Local perceptions about landscape change unveil environmental justice issues in a Colombian Caribbean municipality

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Abstract

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The Tubará municipality is located at the frontier of dramatic regional landscape transformations. In recent decades, urbanization, infrastructure development, and cattle farming have driven landscape change in the municipality, potentially impacting the attributes that determine its future trajectories, namely its adaptive capacity to cope with climate change. 18 semi-structured interviews were conducted to explore the community's perceptions regarding observed changes in the landscape and their drivers. Additionally, this study was concerned with exploring the environmental justice issues unveiled by local narratives. Using content analysis, three main themes emerged: 1) Multidimensional impacts of forest cover and tree loss; 2) Changes in traditional food systems and economies; and 3) Change and its drivers are produced by and produce environmental injustices. Although perceived direct drivers of change vary spatially,

land tenure systems, ineffective and weak policies, regulations and enforcement, and market forces explain indirect drivers underlying them. In the face of change, narrative accounts also display a community that resists through legal action and the keeping of its traditional practices. This research aims to ignite further inquiry and public discussion around questions of justice in social-ecological systems research, its intersection with regional planning, and indigenous and local knowledge inclusion and recognition in decision-making.

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1. INTRODUCTION

Environmental problems have conventionally been approached disjointed from their inherent political, economic, and social-cultural contexts. This is apparent because many environmental problems continue to persist despite decades of solutions being implemented to resolve them (Gordon and Berry 2006; Vogt et al. 1997). This is partially explained by the predominant use of top-down governance and planning models relying mostly on western science. This approach tends to isolate its objects of study from their context, as opposed to other ways of knowing, such as indigenous and local knowledge (ILK), which are more holistic and dependent on their context and particular local conditions (Mazzocchi, 2006). A critical examination of the role of knowledge at the intersection between social and environmental systems enables questioning how contextual factors (e.g., power relations and competing value systems), inherent to social-ecological systems (SES), are crucial drivers of social and environmental outcomes (Cote and Nightingale, 2012).

The prevalence of specific views and values over others, in the environmental decision-making process, poses ethical and justice concerns regarding the implications for unrepresented or less powerful actors. For instance, the limitations of the cost-benefit analysis and the predominance of expert-led planning in decision-making result in the prioritization of biophysical and financial losses (Tubridy et al., 2022). This has been linked to procedural and distributive injustices, where already disadvantaged groups disproportionally bear the negative socio-economic, cultural, and physiological impacts of interventions (Tubridy et al., 2022). Thus, there is a need to pay greater attention to diverse perceptions, values, and goals to avoid biased decisions and the exclusive use of top-down policy-led or science-led judgments concerning SES management (Villamor et al., 2014). Advancing towards this goal is urgent, given current global trends such as the loss of global terrestrial ecosystems' health and their contributions to people (IPBES, 2019), the dramatic increase in urbanization levels, and increasing social and economic inequality (Chancel et al., 2022). These trends are concurrently unfolding with a climate change crisis, which constitutes one of the most pressing issues our society faces today.

There is high confidence that human-induced climate change, particularly through increased frequency and severity of extreme events (e.g., high-temperature extremes, and heavy precipitation events) has already led to irreversible impacts on natural and human systems (IPCC, 2022). Evidence also suggests that these impacts are not experienced equally by these systems, among and within regions, and that the degree of vulnerability is highly determined by contextual factors like socioeconomic conditions, historical and ongoing patterns of inequity, and governance (IPCC, 2022). More vulnerable communities are often those that are poor and experiencing governance challenges that limit their access to basic services. These communities also tend to be employed at a higher level in jobs that are more impacted and sensitive to climates (e.g., subsistence agriculture) (IPCC, 2022). Indigenous and local communities, who directly depend on

nature to meet their basic needs, are among the most impacted, yet they have also been acknowledged as key actors in the race to solve the climate crisis.

Increasing worldwide recognition is being given to indigenous and local communities as holders of vital knowledge and expertise for climate change adaptation and mitigation (World Bank, 2019). Both western knowledge and ILK are powerful determinants of SES' adaptive capacity for dealing with change by allowing actors to make sense of the world, evaluate possible actions, and select the ones that serve their interests, as well as anticipate environmental changes and plan effective responses (Williams et al., 2015). ILK on environmental change, in particular, can serve as early warning indicators that enable communities at risk to take action in a timely manner (Alessa et al., 2016). It has been argued as well that some of the limitations of western scientific knowledge can be addressed with more receptiveness to ILK, given it provides information about ecological processes or variables overlooked by scientific knowledge (Cote and Nightingale, 2012). Therefore, greater recognition and inclusion of ILK in environmental planning and management holds the potential to help tackle the uncertainties related to climate change, while halting the emergence of environmental injustices.

This research was conducted in the Tubará municipality, a landscape in the Colombian Caribbean historically occupied by indigenous and rural communities. The study area is geographically located at the frontier of further landscape transformations at the regional level, which up to date have been mainly driven by the urban expansion of a metropolitan area. These changes have resulted in the loss of natural areas at the regional level and the contributions they provide to people. Using a case study approach, this research examines how the local community of Tubará perceives landscape change. These local perceptions, inherently placed in their social-cultural and political context, enable the expanded exploration of the multiple underlying factors leading to change and their potential environmental justice implications. The questions this study asked are 1) What perceptions do the local community hold regarding environmental and social change and its drivers? and 2) In which ways do environmental injustices manifest in these perceptions? These questions allow further discussion around the relevance of ILK on environmental change to understand the effect of landscape change on the adaptive capacity of local ecological and social systems.

2. THEORETICAL FRAMEWORK

The theories from two fields of knowledge provide a roadmap for the analysis of local perceptions about environmental and social change: Social-ecological Systems (SES) and Environmental Justice (EJ). SES research provides a ground floor for the comprehensive understanding of the complex, cross-scale interactions between humans and nature giving rise to outcomes, which are landscape changes in our case study. The IPBES Nature's

Contributions to People conceptual framework (Díaz et al., 2018) was used to aid in the identification and understanding of these interactions. In addition, this study approach for data analysis was based on an EJ lens to determine if injustices produce, or are a product of, those interactions.

2.1. Social-ecological Systems (SES) theory to understand landscape change

Landscapes are areas composed of dissimilar or diverse components or elements (Risser, 1987). Traditionally, higher attention has been given to the study of biophysical and ecological components and processes driving changes in landscape patterns. However, a growing body of research has engaged with integrating social and ecological drivers of landscape pattern and change (Turner & Gardner, 2015). SES theory has increasingly guided these understandings. SES can be broadly defined as complex adaptive systems in which humans and nature interact at multiple spatial and temporal scales (Berkes and Folke, 1998; Liu et al., 2007). SES frameworks are useful to understand landscape change because they offer a systemic and complex thinking approach to examining the feedback loops between natural and human systems resulting in change (Martín-López et al., 2012; Liu et al., 2007). They also make visible these systems' hierarchical and nested operations across multiple temporal and spatial scales (Martín-López et al., 2017). Nonetheless, some limitations remain in the field.

De Vos et al. (2019) showed that most of our current understanding of SES has been developed by institutions and researchers in the Global North, whereas locations in the Global South are the most studied. Moreover, the authors highlight that methodological pluralism in conducting SES research remains one of the biggest challenges. This points out two limitations of the SES framework. First, is the potential impact of transposing western concepts and models of thought to non-western contexts. This results in inefficient processing of knowledge or even where it reproduces injustices by not recognizing the value systems of local communities and thus their preferences, interests, and perceptions towards nature (Díaz et al., 2018). For instance, SESs research has predominantly focused on the linkages between human and natural systems through ecosystem's supply or Ecosystem Services for human well-being (MA, 2005). Despite SES research providing forums to link and inform policy and decision-making, the economic valuation (often monetary) of nature's benefits to people might mask the other largely intuitive ways in which people understand and value nature. Thus, SES determines what is right which propagates injustices (Klain et al., 2017).

The second limitation, enabled by the remaining challenge concerning the integration of multiple disciplines and methods, raises questions regarding the implications of the siloed understanding of SES. For example, Cote and Nightingale (2012) argue that contextual factors such as power dynamics and cultural values are inherent to SES, rather than externalities, and are the underlying processes influencing systems, the actors within them, and their capacity to adapt. This stresses the importance of contextual factors and

processes as crucial drivers of social and environmental outcomes and motivates further engagement around questions of power and knowledge at the intersection of human and nature interactions. Focusing on these questions helps advance some of the gaps in SES research which has traditionally focused on topics like resilience and ecosystem services. Whereas societal issues are crucial for the global south (poverty, social and environmental justice, and food security) but remain understudied (De Vos et al., 2019).

2.1.1. The IPBES Conceptual Framework: Nature's Contributions to People

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) proposed an evolution of the Ecosystem Services framework to the notion of Nature's Contributions to People. This approach recognizes the role of culture in defining all links between people and nature, which elevates, emphasizes, and operationalizes indigenous and local knowledge in understanding nature's contributions to people (Díaz et al., 2018). The IPBES framework provides a suitable lens to examine landscape change in SES for two main reasons. First, it explicitly brings together diverse systems of knowledge in a common conceptual framework (i.e., western science, and indigenous and local knowledge) and highlights the need for context-specific approaches to understanding the linkages between people and nature. Second, it highlights the role that institutions, governance systems, and other indirect drivers have as the underlying cause of change through their influence on people's perception, behavior, and decisions related to their interactions with nature (Díaz et al., 2018). It is debated whether the IPBES framework actually addresses the limitations of the Ecosystem Services approach (Kenter, 2018) or if significant differences between both approaches even exist (Faith, 2018). Despite that, the conceptual framework still serves as a guide to understanding the multiple ways in which human and natural systems interact and drive landscape change.

The IPBES conceptual framework highlights six key elements that define the links between people and nature. *Nature,* in its multiple interpretations (i.e., biodiversity and ecosystems in western culture, or Mother Earth in local and indigenous cultures), provides *nature's benefits to people*, which include both detrimental and beneficial effects of nature on the achievement of *good quality of life.* The ability of nature to provide those contributions is impacted by *direct* and *indirect drivers* of change. Drivers of change are influential processes in the evolutionary trajectory of landscapes that cause observable change (Bürgi et al., 2004). They affect landscapes directly through natural (out of human control) or anthropogenic (a result of human decisions and actions) processes, or indirectly, by mediating or influencing direct anthropogenic drivers (Díaz et al., 2018; Cinner and Barnes, 2019). The IPBES framework highlights the role of *institutions and governance systems,* which are underpinned by societal values and behaviors, as crucial indirect drivers of change. Moreover, institutions and governance systems determine the allocation, production, and use of *anthropogenic assets,* which enable the co-production of nature's benefits to people.

