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Livelihoods and the valuation of ecosystem services in South America and Ecuador

Los medios de vida y la valoración de servicios ecosistémicos en sur América y Ecuador

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Abstract: The valuation of ecosystem services in high Andean zones, specifically in páramo ecosystems, is essential as they provide livelihoods for local livelihoods through water regulation, water storage, carbon sequestration, protection against landslides and floods, tourism and biodiversity, which is why establishing ecosystem services is essential. The present research focuses on a comprehensive review of peer-reviewed studies related to ecosystem services in South America and Ecuador using Science Direct, Taylos & Francis and Springer databases (search for titles, abstracts and keywords: The search terms used were the combination of the following keywords: "ecosystem services", "payment ecosystem services", "paramo", "Andes", "Ecuador", "grassland". From the bibliographic search, articles were considered only if they met the following criteria: English language articles, focused on high Andean ecosystems, search periods 2010-2020. It has been shown that there are several gaps in ecosystem services issues such as PES (payments for environmental services) as they influence the management of natural resources, also CE (Emissions Trading) are useful to make participants reflect on specific elements of payments for environmental services. The most important findings in this context were the poor distribution of wealth and lack of knowledge of the processes to access these environmental benefits.

Keywords: Ecosystem Services, páramo, Payments for Environmental Services, Emissions Trading

Resumen: La valoración de los servicios ecosistémicos de zonas alto andinas específicamente en ecosistemas de páramo es esencial ya que proporcionan sustento a medios de vida locales ya sea por regulación hídrica, almacenamiento de agua, captura de carbono, protección contra deslizamientos e inundaciones, turismo y biodiversidad por lo que establecer. La presente investigación se centra en una revisión exhaustiva de estudios revisados por pares relacionados a servicios ecosistémicos en América del Sur y Ecuador utilizando bases de datos

de Science Direct, Taylos & Francis y Springer (búsqueda de títulos, resúmenes y palabras clave: Los términos de búsqueda utilizados fueron la combinación de las siguientes palabras clave: “ecosystem services”, “payment ecosystem services”, “paramo”, “Andes”, “Ecuador”, “grassland”. De la búsqueda bibliográfica se consideró artículos solo si cumplían los siguientes criterios: Artículos en idioma inglés, centrado en ecosistemas altoandinos, periodos de búsqueda 2010-2020. Se ha mostrado que existen varios vacíos en temas de servicios ecosistémicos como PSE (pagos por servicios ambientales) ya que estos influyen en la gestión de los recursos naturales, además los CE (Comercio por emisiones) son útiles para hacer que los participantes reflexionen sobre elementos específicos de los pagos por servicios ambientales. Los hallazgos más importantes dentro de este contexto fueron la mala distribución de la riqueza y desconocimiento de los procesos para acceder a estos beneficios ambientales.

Palabras clave: Servicios Ecosistémicos, páramo, Pagos por servicios ambientales, Comercio por emisiones

INTRODUCTION

In the central Ecuadorian Andes, the high mountain tropical ecosystems located above 2,740 m are considered complex, varied, with a cold climate and very sensitive to changes due to land use and climate. As such, they are highly vulnerable to the anticipated impacts of climate change. Existing models have predicted that 56% of the Andean páramo could disappear by 2050 (Pérez et al. 2010). The associated loss of many ecosystem services, such as soil protection, biodiversity conservation, and water regulation and supply, along with a reduction in the area's hydroelectric potential, will affect Ecuador's central highlands, where not only cities such as Quito, Cuenca, and Riobamba are located, but also the entire Ecuadorian Amazon region that depends on water supplied by glaciers in Ecuador's central highlands (Buytaert et al., 2006).

At the same time, the Andean Páramo is an ecosystem of vital importance for climate change mitigation, as it has the capacity to sequester carbon and regulate the climate. In the coming years, it will be necessary to implement conservation and adaptation policies for this type of ecosystem in order to drastically reduce the advance of industrial/conventional agricultural activities, which are increasingly invading this fragile ecosystem. The communities that depend on this ecosystem and its services must adapt and need tools to improve their resilience.

In this sense, the conservation of these ecosystems is strongly related to the socioeconomic context of these communities. Incomes and yields are determined by a wide range of socioeconomic and technological factors, as well as by ecosystem conditions, such as water availability or soil quality. They are also very sensitive to changing climatic conditions. Therefore, the loss of net income and yields from agricultural activities due to climate change and especially extreme events such as droughts can become a driver of degradation of the Andean páramo ecosystem.

Ecosystem management is based on a learning process that helps adapt methodologies and practices to the ways in which these systems are managed and monitored. It uses sustainable ecosystem management, conservation and restoration to provide services that enable people to adapt to the impacts of climate change (Ash and Ninni 2009). It is already recognized that the diversity of social and cultural factors influences the use of natural resources. Ecosystem-based adaptation (EbA) is conceived as a long-term experiment that incorporates information and results to reduce the vulnerability of ecosystems and communities and conserve relevant ecological services (Andrade and Vides, 2009). According to the definition used by the United Nations Environment Programme (UNEP, 2004), the ecosystem approach to adaptation is based on the use of biodiversity and ecosystem services as part of an overall adaptation strategy to help people and communities adapt to negative climate impacts.

