

Land Use Classification Mapping as a Baseline Input for Conservation Incentive Programs

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Integrating Sustainable Livelihoods, Environmental Mortgages, and Science-based Reforestation for Tangible Forest Conservation Change in the Ecuadorian Chocó



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Executive Summary

The intent of this technical report is to provide a detailed illustration of how GIS land use classification can be applied to facilitate effective incentive program design. In reality, the relative success of each conservation incentive program will be fundamentally dependent on how well its particular strategic approach responds to the specifics of local livelihood dynamics, deforestation drivers, existing economic incentives, and culture.

The environmental mortgages concept leverages affordable investments in sustainable, low-impact livelihoods to create perpetual incentives for natural resource conservation by providing forest-dwelling communities with access to specific livelihood improvements in exchange for community-level conservation commitments. This ITTO Small Project sought to comprehensively develop and pilot the environmental mortgage via its application to forest-dwelling communities in the Mache-Chindul Ecological Reserve of Esmeraldas Province, Ecuador. Here, we discuss one important input in program design—GIS land use classification mapping—as a means of accurately quantifying community forest holdings, preventing perverse incentives for further deforestation, estimating parameters for specific livelihood improvement services, and providing a template for the enrollment and monitoring of forest assets.

The specific aims of this land use classification analysis were as follows:

1. to determine total forest holdings in pilot communities as a prerequisite to calculations of required conserved forest for the program's conservation–livelihood trades, based on each community's maximum "environmental asset" potential;
2. to document standing forest before the pilot implementation phase, as a means of preventing perverse incentives for more deforestation once the livelihood chosen for revamping (cacao) becomes economically viable;
3. to quantify the extent of existing cacao plantations in the community for later coupling with in-situ inspections to accurately estimate current and potential harvest production volumes; this information would be used to determine whether sustainable cacao income alone can replace traditional logging + cacao combined income;
4. to calculate land area comprised by degraded forest that could be later enrolled in the program as environmental asset "extensions" once all primary forest has been committed;
5. to establish a baseline template of forests that can be used when mapping and monitoring areas enrolled in the program.

GPS data was collected for a total of 73 properties comprised by 2,088 hectares, over a ten month period from July 2013 through April 2014, in two pilot communities. All surveyed areas were categorized as one of three land uses: primary rainforest, cacao plantation, and degraded forest; transitions from one land use category to another were coded as waypoints. GPS data was then uploaded, tracks and waypoints converted into shapefile format, and imported to ArcGIS 10 using the projection WGS 84/UTM Zone 17 South. Land cover area for all properties and the terrain types contained within was calculated using the ArcGIS "Calculate Geometry" tool. Total community land holdings were tallied and used to determine the number of hectares that represented a quarter of community territory; this 25% was the amount of conserved forest required in exchange for the first and most substantive livelihood improvement package sponsored under the environmental mortgages incentive program.

Proportional similarities in land use composition were striking between the two pilot communities, particularly in light of ethnic and cultural differences. In addition, both communities were willing to commit a full quarter of their territorial holdings (representing nearly half of their remaining forest assets) to conservation in exchange for the livelihood benefits of a direct market connection, the infrastructure required to attain export-level quality and volume, and legal registry as an autonomous producer's association. This finding confirms that forest-dwelling communities understand the long-term value of a sustainable and community-based livelihood option.

1. Introduction

The design of conservation incentive programs—and in particular, innovative approaches to conservation incentives—is a fundamentally iterative process, the success or failure of which hinges upon how well incentive design responds to the case-specific circumstances driving environmental degradation in the area to be conserved. Adaptive design is of paramount importance. Whereas it is oftentimes possible to gain an informative picture of a problem's principal components during the pre-project phase through secondary research and straightforward preliminary observations, there are other critical components that require a deeper level of investigation (typically, via primary research) in order to accurately determine the appropriate incentive design. Here, we discuss one such component—GIS land use classification mapping—as a means of accurately quantifying community forest holdings, preventing perverse incentives for further deforestation, estimating parameters for specific livelihood improvement services, and providing a template for the enrollment and monitoring of forest assets.

The Problem

In low-income nations, efforts to alleviate poverty often produce incentives to degrade the local environment, and efforts to protect the environment often fail to improve livelihoods. Current strategies for tropical forest conservation have struggled with this challenge. Now commonly implemented in developing nations, 'indirect approaches' to conservation promote alternative livelihoods that reduce the use of local natural resources, such as non-timber forest product marketing, sustainable agriculture, and eco-tourism. However, on-the-ground efforts during the past several decades have revealed that alternative livelihoods do not guarantee a concurrent decrease in environmental degradation; most often, these approaches have failed to protect biodiversity and ecosystems to the extent needed (Agrawal and Redford 2006). Recently, incentive payment approaches have been advocated and explored as a more direct means to environmental protection, including payment for ecosystem services, restricted land easements, and performance-based payments for biodiversity. The last of these approaches, such as paying directly for number of forest hectares conserved in critical climate refugia, is the most direct and cost-effective way to protect an environmental asset.

Incentive payments, however, are not livelihoods, and do not take into account the development needs of local inhabitants (Agrawal and Redford 2006). Rather, they are short-term payments (typically annual) that rely on a long-term funding stream, translating into a high-risk scenario for ephemeral incentives (West 2007). Unless continued, these lump or one-time payments do not create sustainable incentives for the long-term protection of an environmental asset (Kinch 2006). Direct payment schemes can also be complicated by other factors, such as ethical issues due to economic differences between “buyer” and “seller” nations. In some cases, government policies can complicate or prohibit direct payment schemes. Lastly, these schemes often require legal land tenure for payments—

a condition that does not coincide with the reality of natural resource expanses in most developing countries, where the poorest of the population settle out of economic necessity.

An alternative approach that circumvents each of these loopholes is the environmental mortgage—a strategy that leverages affordable investments in sustainable, low-impact livelihoods to create perpetual incentives for natural resource conservation by providing forest-dwelling communities with access to specific livelihood improvement needs in exchange for community-level conservation commitments (Mandel et al. 2009). This model directly addresses the three causes identified by the REDDES Thematic Programme Document as leading to a reduced quality and quantity of forest environmental services in ITTO producing member countries: persistent poverty coupled with lack of alternative livelihoods, insecure land tenure and inadequate financing mechanisms for SFM or reforestation, and a fundamental disconnect between compensation for environmental services and the communities that maintain them (ITTO 2009). This ITTO Small Project sought to comprehensively develop and pilot the environmental mortgages concept via its application to forest-dwelling communities in the Mache-Chindul Ecological Reserve of Esmeraldas Province, Ecuador.

Origins of Mache Chindul Reserve

Starting in 1964, the area now comprised by Mache-Chindul Reserve was targeted as part of an Agrarian Reform program aimed at converting unproductive lands into agriculture. Under this program, colonization was incentivized via the promise of legal land title for double the area that a colonist 'worked' (*i.e.* deforested). Colonists rushed into the area from neighboring Manabí province, where a majority of forested lands had already been converted to pasture. The colonization/deforestation process was allowed to proceed for several decades before the Ecuadorian government began to receive international pressure to conserve the area's Chocó forests due to their extraordinary levels of endemism (Dodson & Gentry 1991). Ecuador's response was to "erase" the agency that had made the land title promises and declare the 121,000-hectare area an Ecological Reserve in 1996. Most of the inhabitants that arrived during the colonization process remain, dispersed across the reserve in an estimated 80+ small villages (MAE 2005).

Landholders, with the exception of a small proportion that acquired their legal titles early on, have been told repeatedly by the Ministry of Environment that no individual titles will be given, but the Reserve's management plan affords a formalized, albeit vague "recognition" of the communities as a whole. This management plan, finalized around 2007 and now out of date (MAE 2005), is the area's only guiding document. Economic activities are severely constrained within reserve boundaries, with cacao and timber currently representing the two predominant sources of the cash economy that characterizes most remote rainforest communities.

Deforestation Drivers in Ecuador

According to the FAO, approximately 9,865,000 hectares (35.6%) of Ecuador's surface area was forested in 2010 (FAO 2010). Of this, just under half is classified as primary forest. During the past two decades, Ecuador lost an average of 1.43% of its forests per year, tallying up to 28.6% of the total (Butler 2006). Approximately 80% of this deforestation took place on the coast, with selective logging heavily affecting what remains (as a benchmark, up to 47% estimated to be affected in 1993; Butler 2006). Of the coast, Esmeraldas Province has the highest annual deforestation rate (4.07%), with 674,953.50 hectares of remaining forest estimated in 2000 and between 13,735.30 and 27,470.60 hectares deforested every year since (Zambrano-Barragan, 2010). Compounding this problem is the reality that conservation initiatives in the region are few and far between.

Much of the deforestation is indirectly caused by land tenure conflict--members of the country's poorest sector either squat on, or buy without title, lands that they then proceed to deforest because a) due to their lack of legal collateral, they have no funds for livelihood improvement options and agricultural mainstays all have periods of scarcity, b) it has been culturally drilled into their consciousness that "unworked" land is free for anyone's taking, or c) they reason that since it is a question of time until they are kicked off their land, efficient exploitation is the only economic strategy that makes sense (Morales et al. 2010). All of the reserve communities that we interviewed described one or more of these dynamics when discussing reasons for the need to deforest.

Low opportunity costs in northwest Ecuador incite further exploitation of forests as lands are clear-cut for monocultures (primarily African Palm and eucalyptus) and pastureland. The reason for this conversion is cited in Mache Chindul's Management Plan, which describes average per-hectare land sale prices of \$345 for pasture, \$291 for cacao, and \$272 for standing forest (MAE 2005). This began in the 1980s, when the opening of the Esmeraldas-Borbon road initiated the sale of cacao to intermediaries (Dodson & Gentry 1991). By the 1990s the price of cacao fell significantly on what were already aging cacao plantations, many of which were destroyed by the worst El Niño episode in decades. The result: timber extraction replaced cacao as the region's predominant source of income (Nelson & Galvez 2000). Compounded by the government's refusal to acknowledge the existence of communities in the reserve at that time (including denial of all basic services), logging firms were soon welcomed as a means for facilitating penetration roads.

Research Aim

The aim of this land use classification analysis was five-fold:

6. to determine total forest holdings in pilot communities as a prerequisite to calculations of required conserved forest for the program's conservation–livelihood trades, based on each community's maximum "environmental asset" potential;

7. to document standing forest before the pilot implementation phase, as a means of preventing perverse incentives for more deforestation once the livelihood chosen for revamping (cacao) becomes economically viable;
8. to quantify the extent of existing cacao plantations in the community for later coupling with in-situ inspections to accurately estimate current and potential harvest production volumes; this information would be used to determine whether sustainable cacao income alone can replace traditional logging + cacao combined income;
9. to calculate land area comprised by degraded forest that could be later enrolled in the program as environmental asset "extensions" once all primary forest has been committed:
10. to establish a baseline template of forests that can be used when mapping and monitoring areas enrolled in the program.