2.2. Environmental Justice (EJ)

Since its onset in the United States as a social movement in the 1980s, when it represented a departure from the mainstream environmental discourses of the time by reframing environmental issues as injustice issues (Agyeman et al., 2016), EJ has established itself as an expanding research field. EJ research has expanded its initial focus on the inequitable distribution of environmental hazards as related to class and race, to the inclusion of and discussion around a wider range of issues and geographies, multiple conceptions of justice, the factors leading to the production of environmental injustices, and new definitions of "environment" (Schlosberg, 2013; Agyeman et al., 2016). Conjunctly, methodologies used in EJ research have evolved from objective measures of EJ intended to allow comparison across cases, primarily using spatial analysis, to include qualitative and interdisciplinary approaches and critical theories aimed at exploring the multiple meanings and interpretations of EJ (Agyeman et al., 2016). This gave rise to an expansion of EJ methodology and theory beyond distributional equity, to include a broader definition of justice.

Three dimensions of justice are often used as analytical frameworks in EJ research. Distributive justice is concerned with the uneven distribution of environmental benefits, harms, and burdens of intervention (Martin, 2017). Recognition is related to the disrespect, degradation, and devaluation of individuals and communities versus others, and the places they inhabit and derive their identities (Walker, 2019). Participatory (aka, procedural), is concerned with issues of inclusion or exclusion in participation and procedure, that is, the extent to which actors or groups are meaningfully involved in decision making (Masarella, 2020).

3. METHODS

3.1. Rationale for Research Design

The Tubará municipality is embedded in a region characterized by dramatic transformations, galvanized by the urban sprawl of the Barranquilla Metropolitan Area, the most important city in the Caribbean region in population size and contribution to a country's GDP. Several land use and land cover change studies (Aldana-Domínguez et al., 2019; Schubert et al., 2019; Schubert et al., 2018) suggest that Tubará is located at the frontier of further landscape transformations at the regional level. This research was designed to understand landscape change and its environmental justice implications in the Tubará municipality using local perceptions. Semi-structured interviews were selected as a data collection tool because they provide valid environmental and social change information, as shown by studies that validate social perceptions.

Recently it has been recognized that qualitative data and methods are valid and necessary for the evaluation of ecological processes (Villamor et al., 2014). Moreover, given that perceptions are inherently placed in their social-cultural and political context, the semi-structured interview allowed the expanded exploration of these contextual factors, their links with environmental change, and the potential environmental justice issues derived from these interactions. These results are not meant to be generalized statistically, yet they allow us to build a rich understanding of the contextual factors. In these ways, this method makes a valuable contribution to understanding this system as a SES, in ways that were not possible through the methods used by land use and land cover change studies undertaken in the area. The goal is to ignite further inquiry and public discussion around questions of justice and their relation to landscape change, regional development, and indigenous and local knowledge recognition in the Colombian Caribbean.

3.2. Study Area

The Tubará municipality is a hilly landscape comprising a patchwork of woody vegetation (dominated by tropical dry forest), small agricultural plots, pastures, and indigenous and rural villages. Tubará is one of the 22 municipalities that, along with Barranquilla, comprise the Atlántico department. It has an extension of 176 km^2, and approximately 35% of its land surface is classified as urban, which turns it into a predominantly rural municipality according to the current territorial ordering plan (EOT, 2013). Average annual temperatures are between 25.8ºC and 28.9ºC, with records of maximum temperatures of up to 39ºC and minimum temperatures of 16ºC (EOT, 2013).

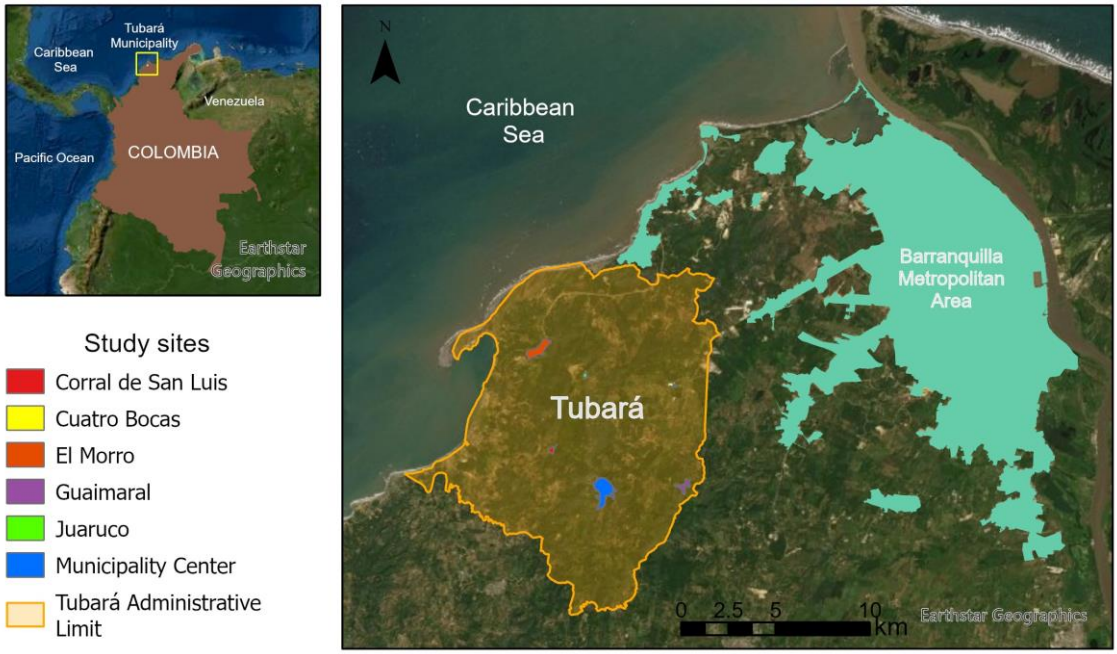
About 12,718 people live in Tubará and 51% of them are settled in the municipality center (DANE, 2018). The rest of the population is distributed across the rural area in four *corregimientos*[1], which we will refer to as villages from now on, and several smaller and dispersed settlements (*Veredas*[2]*)* (Figure 1, a). In the Tubará municipality, 63,8% of the population self-identify as members of the Mokaná indigenous group (DANE, 2018). In the Atlántico department, the Mokaná are the most representative indigenous group, accounting for 44,6% of the total indigenous population, most of which (37,2%) live in Tubará. This emphasizes the importance of the municipality for the cultural diversity of the region.

Subsistence agriculture occurs in small farms with rainfed crops (Alcaldía Municipal de Tubará, 2020). Livestock farming is almost exclusively cattle breeding, with important fluctuations throughout the years (Instituto Colombiano Agropecuario, 2017). Beach tourism is an important economic activity in the municipality and is an informal employment source for the local community. The current municipal administration has

[1] Term used in Colombia to define an administrative subdivision of a municipality.
[2] Term used in Colombia to coin a smaller and dispersed territorial unit where rural communities share values of sense of belonging, neighborhood relationships, and where agricultural dynamics occur. Smaller than *corregimientos* and with lower population density.

prioritized the tourism industry for the upcoming years as means to invigorate the local economy, expanding to include ecotourism, "ethno-tourism" and religious tourism (Alcaldía Municipal de Tubará, 2020). Traditional crafts elaborated from the *Iraca* palm and *totumo* (the fruit of *Crescentia cujete*) are part of the local economy (Alcaldía Municipal de Tubará, 2020). Finally, lithological conditions in Tubará have supported both legal and illegal economies based on the extraction of limestone, common clay, sand, and gravel (Ingeominas, 2001; EOT, 2013). Also, the hydrocarbons potential of the area has attracted interest in the past from oil companies that have drilled exploratory oil wells (Ingeominas, 2001).

Figure 1. Study area and sites. Source: Author



3.3. Data and Methods

Local perceptions on landscape change were explored using data from 18 semi-structured interviews conducted in September of 2021 with community members settled in the municipality center (Tubará), the four main villages (Cuatro Bocas, Juaruco, El Morro, and Guaimaral), and one dispersed village (Corral de San Luis) (Figure 1). With the support of a community leader, the study identified and contacted members of the community based on their leadership role within the Mokaná indigenous organization and their time of residency in the municipality (Table 1).

Table 1. List of interviewed community members' location, and time of residency in the municipality.

Village	Time of residency in Tubará (years)	Duration of the interview (mins)
Tubará	5	70
Tubará	>60	77
Tubará	69	68
Tubará	>60	22
Corral de San Luis	30	30
Corral de San Luis	50	20
Corral de San Luis	>40	28
Corral de San Luis	86	43
Corral de San Luis	52	17
El Morro (Morrito)	>30	17
El Morro (Morrito)	49	27
El Morro (El Cielo)	>50	19
El Morro (El Cielo)	29	33
Cuatro Bocas	>30	96
Cuatro Bocas	>40	25
Cuatro Bocas	39	30
Guaimaral	65	23
Guaimaral	>50	20
Juaruco	47	28

Interviews were recorded and transcribed word verbatim using *Express Scribe* right after they were conducted. *Google Translate* was used to assisting with the translation from Spanish to English after the transcripts were cleaned to remove irrelevant text or fillers.

3.4. Content analysis

Qualitative content analysis is used to identify both manifest and latent (i.e., implicit, or implied meanings) patterns in communication, typically using code lists (Drisko and Maschi, 2016). An initial list of codes was developed based on the literature to analyze the data by research question. For instance, to answer the first question (What perceptions do the local community hold regarding environmental and social change and its drivers?) codes include perceptions around environmental change (e.g., forest cover decline, changes in local climate regimes) and cultural and socioeconomic change (e.g., erosion of traditional food systems). Similarly, codes were developed to characterize patterns in the data pointing at potential drivers of landscape change and the presence of distributive, procedural, and recognition dimensions of EJ. To support each code, direct quotes were extracted from the participant interviews (see section 7. Supplementary Material). A second analysis of the data resulted in the creation of themes and patterns that make up the main findings of this study. Conjunctly to this deductive approach to data analysis, an open exploration of the data was carried out to enable the emergence of new codes and patterns.