In this context, ecosystem services can be defined as the benefits that people obtain from ecosystems. These include provisioning services such as food; regulating services that affect climate and water cycles; cultural services that provide recreational and spiritual benefits; and supporting services such as nutrient cycling (Millennium Ecosystem Assessment, 2005).

In this sense, adaptation to environmental and climate change is an essential component of any community planning effort to become more resilient. Whether communities are aware of these changes or not, knowing how to plan adaptation strategies is a vital component of any development plan or long-term sustainability plan. Planning for these changes requires the inclusion of all segments of the community population in a shared dialogue. It is necessary to implement a community dialogue to develop a consensus on what elements of the community are vulnerable to environmental and climate changes and

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from there develop plans that focus on strengthening community resilience.

To study resilience, vulnerability and adaptation of systems, social and ecological studies have evolved into a connected approach: social-ecological systems, ESS (Liu et al. 2007, An 2012). Social-ecological systems can be defined as complex, integrative and adaptive systems, in which humans are part of nature (Berkes and Folke 1998). Even in urban areas, ecosystems are important elements of resilience (Tyler and Moench 2012). These systems are composed of at least two subsystems: the social subsystem (e.g., a farming community, a family) and the ecological subsystem (e.g., a watershed, a valley, a lagoon). The key aspect of these subsystems is that they interact with each other. In other words, there are reciprocal influences between the subsystems. The main attributes of social-ecological systems, which sometimes cannot be observed in subsystems, are: 1) the non-linearity of their dynamics, 2) emergent properties, 3) the existence of several scales, and 4) feedback loops (Chapin et al., 2009).

Other authors defend the non-linear relationship between resilience and vulnerability (Chelleri, 2017). That is the reason why the complexity of these interactions must be integrated, through a participatory methodology, as well as in the socioecological model to assess effectiveness in an adequate manner.

MATERIALS AND METHODS

A comprehensive search for peer-reviewed studies on ecosystem services in South America and Ecuador was carried out using the Science Direct, Taylor & Francis and Springer databases (search for titles, abstracts and keywords). The search terms used were the combination of the following keywords: "ecosystem services", "payment ecosystem services", "paramo", "Andes", "Ecuador", "grassland". From the bibliographic search, articles were considered only if they met the following criteria:

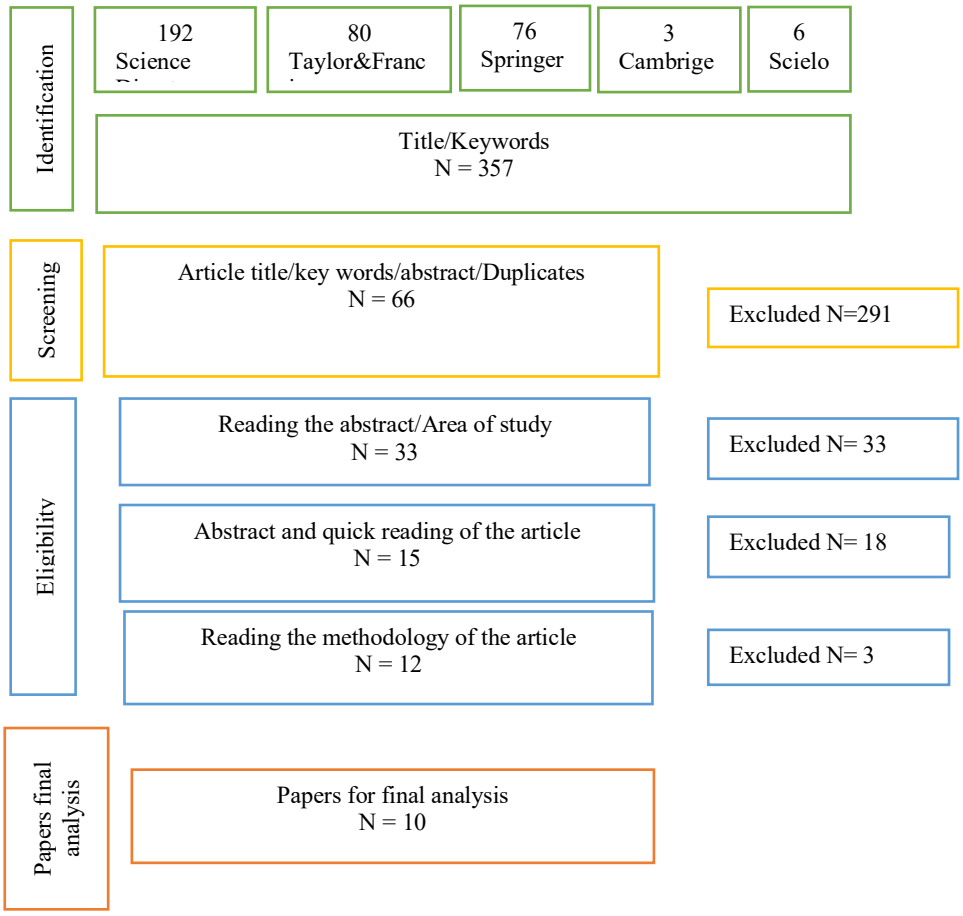
1) The article must be published and written in the English language.

2) The article should have focused on high Andean ecosystems of South America, specifically páramo, i.e. in the countries of Colombia, Ecuador, Peru and Bolivia, therefore, studies conducted in tropical ecosystems, high Andean forests and wetlands were not included.

