	Interviews
	Networks of interinstitutional forest & wildlife crime monitor established & operational	Primary & Secondary	Interviews & government data
Rules & policies to detect & prosecute crimes clarified & enforced	Number of items of new legislation drafted or in place	Primary & Secondary	Interviews & government data
	Number of national policies against transboundary environmental crimes	Primary & Secondary	Interviews & government data
Improved technical abilities for law enforcement	Number of people, officers, or groups trained	Primary	Interviews
	Quantity of products of illegal economic activity available to purchase on the open market	Primary & Secondary	Interviews & government data
	Number of investigators in the zone	Primary	Interviews
	Number of public institutions trained in deforestation activities & environmental crimes	Primary	Interviews
	Number of specialized prosecutors in the zone	Primary	Interviews

TABLE 14. STRATEGY 1.1 & STRATEGY 1.2 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME & IMPACTS FROM TOC	INDICATOR	DATA TYPE	DATA SOURCE
	Number of specialized units for environmental crimes enforcement in the zone	Primary & Secondary	Interviews & government data
	Number of environmental crimes properly documented	Primary & Secondary	Interviews & government data
	Number, hours, or area of patrols	Primary	Interviews
	Number of permanently manned protection posts established at main entry points to the protected areas	Primary	Interviews
Law enforcement willingness & ability to apprehend, prosecute & convict environmental crimes improved	Perception by law enforcement or other actors that necessary resources are in place for environmental crime efforts	Primary	Interviews
	Perception by law enforcement or other actors that there is incentive & willingness to address environmental crimes	Primary	Interviews
Data systems in place to provide technical information for environmental crimes prevention & prosecution	Number of GOC institutions sharing technological platforms to work preventing & prosecuting environmental crimes	Primary & Secondary	Interviews & government data
Increased number of convictions against environmental crime offenders (prosecution)	Average cost estimated per case prosecuted during a given time, usually one year	Primary & secondary	Interviews & government data
	Average length of a trial	Primary & secondary	Interviews & government data
	Average number of cases per prosecutor	Primary & secondary	Interviews & government data
	Institutional perceptions & opinions about conviction process	Primary	Interviews
	Number of arrested persons associated with illicit activities in environmental crimes	Secondary	Government data
	Number of convicted persons associated with illicit activities in environmental crimes	Secondary	Government data
	Number of penalized persons associated with illicit activities in environmental crimes	Secondary	Government data
	Quantity of seizures associated with environmental crimes	Secondary	Government data

TABLE 14. STRATEGY 1.1 & STRATEGY 1.2 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME & IMPACTS FROM TOC	INDICATOR	DATA TYPE	DATA SOURCE
Reduced number of environmental crimes occurring (prevention)	% change in reported illegal environmental activities or rates	Primary & Secondary	Interviews & government data
	Institutional perceptions & opinions about illegal economic activities deterrence rates	Primary	Interviews
Human Well-Being	Governance domain: Change in law enforcement & government transparency related to environmental crimes (people's perceptions)	Primary	Interviews
	Governance domain: Change in law enforcement & government corruption related to crimes (people's perceptions)	Primary	Interviews
	Social domain: Change in total number or % of environmental crimes (objective measures & people's perceptions)	Primary & Secondary	Interviews & government data
	Social domain: Change in violence & homicide rates (objective measures & people's perceptions)	Primary & Secondary	Interviews & government data & NGO data
Forest Cover	Change in the area (ha or %) of deforestation	Secondary	Remote sensing data products

TABLE 15. STRATEGY 1.3 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATA SOURCE
Safe community monitoring & reporting mechanisms established	Number of trainings or workshops on monitoring conducted	Primary	Focus groups & interviews
	Number of formal agreements with local communities on monitoring established	Primary	Focus groups & interviews
	Number of community-level enforcement procedures (manuals, ID guides) produced	Primary	Focus groups & interviews
	Number of local networks for forest & wildlife crime monitors established & operational	Primary	Focus groups & interviews
	Perception by community members that reporting forest & wildlife crime is safe	Primary	Focus groups & interviews
	Number, hours, or area of patrols conducted by community monitors	Primary	Focus groups & interviews