2. Applied Methodology

Study Sites

After a four-month reconnaissance process in Mache-Chindul Reserve during which twelve candidate communities were ultimately visited and interviewed, two communities were selected for participation in the environmental mortgages pilot program. These two communities are located in the reserve's central-western interior, close to the headwaters of the Sucio and Muisne rivers and bordering the reserve's core of intact forest (Figure 1). Guayacan and Mono Bravo both shared each of the following four selection criteria:

- Location within reserve boundaries
- *De facto* stewardship of substantive areas of intact primary forest
- A pre-existing focus on cacao as one of the community's predominant livelihoods
- Pronounced social capital, or community cohesiveness

GPS Data Collection

GPS data was collected over a ten month period from July 2013 through April 2014. On each survey day, two project technicians accompanied the property owners of adjacent lots on foot to register boundaries and record changes in land use. This substantive ground-truthing period is attributable to the fact that terrain in both communities is often comprised by steep and muddy forested slopes, interspersed with frequent narrow rocky drainages and cliffs. Each individual property was recorded as a track on Garmin GPS MAP 62s internal memory. All surveyed areas were categorized as one of three land uses: primary rainforest, cacao plantation, and degraded forest, and transitions from one land use category to another were coded as waypoints stored in the GPS internal memory. Once the GPS mapping of each property was completed, hand-drawn sketch of land use breakdowns and boundary landmarks was

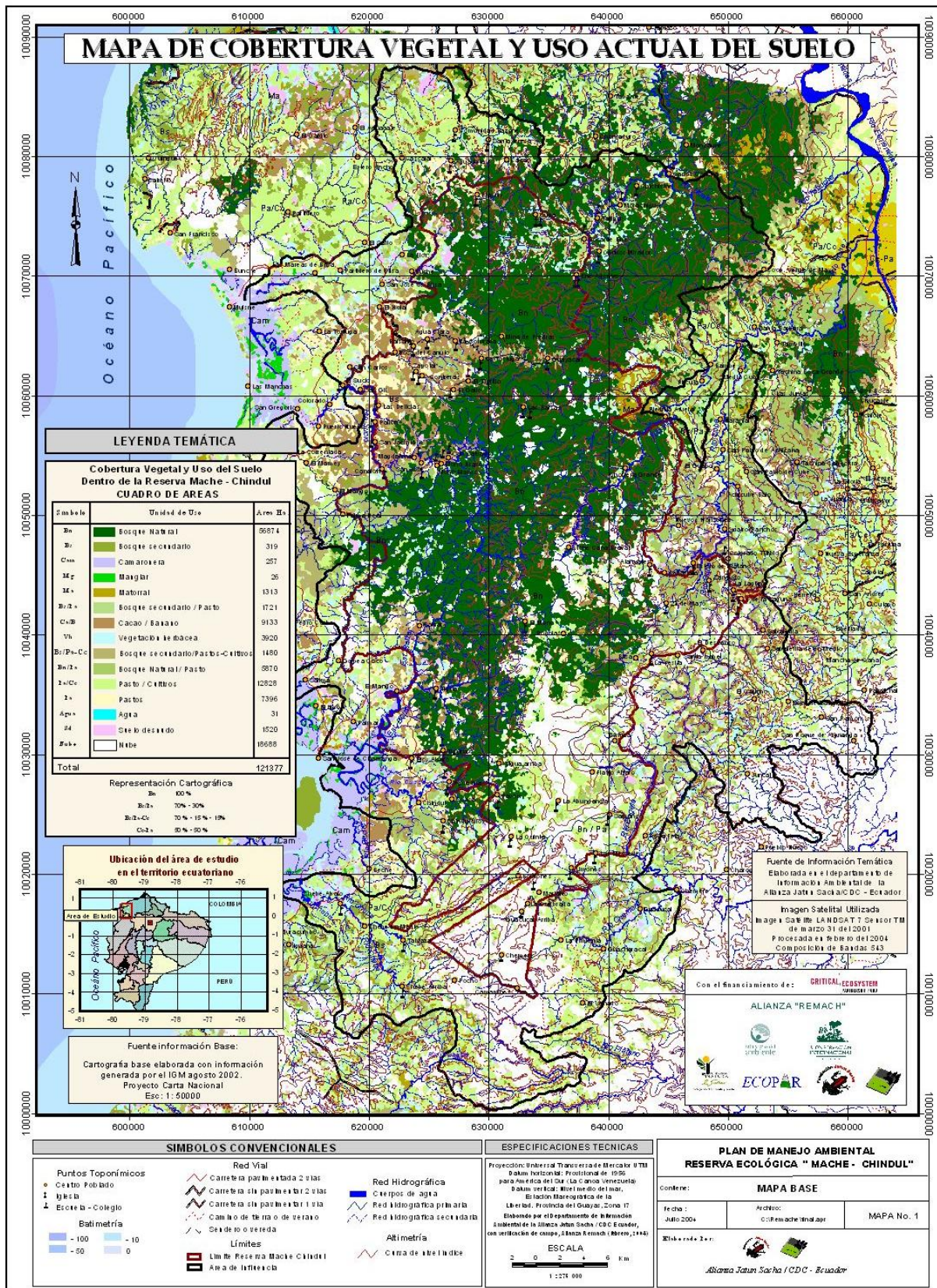


Figure 1. Map of vegetation cover and land use classification in the 121,000-hectare Mache-Chindul Ecological Reserve, circa 2004. Dark green areas represent remaining forest, and yellow arrows indicate environmental mortgage pilot communities. Adapted from Alianza Jatun Sacha/CDC – Ecuador source data.

created in a field notebook with the owner present; this step was implemented to aid in the conceptual grasp of GIS-produced maps at a later date, and to accurately keep track of waypoint sequences and neighboring property ownership boundaries.

GIS Analyses

GPS data was then uploaded, tracks and waypoints were converted into shapefile format, and imported to ArcGIS 10 using the projection WGS 84/UTM Zone 17 South. Polygons representing each property were created using track data, and subsequently divided into terrain types using waypoint data. Each polygon added to the property database was first cleaned and examined for topological errors. Land cover area for all properties and the terrain types contained within was calculated using the ArcGIS "Calculate Geometry" tool in the projection UTM Zone 17 South. Before finalizing property boundaries in the master database, each individual map was reviewed by the pilot community's elected president for accuracy.

Incentive Program Applications

Total community land holdings were tallied and used to determine the number of hectares that represented a quarter of community territory; this 25% was the requisite amount of conserved forest in exchange for the first and most substantive livelihood improvement package sponsored under the environmental mortgages pilot program. A printed and laminated individual property map was created for each community member that allowed their land to be surveyed. For both Guayacan and Mono Bravo, this was the first controlled quantification of individual land holdings to have been conducted. Because not all community members were willing to map their properties, additional deductive measures were required in order to estimate total forest holdings: for "missing" properties, neighboring property borders were used to opportunistically identify transitions to and from rainforest terrain, and an additional map including non-surveyed properties was pieced together.

Individual maps were used by community members participating in the environmental mortgages program to determine the number of hectares that each was going to contribute toward the first conservation-livelihood trade. Once the community collectively reached the required number of conserved forest hectares, areas designated by each participant were ground-truthed as individual tracks on the GPS internal memory, correcting for over- and under-estimates in enrolled area boundaries by using the Garmin GPS Map 62s "calculate area" function while in the field. Finally, a community-level map of all surveyed properties and major topographical landmarks was presented to the local governing body of each pilot community as a planning resource.

3. Data Presentation

A total of 73 properties comprised by 2,088 hectares were surveyed in the pilot communities of Mono Bravo and Guayacan. Rainforest was by far the predominant terrain type in the two territories, totaling 1,380 hectares (66.1% of all surveyed land), with degraded forest as the second-most common terrain type at 514 hectares total (Table 1). Despite the fact that Mono Bravo's mapped properties represented a mere third of the territory mapped in Guayacan (Figure 2), the proportional representation of each terrain type was very similar in the two communities. Surveyed rainforest represented 68.5% of Mono Bravo's mapped territory and 65.3% in Guayacan, cacao plantations represented 12.0% in Mono Bravo and 8.4% in Guayacan, and degraded forest represented 19.5% and 26.4%, respectively (Table 1).

Thirty-five properties total were mapped and classified according to land use composition in the community of Mono Bravo (Figure 3), and an additional 24 properties were mapped via opportunistic deduction (Figure 4) in order to arrive at a total territory size of 817 hectares. Forty-three properties total were mapped and classified according to land use composition in the community of Guayacan (Figure 5), with an additional nine properties mapped via opportunistic deduction (Figure 6) in order to arrive at a total territory size of 2,342 hectares. Again, proportions were very comparable between the two communities, with 65.4% of the total territory surveyed in Mono Bravo and 66.4% of the total territory surveyed in Guayacan.

Table 1. Summary of land use composition surveyed in the pilot communities of Mono Bravo and Guayacan, Mache-Chindul Ecological Reserve, Ecuador. Hectares, followed by percentage of each community's surveyed total (in parentheses), are presented.

Terrain Type	Pilot Community		Total (ha)
	Mono Bravo	Guayacan	
Non-enrolled Forest (ha)	169 (31.6%)	1,014 (65.3%)	1,183
Enrolled Forest (ha)	197 (36.9%)	NA	197
Cacao (ha)	64 (12.0%)	130 (8.4%)	194
Degraded Forest (ha)	104 (19.5%)	410 (26.4%)	514
Total (ha)	534	1,554	2,088

Total territory size was then employed to calculate a 25% requirement of conserved forest as the prerequisite for program participation in each community; 200 hectares was settled upon as the enrollment total for Mono Bravo and 600 hectares for Guayacan. Community members referred to their individual property maps to assess how many forest hectares each could feasibly contribute to the collective goal based on a new understanding of asset distributions (forest, cacao, and degraded forest; Figure 7).

4. Analysis & Interpretation

Proportional similarities in land use composition were striking between the two pilot communities, particularly in light of ethnic and cultural differences: Mono Bravo is dominated by Afro-ecuadorian inhabitants that focus almost entirely on cacao and timber for income, while Guayacan is dominated by Mestizo inhabitants that include cattle ranching as a third source of income. The fact that even the proportion of community lands that were willingly offered up for

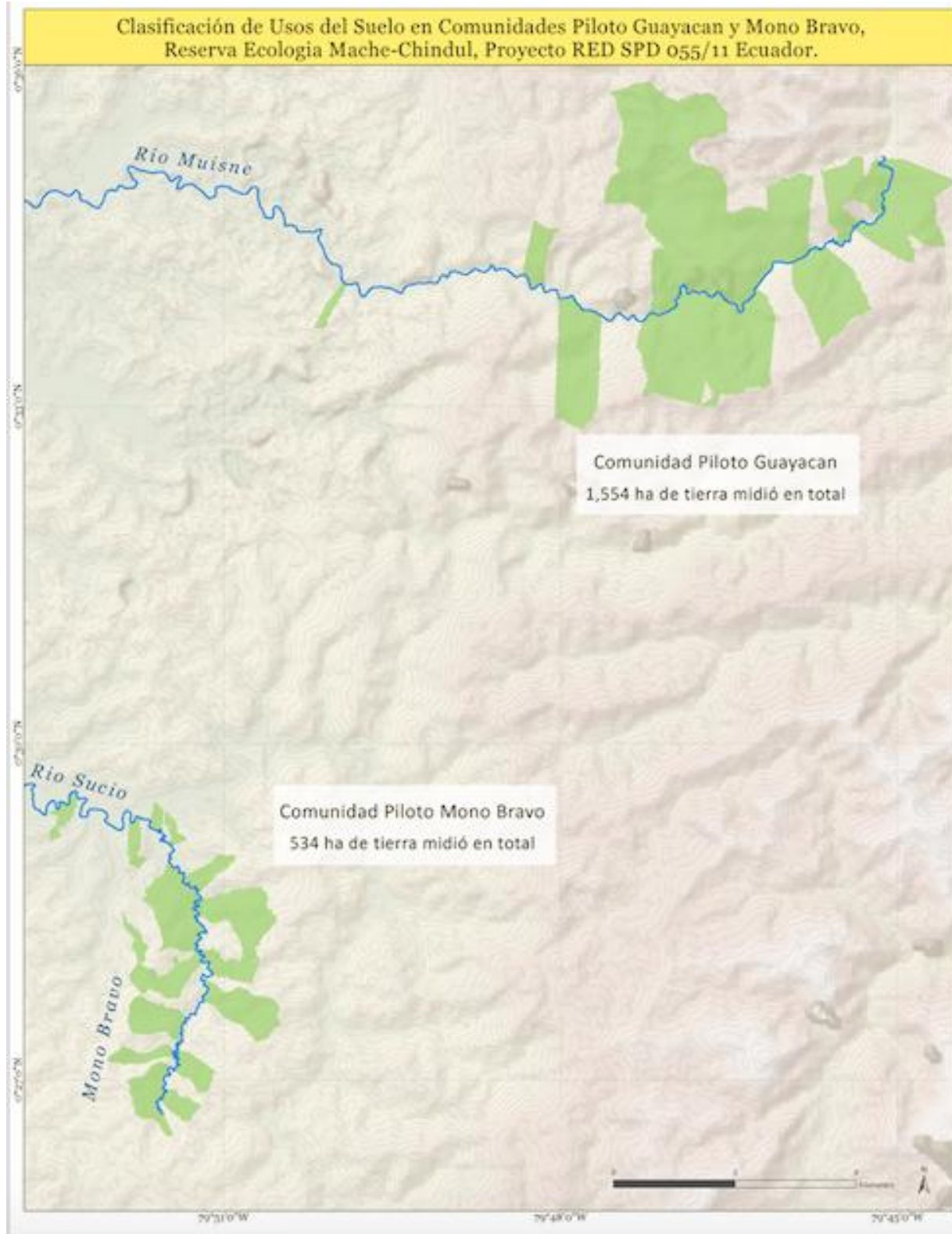


Figure 2. Land use classification for the pilot communities of Guayacan and Mono Bravo in Mache-Chindul Ecological Reserve, Ecuador. Regional overview of the geographic relationship and existing topography between the two.