3) We searched only for articles, conference proceedings and chapters published within the period 2010 to 2020.

Relevant studies identified from the bibliographic lists of the articles were also included.

Studies that were conducted in ecosystems outside the Andes and in forests were excluded. A total of 348 studies were found and the final sample of papers eligible for full text review had 10 publications. We analyzed them in terms of which ecosystem services valuation method was used, which ecosystem services were analyzed, what was the valuation approach and what were the results of the valuation method. We recorded the location



RESULTS

Of the total number of articles reviewed, 10 articles were analyzed that address the topic of Payment for Ecosystem Services in the páramo

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ecosystem, of the 5 countries that have this ecosystem Ecuador is the country with the most studies, followed by Colombia. Bolivia and Venezuela do not present studies specifically on this topic.

The year with the most studies is 2014, in which the mechanisms implemented in Ecuador are analyzed, and one study analyzes both countries, Ecuador and Colombia.

Ecuador has been the only country in the Cordillera to apply payment for ecosystem services, under the name of incentives.

According to authors (cite) there are few studies for the implementation of ES in Latin America, and all agree on the importance of the participation of the communities and the involvement of academia and authorities, to carry out previous scientific studies of the ES provided by the páramo, since in addition to the service of water regulation and carbon content, there are more ES that require, with equal importance, their study.

In the book published in 2019, which consists of a compilation of studies carried out in Latin America regarding social-ecological services, it mentions that although the percentage of areas in Latin America where there are no social-ecological

In the article published in 2019 by Peru, it states that there are no conservation mechanisms in the high Andean lands.

One of the first studies found was carried out in 2011 (Farley et al., 2011)which reviews and analyzes the contribution of emerging ecosystem services (CES) compensation programs (compensation and non-payment) implemented in communities living in the moorlands of Ecuador, focusing on two case studies. Among the contributions of this study are the following:

- There is no scientific study of the ES provided by the paramo ecosystem in these areas, few programs had determined the baseline conditions and these, as well as the objectives, were based on assumptions about the functions of the páramo. The study mentions that the programs considered one ES as the highest priority, mainly hydrological services, followed by carbon, and had expectations that multiple ecosystem services exist. It is mentioned that "the data to support these expectations were limited and representatives of these programs readily acknowledged that they did not have empirical studies to support these assumptions, but based them on what they considered to be the best current scientific understanding."

- Mentions how unlikely it is that the programs implemented will be successful if the local communities do not benefit from them in an equitable manner
- In addition, it mentions that there is a large information gap on the evaluation of implemented programs that measures and monitors their results, due to the lack of clear baseline information and the scientific basis needed to measure program impacts.

In 2014, three studies were conducted mainly in Ecuador and one in Colombia and Ecuador. In Ecuador the Socio páramo program is evaluated (Bremer, Farley, & Lopez-Carr, 2014)(Bremer, Farley, Lopez-Carr, et al., 2014) and the carbon offset program led by PROFAFOR and in Colombia the Fundación Natura silvopastoral program (Hayes et al., 2014). (Hayes et al., 2014).

According to the two studies conducted by the same authors. (Bremer, Farley, & Lopez-Carr, 2014; Bremer, Farley, Lopez-Carr, et al., 2014), in which an analysis of the compensation program called Socio Paramo is carried out. One of the studies evaluates the factors that facilitate and limit participation in the Socio Paramo program in Ecuador(Bremer, Farley, & Lopez-Carr, 2014); while the second study conducted by the authors assesses whether Socio Paramo has the potential to contribute to local livelihoods (financial, natural, social, human and physical management) and sustainable resource management(Bremer, Farley, Lopez-Carr, et al., 2014)..

The results of these studies indicate that:

- Key factors affecting participation in the SP program include land title, social capital including social networks and community organization, and the availability of alternative sources of livelihood outside of enrolled páramo lands. Factors that encourage participation include financial benefits and non-financial benefits, such as increased land security and improved natural resource management, while fear of land expropriation deters participation. (Bremer, Farley, & Lopez-Carr, 2014).
- In terms of equity of access, it mentions that there is a participation of both urban and rural inhabitants, with the highest percentage of participation by rural inhabitants, it is worth mentioning that rural areas are where there is greater poverty. The study mentions that "PES may be accessible and desirable to smaller rural landowners and communities as awareness increases"; yet it also mentions that:

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"the results support other findings of low participation by smallholders who could be considered among the 'poorest of the poor' who see their participation limited by insecure land tenure, distrust of government programs, and hesitancy to lock up limited land. So they suggest considering making the program more accessible and desirable to small landowners and rural communities and avoiding the issue of land conflicts. (Bremer, Farley, & Lopez-Carr, 2014).