4. RESULTS

In relation to environmental changes in the landscape, participants identified changes in forest and tree cover (mainly loss), water bodies (degradation and desiccation), areas for urban development (increase), wildlife (mostly decline), and climate (temperature increase and changes in rainfall patterns) (Supplementary Material, Table 1). The cultural and socioeconomic change was perceived in relation to changes in subsistence agriculture, fishing, and hunting (overall decline), access to public services, and in the local economy (Supplementary Material, Table 2).

A comparative examination of the perceptions expressed across villages suggests that landscape change and its drivers exhibit significant variations across space and time. According to participants, patterns of forest loss, and its effect on streamflow, are heterogeneous across the municipality, with significantly higher loss occurring around specific villages and other places regarded as valuable for the local community (ceremonial and heritage sites and water bodies). Similarly heterogeneous are perceptions around cultural and socioeconomic change. Although participants seemed to agree on the overall erosion of traditional food systems, the degree of change exhibits spatial variations. Subsistence agriculture persists as an important practice for the inhabitants of villages like Juaruco and Guaimaral, yet it is rarely practiced in others, particularly the municipality center. Socioeconomic change manifest through overall improved access to public services (with some important differences across villages), and changes in employment sources and the municipal economic model.

In the eyes of the participants, environmental change is, for the most part, directly and indirectly human-driven. Forest and tree cover loss due to deforestation is a direct driver of landscape change through its effect on the hydrological flow, local climate, and wildlife populations. Prolonged drought and extreme rainfall events are natural drivers of change mentioned by participants. These climate patterns act in conjunction with anthropogenic drivers to aggravate the negative impacts of change on people's quality of life and the environment. Deforestation is indirectly driven by current land tenure systems, the predominance of private short-term economic interests, over collective long-term interests, ineffective and weak regulation and enforcement, and market forces (e.g., increased demand for rural land, tourism services, and labor). Regarding socioeconomic and cultural change, the erosion of traditional food systems is directly driven by the decrease in farm labor and the lack of agricultural assets. Prohibitionist policies also cause the decline of traditional practices such as hunting and field burning. Current land tenure systems, the lack of interest from new generations, and changes in employment sources underlie socioeconomic and cultural change. Drivers of change and the environmental and social outcomes they produce across the landscape are associated with environmental injustices discernible in local community perceptions.

Environmental justice issues manifest through the unequal distribution of harms resulting from landscape change, and the loss of benefits people can derive from nature due to the lack of assets to co-produce them. These conditions are enabled by the exclusion of the local community from decision-making processes around environmental management and municipal planning. Moreover, participants expressed a lack of recognition of indigenous institutions and their customary land tenure systems and identities in such processes. Narratives confirm the existence of power structures based on wealth driving most environmental injustices. The emergence of a new pattern, i.e., resistance, displays how the local community has responded to landscape change and its associated environmental injustices through legal action and the keeping of traditional practices. (Supplementary Material, Table 3).

The analysis of participant's perceptions regarding landscape change and its drivers, and the analysis of these perceptions in the light of EJ theory, resulted in the following three themes: 1) Multidimensional impacts of forest cover and tree loss; 2) Changes in traditional food systems and economies; and 3) Change and its drivers are produced by, and result in, environmental injustices.

4.1. Multidimensional effects of forest cover and tree loss: "The sadness that we feel is due to the forest clearing around the headwaters" (Theme 1)

Participants from all villages, except Guaimaral, reported significant forest loss taking place in the municipality as far back as 40 years ago. Forest loss was repeatedly linked to reduced streamflow and wildlife decline. Local perceptions unveil that deforestation has been the product of a conjunction of indirect drivers, which include the predominance of private land ownership, and weak and ineffective environmental policies. This quote from a participant from Corral de San Luis exemplifies this and confirms the existence of power structures and resistance through direct complaints before governmental authorities.

> "In the year 72, 73, a certain person bought some land up there in Cipacoa, between Juaruco and Corral de San Luis. There were many corpulent *Ceiba* trees there and they removed them all. I went to Tubará to speak with the major and told him that the land was being cleared, I warned him that the stream was going to die because they were stripping the headwaters where the springs are, but they did not listen. After the man cut down all those trees, he came and covered a vein of the stream that comes down from Juaruco, the one we call El Chorro, to make a lake, and after that the stream started deteriorating… it dried up… but since they are wealthy people one cannot do anything"

The underlying causes of deforestation seem to have varied over time. One participant expressed that, in the past, subsistence agriculture and charcoal production by locals were significant drivers of deforestation ("Previously the peasants here in Tubará were going to the countryside to farm and would cut down the forest and turn it into charcoal, they took it to Barranquilla and also got some money and used it for their livelihood… but

they have prohibited it already"). More recently, deforestation for urban and tourism development in certain areas of the municipality, especially around El Morro and Juaruco, was brought up by participants across villages, who also manifested concern regarding the negative impacts on wildlife, the local economy, and lifestyles.

> "For me, the new exploitation that exists is the tourist exploitation, which is to make condominiums in which people are going to enjoy an exotic, ancestral area, the forest, the sea, and Atlantic gastronomy, and behind that, there is a significant geographical impact" Participant from Tubará

> "They're cutting down the forest to urbanize… And these urbanizations are for tourists, people from outside, because how are we supposed to have money to buy land here… we are not against development, but the truth is that it affects us a lot, because of property taxes, and because we are used to being isolated, then the noise affects us a lot, and also the animals" Participant from El Morro

> "Because of the forest cutting they (wild animals) are seen less, and because of the noise, before if a car entered Juaruco it was rare but not now, so the animals are scared away by the noise" Participant from Juaruco

Regarding the link between forest loss and wildlife decline, one participant from Corral de San Luis explicitly stated that changes in wildlife decline are also underlined by environmental regulations allowing excessive habitat loss.

> "Hunting is still practiced, but very little, because with no forest, the animals are withdrawing, they are leaving. They say it's the human, it's not the human, well it is on one hand but not the other because wildlife takes shelter where there are trees, but if the forests are taken away from them, where do they go to? So, it is not the hunter, the environmental authority is responsible because they approve permits to cut down 10, 20, 30, 40, 50 hectares of forest"

Concerns about reduced streamflow exacerbated by prolonged drought were also expressed by a participant from Tubará ("The sadness that we feel is due to the issue of the forest clearing around the headwaters. The tree is what makes or maintains the water, and makes the sources produce […] After the droughts we have experienced, due to lack of water, the micro-basins here have dried up"). Moreover, one participant from Corral de San Luis linked forest cover to local rainfall patterns and streamflow by narrating a childhood memory.

> "I remember when I was 8-10 years old, my grandparents had a piece of land there between Juaruco and Las Perdices, a point they call Pital, at that time there was forest, quite a lot of forest, and it rained all the time, like the moor you see in Bogotá, I've seen it on television, it reminds me of ancient times... I remember that sometimes they would tie us to a rope to pass the stream to go shopping to Puerto Colombia… although the streams were at mid-level all the time, they never ceased to scare us, as I say, because of the rain"

Although perceptions centered on environmental change as a negative outcome, three participants brought up the establishment of a protected area (i.e., *Triangle of the Reserve*) by the environmental authority in recent years, as a positive change. However, two of them deemed it as an ineffective strategy in halting deforestation due to weak enforcement of the measure ("They have not respected the protected area and have done whatever they want. There are streams and springs that had not dried up for a long time and have been drying up because they have been cutting down everything around the headwaters").

4.2. Changing traditional food systems and economies: "The science of nature, agriculture, is being lost, the peasants are disappearing" (Theme 2)

Participants across villages, especially from the municipality center, consistently reported changes in several components of the traditional food system, including an overall decline in local food production (i.e., subsistence and small-scale agriculture formerly taking place in home gardens) and food harvesting (i.e., hunting, and fishing in the coastal area), as well as traditional land management practices such as field burning. However, this was not the case of interviewed farmers from Juaruco, Cuatro Bocas, Guaimaral and Corral de San Luis, who despite confirming the overall erosion of traditional food systems, still resist by preserving such traditions.

One of the most important drivers of this decline, which was repeatedly highlighted by several participants from Cuatro Bocas, Juaruco, El Morro, and Corral de San Luis, is the lack of access rights to land, accompanied by limited access to agricultural assets (e.g., financial, machinery).

> "We are the owners of the territory, but we don't have land. If this man had not lent me this piece of land, I would have had nothing, I would have had to stay locked up in my house... because wherever I am, even if it is a little corner, I am planting... the desire to work does not go away" Participant from Cuatro Bocas

> "In Juaruco they still live from agriculture, my father lived from that, from growing cassava, millet, corn, squash, there are still people who have that tradition, however, here (at El Morro) it was lost, because there is no land to do it"
> Participant from El Morro

Several participants also referred to the effects of perceived changes in rainfall patterns on subsistence agriculture, as exemplified by these quotes from a farmer from Corral de San Luis and a former farmer from Tubará.

> "In 2016 my cropland dried up… I had soursop, guava, mango in production… and all that died… I told my wife if it wasn't for them, I would hang myself... In 2017 it came the rain, that's when we were able to collect a little harvest"

> "Here there is no way to cultivate if it is not with the rain, and if it rains too much it damages them, and if it does not rain, we lost them too"

Several participants emphasized that the decrease in farm labor also drives subsistence agriculture decline, and that underlying this driver it is the lack of interest from new generations in agriculture and preferences for employment sources and lifestyles provided by nearby urban areas.