TABLE 15. STRATEGY 1.3 SUMMARY OF POTENTIAL INDICATORS

OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATA SOURCE
Local communities monitor & report environmental crimes	Number of liabilities identified by monitoring groups	Primary	Focus groups & interview
	Number of liabilities reported to authorities by monitoring groups	Primary	Focus groups & interviews
	Number of liabilities reported to the media by monitoring groups	Primary	Focus groups & interviews
	People perceive the benefits of monitoring & reporting environmental crimes	Primary	Focus groups & interviews
Increased number of convictions against environmental crime offenders (prosecution)	People's perceptions & opinions about their monitoring efforts contributing to environmental crimes prosecution	Primary	Focus groups & interviews
Reduced number of environmental crimes occurring (prevention)	People's perceptions about % of population that adopts or continues illegal environmental activities	Primary	Focus groups & interviews
	People's perceptions & opinions about the government's ability & willingness to prevent environmental crimes	Primary	Focus groups & interviews
	Number of re-socialized lawbreakers that are involved in monitoring activities	Primary	Focus groups & interviews
Human Well-Being	Governance domain: Change in capacity & agency of individuals & communities to combat crime	Primary	Focus groups & interviews
	Social domain: Change in people's perception of citizen safety & security	Primary	Focus groups & interviews
	Social domain: Change in the social capital of communities related to crime prevention	Primary	Focus groups & interviews
Forest Cover	Change in the area (ha or %) of deforestation	Secondary	Remote sensing data products

TABLE 16. STRATEGY 1.4 SUMMARY OF POTENTIAL INDICATORS

OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATA SOURCE
Improved ability to determine legal products	The proportion of mislabeled products in the market	Primary	Interviews

TABLE 16. STRATEGY 1.4 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATA SOURCE
	The proportion of products derived from legal sources	Primary & secondary	Interviews & government data
	Quantity of products of illegal economic origins available to purchase on the open market	Primary & secondary	Interviews & government data
Increased number of convictions against environmental crime offenders (prosecution)	Quantity of seizures associated with environmental crimes	Primary & secondary	Interviews & government data
Reduced number of environmental crimes occurring (prevention)	The proportion of mining products coming from legal sources	Primary & secondary	Interviews & government data
	The proportion of wildlife products coming from legal sources	Primary & secondary	Interviews & government data
	The proportion of forest products coming from legal sources	Primary & secondary	Interviews & government data
Forest Cover	Change in the area (ha or %) of deforestation	Secondary	Remote sensing data products

TABLE 17. STRATEGY 2.1 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATASOURCE
Relevant actors engaged in & supportive of NRM efforts	Number of government institutions aware of and supporting NRM efforts of local communities	Primary	IP data collection
	Number of private actors aware of and supporting NRM efforts of local communities	Primary	IP data collection
	Number of registered community-based organizations or cooperatives engaged in AA Activity	Primary	IP data collection
	Number of Indigenous authorities and Cabildos engaged in AA Activity	Primary	IP data collection
	Number of Juntas de Acción comunal (JAC) or groups of JAC engaged in AA Activity	Primary	IP data collection
	Number of community-based forest or wildlife monitoring networks engaged in AA Activity	Primary	IP data collection
Sustained private sector engagement	Number of private actors engaged in AA Activity strategies	Primary	IP data collection

TABLE 17. STRATEGY 2.1 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATASOURCE
	Number of formal agreements with private actors	Primary	IP data collection
	Satisfaction of private actors with a level of engagement by the AA Activity	Primary	IP data collection