- It was also found that payment levels do not cover opportunity costs for the most productive uses of páramo land, so it is important to seek alternative livelihood strategies. (Bremer, Farley, & Lopez-Carr, 2014)
- It also mentions the need to monitor and evaluate the effect of SP. (Bremer, Farley, & Lopez-Carr, 2014). Similarly in the second study they emphasize "following up with these participants and exploring how outcomes change with new participants in subsequent years is imperative for a more complete understanding of program outcomes" (Bremer, Farley, Lopez-Carr, et al., 2014).
- The value and importance of forming strengthened collaborative networks NGOs, community institutions, landowners to overcome some of the distrust of the program, increase awareness of the program and support in developing alternative livelihoods that enable greater participation of SPs. (Bremer, Farley, & Lopez-Carr, 2014) The authors suggest that focusing on strengthening social networks and developing economic alternatives are two ways that PES programs can improve equity in outcomes and lay the groundwork for PES to strengthen livelihoods. (Bremer, Farley, Lopez-Carr, et al., 2014)

As for the third study conducted in 2014, it evaluates two programs selected for the context of dynamic and complex socio-ecological systems. One of them is the Carbon Offsets Program (SE: Carbon Sequestration) carried out by PROFAFOR and applied in Ecuador. The other program evaluated was Fundación Natura's Silvopastoral Incentives Program (SE: water resources), applied in Colombia. Both programs were implemented in the highlands of the Andes Mountains. The objective of the study was to compare and examine how PES institutions conform to the principles of adaptive decision making for sustainable resource management. (Hayes et al., 2014).

Although both programs are economic incentive programs, the PROFAFOR model is "user-financed", in contrast to the "government-financed" model of the silvopastoral program in Colombia. Another

difference was that the Colombia model constantly interacted with participants generating participatory learning processes and adaptive decision making. (Hayes et al., 2014) mentions that, "In both Ecuador and Colombia, while the economic incentive served to initiate behavioral change, it did not motivate, and probably hindered, resource managers' initiative to maintain those practices, as participants' management activities were dependent on receiving payment," stresses that more research is needed to systematically evaluate how contracts and incentives impact participants' motivation and perceived ability to adaptively manage their resources. (Hayes et al., 2014)

The challenges encountered were:

- The committed participation of all stakeholders to carry out the programs, both in planning and monitoring.
- The need to monitor the broader (social, economic and ecological) and long-term impacts of programs to adapt to changing social and ecological conditions.
- It is mentioned that both studies illustrated that we lack a solid understanding of the ecological dynamics of South American ecosystems, particularly upland systems.
- They conclude that PES that rely on a futures market, such as carbon sequestration, may be particularly inadequate to address changing social and ecological conditions.

In the 5 databases used to carry out this literature review, only one study was found for 2015 in Ecuador, which analyzed the PES of the socio paramo program in collectively managed lands. The socio paramo program continues in that year, but the article mentions that there are very few national laws explicitly dictating what activities are prohibited in the páramo and that conservation laws consist largely of general stipulations to protect fragile ecosystems and biodiversity, many of which are weakly implemented (Hayes et al., 2015)

His findings suggest that community participation and organization is a key factor, as if it is weak, PES alone may not be sufficient. He also mentions the importance of previous studies and viewing PES programs as experiments in need of continuous adaptation, as there is limited understanding of how to successfully structure such systems and the need for effective monitoring mechanisms to analyze the equity and impact of the programs.

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The study concludes with the fact that while ESPs can support and kick-start the development of communal systems, more research is needed to assess how the interaction of the different components of an ESP, the experimental environment, community behavior, services, benefits and more over time.

In 2017, 3 studies were found, one carried out in Peru which reviews ES and proposes technologies to preserve them and payment schemes for them (Rolando et al., 2017). The other two articles found correspond to studies conducted in Ecuador where they make an analysis of the Socio Bosque program implemented already in 2009. (Hayes et al., 2017) . (Farley & Bremer, 2017)

(Rolando et al., 2017) conducts a study where he analyzes how intensified agriculture affects the ES in a high Andean zone of Peru (Puna) and for this he determines which are the key ES in that ecoregion, thus he mentions: provision of food, wool and fiber, soil fertility, nutrient cycling, soil carbon sequestration, water provision and regulation, genetic resources, pest and disease control, pollination regulation and microclimate regulation. The author also analyzes the main drivers of change, where he discusses four: climate change, agricultural intensification and encroachment changes, intensive grazing practices and mining activity. He also makes a brief analysis of traditional practices with empirical evidence to protect the ES. Within his analysis he states that in Peru no compensation scheme for ES has been implemented, there is a lack of attention to the high Andean region, only in 2016 it was proposed to protect COS reserves and provide an opportunity for conservation or restoration plans for grasslands susceptible to ES payment and climate change mitigation schemes.

What it brings to the table is that:

- For the effectiveness of such traditional technologies it is thanks to a high degree of social cohesion to successfully perform the community work required to maintain the technologies.
- Enforcement of policies related to climate change mitigation schemes and ES payment are still very weak. It is important to strengthen such policies hand in hand with scientific studies and combine them with traditional technologies widely used in the Puna to cope with climate variability.

On the other hand the two studies conducted in Ecuador analyze what were the local perceptions of the participants. (Farley & Bremer, 2017) and the impact of PES on communal lands. In one of the studies it states

that PSB are the most direct formal rules of the government to regulate the use of the páramo. But like Peru, Ecuador does not have a national law to protect the páramo and the general measures that do exist are weakly enforced. (Hayes et al., 2017)

The contributions suggest that:

- The key importance of engaging local people as their participation can provide valuable information for developing and adapting policies and management guidelines. In some cases, local perceptions align with research on the ecological outcomes of PES, while in others, the expectations of PES participants are unlikely to be met. (Farley & Bremer, 2017).
- The authors emphasize that data to assess the ecological and social outcomes of these programs are limited and few empirical studies have explicitly examined PES in the context of communal resource management. (Farley & Bremer, 2017; Hayes et al., 2017).. Despite their increasing use of PES limited understanding of the conditions under which PES can serve as an appropriate tool for conservation and how incentivized land management practices affect local values and uses of moorlands(Farley & Bremer, 2017; Hayes et al., 2017).. From an environmental standpoint, more research is needed to better identify whether the environmental practices often prescribed under PES actually produce the desired environmental service (Naeem et al., 2015).
- In other words, social and ecological studies are required, as well as other parameters that influence and must be carried out before and during the implementation of the programs in order to carry out a coherent monitoring and, as a fundamental element, the participants are key actors in the process, who take ownership of the findings and from them arise the doubts, needs for change and solutions, where science and management go hand in hand.
- The results of the study (Hayes et al., 2017) indicate that PSB is producing additional behavioral changes that would be unlikely to occur in the absence of the program, but the changes are also due to socioeconomic, cognitive, local governance factors, and broader contextual factors influencing farmers' use of their collective woodlot.
- They also support that the perception of the páramo is a determinant in the change of land-use behavior, so that greater motivation to carry out a desired conservation activity can be noted.

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- Perception of resources, education, community governance are tools that facilitate PSE and may have a greater impact than program participation. Added to those factors, broader economic trends, technological changes, and educational campaigns may be contributing to the overall decline in usage in both participants and non-participants. (Hayes et al., 2017)

In 2018 a study on PES, conducted in Ecuador is reported which seeks a greater understanding of local perceptions of equity and the role of respective communal governance institutions, to build a clearer and broader vision of how to structure incentive-based conservation programs that better support the development of fair and durable conservation arrangements(Hayes & Murtinho, 2018).

- The study shows that the organizational capacity of a community can play a fundamental role in the successful implementation of PES. For example, the distribution of benefits is perceived to be fair in communities with self-organizing capacity, whereas in communities with an inability to self-organize, distributional outcomes were weaker. And they suggest future research to uncover additional governance attributes and their role in mediating the impacts of PES. (Hayes & Murtinho, 2018).

In 2019 there are 3 studies; two carried out in Ecuador, one evaluates the PES approach and biodiversity protection (Bremer et al., 2019) and the other one performs an analysis of a national PES program, FONAG (Joslin, 2019). The third study found, is part of the 12 case studies compiled in the book. ("Soc. Syst. Lat. Am. Complexities Challenges," 2019)which seeks to analyze the complexities and challenges of socio-ecological systems in Latin America. The selected study was conducted in Colombia where a novel methodology for valuation of ES is implemented.

The study conducted by (Bremer et al., 2019) in the páramo ecosystem of northern Ecuador, fills a gap about the effectiveness of burn exclusion, as the authors indicate "there are very few sites in the country (or elsewhere in the Andes) that allow a comparison of known burn histories, particularly over long periods of burn exclusion." (Bremer et al., 2019). It is important to note that burn exclusion is sometimes incentivized by PSE, but without studies to corroborate such land use decisions at present.

- The study highlights: "the importance of clearly articulating biodiversity objectives in PES programs, as management recommendations depend on which outcomes are prioritized". The published results demonstrate that: "PES and other conservation programs should translate general native vegetation conservation objectives into specific desired outcomes with respect to which components of páramo vegetation are conservation priorities". It also suggests that more research is needed on the contribution of different páramo life forms to ecosystem function and services.
- The results based on the data from the vegetation covers studied suggest that moorlands recover relatively quickly. Therefore, total burn exclusion is not necessary if PES management objectives are focused on maintaining the ecosystem function of páramo soils. However, when PES objectives include increasing the cover of non-herbaceous páramo species that are extremely sensitive to human disturbance, stricter burning regulations may be appropriate.
- Finally, it concludes that in general human-managed systems, the linkages between land use, biodiversity and HE are poorly understood (Ponette-González et al. 2014). and these programs represent a potentially important source of funding in the context of under-resourced biodiversity conservation efforts globally (Hein et al. 2013; Bennett and Ruef 2016). the most appropriate strategies for managing páramo for biodiversity depend on the specific desired outcomes (Bremer et al., 2019)

The second study conducted in Ecuador published in 2019 evaluates the success narrative of the program: Fund for the Protection of Water (FONAG) as a PES model for water funds. (Joslin, 2019). The study cites several authors who consider that the circulation of such PES success narratives along with other conservation programs, among various organizations, governments, academics etc., contributes to an increase in popularity, attracts financial resources and justifies replication of the use of such programs, despite the fact that they present discursive contradictions and never move towards implementation

(Joslin, 2019) suggests that, "widely circulated narratives of success can misrepresent complex interactions among stakeholders as well as within communities and their land management practices." As PES models influence natural resource management, policy adoption and others. As the author indicates the purpose of questioning these narratives is to: "point out the nuanced ways in which water funds and

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any conservation policy model can be interpreted and presents an alternative framework for deciphering local relationships with conservation projects. Assessments that represent situated perceptions of conservation practice can help clarify interactions with PES programs within specific ecosystems." So by generalizing these narratives of success and being applied they generate real-world consequences that affect the dynamics of ecosystems and human communities.