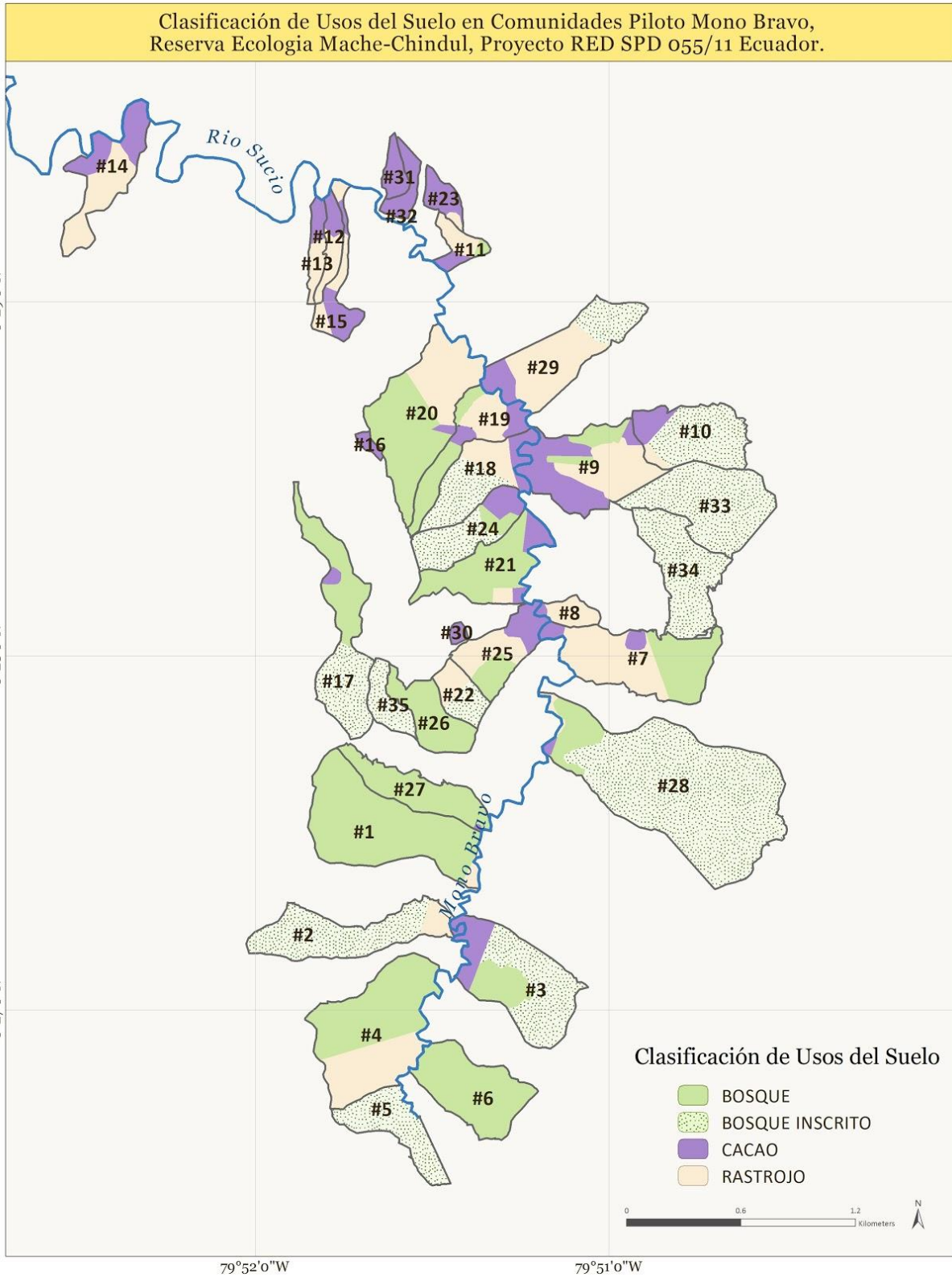


Figure 3. Land use classification in the pilot community of Mono Bravo, Mache-Chindul Ecological Reserve, Ecuador. Overview of mapped community properties. Legend: green = non-enrolled forest, stippled = enrolled forest, purple = cacao plantations, and peach = degraded forest. Number of hectares for each property and terrain type is presented in Annex 1.

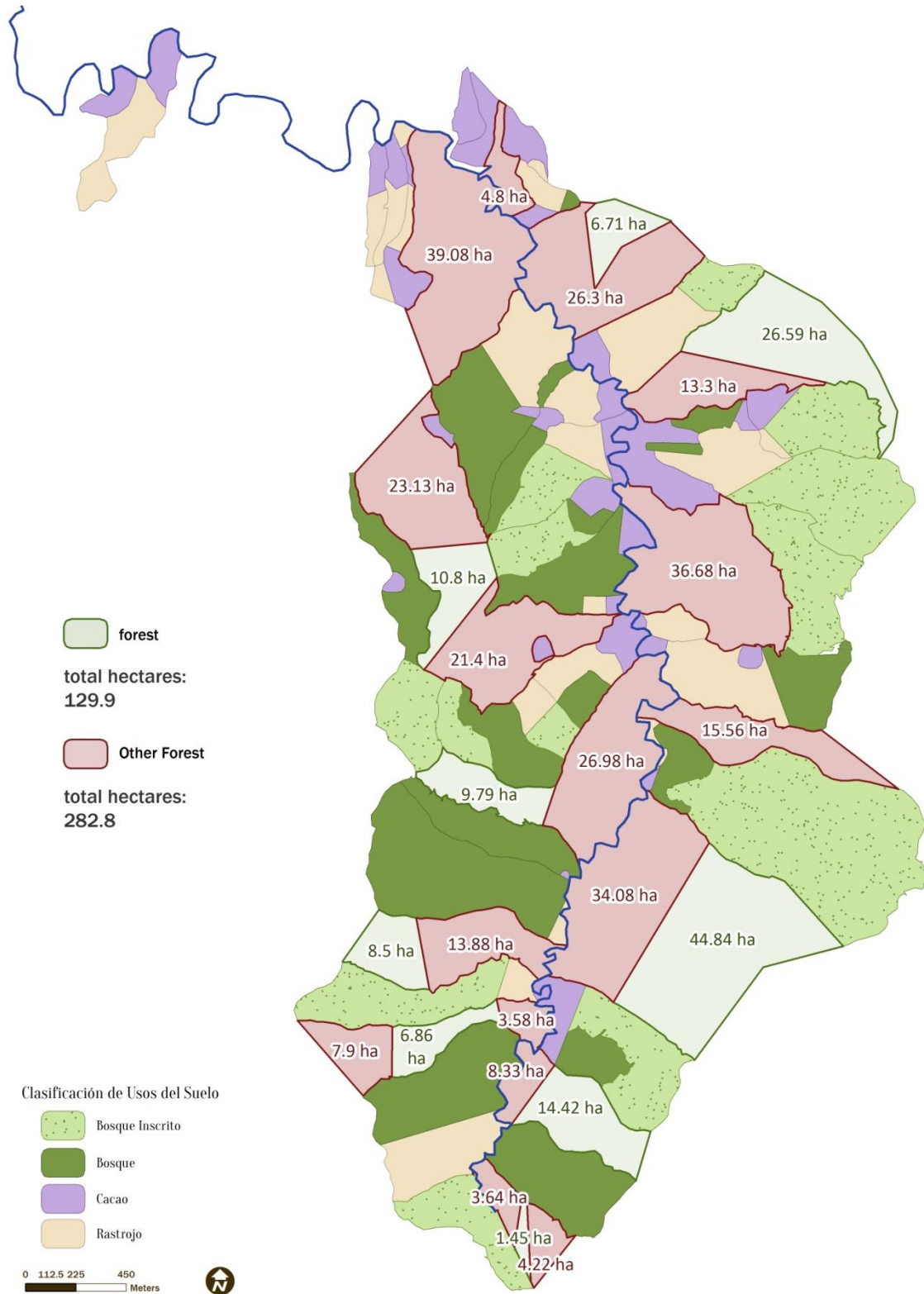


Figure 4. Supplemental map used to deduce total territorial land holdings in the pilot community of Mono Bravo, Mache-Chindul Ecological Reserve, Ecuador. Gray areas with green borders represent forest that was opportunistically estimated using neighboring property boundaries. Legend: green = non-enrolled forest, stippled = enrolled forest, purple = cacao plantations, and peach = degraded forest.

Clasificación de Usos del Suelo en Comunidades Piloto Guayacan
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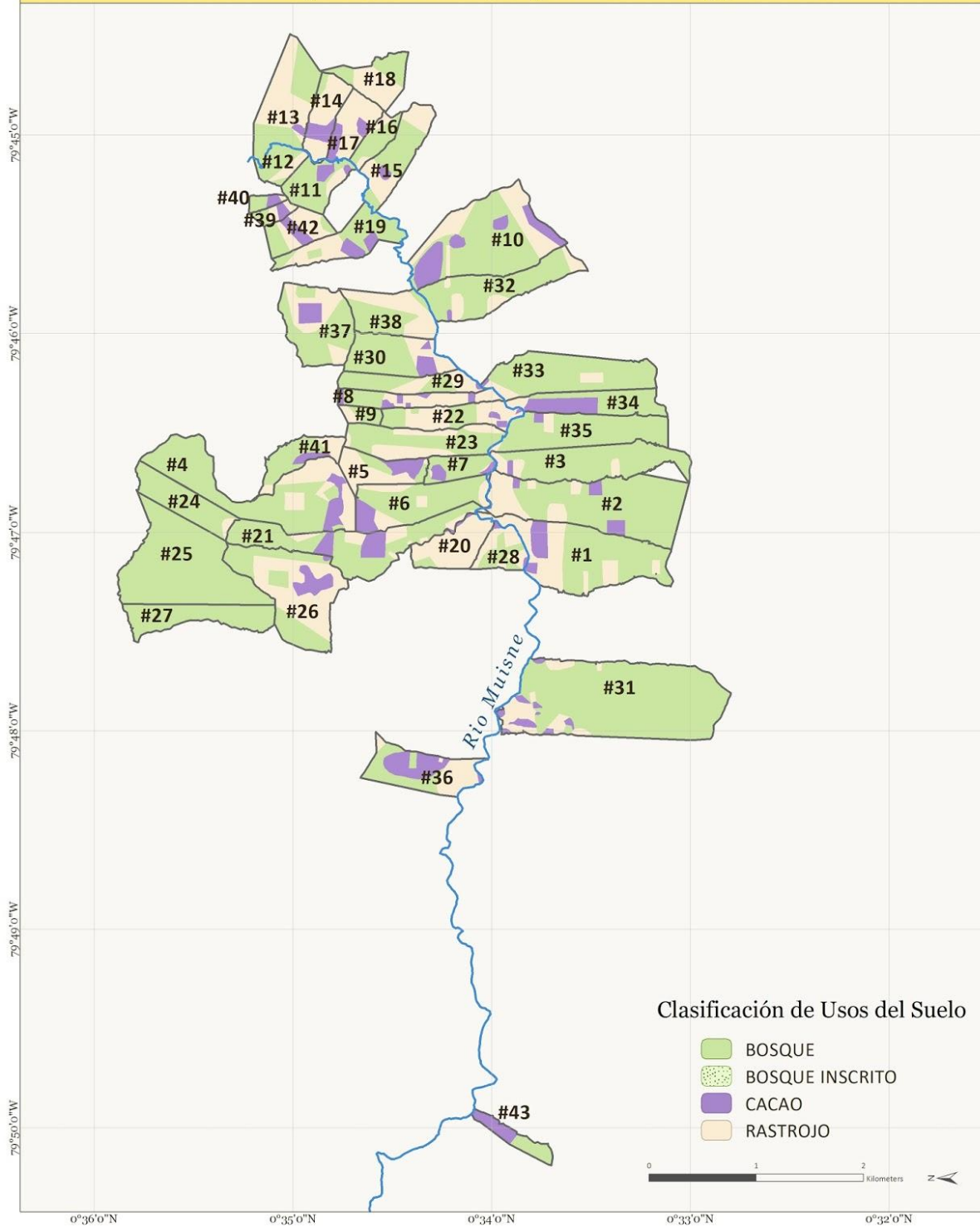


Figure 5. Land use classification in the pilot community of Guayacan, Mache-Chindul Ecological Reserve, Ecuador. Overview of mapped community properties. Legend: green = non-enrolled forest, stippled = enrolled forest, purple = cacao plantations, and peach = degraded forest. The number of hectares for each property and terrain type is presented in Annex 1.