TABLE 18. STRATEGY 2.2 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATASOURCE
Formal land rights in place	Number of land use rights formalized (land titles)	Secondary	Government & IP data
	Number of new land title requests	Secondary	Government & IP data
	Number of new registrations of formalized land titles	Secondary	Government & IP data
	Number of overlapping or conflicting land registrations	Secondary	Government & IP data
Improved tenure security & land governance	Perceived tenure security (assurances of enforcement by the state or future access) by households & communities	Primary	Interviews & surveys
	Number of reported land disputes or land conflicts	Primary & Secondary	Interviews & surveys & government data
	Number of reported land invasions	Primary & Secondary	Interviews & surveys& government data
Reduction in negative conservation behaviors	Perception of need to 'clear land to claim land'	Primary	Interviews & surveys
	Self-reported reduced deforestation on land	Primary	Interviews & surveys
	Reported incidences of land grabbing	Secondary	Government data
	Hectares or % illicit crops	Secondary	Government data/remote sensing
Increase in positive conservation behaviors	Self-reported tree planting on land	Primary	Interviews & surveys
	Self-reported forest conservation on land	Primary	Interviews & surveys
Human Well-being	Governance domain: Change in formal user rights (titles, registration, & cadaster improvements)	Primary & Secondary	Interviews & surveys & government data

TABLE 18. STRATEGY 2.2 SUMMARY OF POTENTIAL INDICATORS

OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATASOURCE
	Governance domain: Change in capacity & agency of individuals & communities to secure land boundaries (current & future tenure security; ability to call upon the state for legal action)	Primary	Interviews & surveys
Forest Cover	Reduced area (ha or %) of deforestation	Secondary	Remote Sensing

TABLE 19. STRATEGY 2.3 SUMMARY OF POTENTIAL INDICATORS*

OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATASOURCE
Coordination of efforts on land-use planning & zoning for NRM	Number of municipalities with updated land-use plans	Secondary	Government data
	Number of indigenous reserves with an environmental management plan	Primary & Secondary	Interviews & IP data**
	Number of conservation agreements with communities or indigenous reserves**	Primary & Secondary	Interviews & IP data**
	Perceived level of coordination among actors working on land-use planning & zoning in the region	Primary	Interviews
Improved capacity to govern /Improved land management	Number of trainings/ workshops on land use planning with communities**	Primary	Interviews & IP data**
	Number of trainings/ workshops on land use planning with other stakeholders	Primary	Interviews & IP data
Reduction in negative conservation behaviors	Hectares or % illicit crops	Secondary	Government data/remote sensing
	Self-reported reduced deforestation on land**	Primary	Interviews & surveys**
Increase in positive conservation behaviors	Self-reported tree planting on land**	Primary	Interviews & surveys**
	Self-reported forest conservation on land**	Primary	Interviews & surveys**
Human Well-being	Social domain: Change in social capital of communities**	Primary	Interviews & surveys**
	Social domain: Change in education & knowledge**	Primary	Interviews & surveys**

Forest Cover	Reduced area (ha or %) of deforestation	Secondary	Remote Sensing
	Landscape fragmentation	Primary	Remote Sensing
	Landscape connectivity (corridors)	Primary	Remote Sensing

*Need more information on specific sub-strategies to refine indicators

**Only if village level strategies used

TABLE 20. STRATEGY 2.4 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATASOURCE
Improved capacity to implement NRM actions	Number of people & communities trained in sustainable livelihood practices	Primary	Interviews & surveys
	Number of local organizations trained in sustainable livelihood practices	Primary	Interviews & surveys
Improved access to economic markets	Number of supportive business alliances/partnerships with value chain actors	Primary	Interviews
	Number of viable value chain products strengthened	Primary	Interviews
	Perceived access to markets by individuals	Primary	Interviews & surveys
Adoption of promoted livelihood strategies	Area (ha) of silvicultural activities	Primary	Interviews & surveys
	Area (ha) of agroforestry activities	Primary	Interviews & surveys
	Area (ha) of reforestation	Primary	Interviews & surveys
	Number of people engaged in silvicultural activities	Primary	Interviews & surveys
	Number of people engaged in agroforestry activities	Primary	Interviews & surveys
	Number of people engaged in reforestation	Primary	Interviews & surveys
	Number of sales or market transactions of targeted products in value chains	Primary	Interviews & surveys
	Quantity of products sold of targeted products in value chains	Primary	Interviews & surveys
Reduction in negative conservation behaviors Primary	Area (ha) of extensive ranching/pasture	Primary & Secondary	Interviews & surveys & remote sensing data
	Area (ha) of illicit crops	Primary & Secondary	Government data/remote sensing