> "Most people here go to work in Barranquilla and Tubará has become a roost because they come at night to sleep, and they leave in the morning… that's why the rural practices have declined… Young people today already have another vision… They look at the city, at change… For our ancestors, food came from agriculture, which was the fundamental basis of the economy here in the municipality. All those people have already passed away, and the young people… hardly look at the countryside, which is where the main source of our food is, but since the city is nearby, 40 minutes away…they prefer the city"
>
> Participant from Tubará

> "Most people do not work in the field, they work in Barranquilla, it is a strange way of life because in many towns they live from agriculture, here most young people have looked for jobs in companies and have forgotten about the field"
>
> Participant from Cuatro Bocas

> "Here (Guaimaral) most of us work in agriculture, but sometimes we say that we don't know how it will be in the future. I have 6 children, but some have already taken jobs in Barranquilla and dedicate very little to the field, but they still know what it is to make a cropland and work in the field"
>
> Participant from Guaimaral

The offer of education and health services from Barranquilla was also identified by participants as one of the reasons why new generations are seeking more urban lifestyles, in detriment to traditional ways of living. As part of the increasing connection to regional dynamics, participants also manifested a higher reliance on local markets for food provision ("We buy food, that is, we don't consume so much bushmeat... We must go to Barranquilla to buy all that"). The municipal tourism economy, especially coastal, is recognized by participants as increasing and an important source of employment. Tourism has also increased in forest areas, like Corral de San Luis, where it was perceived positively by several participants ("I think is good that tourism is coming. Right now, there is good tourism around here because you didn't see that before. Before it was the same people from Tubará, but now people from Barranquilla also come").

Hunting and fishing were also mentioned but as declining practices of the communities. Some drivers of these declines are based on policies discouraging these practices. For example, the perceived decline in wildlife populations and the establishment of prohibitionist policies against hunting decrease hunting practices by community members. Whereas less fishing is being driven by the regional markets and a monopolized coastal economy is decreasing fishing opportunities and income generation.

> "Here we still eat deer… That meat is tasty. They also catch rabbit, *guartinaja, ñeque*, about three days ago they caught two armadillos... They are tasty, the little ones eat them, I don't eat them... my grandparents hunted, that's what they lived on... it is still consumed but not so much because there are almost no more animals"
>
> Participant from Corral de San Luis

> "There in front there is a man who does kill deer, *guartinaja*, he kills everything, he hunts. No one hunts here anymore, these old men don't hunt anymore... and the boys even less, one day they went hunting and the police caught them, they took away their shotgun and put them in jail, my children didn't go back to doing it, they were on these lands over here" Participant from El Morro

> "The fishermen used to sell a lot of fish, now is rare for them to fish, …, since the hotel began it has affected many things. Before when I worked at the beach I found fish easily, they sold it and they gave you a lot, you don't see that anymore…they bring the fish for the businesses from Barranquilla and here they fish very little…before the huts sold a lot and one earned 60-70 thousand pesos, not anymore, they give you 30-40 thousand pesos… Because now they (tourists) go to the new hotel"
>
> Participant from El Morro

Participants across settlements also expressed health concerns related to the quality of the foods they were consuming. They often discussed differences in the way farm animals were traditionally fed as opposed to industrial farming, and associated that with the longevity of older generations. Change in food systems also manifest through a perceived decrease in the diversity of food items available to consume. Participants reinforced this perception by recalling the varieties of crops that used to be sowed and consumed in the past ("Here they used to plant everything, they planted yucca, corn, millet, yam, kidney beans, beans, pigeon pea, watermelon, melon. *Tubará* was rich in all those things, wherever you'd go to, you'd find food, people would have a hen in the backyard, a pig, a goat, not anymore").

4.3. Exclusion from participation and lack of recognition produce distributive injustices: "For better or worse, they (developers) entered, economic power is what rules whether we like it or not" (Theme 3)

For the most part, environmental justice issues were identified implicitly in participants' accounts as indirect drivers of landscape change. They include current land tenure systems, environmental management and regulation, municipal and regional planning, weak enforcement, and ineffective policy. The exclusion and lack of recognition of certain groups in decision-making explain many indirect drivers of change and the resulting distributive injustices. Perceptions confirm existing power structures based on wealth and land ownership by individual and private actors. In response, a variety of forms of resistance are discernible in participants' narratives.

4.3.1. Recognition

One of the participants expressed that the root of current challenges faced by the indigenous group in terms of their capacity to organize, resist as a cohesive institution and gain governmental recognition, dates back to colonial times, through the impacts of colonization on the indigenous culture, identities, and systems of knowledge. The following statement made by a community member explains this well.

> "From the time of the arrival of the Spaniards they determined the indigenous to be wild beings, without souls, so they put in the hard drive of the communities that being indigenous was despicable, and today there is a lag of that…Western culture has permeated our culture, many features of the mother tongue were lost, many indigenous people were ashamed to be called indigenous, in short, that difficulted the organization and defense of the councils and the territory"

The lack of recognition of sites valuable to the indigenous community is evidenced in this participant's account from El Morro, who recounted having a discussion with the environmental authority after the environmental permitting process allowed vegetation clearing around a heritage site. This was enabled by the unawareness of government staff at several institutional scales.

> "In fact, about this urbanization project here, on Saturday we had a discussion with the environmental authority because there is a heritage site there (*Piedra del Beso*) that fell within private property and was affected. The man who bought it said he wasn't told about it, so he didn't think it was a bad idea to clear the vegetation around it… But even if the process continues, as much as they want to repair it, the damage is already done... they even have all the permits from the environmental authority and the municipality that are required to carry out the project... There are officials who are there for the salaries, but they really don't know our territory. The environmental authority says that if the municipality gives permission, why would they hinder a permit, but they don't come to inspect the areas where they're giving the permits either"

Despite the lack of government recognition of culturally significant sites for the indigenous community, other participants' accounts also display other forms of resistance, such as keeping traditional practices, especially in relation to agriculture and land management. One participant from Corral de San Luis talked about the practice of seed saving.

> "The corn that we sow is called Creole corn, not the one that the environmental authority gives you, which only gives a single harvest, hybrid corn… if you plant this (creole corn) this month, they give you a harvest and you take it just as I have it there and save it for the next year, and it comes back and always gives you a harvest, that's like one's family, from generation to generation, we have years of having that same corn crop"

Participants from Cuatro Bocas also resist by organizing and through legal action.

> "The fight that my grandparents had we have continued… In the last 20 years people like me and other brothers have been brave in the fight, they have come to threaten us, but we do not let ourselves be intimidated, and the goal is to continue with this, and now with the ruling of the Court we have more reasons to continue in the vindication of territorial and ethnic rights of the indigenous community, of the reservation, especially in Tubará"

Several participants expressed that their actions of resistance have historically been met with violence ("Our leaders are in danger for the claim of our lands …Some mayors of indigenous lineage who defended the cause were killed, kidnapped...") and in the present ("One who is leading things is not well seen, because we always file complaints, I have had enough threats, from people around here who are powerful") which hinders their efforts for recognition.

4.3.2. Procedural

Participants repeatedly expressed the existence of failures in the process of environmental permitting and law enforcement. Narrative accounts from participants from Cuatro Bocas and El Morro suggest that environmental policies based on fines are inefficient, as they do not seem to be deterring certain stakeholders from deforesting ("With the environmental authority we have filed reports of deforestation and they come and make arrangements with the person who is building or deforesting, and nothing happens, they pay the fine and continue as if nothing had happened"). In the eyes of several participants, the local community is also excluded from the decision-making process, which is also prone to be influenced by existing economic power structures.

> "You know that money moves everything, so they give free rein to permits, authorities like the environmental authority and other entities, but they have not done an in-depth study, they have not even listened to us" Participant from Cuatro Bocas

> "The environmental authorities, who are the ones who give permits, are to blame. They won't give me a permit to cut down a hectare of forest for my crops because it is going to harm nature…But then another (wealthy) person comes and asks for a permit to cut down 20, 40 or 50 hectares of forest and they give them the permit, and the land is left as a desert. So, who is to blame?" Participant from Corral de San Luis

Moreover, one participant from El Morro expressed concern about the unfair expenditure of revenue raised from fines by the environmental authority, accompanied by a sense of hopelessness in relation to institutions working against them.

> "At first, we started the complaining because they did not envision the magnitude of the danger that they were going to cause, they said that we were opposing to development. In that fight, I sent a complaint to the environmental authority and requested that they give me the permits that they (urban developers) had obtained, and they responded that

> they had not authorized anything. They paid a visit, and in the end, the winners are the environmental authority because they impose a fine, then give the permits, and the money goes to them, and we are fighting for the resources to be invested in the communities that are the most affected. I said that, from now on, I am not going to file complaints so that the environmental authorities benefit, I do not see any guarantee in that. In addition, one gets an enmity for messing with these people, one is exposing oneself. But nevertheless, if one would find support in the authorities it does not matter, we continue, but if one does not find support in the authorities, and they say they have the permits, then what can we do?"

4.3.3. Distributive

In Corral de San Luis participants' testimonies suggest that the local community is bearing the burdens of inefficient governmental interventions in the landscape. After the construction of a new tertiary road intersecting the natural stream system, participants' accounts express new antagonistic interactions between locals and the environment.

> "Transportation is very difficult when it rains too much, which is what is terrible, because of the streams, there are no bridges nor anything, the streams are the only problem we have here"

Similarly, in El Morro, the *Vía al Mar* national highway expansion project impacted local water bodies valued by the community.

> "Before, access was super complicated, when it rained even worse, the roads, although they bring progress, also deteriorate the environment…The two *Vía al Mar* consortiums (national highway) they found a waterhole, covered it up, and then generated a series of impacts on the environment"

Local perceptions regarding forest and tree cover loss also confirm existing power structures based on wealth and land ownership driving distributive injustices. In the eyes of participants expressing perceived forest loss, this change impacts water bodies, and it is also concentrated around villages that still rely on artisanal wells for freshwater provision. This pattern is shown in this quote from a participant from the municipality center.

> "Where the basin is born in Cipacoa we had an altercation with a number of people who have economic power, because we saw that they were going to cut down 70, 100 hectares of forest where the real waterhole is, then almost the entire area was left without water, and with the issues with the drought, they cut down all those trees"

Narratives express that Barranquilla is outsourcing externalities of industrial operations to Tubará. Specifically, the operation of the landfill was brought up by the participants as a source of environmental harm to the community of Cuatro Bocas ("It is a great environmental impact because (Tubará) is Barranquilla's landfill"). The community of

Cuatro Bocas has responded to the impacts of these and other industrial operations through organizing and legal action ("We have filed complaints, in fact we are going to speak out soon… not to go to fight, because that monster is already there, but for them to mitigate and study the impact that is carrying out with those projects").

Lastly, distributive injustice also manifests through the unfair distribution of environmental goods. Two farmers from Cuatro Bocas and El Corral de San Luis manifested that the lack of agricultural assets (i.e., financial, machinery) has been one of the main drivers of agriculture decline. Perceptions unveil that the governmental institutions' limited allocation of agricultural assets, together with the lack of land property rights, hinder the co-production of environmental benefits (e.g., food from agriculture).