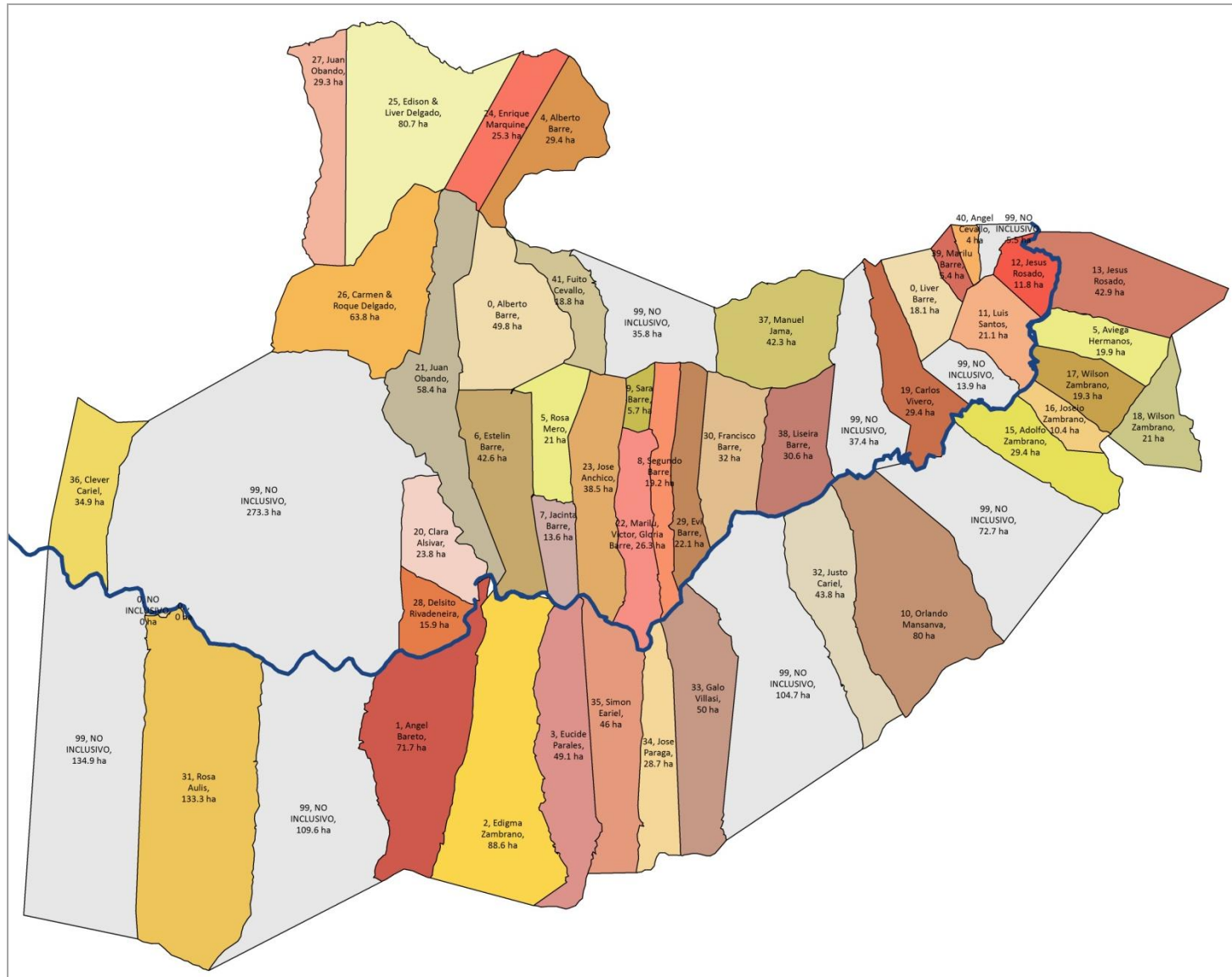


Figure 6. Supplemental map used to deduce total territorial land holdings in the pilot community of Guayacan, Mache-Chindul Ecological Reserve, Ecuador. Gray areas represent forest that was opportunistically estimated using neighboring property boundaries. Map shows only individual property boundaries; land use classifications are not represented.

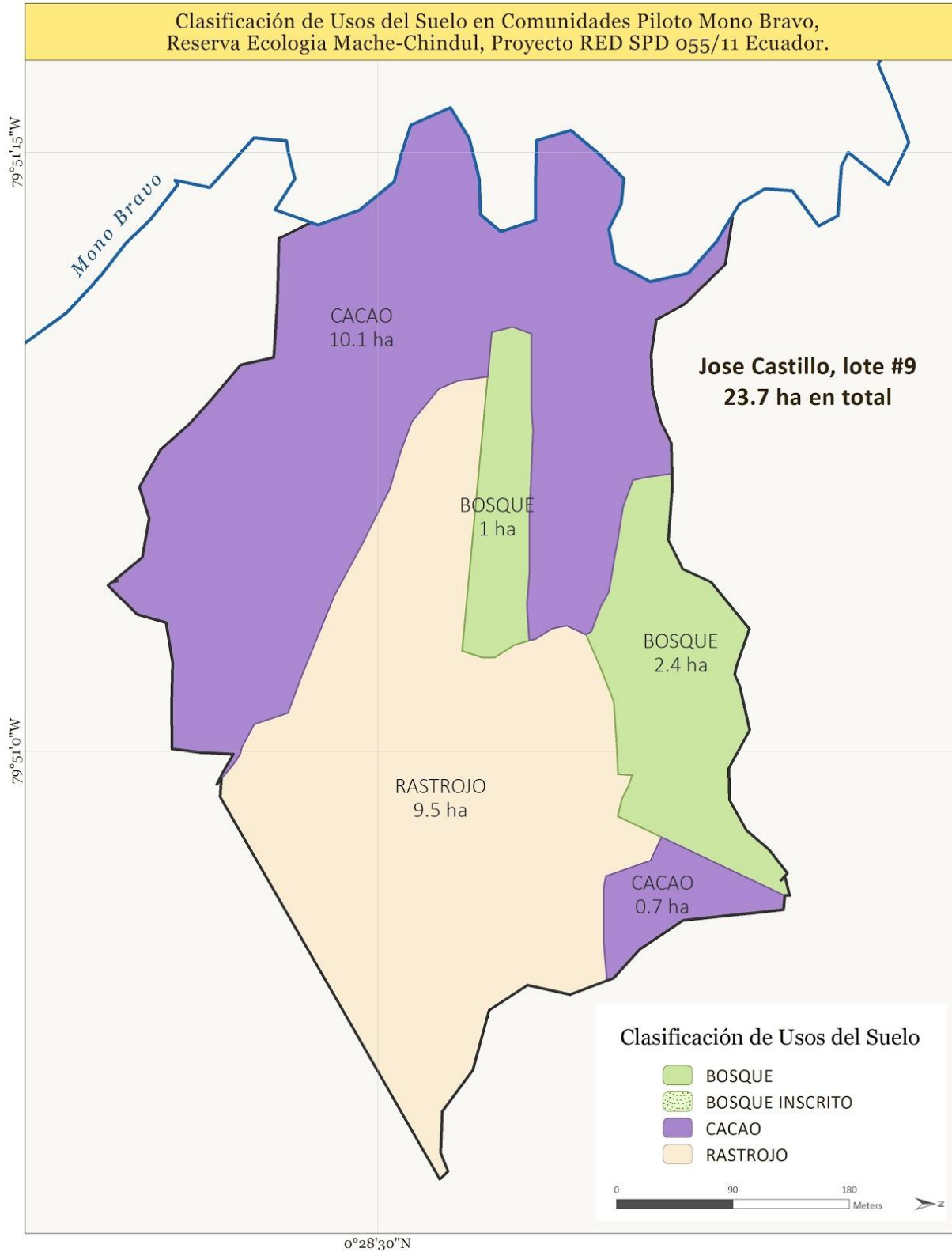


Figure 7. Land use classification in the pilot community of Mono Bravo, Mache-Chindul Ecological Reserve, Ecuador. Example of an individual property map. Legend: green = forest, stippled = enrolled forest, purple = cacao plantations, and peach = degraded forest.

mapping was nearly identical underscores this point, as it is a mapping-related measure that is entirely behavior-based. Sadly, the remaining 68.5% and 65.3% of territory represented by rainforest (in Mono Bravo and Guayacan, respectively; Table 1) can almost certainly be attributed to the logistical challenges associated with timber extraction rather than to an innate conservation mentality. In both cases, steep and muddy terrain complicates log extraction to the nearest river system, significantly slowing the rate of potential felling, and dry season conditions make for a near-impossible trajectory to the nearest intermediary buyer, limiting most extraction to approximately half of the year.

Similarities in the proportion of lands comprised by cacao plantations are also interesting, given the substantive difference in harvest production between the two communities. Mono Bravo plantations innately produce more cacao due to climatic micro-conditions, and do not require the chemical inputs that are commonly used in Guayacan to augment production. Patterns of degraded forest show an analogous unexpected trend, given that proportions are so similar in the two communities despite only Guayacan having a notable focus on cattle ranching activities.

With respect to incentive program design, the *a priori* determination of environmental assets for each participating community ensures a perception of program equity, should different communities compare notes. The influence of this factor should not be underestimated, as current forest holdings (or lack thereof) are typically the collective legacy of generations of difficult land management decisions, many of which require great sacrifice. It is worth noting that both communities were willing to commit a full quarter of their territorial holdings (representing nearly half of their remaining forest assets) to conservation in exchange for the livelihood benefits of a direct market connection, the infrastructure required to attain export-level quality and volume, and legal registry as an autonomous producer's association. This finding definitively confirms that forest-dwelling communities understand the long-term value of a sustainable and community-based livelihood option.

5. Conclusions

Land use classification analyses comprise a fundamental baseline input for the successful adaptive design of any conservation incentive program due to their roles in establishing parameters and elucidating behaviors. Mapping results have a multitude of incentive program applications, including the quantification of environmental assets for assessment of maximum participation potential, the documentation of existing intact forest resources for prevention of perverse incentives, and area-based calculations of future livelihood potential to enable long-term benefit planning. Via the present study, land use classification was used to quantify previously unknown territorial forest holdings, to create equitable incentive program enrollment terms, and to enable both short- and long-term planning for cacao market revamping steps and the environmental assets required for future conservation-livelihood trades.

6. Recommendations

The intent of this technical report is to provide a detailed illustration of how GIS land use classification can be applied for effective incentive program design. In reality, the relative success of every conservation incentive program is fundamentally dependent on how well a strategic approach responds to the specifics of local livelihood dynamics, deforestation drivers, existing economic incentives, and culture. As stated in the introduction, an iterative process of adaptive design is critical. Each land use classification approach will therefore be both project- and site-specific.

7. Implications for Practice

Toward the aim of facilitating the advancement of conservation incentive programs as a tangible solution to the now-common conservation-poverty dilemma that characterizes tropical forests, we have developed a comprehensive set of user-friendly design guidelines based on the learning process gained from this project (Annex 3).