TABLE 20. STRATEGY 2.4 SUMMARY OF POTENTIAL INDICATORS			
OUTCOME FROM TOC	INDICATOR	DATA TYPE	DATASOURCE
	Area (ha) of illegal fires for subsistence agriculture	Primary & Secondary	Interviews & surveys & remote sensing data
	Reports of illegal fishing or hunting	Primary	Interviews & surveys
	Interviews & surveys	Primary	Interviews & surveys
	Self-reported reduced deforestation	Primary	Interviews & surveys
Increase in positive conservation behaviors	Self-reported tree planting on land	Primary	Interviews & surveys
	Self-reported forest conservation on land	Primary	Interviews & surveys
	Self-reported attitudes toward forest conservation	Primary	Interviews & surveys
Human Well-being	Social domain: Change in social capital of communities	Primary	Interviews & surveys
	Social domain: Change in education & knowledge	Primary	Interviews & surveys
	Economic domain: Change in material wealth (assets)	Primary	Interviews & surveys
	Economic domain: Change in financial wealth (income)	Primary	Interviews & surveys
	Economic domain: Change in Multidimensional Poverty Index	Primary	Interviews & surveys
	Health domain: Change in food security	Primary	Interviews & surveys
	Governance domain: Change in empowerment to fulfill life goals	Primary	Interviews & surveys
	Ecosystem Services: Perceived benefits from forests (material & non-material)	Primary	Interviews & surveys
Forest Cover	Reduced area (ha or %) of deforestation	Secondary	Remote Sensing
	Tree (Forest) growth (ha or %)	Secondary	Remote Sensing
Biodiversity	Species richness (Number of species detected)	Primary	Fieldwork
	Species diversity (e.g., Shannon-Weiner index)	Primary	Fieldwork
	Self-reported forest integrity & presence of wildlife species	Primary	Interviews & surveys

ANNEX 11. LIST OF REMOTE SENSING DATA SOURCES

TABLE 21. EXAMPLES OF AVAILABLE FREE ONLINE PROCESSED SERVICES OF LAND COVER SPATIAL DATA						
SOURCE	NAME	PRODUCT	EXTENT	RESOLUTION		AVAILABILITY
				SPATIAL (M)	TEMPORAL	
Global Forest Watch* (Nasa): https://www.globalforestwatch.org/	Land Cover	Forest Cover	Colombia	30	Annual	2000, 2010
		Forest cover gain	Colombia	30	Year	2001-2012
		Forest cover loss	Colombia	30	Annual	2001-2020
		Deforestation Hot spots	Colombia	NA	Year	2002-2020
		Deforestation alerts (GLAD)	Colombia	30	Week	2018-Current
		Deforestation alerts (GLAD-S2)	Colombia	10	5 days	2019-Current
IDEAM: http://puntosdecalor.ideam.gov.co/	Fires	Monitoring of hot spots	Colombia	Point	Day	2016-Current
		Burned area	Colombia	500	3 months	2010-Current
IDEAM: http://smbyc.ideam.gov.co/MonitoreoBC-WEB/reg/indexLogOn.jsp	Land Cover	Deforestation alerts	Colombia	Point	Week	NA
		Forest Cover	Colombia	30	Annual	2000 2005 2010 2012 2013 2014 2015 2016 2017 2018
		Forest Cover Change	Colombia		Annual	1990-2000 2000-2005 2005-2010 2010-2012 2012-2013 2013-2014

TABLE 21. EXAMPLES OF AVAILABLE FREE ONLINE PROCESSED SERVICES OF LAND COVER SPATIAL DATA						
SOURCE	NAME	PRODUCT	EXTENT	RESOLUTION		AVAILABILITY
				SPATIAL (M)	TEMPORAL	
						2014-2015 2015-2016 2016-2017 2017-2018

*The platform includes other products related to land cover, however, here is only presented a selection based on availability and temporal/spatial resolution.