> "If you don't have land, there is another person who rents it, it's like with houses, it is rented for two or three years. But since one is poor and the misfortune is greater, if in those three years it doesn't rain one loses the harvest… If there was irrigation, it would be different, having the resources is different, I could buy a hose, pumps and I set up my irrigation, but we don't have the money" Participant from Corral de San Luis

5. DISCUSSION

5.1. EJ issues arise from the complex social and ecological interactions leading to landscape change in Tubará

5.1.1. Land tenure systems drive landscape change and are associated with environmental injustices

Examining the indirect drivers of environmental, cultural, and socioeconomic change highlights the role of current land tenure systems in underlying direct drivers of change in the Tubará landscape. Land tenure systems in place favor private property and the predominance of private short-term economic interests, over long-term collective ones. To the Tubará SES, these systems can be interpreted as legacies of colonization and conquest processes. During the colonial period in Colombia (1550-1810) patterns of property in the countryside consisted of a dual model in which large extensions of land were taken by descendants of the Spanish colonizers (mainly for cattle farming) and smaller plots of land called *resguardos* were handed to indigenous peoples for their collective use and the production of food for surrounding populations (Melo, 2017). Some of these *resguardos* dissolved or significantly decreased in size, and some remain today. Mokaná indigenous peoples in the Colombian Caribbean inhabit a *resguardo* of colonial origin which encompasses the municipality of Tubará and other municipalities in the

Atlántico department. However, legal controversies related to the recognition of Mokaná's cultural, ethnic, and land rights, remain and explain patterns of landscape change resulting in environmental injustices (Section 5.1.3.).

Land tenure systems described above, have resulted in the privatization and unequal distribution of the land in Tubará. Barón-Rivera (2002) found that in 1996, small plots (less than 15 ha) made up 15% of the total surface of the municipality and were owned by 71% of the landholders. In contrast, large plots (more than 50 ha), which made up 52% of the land surface, were owned by 9% of the total landholders. This indicates that a greater proportion of the municipality's surface was by then, in hands of relatively few landowners. This means very few can potentially initiate greater transformations in the landscape, which is repeatedly revealed by perceptions of indigenous community members. Although cadastral data (evidence primarily used for boundary determination) is not updated, hampering a precise assessment of inequalities in the distribution of the land, participants' accounts confirm that these conditions persist. This data has further enabled landscape change and environmental injustices to continue.

5.1.2. Lack of recognition and participation in decision-making drives distributional injustices and undermines the local adaptive capacity

The intersection between recognition and procedural injustices is expressed as the exclusion of certain groups from participating in analyzing problems and the political development of solutions (Schreckenberg et al. 2016, Sikor et al. 2019). The underlying roots of this injustice disrespects indigenous identities, values, interests, and ways of knowing. In Tubará, urbanization and infrastructure development projects have affected and devaluated culturally significant places for the local community, such as water bodies and ceremonial sites. These transformations also exhibit heterogeneous spatial patterns across the landscape. Greater impacts seemed to be experienced by communities more reliant on nature to provide positive contributions to a good quality of life. For example, perceptions expose that forest loss is greater around villages such as Juaruco and El Morro, which still rely on local water systems for their freshwater provision.

Assets people can draw upon (e.g., financial, technical, technological, service-related like health care) are important determinants of indigenous community adaptive capacity to land-uses and climate change (Cinner and Barnes, 2019). The IPBES framework highlights the role of institutions and governance systems in determining the access to, control, and allocation of assets, and thus, the co-production of nature's contributions to people (Díaz et al., 2018). In relation to the erosion of traditional food systems, it can be argued that environmental injustices manifest by undermining the adaptive capacity of local communities through the lack of allocation of agricultural assets. These conditions, mixed with insecure land tenure, have contributed greatly to the erosion of traditional food systems. Thus, there is a need for institutions and governance systems to mobilize these assets to reduce these negative trends.

Nature's contributions to people can also be negative because of the interlinked factors causing the selection of one land-use to reverberate negatively on another part of the matrix landscape following another land-use (Blanco et al., 2019). In that sense, institutions and governance systems also produce environmental injustices by allocating anthropogenic assets that change the landscape and, in conjunction with the environment, co-produce negative contributions burdened to specific social groups. This is apparent in narrative accounts in regard to the impacts of infrastructure development, specifically roads, on streams and water bodies valued by the community. Although implemented policies responded to local needs for an asset that would improve their quality of life, its design ignored the local community's values and potentially twisted them (i.e., now the stream poses safety challenges for the inhabitants of one of the villages).

5.1.3. Local and indigenous groups resist environmental injustices associated with change

ILK inherently evolves by adaptive processes (Díaz et al., 2015), and it initiates institutional responses in relation to the management of resources and the way they are used (Gadgil et al., 2003). The knowledge about environmental change held by local and indigenous communities in Tubará, has ignited local responses in the form of resistance. There is a need to make visible the multiple ways these communities resist dominant societal structures and their associated power dynamics. Research focused solely on the negative aspects of oppression in indigenous communities can be significantly harmful (Tuck, 2009). Resistance expresses in multiple ways, such as direct action through protest, and legal actions, but also through participation in ceremonies, learning and teaching of indigenous languages, and continuing traditional practices like hunting and fishing despite personal risks (Norgaard and Reed, 2017). These forms of resistance are present in participants' narratives, especially legal action.

In 2017, the Mokaná indigenous group filed a *tutela action* (a legal mechanism that allows Colombian citizens to assert their fundamental rights) against several governmental institutions (including the National Lands Agency, the Tubará Town Hall, and the environmental authority) and private actors (e.g., industries operating in Barranquilla, urban and infrastructure developers). After the legal review of the evidence that indigenous lands could not be transferred to private ownership, it concluded that there are obligations between both parties and that the government institutions had violated the consultation rights of indigenous groups by not recognizing their ethnic and cultural identity and customary lands.

In 2019 the Court pronounced in favor of the Mokaná. This ruling stated that the actors involved did not verify the presence of ethnic groups in the areas to be modified. It reaffirmed the violation of the fundamental right to prior consultation and the imminent impact of the disturbance on the geographic, cultural, ancestral, and spiritual territory of the community (Sentence T-011/19). This judgment from the court sustained that, despite existing controversies around the governmental recognition of the indigenous group and

its collective rights over the land, actors responsible for projects that might affect communities and their territories cannot disregard the existence of ethnic communities and their rights to be consulted. Thus, the decision required that parties must settle controversies through dialogue mechanisms that guarantee the effective participation of all communities. This legal precedent will be key to ensuring that indigenous and local communities effectively participate in decision-making processes related to landscape change in Tubará.

5.2. Indigenous and local knowledge to build new ways of framing environmental problems and adaptive capacity

Drivers of change form a complex system of dependencies, interactions, and feedback loops, and affect landscapes at multiple spatial, temporal, and institutional scales (Bürgi et al., 2004). Understanding how drivers of change alter landscapes and the benefits people derive from nature aids in the identification and testing of policy options (Díaz et al., 2018). Perceptions about environmental change in Tubará signal relevant knowledge on ecological processes and change held by the indigenous and local community members that needs to be part of a framework of environmental problem-solving. This is shown by the emergence of patterns in participants' accounts pointing at the negative effect of human-induced forest and tree cover loss on available water supplies.

FAO (2020) reported that 90% of the world's cities rely on forest watersheds for their water supplies and that approximately 75% of the world's accessible fresh water for agricultural, domestic, industrial, and environmental uses come from forests. Local perceptions of environmental change in Tubará might be signaling potential environmental problems deriving from forest loss, which might impact the adaptive capacity of SES beyond the Tubará municipality. Although other studies found significant land use and land cover changes in some areas of the municipality during the last 10 years (Shubert et al., 2019), they did not identify any environmental issues that needed to be addressed. In such a way, knowledge derived from the local community could be regarded as an early warning indicator of emerging problems not detected at some scales of analysis used by evidence-based science.

Centering approaches to landscape planning and management around the adaptive capacity of nature and rural and indigenous peoples in relation to potential damages of climate change is important to determine whether these communities will be able to continue to live on their historical and customary lands (Marchand et al. 2020). Cinner and Barnes (2019) propose several social factors that build or undermine resilience to social-ecological change, providing insights into the implications of landscape change for the adaptive capacity of the Tubará SES. Learning, that is, a social system's capacity to recognize change, identify causes and assess potential response strategies, is a pattern discernible in local perceptions of landscape change in Tubará. Interviewed participants recognized several types of environmental change over time and identified

interdependences between elements of the natural system (e.g., forest and water cycle), which signals the existence of valuable knowledge that could serve as an input for planning and environmental management around adaptive capacity. Social systems are also more resilient to social-ecological change when they can access a diversity of assets, and when social networks and institutions share knowledge and cooperate to build resilience. As discussed before (section 5.1.2.), the lack of access to assets (e.g., financial and agricultural assets) and the exclusion of local voices and knowledge from decision-making have hindered the local community's adaptive capacity. Further it has contributed to the erosion of traditional food systems and enabled landscape transformations that disproportionally impact local communities. These implications gain greater relevance for Tubará, based on local perceptions indicating that climate change exacerbates the negative outcomes of landscape change through heavy precipitation events and prolonged drought seasons.

5.3. Landscape planning and environmental management: Decision-making should incorporate all relevant stakeholders, at multiple scales

5.3.1. Multistakeholder engagement and collaborative governance at the municipal level

Insufficient consideration of multiple stakeholders' perceptions and values in decision-making processes will likely result in ineffective policies (Villamor et al., 2014). Furthermore, it has been argued that the extent to which ecological and social outcomes are a problem depends on politicized, social-cultural processes, which shape the positionality and subjectivity of involved actors, that is, power operates in and through SES (Cote and Nightingale, 2012). This study's results suggest that the exclusion of certain groups and their ways of knowing from decision-making has resulted in negative environmental and social outcomes of policy implementation, and that power structures based on wealth and land ownership exist and drive great transformations in the landscape. Although these results represent the voices of local community members historically and unequally burdened with the negative outcomes of interventions, they only account for one side of the story.