Implications for practice that are specific to the land use classification component of incentive mechanism design can be summarized as follows:

- When quantifying any measurable geographic unit, there is no substitute for the reliable and rigorous data attained via GIS mapping; community estimates and outdated approaches most often result in inaccurate data that can seriously skew results.
- The importance of establishing a baseline of existing forest resources cannot be over-stressed. Given the rapidly evolving nature of today's tropical forest cover trends, these data often generate unexpected project benefits, particularly with respect to long-term planning.
- For projects addressing deforestation and economic alternatives, land use classification serves as a first line of defense in determining how comparable "replicated" study sites are in actuality, providing perspective on behavioral similarities or differences that can help to shape strategic approaches.
- Critical to the success of any conservation incentives initiative is a vision deliberately oriented toward long-term program sustainability, both financially and logistically. Design decisions made now will have ramifications that reach far into the future; GIS mapping can supply one source of the fundamental baseline data that is required for proper planning.

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Annex 1. Land surveyed in Mono Bravo pilot community.

Lot Number	Owner Code	Community	Forest (ha)	Enrolled Forest (ha)	Cacao (ha)	Degraded Forest (ha)	Total (ha)
1	AT	Mono Bravo	31.7			0.9	32.7
2	SJ	Mono Bravo		17.2		2.4	19.5
3	LA	Mono Bravo	5.6	15.8	4.8		26.1
4	BC	Mono Bravo	20.7			12.1	32.9
5	Reserva	Mono Bravo		11.7			11.7
6	JC	Mono Bravo	18.2				18.2
7	AC	Mono Bravo	9.6		1.9	13.1	24.7
8	JC	Mono Bravo			0.3	3.3	3.6
9	JC	Mono Bravo	3.5		10.8	9.5	23.8
10	CC	Mono Bravo		13.4	2.6	0.8	16.9
11	AJ	Mono Bravo	0.5		1.1	2.5	4.1
12	AT	Mono Bravo			1.7	2.6	4.2
13	KT	Mono Bravo			1.6	2.2	3.8
14	AT	Mono Bravo			6.4	8.3	14.6
15	FT	Mono Bravo			3.6	3.2	6.8
16	FT	Mono Bravo			0.9		0.9
17	FT	Mono Bravo	10	10.3	0.6		21
18	CC	Mono Bravo		8.5	2.4	4.1	15
19	JC	Mono Bravo	6		2.8	4.5	13.3
20	LC	Mono Bravo	17.3		0.4	11.7	29.4
21	JB	Mono Bravo	13.3		2.6	0.8	16.7
22	FJ	Mono Bravo		3.3		2.6	5.9
23	JB	Mono Bravo			3.2	0.4	3.6
24	EA	Mono Bravo	1.7	7.9	2.6		12.2
25	AJ	Mono Bravo	3.3		3.4	5.2	11.8
26	FJ	Mono Bravo	9.8				9.8
27	AT	Mono Bravo	12.1		0.1		12.2
28	MA	Mono Bravo	5.8	57.6	0.4	0.7	64.6
29	FA	Mono Bravo		5.8	2.8	12.7	21.3
30	SJ	Mono Bravo			0.8		0.8
31	EA	Mono Bravo			2.9		2.9
32	MA	Mono Bravo			3.5		3.5
33	JBC	Mono Bravo		22.6			22.6
34	JB	Mono Bravo		17.8			17.8
35	AJ	Mono Bravo		5.2			5.2
TOTAL			169	197	64	104	534

Annex 2. Land surveyed in Guayacan pilot community.

Lot Number	Owner Code	Community	Forest (ha)	Cacao (ha)	Degraded Forest (ha)	Total (ha)
1	AB	Guayacan	41.3	6.2	24.3	71.7
2	EZ	Guayacan	64.5	4.5	15.5	84.4
3	EP	Guayacan	43.5	0.8	4.8	49.1
4	AB	Guayacan	54.8	5.8	18.6	79.2
5	RM	Guayacan	4.2	4.5	12.4	21
6	EB	Guayacan	28.6	5.1	8.8	42.6
7	JB	Guayacan	10.7	2.6	0.3	13.6
8	SB	Guayacan	5.7	3.3	10.7	19.8
9	SB	Guayacan	3.8		1.8	5.7
10	OM	Guayacan	44.3	15.4	20.3	80
11	LS	Guayacan	16.1	2.6	2.4	21.1
12	JR	Guayacan	8.5		3.3	11.8
13	JR	Guayacan	19.9	0.9	22.1	42.9
14	AA	Guayacan	1.6	3.9	14.4	19.9
15	AZ	Guayacan	15.2	1.1	12.5	28.8
16	JZ	Guayacan	8.5		2.5	11
17	WZ	Guayacan		4.7	14.6	19.3
18	WZ	Banbe	9.5		11.4	21
19	CV	Guayacan	16.5	4.2	8.8	29.4
20	RR	Guayacan	1.7	0.5	21.6	23.8
21	JO	Guayacan	42.1	8.2	8.1	58.4
22	GB	Guayacan	9.7	1.3	14.8	25.9
23	JA	Guayacan	24.1		14.4	38.5
24	EM	Guayacan	24		1.4	25.3
25	ED	Guayacan	80.7			80.7
26	CD	Guayacan	26	6.2	31.5	63.8
27	JO	Guayacan	29.3			29.3
28	DR	Guayacan	7	0.8	8.2	15.9
29	EB	Guayacan	13.8	0.3	7.8	21.9
30	FB	Guayacan	21.7	3.6	6.7	32
31	RA	Guayacan	115	4.9	13.3	133.3
32	JC	Guayacan	35.5	0.5	7.8	43.8
33	GV	Guayacan	45.1	0.3	4.5	50
34	JP	Guayacan	17.4	9.4	1.9	28.7
35	SC	Guayacan	42.8	0.8	2.4	46
36	CC	Guayacan	12.6	10.8	11.5	34.9
37	MJ	Guayacan	25.1	4	13.2	42.3
38	LB	Guayacan	15		15.6	30.6
39	MB	Guayacan	1.9	1.4	2.1	5.4
40	AC	Guayacan	2.3	1.3	0.4	4
41	FC	Guayacan	11.9	2	4.9	18.8
42	LB	Guayacan	5.9	3.3	8.9	18.1
43	EP	La Tortuga	5.4	4.9		10.4
Total			1,014	130	410	1,554

Design Guidelines for Value Transfer Mechanisms for Incentive-based Pro-poor Biodiversity Conservation Schemes (Version 1.1)¹

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ABBREVIATIONS USED

CCT	Conditional cash transfer
MFI	Microfinance institution
PES	Payment for ecosystem services
PPC	Pro-poor conservation
VTM	Value transfer mechanism

POSSIBLE VALUE TRANSFER MECHANISMS FOR PRO-POOR CONSERVATION PRACTITIONERS

Practitioners wishing to implement incentive-based PPC schemes will need to perform a thorough analysis of the natural capital, the community in which it resides, and the dynamics between the community and its environment. The community in question should be party to this analysis; in many cases the primary determinant of which VTM to employ in a community should be the community itself. However, before practitioners can begin to discuss program ideas with a community, they must have a thorough understanding of their organizations' own competencies and resources.

This section presents four broad categories of VTMs, with the aim of creating a framework PPC practitioners can use to evaluate the viability of each for their organizations and the communities they hope to serve. This is not intended to be a tool practitioners use to identify natural capital to conserve, or communities with which to work. Rather, this section is aimed at practitioners who have already had some engagement with a community and have identified environmental degradation, poverty, and the linkage between the two as community issues.

Value can be transferred to sellers of ecosystem services in the following forms: cash, productive assets, services, and access to credit.

CASH

Cash is frequently deployed as a value transfer mechanism in the conservation space in PES programs—the transfer of value from the buyer of ecosystem services to the seller is usually a cash transaction (Engel, Pagiola, & Wunder, 2008). While some CCT practitioners have also had success with in-kind payment of immediate consumables² like rice or wheat, the majority of CCT programs that have been studied and found to be effective also involve cash transfers. Best practices suggest that cash is a superior transfer mechanism to in-kind consumables unless recipients of payments are not able to purchase what they need easily with cash, or security concerns or geography make cash transfer undesirable.

² Consumable transfers used to be preferred by governments who feared the misuse of cash by recipients, but the success of cash transfers in recent history suggests that fear is unfounded—while undesirable consumption (e.g. alcohol, tobacco) sometimes increases as a result of cash transfers, it does not do so disproportionately to increased consumption of desirable goods and services like food or health services (Fuller, 2013). Therefore, the decision to transfer value with consumables instead of cash should be pragmatic, not based on any ideology.

<i>Advantages</i>	<i>Disadvantages</i>
<ul style="list-style-type: none"> • The poor know best how to help themselves • Easily adjusted if necessary • Well-understood • Technological innovation is making cash transfers easier, even in remote areas 	<ul style="list-style-type: none"> • No graduation • Difficult to sustain financially • Vulnerable to market fluctuations • Might create dependency • Most likely to face fraud problems • Potential equity issues

ADVANTAGES

The main advantage of cash as a VTM is that the poor know how to help themselves, and cash is often the best way to facilitate this. Fuller (2013) suggests that all nonprofits with a focus on poverty alleviation should use cash transfer as a benchmark against which to measure all development aid—cash is the preferable VTM unless it is determined that the nonprofit can do more for the poor with a dollar than the poor can do for themselves.

In many cases, the payments in a PES system compensate recipients for the opportunity costs they incur by not degrading their natural capital for its extractive value. Cash is the ideal mechanism to accomplish this, because payments can theoretically be adjusted as opportunity costs change, perhaps indexed to global commodity prices. However, this flexibility requires the administering organization to be financially sophisticated enough to adjust payments quickly enough to keep the program healthy.

Mobile phone penetration and technological innovation involving mobile phone cash transfers such as Safaricom’s M-Pesa program in Kenya make it increasingly easy to transfer funds even in remote regions (Buku & Meredith, 2013; Suri, Jack, & Stoker, 2012). With M-Pesa, cash is physically deposited and withdrawn by customers via a network of more than 35,500 agents, which are located at fueling stations, grocery stores, Safaricom dealers, and other easy-to-access locations. The program has seen rapid adoption. Since its launch in 2007, M-Pesa has facilitated more \$1.4 trillion in peer-to-peer SMS transfers for over 15 million customers (Buku & Meredith, 2013). Around 80% of Kenya’s population uses mobile money services, a fact which has revolutionized many aspects of daily life in the country, and which has helped participating households cope with and spread risk (Suri, Jack, & Stoker, 2012). The undeniable success of M-Pesa has been difficult to recreate outside Kenya to date (Buku & Meredith, 2013), but it stands as encouraging proof of concept—transaction costs of using cash as a value transfer mechanism are likely to decrease in the future, even in remote areas.

DISADVANTAGES

Although CCT programs have not been around long enough for studies to determine whether they are effective at breaking the intergenerational cycle of poverty, doing so is a goal that informs program design. This is why payments in programs like Oportunidades are tied to school attendance and medical

checkups for children. Some people will probably always be poor, so there will always be a need for poverty alleviation programs, but if CCT programs are effective, they will slowly chip away at the conditions that necessitate them in the first place. One might optimistically predict payouts to decrease over time.

It is difficult to draw a parallel to PES in this respect. Even a successful PES program is unlikely to make itself less necessary. In fact, global economic realities will probably dictate that the opportunity cost of conservation will continue to increase, and therefore a simple PES program that aims to compensate communities or individuals for conserving ecosystem services will need to increase payouts over time to remain effective. This has obvious implications for program funding. Organizations wishing to administer cash-based PES programs will have to be financially sophisticated and have diversified and reliable funding sources.

Some suggest that the use of cash as a VTM might create dependency (Medeiros, Britto, & Soares, 2008; Robertson & Wunder, 2005) and fail to promote economic development for the poor. In the case of a homogenous agricultural community of smallholders whose primary economic activity is harmful to the environment, cash payments in exchange for not producing might lead to undesirable social outcomes. This is a tension between conservation and poverty reduction—practitioners who view conservation as a tool for poverty reduction will consider this outcome a failure (Roe & Elliott, 2006). Practitioners who view poverty as a critical constraint on conservation (Adams et al., 2004) will also recognize this outcome as undesirable. Individuals or communities will be less likely to become dependent on cash transfers if there are a variety of economic activities available to the community.