It concludes the study by stating that the challenge for future research is to "value local perspectives as a form of evidence and to further examine the context and mechanisms of how conservation policies function on the ground as forms of environmental governance. It invites further development of innovative evaluations aimed at examining the role in pre-existing land management practices and institutions in supporting PES programs and recognizing the complex political, economic and social context of PES deals.(Joslin, 2019)

On the other hand, we found a study conducted in Colombia which is part of a book that makes a compendium of analysis, research and compilation of 12 studies in Latin America that analyzes socio-ecological systems. ("Soc. Syst. Lat. Am. Complexities Challenges," 2019). Said study performs the valuation of ecosystem services, specifically the water resource, in the upper zone of the Chinchiná-Colombia river basin. To determine the economic value per cubic meter of water generated by wetlands, it analyzes variables such as forest areas and the volume of water collected, the importance value of the forest, the opportunity costs of the productive system and the cost of ecosystem restoration. The study arrives at a value of US$4.28 per cubic meter if valued according to public service rates.

An interesting point of the study that is of interest to us for this review was that a key part of its methodology was community participation in the identification and prioritization of ecosystem services. This participation states that: The community is aware of the importance of ecosystem care, actions to maintain a healthy environment, not only for the community but the entire planet and they mention that the mountain should always be maintained due to its vital importance in providing water for the population.

The study concludes with the following points of interest:

- Community participation in the identification of ecosystem services was fundamental to understanding the recognition of their environment, and their priorities served to decide the valuation

method". He stresses that "there must be a great social responsibility to manage water through governance, transparency, equity, and well-defined conservation criteria in the medium and long term. Society is called to know its natural environment, its internal function, identifying the ecosystemic value of the natural heritage, especially water, in the hope that from there, conservation decisions can be generated, since it is not possible to conserve something that is not known. For this to happen, it is necessary to consider society and nature in an integrated manner, or in this case, society and water, given their close relationships. Problems and solutions for human-nature relations must be approached with a holistic perspective to ensure the quality of life of society and the preservation of our natural heritage.

- Contingent valuations are difficult to perform in the area since the communities interested in water conservation are mainly those living in medium or low altitude zones, being the ones that benefit mainly from having a recharge zone at higher altitudes. And they mention that although major investments in the research were not available and there could be subjective variables that affect the results, the participation of the community was vital in prioritizing ecosystem services.

To conclude the results obtained in the search, a study conducted in Colombia was found which consists of the application of a deliberative assessment in an indigenous community in Colombia. (Lliso et al., 2020). The author mentions and as can be evidenced in our search, this study was one of the first implementations of Deliberative Choice Experiments (DeCE) in the Global South. (Lliso et al., 2020)

Since the legislation in Colombia passed in 2017 to regulate and encourage the use of PSE, and with the evidence that this may result opportunities as risks, the author sets out as the objective of the study of (Lliso et al., 2020) find appropriate approaches that can be used to elicit the preferences of indigenous peoples with respect to PES design, in order to ensure that these programs are adapted to their context and to determine whether deliberative valuation approaches are adequate for this task.

The author mentions two reasons for the choice of methodology: 1) it has been found to successfully address many of the criticisms and limitations of traditional valuation approaches, such as reducing the cognitive load on participants and giving them more time to process the

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information and form their preferences quotes a (Bunse et al., 2015). He suggests that it is a relevant point when participants value unfamiliar goods and when there are low levels of education and 2) The second reason he mentions (Lliso et al., 2020) is that, "the CE component was useful for getting participants to reflect on specific elements of PES implementation and provide quantitative evidence of the importance of equity considerations, the focus groups between round one and two of the DeCE can provide rich qualitative information about The preferences of participants in a format that is familiar and comfortable to them, as it is similar to the mingas de pensamiento that they hold regularly in their community."

Some of the study's contributions to our review, in order to achieve effective PES design and implementation are:

- Community participation: One of the first steps was to explore under what conditions participants are most likely to agree to participate in a future PES. It mentions that, for the design of these programs, active community participation is significant in making decisions about land use, the perspective of who should lead, which stakeholders to involve, and equity in PES design. Thus, adapting PES to the full range of worldviews and ways of life of these groups is more likely to ensure success.
- Terminology: The author states in his research that the economic terminology used in academic contexts of PES, implementing them in the indigenous context could be counterproductive, and he recommends adapting the language and structure of PES to fit the jargon and concepts used by indigenous peoples in order to involve their participation. As the author cites, these could be important first steps to avoid PES being perceived as a neoliberal tool used to commodify nature in a way that often clashes with the values of these communities (Kosoy and Corbera, 2010). In addition to adapting terminology, it is also important to adapt PES to fit indigenous worldviews and reinvent them in a way that allows indigenous groups to take ownership.
- They conclude that: the deliberative valuation approach is a useful way to elicit preferences in an indigenous context. One of the advantages of adding a deliberative component to the CE methodology is that it allowed us to extract information not only about what participants value, but also why they value it (Lienhoop et al., 2015). The deliberative process helped people carefully consider the importance of each of the attributes in question, not only to them but also with respect to how implementation of a PES

scheme would interact with their community more broadly (Kenter et al., 2016).

CONCLUSIONS

Harmonizing the relationship between humans and nature is complex. In this study, the awareness of various entities and institutions, such as academia, governmental organizations, various organizations and people directly or indirectly linked to ecosystem services, is considered important. Briefly, after the information reviewed, it is undoubtedly of utmost importance to link research, management institutions and communities committed to any conservation program.