Venues for multistakeholder engagement in decision-making should have representation from all other social groups that are part of the local community, such as cattle farmers, incoming dwellers, coastal communities, as well as governmental institutions, and private actors. Bringing these stakeholders together should guarantee that existing power imbalances are resolved, to prevent more powerful political and economic interest groups from manipulating the process or discouraging the participation of less powerful actors (Ansell and Gash, 2007). This is particularly relevant, as it has been shown that interest groups such as businesses and professional groups can heavily influence the later stages of the environmental rulemaking process during *ex parte* or off-the-record communications (Reinfret and Furlong, 2013).

New forms of governance, such as collaborative partnerships, prioritize the engagement of multiple stakeholders in consensus-oriented decision-making processes and hold the potential to minimize the emergence of environmental injustices. Collaborative approaches to governance pose a promising alternative for Tubará, since they provide forums where social capital is enhanced among stakeholders, leading to better decisions, reduced conflict, sustained policy implementation, and improved environmental outcomes (Gerlak et al., 2013). Local perceptions revealed that the Mokaná indigenous group has traditionally been excluded from environmental management and municipal planning decisions, which has propelled them to pursue alternative venues (i.e., legal action). By creating forums to address the different sets of interests, while elevating those of underrepresented groups, collaborative governance approaches in Tubará can enhance the very much needed procedural and distributive fairness of policy decisions (Gerlak et al., 2013).

Finally, collaborative approaches to decision-making could help solve issues arising from scale mismatches, where the scale of planning might not align with the scale of management. In our case, whereas the environmental authority operates at the departmental level (which includes 21 other municipalities besides Tubará), individual municipalities, and even villages, may face concerns and challenges that do not align with conservation plans established at the departmental level. This is evident in wildlife conservation policies that prohibit hunting at the departmental level, ignoring the importance of bushmeat in sustaining traditional food systems. Relying on prohibitionist policies, mainly focused on criminalizing hunting, is a narrow approach. There is a need for integrative programs that consider ecological, socioeconomic, and institutional contexts in which these wildlife conflicts occur (Bashares, 2014). Collaborative platforms could be useful on this matter, as it has been argued that incorporating stakeholders' perceptions and values in the decision-making process can facilitate the achievement of conservation goals and targets (Young et al., 2013). In this sense, scale-specific knowledge, such as ILK, gains greater relevance for decision-making to reduce the emergence of injustices. The need to produce policies and programs that consider smaller divisions within the municipality, both rural and more urban, is key. Whether these can be equitably governed by the same policy, or meet the needs of different ecosystems and people, is a question for further inquiry.

5.3.2. The importance of scale in SES analysis: the regional context highly constrains the Tubará SES

This study's results show that trajectories of landscape change in Tubará have been highly influenced by processes and dynamics unwrapping in the Barranquilla Metropolitan Area. Aldana-Domínguez et al. (2019) showed that, in the last 30 years, natural areas such as tropical dry forests and mangroves have decreased after Barranquilla's urban expansion, together with their supply of positive contributions to people. In contrast, the authors found that urban areas have increased, and projected that this trend would continue based on the current Territorial Ordering Plan. Schubert et al. (2018) also found that hotspots

of woody vegetation loss in the Barranquilla hinterland have varied over time, expanding from Barranquilla and its surrounding smaller municipalities between 1985 and 1990 to farther areas in the region, such as Tubará, between 2001 and 2010.

The relationship between Barranquilla's urban expansion and environmental change in the Tubará municipality is supported by local perceptions regarding the drivers of forest loss. The local community perceives that cattle farming used to be a major driver of landscape change decades ago, whereas urban development in the municipality, boosted by higher demand for housing, land for development, and tourism services, is driving greater transformations nowadays. These perceptions are supported by a second study by Schubert et al., (2019), who reported that significant areas of pastures and fields have been converted to bare and cleared soil for construction in the last ten years, which increased by 423%. The conversion of agricultural rural, and forested lands to residential (i.e., urban, and suburban development) is also recognized as one of the main drivers of fragmentation of landscapes and forest cover worldwide (Munroe et al., 2005).

Cultural and socioeconomic change in Tubará can also be explained by looking at the interactions with the Barranquilla Metropolitan Area. The linkages between urban and rural systems, and their outcomes, have been widely explored in the literature. For instance, it is recognized that outmigration from rural areas affects land-use patterns through the decrease in the labor force and consumption needs, and the inflow of remittances (Lambin and Meyfroidt, 2011). More specifically, the increase in rural households' wealth has been associated with less engagement in agriculture worldwide (Barrett et al., 2001). This global trend seems to manifest in Tubará, where the local community attributes subsistence agriculture declines to the lack of farm labor and a change from subsistence to market-based economies. Although remittances from family members working in Barranquilla could increase food security in the event of crop failures caused by droughts (Liu et al., 2007), greater dependence on regional markets for food provision can result in negative feedback loops. For example, food price increases and volatility resulting from the effect of virus outbreaks on food supply chains can impact food security (Torero, 2020). Several participants mentioned this concern. The link between wealth and cultural valuation is more complex, given that some communities continue to value subsistence agriculture despite remittances (Jokisch, 2002). This might also be the case in the Tubará municipality, where subsistence agriculture continues to be practiced and valued by some community members.

Lastly, although participants did not link observed landscape change to policy outputs such as Territorial Ordering Plans, further research should explore how these policy tools might be incentivizing development in Tubara's rural lands. It has been argued that land use and zoning policies often respond to a variety of political interests and stakeholders. At regional scales, inconsistent zoning, expressed in less restrictive zoning policies in rural areas, might incentivize development in rural areas proximate to urban centers (Munroe et al., 2005). It has also been discussed that interconnectedness is a key feature in landscapes that could have implications on geographies of power. Gold and Revill

(2000) propose that “landscapes that express power and privilege are always the flip side of landscapes of exploitation and disadvantage”. The results of this study motivate the exploration of future questions around the role of power and knowledge in influencing landscape change and planning at regional scales, and whether they translate into environmental justice issues. These questions should also be examined within the municipality, given the heterogeneity of social groups and interactions with the environment.

6. CONCLUSION

SES theory motivates us to avoid reductionist perspectives that could miss relevant cross-scale effects (Arlinghous, 2017) by placing greater attention on cross-scale relationships and hierarchical organizations. Landscape change can only be understood when situated within its general geographic context with all its related dynamics (Antrop, 2004). Trajectories of landscape change at the regional level, significantly driven by the urban sprawl of the Barranquilla Metropolitan Area, explain many of the environmental and social changes taking place in the Tubará SES. In addition to this, political, cultural, and socioeconomic contexts are crucial to understanding the interactions between social and natural systems producing social-ecological change. In this matter, local perceptions about environmental change in Tubará serve, not only to reveal patterns and drivers of observable landscape change, but also their connections to culture, power, and justice.

The insufficient consideration of all relevant stakeholder and their perceptions, values, and goals in decision-making at the municipal level, has resulted in negative social-ecological outcomes. This stresses the need to move towards more inclusive approaches to making decisions in Tubará. The integration of diverse ways of knowing, and values, allows a more holistic understanding of SES (Villamor et al., 2014). Local and indigenous communities in Tubará hold valuable and holistic environmental knowledge that should be incorporated into more collaborative decision-making processes. This will bring about policy and governance actions that effectively support the continuance of cultural and livelihood traditional practices and the adaptive capacity of human and natural systems at local and regional levels. These considerations gain greater applicability for the development of climate change adaptation strategies, as knowledge held by indigenous and local communities could signal latent environmental problems potentially aroused by extreme weather events related to climate change.

Finally, the inclusion of local and indigenous communities' voices in the collaborative framing, design, and development of interventions, holds the promise to attenuate and prevent the further emergence of environmental and social injustices in Tubará. Future SES research in Tubará should keep exploring the pervasive influence of power relations, politics, and cultural values in shaping how people, communities, and institutions interact with natural systems. The answers to these questions will help initiate and steer desirable change for all stakeholders in Tubará, especially for the local and indigenous communities that have historically occupied this landscape.

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8. SUPPLEMENTARY MATERIAL

Table 1. Quotes supporting predefined and emerging codes in relation to environmental change and its drivers

Perceptions about environmental change and its drivers		
		Quotes
Land cover	**Forest/tree cover decrease and degradation of water bodies**	Corral de San Luis "In the year 72, 73, a certain person bought some land up there in Cipacua, between Juaruco and Corral de San Luis. There were many corpulent Ceiba trees there and they removed them all. I went to Tubará to speak with the major and told him that the land was being cleared, I warned him that the stream was going to die because they were stripping the headwaters where the springs are, they did not listen. After the man cut down all those trees, he came and covered a vein of the stream that comes down from Juaruco, the one we call *El Chorro* to make a lake, and after that *El Chorro* started deteriorating" "That (urbanization) is another thing that damages nature, the land, the environment, because they bring in the machines and they cut down all the trees, so we complain because there's no rain, and it's because there is no forest, if there is forest the rain remains" "El Chorro has changed a lot, because when I was a little girl, the stream was bigger, and the stream pool wider and deeper and it was better because you could jump in, but now is not and there are a lot of rocks, so you have to know where you're going to fall after you jump"
		Tubará "The sadness that we feel is the issue of the forest clearing around the headwaters. The tree is what makes or maintains the water, and makes the sources produce […] After the droughts we have experienced, due to lack of water, the micro-basins here have dried up […] but in that part we have improved a lot, already, because the farmers are fewer…" "Tubará emanates water from anywhere, water comes out of any stone, such as the Corral de San Luis and its surroundings, even parts of El Morro, and that water has dried up because its terrain has been impacted with the removing of the trees and mining… this land is rich in stones, and they have mined them for business, so they sell big trucks and take out big trucks of stones" "Previously the peasants here in Tubará were going to the countryside to farm and would cut down the forest, and they turned it into charcoal, they took it to Barranquilla and also got some money and used it for their livelihood… but they have prohibited it already" "For me, the new exploitation that exists is the tourist exploitation, which is to make condominiums in which people are going to enjoy an exotic, ancestral area, the forest, the sea, and Atlantic gastronomy, and behind that there is a significant geographical impact" "There are companies that extract charcoal from this area and are not legal…so for people their short-term survival is much more important, then the charcoal business is a quick way to generate food and a livelihood…people live in the short term because hunger is a short-term situation"