Most PES schemes require enforceable land tenure to be effective. Equity issues arise from these requirements: poor smallholders are less likely to have formal land tenure (Muradian et al., 2010).

Of all the VTMs discussed here, cash is most likely to create fraud problems for a PPC scheme. Fraud can occur at the transfer recipient level, but also at program agent, politician, other intermediary levels (Lindert, Linder, Hobbs, & De la Brière, 2007).

REQUIRED ORGANIZATIONAL CAPACITIES

Use of cash as a transfer mechanism requires sufficient cash flow to be able to provide regular, timely payments to program participants. It also requires infrastructure to facilitate those transfers (e.g. local banking capacity, mobile phone penetration, distribution stations). Therefore, organizations should not consider cash transfer PES systems unless they have multiple, stable sources of income that can reasonably be expected to provide long-term—and potentially increasing—payments to providers of ecosystem services, and access to payment-facilitating infrastructure.

Because of the risk of fraud, organizations deploying cash transfers as a VTM will need to devote significant resources to oversight to keep fraud in check.

DESIRABLE COMMUNITY TRAITS

PES is not a one-size-fits-all model—it is a tool best matched to an ecosystem in which the benefits of services are seen as externalities by the managers of that ecosystem (Engel, Pagiola, & Wunder, 2008). Therefore, for cash to be a viable VTM for PPC, the environmental asset being protected must be imperiled by the community's routine economic activities, and the benefits of the asset's continued existence should be seen by the community as externalities. In this case, transfer values must exceed the

opportunity costs of conservation. Therefore, consensus must be reached within the community and between the community and the PPC organization about the community’s opportunity costs.

The lack of clear and enforceable property rights is considered a real impediment to PES implementation (Muradian et al., 2010). A good candidate community for cash transfers has formal land tenure.

In order for cash to be a desirable VTM, there must be a functioning market in the community at which ecosystem managers can convert the cash they receive for conservation to goods and services they value.

Of all the VTMs, cash has the highest risk of fraud. The administering organization will have to devote resources to oversight, but a high level of social capital in the community is also desirable to help minimize fraud.

PRODUCTIVE ASSETS

Occasionally, practitioners and communities that control some environmental asset might agree that an appropriate VTM is an appreciable, or productive, asset. One case in which this decision was made is a payment for watershed services (PWS) scheme in Bolivia’s Los Negros valley, where 42 farmers are paid to 2774 hectares of watershed. The buyers in this PWS scheme are twofold: the US Fish and Wildlife Service, which has a broader interest in conservation of biodiversity, and downstream irrigators, who are the direct users of the watershed services being paid for (Asquith, Vargas, & Wunder, 2008). The PWS recipients in this scheme specifically rejected cash as a VTM out of fear that it would be spent immediately and create no lasting value. They opted instead to receive payments in the form of artificial beehives—one for each 10 hectares of watershed enrolled per year. Training in apiculture is also made available to recipients of the beehives to help them achieve high returns on their hives (Robertson & Wunder, 2005). In the case above, beehives presented a new alternative economic activity to the farmers in Los Negros. Productive assets can augment current economic activities.

<i>Advantages</i>	<i>Disadvantages</i>
<ul style="list-style-type: none"> ● Source of continued income ● “Demonstration effect”—more “wow” per dollar ● Can help build relationships when communities mistrust cash transfers ● Can introduce alternative, more sustainable economic activities into a community 	<ul style="list-style-type: none"> ● Require labor inputs and upkeep costs ● Require skill to produce value ● Difficult to give conditionally in practice ● Not easily subdivided—less program flexibility ● Less liquid than cash

ADVANTAGES

If managed with care, productive assets can become a source of continued income. This can be appealing to sellers of ecosystem services, especially if they are not convinced that the PES scheme is built to last and provide similar future income. It becomes something the recipient must care for, which is particularly

relevant to the goals of conservation. In cases where there is limited local capacity for saving, investment, and entrepreneurship, asset transfer might provide a more lasting value to the community than cash transfer. (Robertson & Wunder, 2005)]

Low-value in-kind transfers such as beehives—valued at \$35—provide a “demonstration effect” that similarly valued cash transfers do not (Robertson & Wunder, 2005). Therefore, payment in the form of productive assets might be an attractive option for program administrators with severe budget constraints.

Sellers of ecosystem services sometimes reject cash as a transfer mechanism out of fear that such payments will lead to land expropriation, whether or not this fear is rational (Robertson & Wunder, 2005). In such cases, where building trust with ecosystem services sellers is an issue, in-kind transfers are a less threatening way to establish a strong relationship.

Productive assets can introduce alternative economic activities that are compatible with conservation. These activities have the potential to replace environmentally harmful economic activity. Further, an asset like a beehive provides a lasting incentive to conserve the bees’ forest habitat (Robertson & Wunder, 2005). Of course, the incentives that come along with an asset used as a VTM must be given significant consideration: incentivizing farmers to preserve forest by providing them with cattle would be self-defeating.

DISADVANTAGES

Productive assets require labor inputs and upkeep costs, which increase the opportunity cost of conservation for the seller of the ecosystem services (Robertson & Wunder, 2005).

Assets are not equally useful to all recipients. They will produce little or no value for an unskilled manager.

Transferring productive assets on a conditional basis is difficult in practice. In Bolivia, the administering organization determined early on that although their stated policy was that beehives would be recaptured by the organization if farmers violated their agreements not to deforest, doing so would have unacceptably very high political costs (Robertson & Wunder, 2005). The practical realities of asset recapture might slowly erode the program’s effectiveness over time as word spreads that violations are not punished.

Assets are also less easily subdivided. In the case of the PWS system in Bolivia, for example, a farmer could not set aside 5 hectares for a year and receive half a beehive. He would, instead, have to set aside those 5 hectares for two years before receiving payment (Robertson & Wunder, 2005).

While assets can be sold on a secondary market, they are not as liquid as cash.³ Further, the use of assets in a PES scheme might overwhelm the local market for that asset. If everyone in a small village is trying to sell beehives, sellers will realize little or no value for their assets. This underscores the importance of deciding on a VTM with a great deal of input from the community. In the PWS scheme in Bolivia, a number of value transfer options were discussed, road improvements, marketplace construction, bridge construction, and barbed wire for property lines (Asquith, Vargas, & Wunder, 2008).

³ If many recipients are turning around and sell the asset for cash, that indicates that cash (or a different asset) might have been a better VTM in that context.

REQUIRED ORGANIZATIONAL CAPACITIES

An organization will only have success using productive assets as a VTM if it is able to demonstrate the value of that asset. Most productive assets will not produce value for their owners without skilled management. Organizations deploying productive assets as a VTM should be prepared to train recipients in the use and maintenance of their new assets.

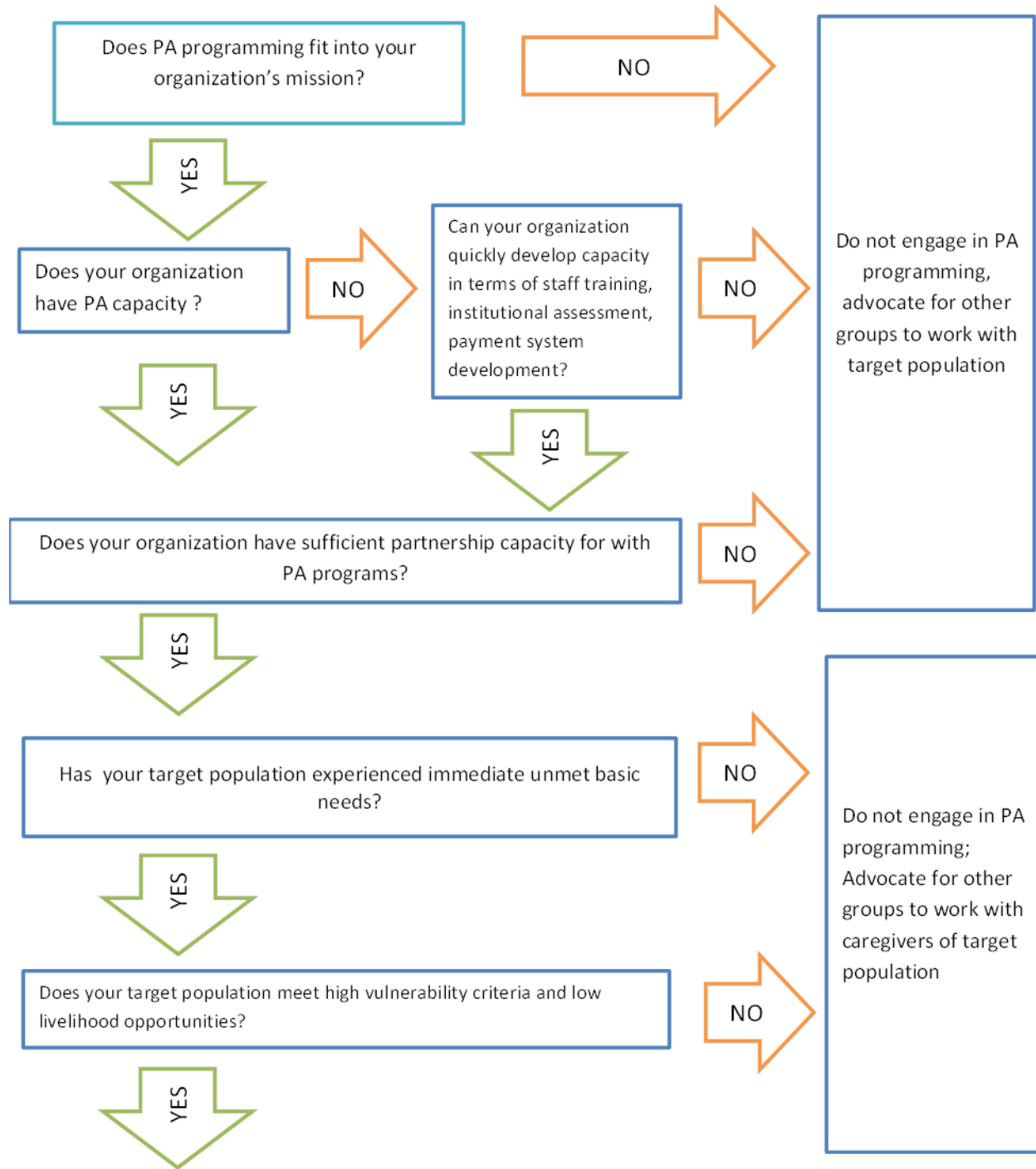
DESIRABLE COMMUNITY TRAITS

Communities will only be receptive to productive assets as an incentive if they are open to diversifying their economic activities and understand the value that can be created with the new assets. The community must also have access to a market that is willing to pay them for the goods and services their new assets are capable of producing (e.g. if beehives are used as a VTM, value is only created if the recipients of the beehives are able to sell the honey they produce, especially if they do not consume much honey themselves).

Not all members of the community will be equally able to create value from a productive asset. Therefore, the asset should be compelling to a large enough portion of the community that a secondary market for the productive asset is possible—the scheme will benefit from additional participants that, although they do not want the asset for its primary value, are able to sell it to access value.

Because asset recapture is likely to be infeasible in practice, a high level of social capital in the community will serve as an additional—and possibly necessary—driver of compliance after the assets are transferred.

Productive Assets (PA) Decision Tree – Organizational Capacity & Targeting



SERVICES

Because of the success of CCT, the prevailing sentiment in modern poverty alleviation—especially in Latin America—is that the poor can usually do more for themselves with cash than can be done for them with equivalently valued services (Santos, Paez-Sousa, Miazagi, Silva, & Medieros da Fonseca, 2011). However, there are often services that a poor community is unable to provide for itself. If a need for a

particular service is evident in a community that manages ecosystem services, the provision of that service or services might be an appropriate way to transfer value through a PPC scheme.