TABLE 22. EXAMPLES OF AVAILABLE FREE ONLINE CARTOGRAPHY OF LAND COVER FOR THE COLOMBIAN TERRITORY						
SOURCE	NAME	PRODUCT	EXTENT	RESOLUTION		AVAILABILITY
				SPATIAL (M)	TEMPORAL	
IDEAM: http://www.siac.gov.co/catalogo-de-mapas	Land Cover	Forest - No Forest	Colombia	1:500.000	Multiannual	1990 2000 2005 2010 2012 2013 2014 2015
		Forest Change	Colombia	1:500.000	Multiannual	1990-2000 2000-2005 2005-2010 2010-2012 2012-2013 2013-2014 2014-2015
		Land Covers	Colombia	1:100.000	Multiannual	2000-2002 2005-2009 2010-2012
		Ecosystems	Colombia	1:100.000	Multiannual	2017
SINCHI: https://datos.siatac.co/ http://www.siac.gov.co/catalogo-de-mapas	Land Cover	Land Cover	Colombian Amazon**	1:100.000	Annual	2002 2007 2012

TABLE 22. EXAMPLES OF AVAILABLE FREE ONLINE CARTOGRAPHY OF LAND COVER FOR THE COLOMBIAN TERRITORY

SOURCE	NAME	PRODUCT	EXTENT	RESOLUTION		AVAILABILITY
				SPATIAL (M)	TEMPORAL	
						2014 2016 2018
		Forest Degradation	Colombian Amazon**	1:100.000	Multiannual	2002-2007 2007-2012 2012-2014 2014-2016 2016-2018
		Forest Loss	Colombian Amazon**	1:100.000	Multiannual	2002-2007 2007-2012 2012-2014 2014-2016 2016-2018
		Praderization	Colombian Amazon**	1:100.000	Multiannual	2002-2007 2007-2012 2012-2014 2014-2016 2016-2018
		Ecosystems	Colombian Amazon**	1:100.000		2012 2014 2016 2018 2020
		Agricultural Landscapes	Colombian Amazon**	1:100.000	Annual	2002 2007 2012 2014 2016 2018 2020
		Intervention Strata***	Colombian Amazon**	1Km 2	Annual	2002 2007 2012 2014 2016

TABLE 22. EXAMPLES OF AVAILABLE FREE ONLINE CARTOGRAPHY OF LAND COVER FOR THE COLOMBIAN TERRITORY

SOURCE	NAME	PRODUCT	EXTENT	RESOLUTION		AVAILABILITY
				SPATIAL (M)	TEMPORAL	
						2018 2020
SINCHI: https://datos.siatac.co/ http://www.siac.gov.co/catalogo-de-mapas	Conservation	Water round priorities for restoration	Colombian Amazon**	1:100.000	Annual	2002 2007 2012 2014 2016 2018 2021
		Land Legal status	Colombian Amazon**	1:100.001	Annual	2013 2015
	Fires	Hot Spots (Historical)	Colombian Amazon**	1:100.000	Day	2000-Current
		Burned Area (Historical)	Colombian Amazon**	1:100.000	Month	2017-Current

** The limit of the region is officially defined by the SINCHI institute

*** High, Medium, Low, Null

TABLE 23. EXAMPLES OF AVAILABLE FREE ONLINE SATELLITE IMAGERY FOR THE COLOMBIAN TERRITORY

SENSOR	SOURCE	RESOLUTION			AVAILABILITY	CARTOGRAPHY	
		SPATIAL (M)	TEMPORAL (DAYS)	SPECTRAL (BANDS)		MAXIMUM SCALE (APPROX)[36]	MINIMUN DETECTABLE AREA (HA)
Landsat (7-9)	NASA[37]	30	16	7	1999 – Current	100,000	16
		15		1		50,000	4
		100		2		375,000	60
		60	5	3	2015-Current	225,000	36

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[36] ESRI: http://resources.arcgis.com/en/help/main/10.1/index.html#//009t00000042000000

[37] https://landsat.gsfc.nasa.gov/

| SENSOR | SOURCE | RESOLUTION | | | AVAILABILITY | CARTOGRAPHY | |
		SPATIAL (M)	TEMPORAL (DAYS)	SPECTRAL (BANDS)		MAXIMUM SCALE (APPROX)[36]	MINIMUN DETECTABLE AREA (HA)
Sentinel 2 (2b)	European Space Agency[38]	10		4		35,000	6
		20		6		75,000	12
ASTER (Terra Level 1)	NASA[39]	15	16	4	2000-Current	50,000	4
		30		6		100,000	16
		90		5		350,000	56
PlanetScope	PlanetScope[40]	5	182	4	2015-2020	20,000	3.2
			30		2020-Current		