It is important for the PES to carry out previous studies to establish scientific baselines for both the ES and the social aspect, which contributes to an effective monitoring of the process and results of the programs. Although it will not always be possible to have a comprehensive baseline before implementing the PES, information should be fed during the course of the implementation of the programs. Therefore, there is no doubt that these PES programs require continuous adaptation, flexibility, evidence of shortcomings and achievements, and awareness that these processes take time and need to be approached with care, i.e., adaptive management must be implemented.

Although it is mentioned that PES have been generalized and popularized in South America, no evidence was found in scientific articles and many have been designed and implemented by assumptions without scientific backing and a joint and conscious participation of all those involved.

It is evident that in recent years (Peru and Colombia) have begun to notice the need to strengthen legislation and holistic conservation of resources. Although Ecuador has been one of the countries that has been involved in PES for many years, it has shown some gaps on the subject. This is quite useful because it supports the need to manage the trinity and awareness, and provides experience and thus strengthen and understand that it is a process of adaptation, flexibility and participation. The PES has Our findings contribute to fill this gap in the context of PES in ecosystems as complex as the páramo, evidence what have been the shortcomings and where to strengthen the process**.**

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References

Bremer, L. L., Farley, K. A., Chadwick, O. A., & Harden, C. P. (2016). Changes in carbon storage with land management promoted by payment for ecosystem services. *Environmental Conservation.* https://doi.org/10.1017/S0376892916000199

Bremer, L. L., Farley, K. A., DeMaagd, N., Suárez, E., Cárate Tandalla, D., Vasco Tapia, S., & Mena Vásconez, P. (2019). Biodiversity outcomes of payment for ecosystem services: lessons from páramo grasslands. *Biodiversity and Conservation*, *28*(4), 885-908. https://doi.org/10.1007/s10531-019-01700-3. https://doi.org/10.1007/s10531-019-01700-3

Bremer, L. L., Farley, K. A., & Lopez-Carr, D. (2014). What factors influence participation in payment for ecosystem services programs? An evaluation of Ecuador's SocioPáramo program. *Land Use Policy*, *36*, 122-133. https://doi.org/10.1016/j.landusepol.2013.08.002.

Bremer, L. L., Farley, K. A., Lopez-Carr, D., & Romero, J. (2014). Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for 'win-win'? *Ecosystem Services*, *8*, 148-165. https://doi.org/10.1016/J.ECOSER.2014.03.007.

Farley, K. A., Anderson, W. G., Bremer, L. L., & Harden, C. P. (2011). Compensation for ecosystem services: An evaluation of efforts to achieve conservation and development in Ecuadorian paramo grasslands. *Environmental Conservation.* https://doi.org/10.1017/S037689291100049X

Farley, K. A., & Bremer, L. L. (2017). "Water Is Life": Local Perceptions of Páramo Grasslands and Land Management Strategies Associated with Payment for Ecosystem Services. *Annals of the American Association of Geographers*, *107*(2), 371-381. https://doi.org/10.1080/24694452.2016.1254020

Hayes, T., & Murtinho, F. (2018). Communal governance, equity and payment for ecosystem services. *Land Use Policy*, *79*, 123-136. https://doi.org/10.1016/J.LANDUSEPOL.2018.08.001

Hayes, T., Murtinho, F., Cárdenas Camacho, L. M., Crespo, P., McHugh, S., & Salmerón, D. (2014). Can Conservation Contracts Co-exist with Change? Payment for Ecosystem Services in the Context of Adaptive Decision-Making and Sustainability. *Environmental Management*, *55*(1), 69-85. https://doi.org/10.1007/s00267-014-0380-1. https://doi.org/10.1007/s00267-014-0380-1

Hayes, T., Murtinho, F., & Wolff, H. (2015). An institutional analysis

of Payment for Environmental Services on collectively managed lands in Ecuador. *Ecological Economics*, *118*, 81-89. https://doi.org/10.1016/J.ECOLECON.2015.07.017

Hayes, T., Murtinho, F., & Wolff, H. (2017). The Impact of Payments for Environmental Services on Communal Lands: An Analysis of the Factors Driving Household Land-Use Behavior in Ecuador. *World Development*, *93*, 427-446. https://doi.org/10.1016/J.WORLDDEV.2017.01.003.

Joslin, A. J. (2019). Unpacking 'Success': Applying Local Perceptions to Interpret Influences of Water Fund Payments for Ecosystem Services in the Ecuadorian Andes. *Society and Natural Resources*, *32*(6), 617-637. https://doi.org/10.1080/08941920.2018.1559379

Lliso, B., Pascual, U., Engel, S., & Mariel, P. (2020). Payments for ecosystem services or collective stewardship of Mother Earth? Applying deliberative valuation in an indigenous community in Colombia. *Ecological Economics*, *169*, 106499. https://doi.org/10.1016/J.ECOLECON.2019.106499

Rolando, J. L., Turin, C., Ramírez, D. A., Mares, V., Monerris, J., & Quiroz, R. (2017). Key ecosystem services and ecological intensification of agriculture in the tropical high-Andean Puna as affected by land-use and climate changes. *Agriculture, Ecosystems and Environment*, *236*, 221-233. https://doi.org/10.1016/j.agee.2016.12.010.