Services can be broken into two categories: income-improving services and non-income-improving services. Income-improving services include technical assistance (e.g. to increase agricultural yields, to improve quality through processing) and market access services, whereby a major market participant provides access to substantial selling opportunities. Non-income-improving services include social goods like health services and education, which are not linked to income but which all communities need and which might, in certain situations, prove to be powerful incentives.

<i>Income-improving services</i>	<i>Non-income-improving services</i>
<ul style="list-style-type: none"> ● Market access services (e.g. advanced purchase commitment, price premium) ● Technical assistance to improve quantity or quality of product 	<ul style="list-style-type: none"> ● Health services ● Education services

Most services that could be provided as incentives in a PPC scheme are well understood in the practitioner community, and the breadth of possibilities is outside the scope of this work. However, the concept of conditional market access service might benefit from some illustration. In 2001, with the help of Conservation International, Starbucks Coffee Company announced new purchasing guidelines aimed at more sustainable coffee production. The company scored suppliers on a 100 point scale: 50 points for environmental impacts, 30 for social conditions, and 20 for economic issues. Suppliers who met all Starbucks’ requirements became preferred suppliers, receiving priority in Starbucks’ purchasing queue (Austin & Reavis, 2004). The income-improving service in this model is simply the guarantee of purchase at favorable prices, which is provided on the condition that the supplier meets Starbucks’ and Conservation International’s sustainable production guidelines.

<i>Advantages</i>	<i>Disadvantages</i>
<ul style="list-style-type: none"> ● Complement other VTMs well ● Partner organizations might help diversify funding sources ● Might change behavior beyond life of PPC scheme 	<ul style="list-style-type: none"> ● Difficult to provide conditionally in practice ● Difficult to value ● Might exclude some community members ● Non-liquid and non-transferable ● Increased risk of conflict between providing organizations

ADVANTAGES

Services need not comprise the entirety of a PPC scheme's incentives; services are likely to complement other VTMs well. Some level of technical assistance services should probably be bundled with most productive assets, for example.

Because provision of multiple services will probably require a coalition of organizations to participate in a PPC scheme, the scheme might have more diversified funding sources and therefore be more able to withstand occasional funding interruptions.

Technical assistance services have the potential to change the way an economic activity is carried out, even beyond the lifetime of the PPC scheme. To the extent that new techniques achieve both greater sustainability and greater income, communities are incentivized to continue them.

In the case of market access services through a large corporation like Starbucks, funding is relatively secure. As the end provider of value to the community, Starbucks benefits not only from bringing a high quality product to market, but also from the public relations generated by such a program. Starbucks will, for the foreseeable future, be purchasing great quantities of coffee, and selling cups at a premium to customers who are willing to pay well above commodity prices for coffee with a story.

DISADVANTAGES

Many will find applying conditionality to provision of certain services (especially non-income-improving ones like health or education services) morally problematic. Even those who view poverty alleviation only as a means of achieving environmental conservation will struggle with the implications of program failure. If an organization cannot agree internally and with all its partners that it is willing to withhold services if conservation goals are not achieved, it should not consider service provision as a VTM.

Because the goal of any VTM is to encourage conservation in a community of ecosystem managers, any VTM must be more valuable to that community than practices that will degrade the environment. Because some services are difficult to value—there is surely value in bettering the education of young people in a community, but reasonable people will disagree about dollar amounts—it will be a challenge to establish a level of service provision that achieves the goals of a PPC scheme.

Provision of non-income-generating services could fail as a VTM if those services are valued highly by some, and not at all by others within a community. For example, education services might be valued by community members with children, and not valued by those without children. It is even possible that those without children would feel cheated by and develop resentment towards educational services as a VTM.

Schemes that offer a wide variety of services as VTMs will probably involve a coalition of partner organizations to provide those services. This will necessitate a great deal of attention paid to coordination and management by the lead organization, which might require additional personnel and funds to be diverted to program management, and not the provision of services.

It is always possible for tensions to emerge between partner organizations due to fundamental mission disagreements or more workaday concerns, and this possibility is increased with each additional partner. Practitioners considering provision of services they do not have internal capacities to provide should

choose their partners carefully to mitigate this risk. The lead organization should ensure that all parties agree about where the project falls on Roe and Elliott's (2006) PPC continuum.

REQUIRED ORGANIZATIONAL CAPACITIES

Many organizations considering service provision as a VTM will have the provision of that service at the core of their mission, and will have built their organizations around the effective provision of that service. For example, an organization that offers health services as a VTM probably employs doctors, nurses, or other health practitioners for that purpose, and probably offers a similar suite of health services in each community in which it works. It is unlikely that the same organization would also provide technical assistance for improving agricultural production.

This is not to say that organizations that are not built around the provision of a particular service cannot offer services as VTMs. It is certainly possible that the health-focused organization discussed above might identify a need for agricultural technical assistance and seek a partner to provide that service. Therefore, the ability to identify partners—and work constructively with them—is an important organizational capacity for service provision as a VTM.

In the special case of market access services, organizations must have the ability to purchase and market the products produced by the community. It is better if this is accomplished through established channels such as the Starbucks model discussed above, in which there is little risk of the purchaser of goods disappearing and uprooting the entire PPC scheme in the process.

DESIRABLE COMMUNITY TRAITS

For service provision to be a viable VTM, a need for particular services must be identified in the community, and the community must agree that receiving those services on a conditional basis would be valuable enough to make them engage in good conservation practices. Therefore, the most important traits a community must have for services to be an ideal VTM are the need for a service, internal recognition of that need, and cohesive agreement about the value of meeting that need.

ACCESS TO CREDIT

Many potential sellers of ecosystem services face the same barriers to conventional credit that traditional microfinance customers face: they do not own property that would be acceptable as collateral, and they have no credit history. For this reason, access to credit might be a compelling incentive to conserve valuable ecosystem services and promote economic development.

ACS has proposed a conservation scheme inspired by microfinance: environmental mortgages (Mandel et al. 2009). In an environmental mortgage scheme, a community-held natural asset is capitalized, and that capital is made available to the local community and individuals within that community through microfinance mechanisms—small loans and other livelihood development investment instruments. The asset is closely monitored, and the capital made available to the community is linked directly to the quality of the asset. In this way, communities are rewarded for environmental stewardship with additional access to credit, and penalized with less access to credit should the targeted asset degrade.

One way to conceptualize an environmental mortgage scheme is that the natural capital becomes wealth for the community that cares for it, not simply income. It is an asset, not simply a source of income—it is stock, not flow. Because loans must be paid back, lent funds are likely to be invested to increase income by improving product quality or increasing productive capacity. Because the future availability of credit is dependent on the continued health of the natural asset, these income improvements are less likely to come at the expense of the environment.

A community is a good candidate for an environmental mortgage program if its primary economic activities pose a threat to the health of its environmental assets, but small alterations to those economic activities might create economic and environmental win-wins. Environmental mortgage schemes have not yet been piloted and studied, but the following hypothetical scenario is one in which an environmental mortgage scheme might be effective.

A hybrid species of cacao plant called CCN-51 that thrives on direct sunlight has recently gained popularity in cacao farming communities in Ecuador. Although CCN-51 cacao is of a poorer quality than Nacional—the local, traditionally shade-grown species—it is believed to produce greater yields (Bentley, Boa, & Stonehouse, 2004). Therefore, if local cacao farming communities cannot access markets that will pay premium prices for Nacional, economic incentives exist for them to raze rainforest canopy, their valuable environmental asset, and plant CCN-51 in order to increase cacao yields.

If the community views the rainforest itself as a source of wealth and income, however, the incentive to clearcut is abated. If the value the rainforest produces for the community is greater than the opportunity cost of not realizing the extra yield from CCN-51, the forest might remain.

In this hypothetical environmental mortgage scheme, the portion of rainforest canopy that the community has actual or de facto control over is capitalized by a conservation organization (with funds from donations or sales of carbon offsets). The community would be able to take out small loans against the capitalized value of the rainforest canopy. The canopy is closely monitored, and the amount of available credit fluctuates proportionally with the canopy’s health.

Farmers are able to use this access to credit to increase their shade-grown Nacional yields, or to refine their harvesting and processing practices to make their Nacional yields meet the standards necessary to sell them at a price premium, further increasing income. All the while, the rainforest canopy, upon which the access to credit relies, becomes ever more valuable to the community.

<i>Advantages</i>	<i>Disadvantages</i>
<ul style="list-style-type: none"> ● Microfinance has been successful in reducing poverty ● Clear and enforceable property rights are not necessary ● Unlikely to create dependency ● Funds might be recoverable in event of program failure 	<ul style="list-style-type: none"> ● Untested ● Ability to fund uncertain ● Difficult to value ● Might exclude some community members ● Vulnerable to market fluctuations ● Unlikely to be able to follow all microfinance best practices

ADVANTAGES

As Mandel et al. (2009) point out, access to credit might be a superior VTM to cash in communities where there are not clear and enforceable property rights. A capitalized community asset from which a community can borrow does not require property rights, just de facto management ability.

There are some concerns that CCT schemes can create transfer dependency, a poverty trap. This is most likely to occur when increases in income are directly linked to decreases in transfer benefits (Lindert, Linder, Hobbs, & De la Brière, 2007). Although sufficient study has not been done on PES to determine whether it is susceptible to the same danger, the similarities between CCT and PES suggest that it is at least a possibility, especially in cases where smallholder farmers are compensated not to produce, or to produce less than they otherwise would and no alternative economic activities are viable or available. Because loans are of a determinate length and are meant to be used to some income-generating end, the microfinance industry has not had to address dependency as a poverty trap. Therefore, access to credit as a VTM is probably not in danger of creating the same dependency dynamic.

An interesting advantage to access to credit in general, and specifically environmental mortgages, is that funders might be able to recover their funds in the event of program failure. If a fund is capitalized based on the health of an environmental asset and that asset is destroyed, the money is not destroyed. Contrast this with PES schemes, in which transferred funds are unrecoverable. In PES, donors give hopefully and payments are meted out conditionally. In environmental mortgages, the donor gives conditionally. This distinction might aid in securing funding for a pilot PPC scheme that uses access to credit as a VTM.

DISADVANTAGES

The primary disadvantage to using access to credit as an incentive for PPC schemes is uncertainty: environmental mortgages are untested. There are many parallels between microfinance and environmental mortgages, but many questions remain.

An established pipeline of funds for capitalizing environmental mortgage schemes does not exist, so an organization seeking to pilot an environmental mortgage program will have to do significant development. It might be possible to excite private donors about a new VTM, but organizations might also consider following the Plan Vivo model of selling emissions offset certificates, or biodiversity banking, a market mechanism by which developers pay to offset potential biodiversity losses that might result from their projects (Kumaraswamy & Udayakumar, 2011). However, a number of concerns exist about the effectiveness of biodiversity banking as it is currently formulated (Bekessy et al., 2010; Walker, Brower, Stephens, & Lee, 2009). Practitioners wishing to pilot an environmental mortgage program might not want to rely on an embattled mechanism for their own funding.

There are a number of imaginable scenarios in which access to credit could quickly become unattractive relative to an asset's extractive value. This could occur due to a spike in global commodities markets, or due to an inability to achieve satisfactory returns on investments made with that credit. In the former case, the cost of borrowing could be indexed, inversely, to the relevant global commodity price. In the latter case, access to credit would need to be paired with technical assistance and/or market access services. In either case, anticipating the point at which incentives flip would be a nontrivial task—access to credit is more difficult to quantify than, say, cash transfers. Tipping points would likely vary from community to

community, and individual to individual, just as internal rates of return vary from organization to organization and individual to individual.

Implementing and administering an environmental mortgage scheme would require some level of financial sophistication. If this is not present internally, a partner MFI in the area might be able to assist, but if an MFI is already operating nearby then the incentive of access to credit is dampened to the extent that the MFI in place is making credit available to the target community.