TABLE 23. EXAMPLES OF AVAILABLE FREE ONLINE SATELLITE IMAGERY FOR THE COLOMBIAN TERRITORY

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[38] https://sentinel.esa.int/web/sentinel/missions/sentinel-2
[39] http://asterweb.jpl.nasa.gov/
[40] https://www.planet.com/explorer/#/zoom/2.82
  https://www.planet.com/nicfi/
  https://assets.planet.com/docs/NICFI_GeneralFAQs_SPAN.pdf"

ANNEX 12. LIST OF EVALUATION UNITS BY STRATEGY

TABLE 24. LIST OF EVALUATION UNITS BY STRATEGY			
STRATEGY	UNIT OF ASSIGNMENT	UNIT OF TREATMENT	UNIT OF ANALYSIS
Strategy 1.1. Strengthen policies, regulations, rules	National, Municipality	Municipality	Municipality, Individuals, Reports, Cases, Sentences
Strategy 1.2. Strengthen law enforcement capacity	National, Municipality	Municipality	Municipality, Individuals, Reports, Cases, Sentences
Strategy 1.3. Strengthen reporting by indigenous/local communities	Village	Village, Monitoring teams	Village, Monitoring teams, Reports
Strategy 2.1: Stakeholder engagement & coordination	Household, Village, Government, Private sector, NGO	Household, Village, Government, Private sector, NGO	Household, Village, Government, Private sector, NGO
Strategy 2.2: Strengthen land tenure rights & security	Administrative unit**, Statistical unit***	Household, Indigenous community	Household, Indigenous community, Land parcel
Strategy 2.3: Land-use planning & zoning	Village, Administrative unit, Statistical unit, Regional corridors	Village, Administrative unit, Statistical unit, Regional corridors	Village, Administrative unit, Statistical unit, Regional corridors
Strategy 2.4: Livelihood-focused approaches	Village, Indigenous Community	Household	Household, Land parcel

*These evaluation units need to be confirmed with the IP and adjusted according to specific sub-strategies

ANNEX 13. NUMBER OF HOUSEHOLDS BY RURAL SECTORS AND SECTIONS

To demonstrate that the number of clusters that would need to be targeted in an impact evaluation strategy is achievable, the EA team considered the number of rural sectors and rural sections in the arc of deforestation that are available (Tables 1 and 2). While there is quite a bit of missing information (row 2 shows the number of sectors or sections where data are available), for those areas where data on households are available, there are >37 thousand households. For the sector unit, there is an average of 138 households and for the section unit, there is an average of 33 households. Given the large rate of missing data, these numbers are presumably an underestimation of the reality on the ground as the 2018 Colombian Census faced logistical difficulties reaching remote areas.

TABLE 25. NUMBER OF RURAL HOUSEHOLDS BY SECTORS ASSOCIATED WITH THE NORTHWESTERN DEFORESTATION ARC IN THE COLOMBIAN AMAZON

DESCRIPTION	VALUE
Sectors in the Deforestation Arc Municipalities	542
Sectors in the Deforestation Arc Municipalities with information of households	273
Total of households	37.683
Minimum number of households by section	1
Maximum number of households by section	2382
Average number of households by section	138
Median of households by section	65

TABLE 26. NUMBER OF RURAL HOUSEHOLDS BY SECTIONS ASSOCIATED WITH THE NORTHWESTERN DEFORESTATION ARC IN THE COLOMBIAN AMAZON

DESCRIPTION	VALUE
Sectors in the Deforestation Arc Municipalities	5071
Sectors in the Deforestation Arc Municipalities with information of households	1135
Total of households	37.683
Minimum number of households by section	1
Maximum number of households by section	845
Average number of households by section	33
Median of households by section	13