	Forest/tree cover decrease and degradation of water bodies	
		Cuatro Bocas “About 30 years ago (the cattle ranchers) cut down a series of trees such as the Jobo, the Red Ceiba, the Yellow and White Ceiba, the Banco, which is a tree that grows in this area. The ranchers cut down everything to have grass for the cattle and that causes damage, a great environmental impact... Here there is a farm close to Cuatro Bocas which had a large quantity of trees, and the man arrived and deforested 205 hectares” “In Juaruco they requested permission for 6 hectares and more than 300 hectares have been cut down already, and they have impacted more than 17 native species of animals" “There are farms that need to be cleared for pasture, so how are you going to tell a farmer not to cut down if he needs to clear the forest to have pasture and animals? I knew farms with lots of trees, but I don’t see them that much anymore… Recently I saw a completely uncovered farm, and it is already bare” “There are two resolutions from the Ministry of Environment where a “Triangle of the Reserve” is created between Corral de San Luis, El Morro, and Juaruco. Larger trees are still preserved there, and the flora and fauna that is there is more numerous, but they have not respected that, and they have done whatever they want. There are streams and springs that do not dry up for a long time and have been drying up because they have been felling everything around the bed of the spring, so we are concerned because our ways of using the land to plant crops are very traditional, taking care of the environment”
		El Morro “They’re cutting down the forest for urban development… There are several urbanizations, they are deforesting a lot… And these urbanizations are for tourists, people from outside, because how are we supposed to have money to buy land here...we are not against development, but the truth is that it affects us a lot, because of property taxes, and because we are used to being isolated, then the noise affects us a lot, and also the animals”
	Areas for urban	Corral de San Luis "They are building model houses here on the road to exit the highway... Those who are building now are more outsiders, all those farms belong to outsiders"

	development and built-up infrastructure	Tubará "The viewpoint park is in the highest part, you can see Barranquilla, Cartagena, all of Puerto Colombia, everything around it and people come there and see the environment and say that it is a different environment, due to the change in temperature" "In other words, from there it is said that the important thing is the people who come to visit and not what can be generated for the development of the people […] and accept it simply as a form of development, right? […] That is to say, asphalt, and that that aesthetics can be seen is telling me that there is development, although it is not proportional to what an ancestral territory means, no?" "The truth is that Tubará has changed quite a lot, quite a lot, before the trails were pure mud (earthen roads), now it is pure pavement, where one least thinks there is pure pavement…one no longer walks in mud like before, it was very challenging"
		Guaimaral "Guaimaral has grown, there are several neighborhoods up there, before there used to be tree or four houses… they're building houses, gated projects by plots"
		El Morro "Urbanizations are already arriving; we are not against development, but the truth is that it affects us a lot. One, property taxes, and also that we are used to being isolated, then the noise affects us a lot and also the animals" "Before, the essence of the Mokana people was Juaruco, now Juaruco is civilized, there are no longer bareque houses, they're all made of material"
	Pastures	Corral de San Luis "Around here you used to see a lot of cattle, not anymore. My uncle would have almost a hundred heads of cattle. The other old man had more than two hundred…They had cattle on their own land... My uncle did not kill cattle, there are people who they came from outside, they bought it and took it away, and in Tubará there was also a slaughterhouse…But the truth is that I don't see many cattle anywhere anymore. I see they are raising pork now, maybe that's more profitable now"
		El Morro "The only one who has cattle here is Mr. X, here going up to Juaruco, he is a landowner who is not from here, he has a lot of land and animals, because nobody else has. Before when I was little in each house there was one or two cows and with that they survived"
Climate		Corral de San Luis "I remember when I was 8-10 years old, my grandparents had a piece of land there between Juaruco and Las Perdices, a point they call Pital, at that time there was forest, quite a lot of forest, and it rained all the time, like the moor you see in Bogotá, I've seen it on television, it reminds me of ancient times... I remember that sometimes an uncle of mine, all those people have died, they would pass us through the stream tied to a rope to go shopping in Puerto Colombia… because although the streams were at mid-level all the time, they never ceased to scare me, as I say, because of the rain, and previously one harvest would overlap on the following " "In 2016 my cropland dried up… I had soursop, guava and mango in production… and all that died… I told my wife if it wasn't for them, I would hang myself... On 2017 it came the rain, that's when we were able to collect a little harvest" "Transportation is very difficult when it rains too much, which is what is terrible, because of the streams, there are no bridges nor anything, the streams are the only problem we have here" "I remember the year in which there were several houses that slid, and those people now live in Nueva Esperanza, a sister of mine was affected, a daughter of mine too, a niece, a cousin from there, from Tubará"

	Tubará “Time has failed us a bit, because in the field everything is managed with the time, if the time is good, everything is good, if the time is bad, everything is bad, and that's what I and many people say, that times have changed too” “Here there is no way to cultivate if it is not with the rain, and if it rains too much it damages them, and if it does not rain, we lost them too”
	Cuatro Bocas “The climate has changed, especially the heat, sometimes it cannot be tolerated, one has to look for a mango tree, which is leafy, to sit under it and spend the time”
	El Cielo “Before it did rain hard every day, very little now, it has changed… the heat is higher when it doesn't rain, you can't stand the heat, you have to get under a tree to cool down”
Wildlife	Corral de San Luis “Hunting is still practiced, but very little, because with no forest, the animals are withdrawing, they are leaving. They say it's the human, it's not the human, well yes on the one hand, but on the other not because the mountain animal takes shelter where there are trees, but if the forests are taken away from them, where do they go to? So, it is not the hunter, the environmental authority is responsible, because they approve permits to cut down 10, 20, 30, 40, 50 hectares of forest”
	Tubará “If the man arrives and cuts down the trees, they (howler monkeys) are left unprotected, they have migrated” “It is recognized that a lot of species have been lost, especially birds, animals that are no longer part of the geography, not even the countryside, such as the Yaguaro, which is the big cat, the tigrillo, or the opossum called the Zorrochucho, things like that have been disappearing significantly”
	Juaruco “Because of the logging they are seen less, and because of the noise, before if a car entered Juaruco it was rare but not now, so the animals are scared away by the noise”
	El Morro “Around here there were wild animals such as deer, ñeque, guartinaja, armadillo, but as the forest has been deforested, the animals have withdrawn” “You don't see them very much anymore, I used to see them when I was younger but not anymore”

Table 2. Quotes supporting predefined and emerging codes in relation to cultural and socioeconomic change

Perceptions about cultural and socioeconomic change		
		Quotes
Traditional food syste	**Subsistance and small-**	Corral de San Luis

	scale agriculture	"I say that the youth don't like that anymore... There are fewer people (engaging in agriculture), it's not like before" “The science of nature, agriculture, is being lost, the peasants are disappearing … I came here in the year 70, when there were good forests around here because at that time it rained a lot… At that time agriculture was preserved a lot because I am a farmer and I had crops in 4 different parts. Nature was conserved a lot but later that was ending because one kills it oneself” “My dad raised us with food crop because he was a farmer, and he made charcoal. My father lived on that, farming and charcoal, he did not work as a day laborer with anyone, that was his job”
		Tubará "Here they used to sow everything, they planted yucca, corn, millet, yam, kidney beans, beans, pigeon pea, watermelon, melon. Tubará was rich in all those things, wherever you’d go to, you’d find food, people would have a hen in the backyard, a pig, a goat” “Agriculture is fundamental in Tubará, but it has already been lost over time. The young man no longer wants to work on the farm or have some animals in the yard, that has already disappeared in the town” “Most people here go to work in Barranquilla and Tubará has become a roost because they come at night to sleep and they leave in the morning and so on … that's why the rural practices have declined a bit… People already work in Barranquilla and have left the town, they have abandoned the land, but there are people who still have crops and harvest” “Here in the town you also see all the young people go “Dad, buy me a motorcycle to work with it” but they don't look at the countryside, and they abandon it” “A person around the age of 40, 50 grew up with the idea that they had to go to a university, or to SENA (in Barranquilla) for a technical career, even go to work at his family's house in the city because they weren’t going to get anything working in the field” "Tubará ceased to be an agricultural land to become the tourist capital of the department of Atlántico"
		Cuatro Bocas “There are people practicing agriculture, but unfortunately they are older people, you cannot find people 30 years old and below who are currently planting, you will find people 40 years old and above” “Most people do not work in the field, they work in Barranquilla, it is a strange way of life because in many towns they live from agriculture, here most of the youth work in nearby companies… most young people have looked for jobs in companies and have forgotten about the field”
		Guaimaral “Those who work in a company are rare… here people still have their crops, I have planted cassava, corn, yam, back there (in my yard)” “Yes, here most of us work in agriculture, sometimes we start talking that we don’t know how’ll be in the future. I have 6 children but some have already taken jobs in Barranquilla and dedicate very little to the field but they know what it is to make a cropland and work in the field”

		El Morro “In Juaruco they still live from agriculture, my father lived from that, from growing cassava, millet, corn, squash, there are still people who have that tradition, however, here it was lost, because there is no land to do it… people in Juaruco still farm” “Here there are no crops, nobody farms, the ones that do farm go and do it nearby Cipacua, and the boys work as bricklayers… we used to cultivate pigeon pea, kidney beans, all that, now you have to buy it, and it’s getting more expensive” “Now the boys work as masons, they go to the construction sites to work”
	Hunting	Corral de San Luis “Here we still eat deer… That meat is tasty. They also catch rabbit, guartinaja, ñeque, about three days ago they caught two armadillos... They are tasty, the little ones eat them, I don't eat them... my grandparents hunted, that's what they lived on... it is still consumed but not so much because there are almost no more animals” "We buy food, that is, we don't consume so much bushmeat... We must go to Barranquilla to buy all that" “My father hunted, the rabbit, the armadillo, deer, the guartinaja, ñeque, … and as he always worked on the farm, the boss would kill a cow and give him some meat. My mother raised chickens, turkeys, ducks… It is still done but it is different, now one goes and buys half a pound of chicken at the store because it’s faster, but I continue raising my animals, I have my chickens”
		El Morro “There in front there is a man who does kill deer, guartinaja, he kills everything, he hunts. No one hunts here anymore, these old men don't hunt anymore... and the boys even less, one day they went hunting and the police caught them, they took away their shotgun and put them in jail, my children didn't go back to doing it, they were on these lands over here”
	Fishing	Tubará “We have the littoral zone, from Puerto Colombia to Juan de Acosta, and people fed on artisanal fishing, they had all those inputs” (Fishing has changed) "quite a lot, a lot, because of the fishing boats... before, a man came with 4 loaded donkeys... but now, they don't eat any of that, from the sea"
		El Morro “The fishermen used to sell a lot of fish, now is rare for them to fish, …, since the (hotel) began it has affected many things. Before when I worked on the beach I found fish easily, they sold it and they gave you a lot, you don't see that anymore…they bring the fish for the businesses from Barranquilla and here they fish very little, because if they fish they do not catch fish, the fish is not available, before (they did catch) good quantities of fish in a hammock, all that has been lost”
	Food quality and health	Tubará “Now everything is contaminated, and we are already seeing it, we are going to die of cancer because the foods we eat are already contaminated…no one can compare creole foods with what is produced now” “Before, they ate meat from the countryside, now they eat industrial farm-raised