Social-ecological Systems of Latin America: Complexities and Challenges (2019). In L. E. Delgado & V. H. Marín (Eds.), *Social-ecological Systems of Latin America: Complexities and Challenges*. Springer International Publishing. https://doi.org/10.1007/978-3-030-28452-7

Vásconez, P. M., Castillo, A., Flores, S., Hofstede, R., Josse, C., Lasso, S., Medina, G., Ochoa, N., & Ortiz, D. (Eds.) (2011). *Páramo : studied, inhabited, managed and institutionalized landscape*. EcoCiencia.

Vergara-Buitrago, P. A. (2020). Strategies implemented by Colombia's National System of Protected Areas to conserve páramos. *Revista de Ciencias Ambientales*, *54*(1), 167-176. https://doi.org/10.15359/rca.54-1.9

Bremer, L. L., Farley, K. A., Chadwick, O. A., & Harden, C. P. (2016). Changes in carbon storage with land management promoted by payment for ecosystem services. *Environmental Conservation.* https://doi.org/10.1017/S0376892916000199

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Bremer, L. L., Farley, K. A., DeMaagd, N., Suárez, E., Cárate Tandalla, D., Vasco Tapia, S., & Mena Vásconez, P. (2019). Biodiversity outcomes of payment for ecosystem services: lessons from páramo grasslands. *Biodiversity and Conservation*, *28*(4), 885-908. https://doi.org/10.1007/s10531-019-01700-3. https://doi.org/10.1007/s10531-019-01700-3

Bremer, L. L., Farley, K. A., & Lopez-Carr, D. (2014). What factors influence participation in payment for ecosystem services programs? An evaluation of Ecuador's SocioPáramo program. *Land Use Policy*, *36*, 122-133. https://doi.org/10.1016/j.landusepol.2013.08.002.

Bremer, L. L., Farley, K. A., Lopez-Carr, D., & Romero, J. (2014). Conservation and livelihood outcomes of payment for ecosystem services in the Ecuadorian Andes: What is the potential for 'win-win'? *Ecosystem Services*, *8*, 148-165. https://doi.org/10.1016/J.ECOSER.2014.03.007.

Farley, K. A., Anderson, W. G., Bremer, L. L., & Harden, C. P. (2011). Compensation for ecosystem services: An evaluation of efforts to achieve conservation and development in Ecuadorian paramo grasslands. *Environmental Conservation.* https://doi.org/10.1017/S037689291100049X

Farley, K. A., & Bremer, L. L. (2017). "Water Is Life": Local Perceptions of Páramo Grasslands and Land Management Strategies Associated with Payment for Ecosystem Services. *Annals of the American Association of Geographers*, *107*(2), 371-381. https://doi.org/10.1080/24694452.2016.1254020

Hayes, T., & Murtinho, F. (2018). Communal governance, equity and payment for ecosystem services. *Land Use Policy*, *79*, 123-136. https://doi.org/10.1016/J.LANDUSEPOL.2018.08.001

Hayes, T., Murtinho, F., Cárdenas Camacho, L. M., Crespo, P., McHugh, S., & Salmerón, D. (2014). Can Conservation Contracts Co-exist with Change? Payment for Ecosystem Services in the Context of Adaptive Decision-Making and Sustainability. *Environmental Management*, *55*(1), 69-85. https://doi.org/10.1007/s00267-014-0380-1. https://doi.org/10.1007/s00267-014-0380-1

Hayes, T., Murtinho, F., & Wolff, H. (2015). An institutional analysis of Payment for Environmental Services on collectively managed lands in Ecuador. *Ecological Economics*, *118*, 81-89. https://doi.org/10.1016/J.ECOLECON.2015.07.017

Hayes, T., Murtinho, F., & Wolff, H. (2017). The Impact of Payments for Environmental Services on Communal Lands: An Analysis of

the Factors Driving Household Land-Use Behavior in Ecuador. *World Development*, *93*, 427-446. https://doi.org/10.1016/J.WORLDDEV.2017.01.003.

Joslin, A. J. (2019). Unpacking 'Success': Applying Local Perceptions to Interpret Influences of Water Fund Payments for Ecosystem Services in the Ecuadorian Andes. *Society and Natural Resources*, *32*(6), 617-637. https://doi.org/10.1080/08941920.2018.1559379

Lliso, B., Pascual, U., Engel, S., & Mariel, P. (2020). Payments for ecosystem services or collective stewardship of Mother Earth? Applying deliberative valuation in an indigenous community in Colombia. *Ecological Economics*, *169*, 106499. https://doi.org/10.1016/J.ECOLECON.2019.106499

Rolando, J. L., Turin, C., Ramírez, D. A., Mares, V., Monerris, J., & Quiroz, R. (2017). Key ecosystem services and ecological intensification of agriculture in the tropical high-Andean Puna as affected by land-use and climate changes. *Agriculture, Ecosystems and Environment*, *236*, 221-233. https://doi.org/10.1016/j.agee.2016.12.010.

Social-ecological Systems of Latin America: Complexities and Challenges (2019). In L. E. Delgado & V. H. Marín (Eds.), *Social-ecological Systems of Latin America: Complexities and Challenges*. Springer International Publishing. https://doi.org/10.1007/978-3-030-28452-7

Vergara-Buitrago, P. A. (2020). Strategies implemented by the Colombian National System of Protected Areas to conserve páramos. *Revista de Ciencias Ambientales*, *54*(1), 167-176. https://doi.org/10.15359/rca.54-1.9

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