An evaluation team can use the maps of the household distribution (Figures 1 and 2) with the IP to target specific geographies to implement an impact evaluation. These maps were built with information from DANE. This includes microdata from the 2018 census[41] and sectors and sections from the "National Geostatistical Frame" (Marco Geoestadístico Nacional, MGN[42]).
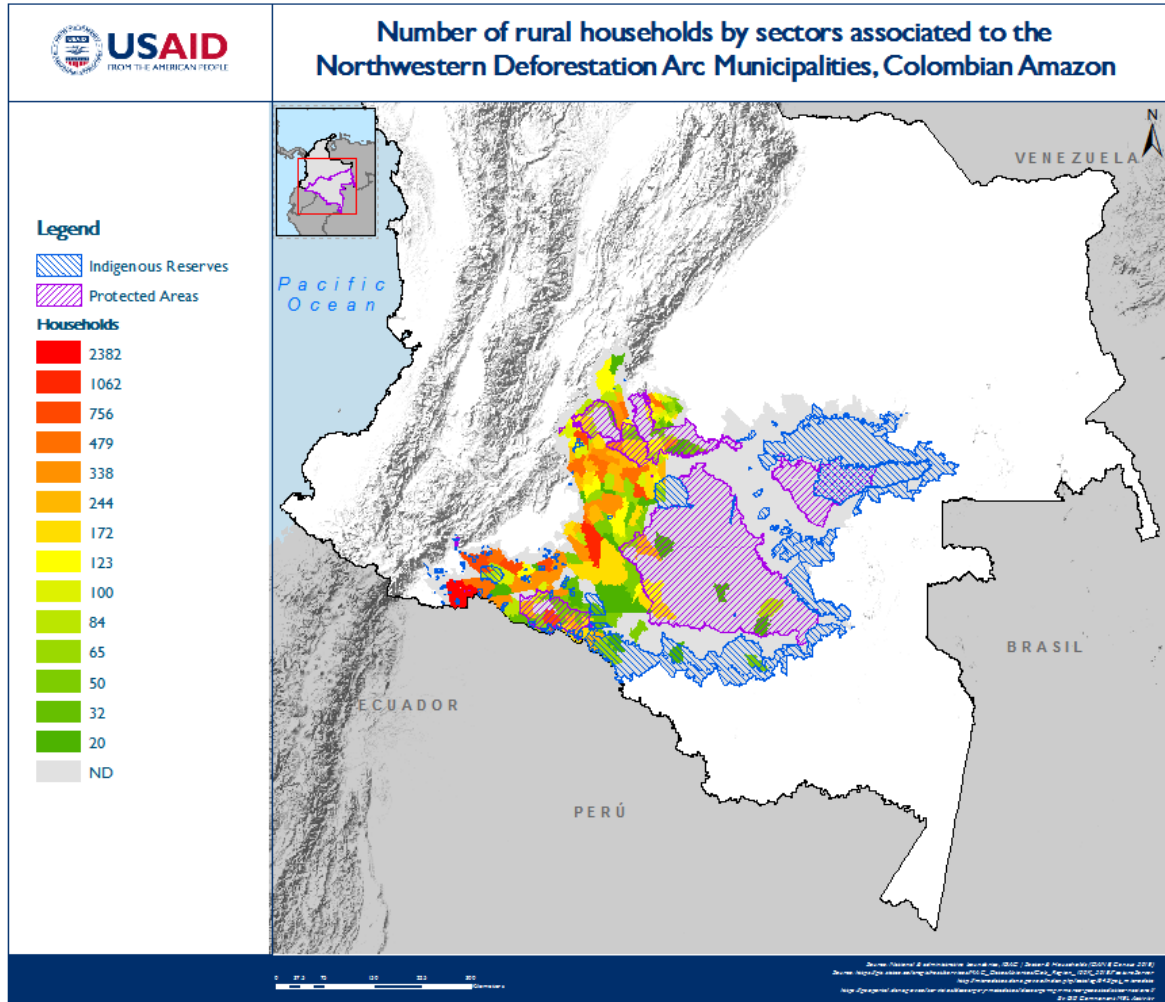

Exhibit 4: Number of rural households by sectors associated with the northwestern deforestation arc in the Colombian Amazon