		food. My grandfather was a farm owner, we knew how the farms were managed, but now is different. I grew up in a different time"
	Field burning	Corral de San Luis (according to the authorities it is forbidden to burn) "but I don't stop it, they will take me prisoner, and I argue. I better burn the land before pouring poison on it because the poison does mistreat the land because it gets into the soil through the pores and deepens when there is rain and the fertilization of the land is lost"
		Tubará "It is a tradition that has existed since previous times, it is an ancestral tradition, where they make charcoal and then use that land to plant cassava" "This was a piece of land that had enough food for everyone in the town, that is why today there are so many people who are 110, 120, 130 years old… At El Morro and Juaruco there are quite old people… before, the chickens were pure Creole chickens, now chickens are fed differently. People are no longer the same, we get tired easily, we can no longer stand the walk"
Economic		Corral de San Luis "When my grandmother was alive, a lot of people used to come here to see El Chorro but we didn't sell anything here, they brought their food and my grandmother cooked for them. Everything has changed because here we already sell food... We are the only people that does not charge any money to tourists, and on weekends the motorcycles and cars come and park here and we do not charge for parking, we receive whatever they want to give us" "I think is good that tourism is coming. Right now, there is good tourism around here because you didn't see that before. Before it was the same people from Tubará, but now people from Barranquilla come"
		Tubará "Beach tourism has been growing constantly, all of that is already overflowing and I have seen the growth of that economy"
		El Morro "I liked working on the beach… I worked in Puerto Velero for a while and then in Caño Dulce… I fried fish" "I used to work at the Puerto Velero beach, it is no longer the same since the (hotel), because before the huts sold a lot and one earned 60-70 thousand pesos, not anymore, they give you 30-40 thousand pesos… Because now they all go to the (hotel)"
Access to public services (basic utilities, education, healthcare)	**Public utilities**	Corral de San Luis "First came the electricity, then came the water, here the only thing we need is gas. We cooked with cylinder gas, others with firewood... Before, we had to haul water in a donkey and on our shoulders... We used to catch it down there in the well and up here in El Chorro. To wash we had to go to the stream because there was no washing machine, that's why everything has already changed, thank God"
		Tubará "Previously there were artisanal wells here in Tubará made by the natives themselves… But thank God since development came it has brought public services such as water […] Now we have an internal aqueduct that's supplied with water from Barranquilla, and we are almost equal to the city"

		Cuatro Bocas "We used to go out fishing, there was a natural dam around here and we would spend a cool day, that was the town's aqueduct, a well, but we have made progress since we have the coastal aqueduct… the well it is still well maintained by the community, the community action board and the leaders, they are always there to clean up and tourist go to check it out"
		El Morro “In El Morrito (the water) comes from a deep well here... Here in El Morro the (public utilities enterprise) has already come. Bajo Ostión, Juaruco, Morrito remain connected to the water service here (community aqueduct), it is treated with granulated chlorine and the storage tank is in the upper part” “There was always water (supply from the community aqueduct), sometimes it was damaged there but we had tanks here to store water… It is better now (with the Triple A aqueduct), because they pump every day at 8 and 6 in the afternoon”
	Education	Tubará "We had a nice production here at the school, when 6, 7, 8 tons of millet were produced at the school, there were chicken sheds, there were ponds, that was lost" “We have learned for generations that if I am not going to study something technical or something that generates a job for me in the city of Barranquilla, I am not going to generate development, then the traditions that were promoted before about the use of agricultural lands that came from the indigenous heritage are already losing value because they don’t generate any type of guarantee for people to feed themselves”

Table 3. Quotes supporting predefined and emerging codes in relation to environmental justice

	Percections unveil environmental justice issues
Distributive	Tubará “They say that at some point that territory was a sanitary landfill, which is also a reality in Tubará […] it is a great environmental impact because it is Barranquilla’s landfill. So, there are many areas that already receive this impact, such as the people of Cuatro Bocas, who are close to the landfill” “I have been proclaiming the leachate that the compactors spread on the road, it turns into dust, as one can breathe it, as it can stick to the skin” “Where the basin is born in Cipacua we had an altercation with a number of people who have economic power, because we saw that they were going to cut down 70, 100 hectares of forest where the real waterhole is, then almost the entire area was left without water, and with the issues with the drought, they cut down all those trees”

		El Morro “They paid a visit (environmental authority) and in the end, they are the ones who win because they put the fine and then they give the permits, those (financial) resources go to the CRA, and one is fighting for the resources to be invested in the communities that are the ones affected. I said that from now on I am not going to file complaints so that the environmental authorities come and benefit, I do not see the guarantee. In addition, one gets an enmity for messing with these people, one is exposing oneself, but nevertheless if one finds that support from the authorities it does not matter one continues, but we don’t find support from the competent authorities”
	Resistance	Cuatro Bocas “We have filed complaints, in fact we are going to speak out soon because we are organizing all the social, cultural, environmental fronts, not to go to fight, because that monster is already there, but for them to mitigate and really study the impact that is carrying out with those projects” “For example, there is a waterhole there, and irresponsibly a man gave permission to another man to cut down some trees, I got very angry at him, because we have to conserve the water, and the trees there help contain the terrain and the pressure of the water”
		Tubará “The association of fishermen are fighting because they are going to be taken out of the sea to be able to open a road there… those gentlemen who are fighting are over 60 and 70 years old… it seems more important to open a sailing port and improve access than protecting the knowledge of these ancestral fishermen”
Procedural		Cuatro Bocas “You know that money moves everything, so they give free rein to permits, authorities like the CRA and other entities, but they have not done an in-depth study, they have not even listened to us"
		Tubará “This knowledge should not be recognized and there is a way to silence them. When they participate, they have been silenced very aggressively. They tell them “How beautiful the old lady" but they are not really part of any process”
		El Morro "With the environmental authority we have filed reports of deforestation and they come and make arrangements with the person who is building or deforesting, and nothing happens, they pay the fine and continue as if nothing had happened"
	Resistance	El Morro “At first, we started the complaining because they did not envision the magnitude of the danger that they were going to cause, they said that we were opposing to development. In that fight, I sent a complaint to the environmental authority and requested that they give me the permits that they (urban developers) had obtained, and they responded that they had not authorized anything. They paid a visit, and in the end, the winners are the environmental authority because they impose a fine, then give the permits, and the money goes to them, and we are fighting for the resources to be invested in the communities that are the most affected. I said that, from now on, I am not going to file complaints so that the environmental authorities benefit, I do not see any guarantee in that. In addition, one gets an enmity for messing with these people, one is exposing oneself. But nevertheless, if one would find support in the authorities it does not matter, we continue, but if one does not find support in the authorities, and they say they have the permits, then what can we do?”

Recognition		Cuatro Bocas “From the time of the arrival of the Spaniards they determined the indigenous to be wild beings, without souls, so they put in the hard drive of the communities that being indigenous was despicable, and today there is a lag of that…Western culture has permeated our culture, many features of the mother tongue were lost, many indigenous people were ashamed to be called indigenous, in short, then that difficulted the organization and defense of the councils and the territory”
		Cuatro Bocas The political situation is what has us in this situation… the rulers who have another vision. The Tubará reservation has suffered a setback for perhaps almost 140 years, since 1886, a struggle of the grandparents, great-grandparents, to maintain the institution and the rights of the indigenous community with respect to the territory, so today we still see the lags and today we do not sing victory but we do celebrate a great step, which is the sentence regarding the territory”
		Cuatro Bocas “Our leaders are in danger for the claim of our lands, you know that in Colombia there have been deaths of indigenous social leaders, so we have to find the best way to avoid deaths…Some mayors of indigenous lineage who defended the cause were killed, kidnapped...”
		El Morro “The Cement company has private property all around Piedra Pintada. And right now, all these lands are already being privatized for urbanization. In fact, about this urbanization project, on Saturday we had a discussion with the environmental authority, because there is a heritage site there (Piedra del Beso) that fell within private property and was affected. The man who bought it said he wasn’t told about it so he didn't think it was a bad idea to clear the vegetation around it… But even if the process continues, the damage is already done, as much as they want to repair it, the damage is already done... they even have all the permits from the environmental authority and the municipality that are required to carry out the project... There are officials who are there for the salaries, but they really don't know our territory. They say (environmental authority) that if the municipality gives permission why would they hinder a permit, but they don't come to inspect the areas where they’re giving the permits either”
	Resistance	Corral de San Luis “The corn that we sow is called Creole corn, not the one that the environmental authority gives you, which only gives a single harvest, hybrid corn… if you plant this (creole corn) this month, they give you a harvest and you take it just as I have it there and save it for the next year, and it comes back and always gives you a harvest, that's like one's family, from generation to generation, we have years of having that same corn crop”
		Cuatro Bocas “We are making a compilation for an ethno-educational curriculum... we are writing many documents and creating other film and written material, and apart from that we have almost 2,000 archaeological pieces, we plan to make a museum at the service of the entire indigenous and non-indigenous population” “We are looking for a way to be self-sustaining, self-sufficient, create farms, agricultural pantries so that there is food security and show the outside world that we are good administrators, that we have self-sufficiency in food security” "The fight that my grandparents had we have continued… In the last 20 years people like me and other brothers have been brave in the fight, they have come to threaten us, but we do not let ourselves be intimidated, and the goal is to continue with this, and now with the ruling of the Court we have more reasons to continue in the vindication of territorial and ethnic rights of the indigenous community of the resguardo, especially Tubará”