Microfinance practitioners overwhelmingly prefer to lend to women, who are considered most likely to invest in the family and thereby break the poverty cycle (Brau & Woller, 2004). In the case of environmental mortgages or other microfinance-inspired conservation themes, it is unclear if this convention can be followed. The access to credit in an environmental mortgage scheme is meant to incentivize good environmental stewardship, e.g., producing shade-grown cacao rather than clearcutting canopy to produce higher yields. If it is men who make the decisions germane to conservation, e.g., whether to deforest a parcel of land, it follows that men are the ones who must be incentivized in an environmental mortgage scheme. More research is necessary to understand whether this presents a serious problem in an environmental mortgage scheme.

Practitioners interesting in piloting the environmental mortgage concept will need to be clear about whether their primary motivation is poverty reduction or conservation. If the asset is damaged through no fault of the community participating in the environmental mortgage program (e.g. natural disaster, roving bandits), the organization administering the environmental mortgage will need to decide whether to continue lending to the community in the hopes of capital recovery, or to stop lending once the protected asset has been destroyed. This is a problem that exposes some tension within PPC: different practitioners will react differently depending on where they fall on the continuum proposed by Roe and Elliott (2006). Those whose overarching motivation is conservation might be willing to close down shop, while those whose primary goal is poverty reduction might not.

REQUIRED ORGANIZATIONAL CAPACITIES

Organizations considering an environmental mortgages or other credit-access VTM must be financially sophisticated and well-versed in microfinance best practices, or have access to a partner MFI who is not already making credit available to the target population. Because no established funding mechanisms for environmental mortgages exist, an organization should only consider access to credit as a VTM for PPC if they are confident in their ability to secure sufficient funds to capitalize a natural asset.

DESIRABLE COMMUNITY TRAITS

If an MFI is already providing the community access to credit on any significant scale, then a PPC scheme offering more of the same might be able to distinguish itself with lower borrowing costs, but access to credit will be a less attractive VTM than it would be in a community with no access to credit. Therefore, especially if an organization is piloting a new instrument like an environmental mortgage, it will want to identify a community that is not currently receiving access to credit.

Conventional microfinance wisdom states that a high level of social capital is important—it reduces information costs for the lender, and increases social pressure to repay loans in a timely manner. Questions have been raised in academic circles as to whether social capital matters as much as microfinance practitioners believe (Ito, 2003), but it would still be better to have high social capital in a community than not to pilot a credit-access PPC scheme there.

One advantage of environmental mortgages, in theory, is that enforceable property rights are not necessary (Mandel, et al., 2009), which would make access to credit a viable VTM in some communities in which cash is not one. A community receiving access to credit does not need official property rights, just de facto control of the natural capital being preserved. Communities that are somewhat isolated are also desirable—as isolation is a guard against “roving bandits” from outside the community who might try to capture the extractive value of the environmental asset.

DECISION-SUPPORT TOOLS

Which VTM or VTMs to offer is a decision that must be made on multiple levels. The first is the organizational level—an organization considering incentive-based PPC must evaluate its own ability to deploy each VTM. Second is the community context level—each PPC scheme will be different at this level, and will rely on the community stakeholder support for its success. A program will only work if the VTM recipients value the incentive; the final program decisions will have to involve the community.

The following sections will help practitioners assess the viability of offering the four broad VTM categories, first at the organizational level, then at the community context level. At each level, a number of statements germane to particular VTMs are made. Practitioners can either check the box next to a statement, affirming it, or describe their organizations’ response if they cannot affirm it. Responses may include partnering with other organizations that can provide needed capabilities, or other organizational responses (e.g. a community does not have the expertise to profit from a productive asset, but the organization can provide complementary technical assistance). If an organization has to leave more than 2 boxes unchecked for a particular VTM, it should probably not consider deploying that VTM.

Many organizations that choose to run PPC schemes will forge partnerships to boost capacity and mitigate risk. While partnerships can make PPC schemes possible where they might otherwise not be and expand the range of VTMs available, partnerships also introduce complexity and the risk of inter-organizational conflict. To mitigate this risk, all potential partners should engage in open and frank communication about their conception of PPC. Irreconcilable disagreements between organizations in these conversations—one organization sees poverty reduction as a way to conserve and another sees conservation as a way to reduce poverty, for example—should be taken very seriously as reasons not to partner. The frameworks proposed by Adams et al. (2004) and Roe and Elliott (2006) are a good starting point for these discussions. A brief worksheet based on these frameworks can be found at the end of this section.

CASH

Organization

If you are unable to check any box, explain how your organization will respond to that difficulty (e.g. partnership with another organization). If you have to leave any boxes unchecked, you should reconsider using cash as a VTM.

<i>Condition</i>	<i>Check</i>	<i>Response</i>
1. My organization has multiple, stable funding sources that are available for PPC projects	<input type="checkbox"/>	
2. My organization has experience administering cash transfer programs	<input type="checkbox"/>	
3. My organization has the resources to devote to fraud prevention measures.	<input type="checkbox"/>	

Community

Rate your confidence on a 1–5 scale (1 = not confident; 5 = completely confident) that the community meets each of the following conditions. For any conditions with confidence ratings less than 5, indicate how your organization will respond to increase that confidence level or mitigate that difficulty. If there are two or more conditions about which you are not able to reach high levels of confidence, you should reconsider using cash as a VTM.

<i>Condition</i>	<i>Confidence</i>	<i>Response</i>
1. The community’s primary economic activity currently contributes to environmental degradation	—	
2. The goods and services the community values are available for purchase at market	—	
3. Infrastructure exists that will enable regular, reliable cash transfers (e.g. banking services, mobile phone penetration)	—	
4. The community is able to reach internal consensus about the opportunity costs of conservation	—	
5. My organization is able to reach consensus with the community about opportunity costs of conservation and a	—	

fair transfer amount and schedule		
6. My organization understands the market for the goods the community produces, and is able to react to changes in that market that might change the efficacy of previously agreed-upon payment amounts	—	
7. There are clear and enforceable property rights in the community	—	
8. The community has a high level of social capital	—	

PRODUCTIVE ASSETS

Organization

If you are unable to check any box, explain how your organization will respond to that difficulty (e.g. partnership with another organization). If you have to leave any boxes unchecked, you should reconsider using productive assets as a VTM.

Condition	Check	Response
1. My organization is familiar with the operation of this productive asset	<input type="checkbox"/>	
2. My organization can demonstrate the benefits of this asset	<input type="checkbox"/>	
3. My organization is able to provide technical assistance related to the use of this asset	<input type="checkbox"/>	

Community

Rate your confidence on a 1–5 scale (1 = not confident; 5 = completely confident) that the community meets each of the following conditions. For any conditions with confidence ratings less than 5, indicate how your organization will respond to increase that confidence level or mitigate that difficulty. If there are two or more conditions about which you are not able to reach high levels of confidence, you should reconsider using productive assets as a VTM.

<i>Condition</i>	<i>Confidence</i>	<i>Response</i>
1. The community has demonstrated an interest in diversifying its economic activity	—	
2. The community has the technical ability to profit from the use of this productive asset	—	
3. There is a functioning market for the products or services this asset will help participants generate	—	
4. There is a high level of social capital in the community	—	
5. There is a secondary market for the productive asset itself	—	
6. With this productive asset, my organization can provide more value to the community per dollar than the community could provide for itself per dollar	—	

SERVICES

Organization

If you are unable to check any box, explain how your organization will respond to that difficulty (e.g. partnership with another organization). If you have to leave any boxes unchecked, you should reconsider using services as a VTM.

<i>Condition</i>	<i>Check</i>	<i>Response</i>
1. My organization's core capability is the provision of a service	<input type="checkbox"/>	
2. My organization is willing to	<input type="checkbox"/>	

provide this service conditionally and withdraw it if conservation goals are not met		
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Community

Rate your confidence on a 1–5 scale (1 = not confident; 5 = completely confident) that the community meets each of the following conditions. For any conditions with confidence ratings less than 5, indicate how your organization will respond to increase that confidence level or mitigate that difficulty. If there are two or more conditions about which you are not able to reach high levels of confidence, you should reconsider using services as a VTM.

Condition	Confidence	Response
1. My organization has identified a need or needs within the community that cannot be addressed by cash transfer	—	
2. The community agrees that it has these needs	—	
3. The community would value services that address these needs	—	
4. With this service, my organization can provide more value to the community per dollar than the community could provide for itself per dollar	—	

ACCESS TO CREDIT

Organization

If you are unable to check any box, explain how your organization will respond to that difficulty (e.g. partnership with another organization). If you have to leave any boxes unchecked, you should reconsider using access to credit as a VTM.

<i>Condition</i>	<i>Check</i>	<i>Response</i>
1. My organization is familiar with microfinance best practices	<input type="checkbox"/>	
2. My organization has identified funders who are interested in conditionally capitalizing loan funds that are tied to the health of natural assets	<input type="checkbox"/>	

Community

Rate your confidence on a 1–5 scale (1 = not confident; 5 = completely confident) that the community meets each of the following conditions. For any conditions with confidence ratings less than 5, indicate how your organization will respond to increase that confidence level or mitigate that difficulty. If there are two or more conditions about which you are not able to reach high levels of confidence, you should reconsider using access to credit as a VTM.

<i>Condition</i>	<i>Confidence</i>	<i>Response</i>
1. The community is relatively isolated	—	
2. There is a high level of social capital in the community	—	
3. If there are not enforceable property rights, the community has de facto control of an important environmental asset	—	
4. If there are currently any MFIs providing access to credit in the community, their reach is minimal	—	

Partnerships between organizations should only be entered after a careful vetting process. A robust literature exists to provide guidance through partnering negotiations; synthesizing it is outside the scope of this document. However, when partnering in the specific context of PPC, practitioners must engage in discussions about how they view both the root causes of poverty and environmental degradation, and the relationship between the fields of conservation and poverty reduction. These discussions will help the organizations to avoid some conflicts in the context of the PPC schemes they create together, and navigate those conflicts that still arise. Strong disagreements should be seen as reasons not to partner.

ROOT CAUSES OF POVERTY AND ENVIRONMENTAL DEGRADATION

The following broad questions are intended to spark conversations in which each organization outlines its working assumptions about the root causes of the problems PPC aims to address, and how those assumptions inform the solutions they deploy.

Poverty

What are the root causes of poverty?

Why is poverty reduction important?

Why is poverty reduction difficult?

How should the preceding responses inform our poverty reduction efforts?

Conservation

What are the root causes of environmental degradation?

Why is conservation important?

Why is conservation difficult?

How should the preceding responses inform our conservation efforts?

RELATIONSHIP BETWEEN CONSERVATION AND POVERTY REDUCTION

The following brief worksheet, based on frameworks from Adams et al., (2004) and Roe and Elliott (2006), is suggested as a way to begin discussions about the relationship between the fields of conservation and poverty reduction.

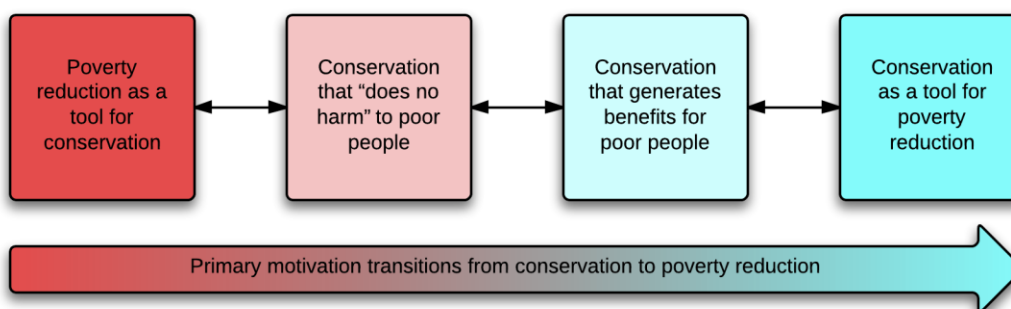
For each statement, indicate the level to which you agree or disagree on a scale of 1–5 (1 = Disagree completely; 5 = Agree completely)

<i>Statement</i>	<i>Agreement level</i>
Poverty reduction and conservation are separate policy realms	—
Poverty is a critical constraint on conservation	—
Conservation should not compromise poverty reduction	—
Poverty reduction depends on living resource conservation	—

With which statement do you agree most? Why?

With which statement do you disagree most? Why?

Where does your organizational focus fall on the following continuum?



Why?