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[41] http://microdatos.dane.gov.co/index.php/catalog/643/get_microdata
[42] https://geoportal.dane.gov.co/servicios/descarga-y-metadatos/descarga-mgn-marco-geoestadistico-nacional/
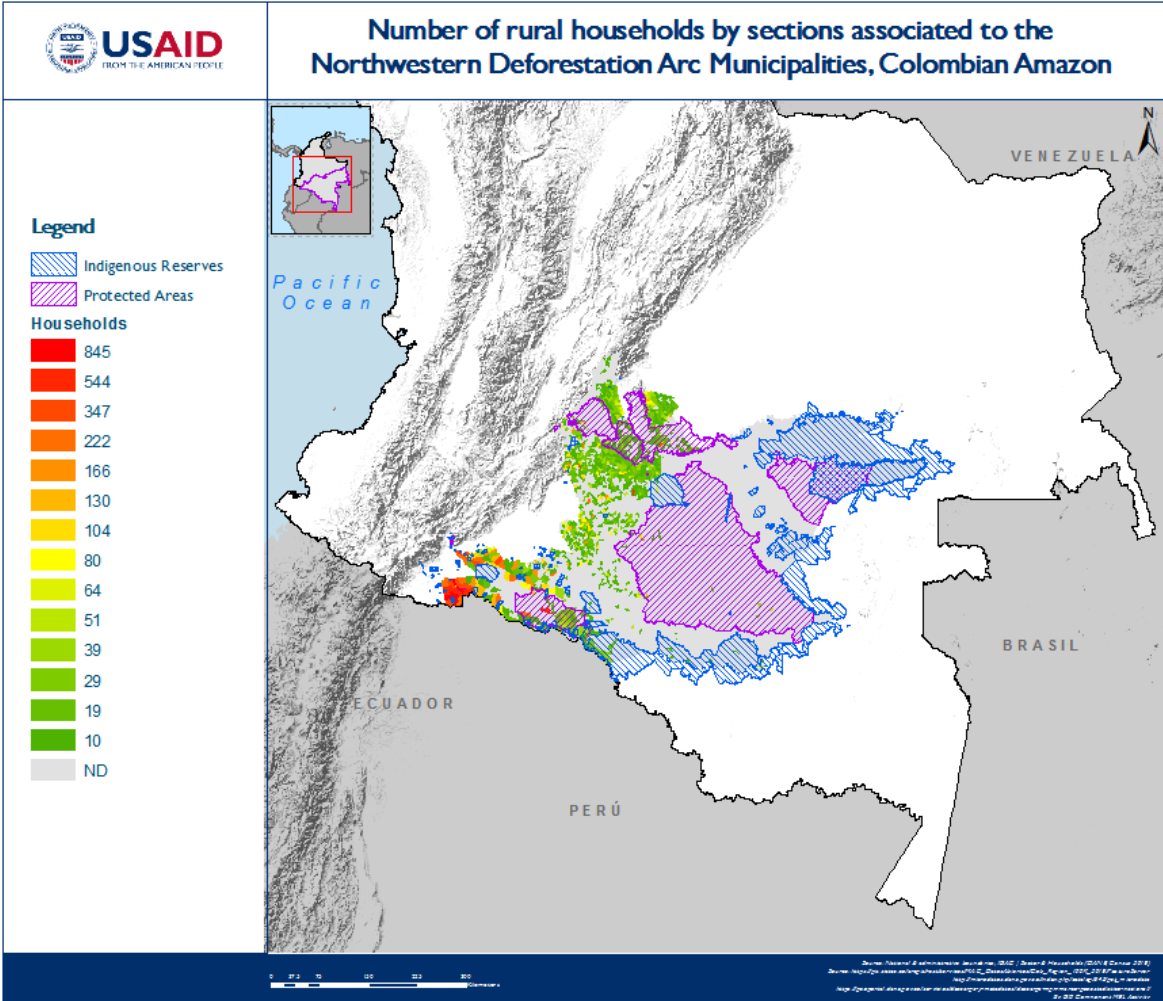
Exhibit 5: Number of rural households by sections associated with the northwestern deforestation arc in the Colombian Amazon