



Reach Alliance

# The Sociocultural Impact of Pollution in Urban Rivers: Arroyo Seco and Distrito Campana–Altamira

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# The Reach Alliance

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*Note:* Authors are listed alphabetically with the faculty mentor listed last.

*Cover photo:* River with garbage and pollution wastewater (iStock)





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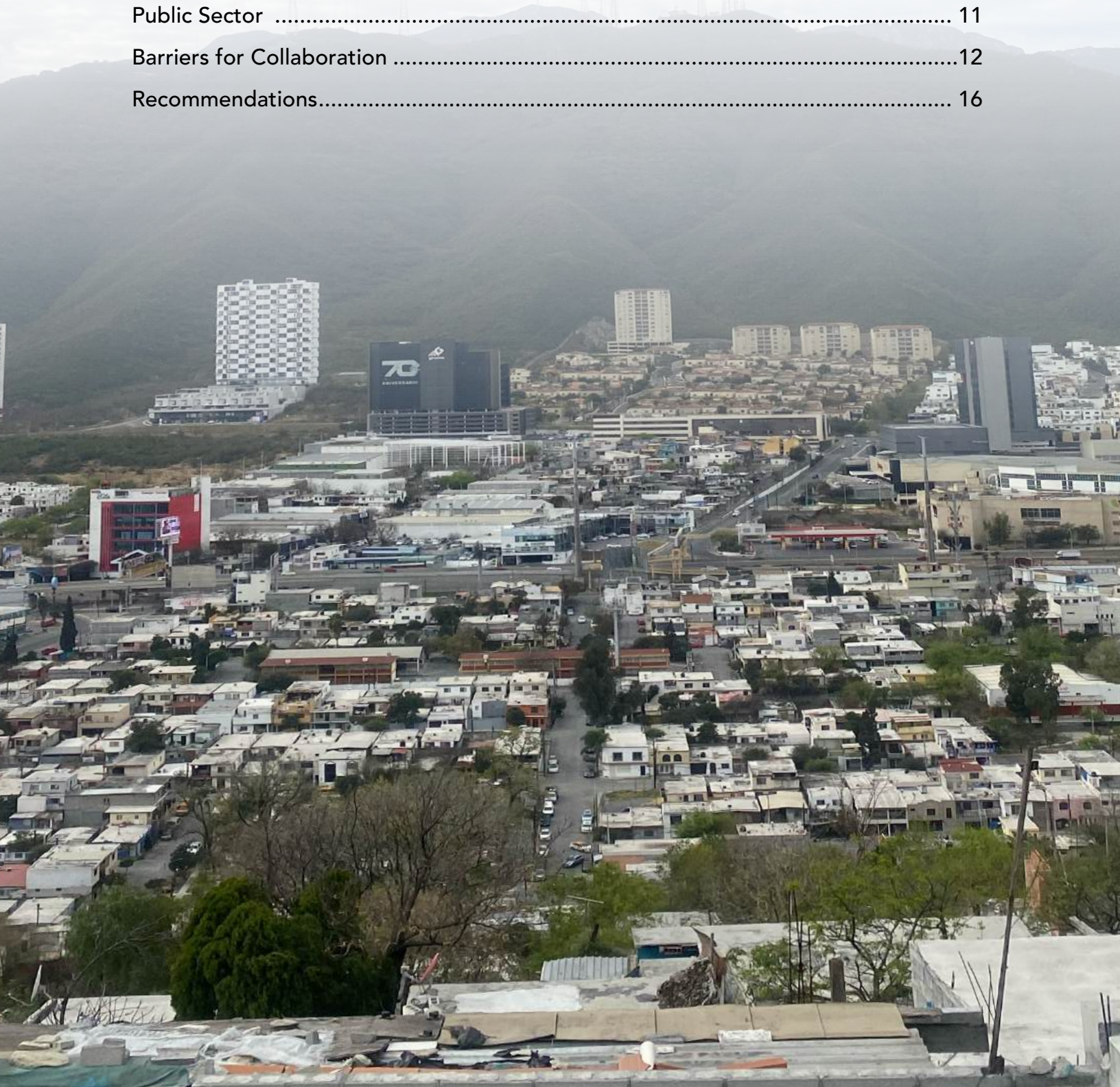
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**Figure 1.** The research team during a field visit to the Campana-Altamira community

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## Executive Summary

As cities undergo rapid urbanization, developing countries have been subject to significant deterioration of their ecosystems, rising socio-environmental issues, and unsustainable management of social-environmental systems (SES). This research focuses on the case of Arroyo Seco, a heavily polluted urban stream located in a marginalized community in the industrial city of Monterrey, Mexico. We aim to understand the effects of environmental degradation in the social and environmental sphere and to evaluate how public, private, and community sectors can collaboratively employ adaptive co-management to integrate ecological and social solutions and support the sustainability and resilience of socio-ecological systems. Through qualitative research and analysis, we identify crucial barriers for collaboration among these three spheres which are rooted in social-fabric damage and a misalignment in perception and motivations around this natural space. We also provide

recommendations for structuring an efficient co-management strategy that ensures environmental and social well-being.

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## Collaborative Governance to Revitalize Urban Rivers

The expansive growth of cities has generated complex challenges in sustainability and resilience, especially in marginalized territories. The invasion, exploitation, and transformation of spaces of ecological, social, and urban relevance, such as rivers, have been common to facilitate urban development. Initiatives to address environmental-social deterioration at different scales require innovative governance approaches. One such approach involves adaptive co-management methods that emphasize the need for flexible social arrangements among stakeholders to develop regulations, institutions,

and incentives to restore urban ecological spaces.<sup>1</sup>

This approach facilitates effective governance through collaboration between public, private, and community sectors. The public sector, encompassing all levels of the Mexican government (federal, state, and municipal), is responsible for creating policies, regulations, and the necessary infrastructure for water and waste management and environmental protection. The private sector, made up of academia, nongovernmental organizations, and businesses, contributes with research, planning, and managing initiatives. The community, made up of residents, actively participates in resource management by setting up the public agenda based on their needs. Adaptive co-management represents an opportunity for the sustainable development of the country's socio-ecological zones, mainly in areas where public, private, and community sectors hold different perspectives on managing urban-ecological spaces.

## Urban Rivers with Unsustainable Growth of Cities

Urban rivers have been an essential source of life, providing water resources, transportation routes, and economic prosperity for societies that settled on their banks.<sup>2</sup> However, in many cities the urbanization process has prioritized industrial and residential expansion over the conservation of natural resources. This has led to the degradation of river ecosystems, which now face problems such as loss of biodiversity, alteration of the hydrological cycle, and decreased water quality.

Andrés Bailao describes how urban rivers have become “ghost landscapes,” where pollution and unplanned development have relegated these bodies of water to being abandoned or dangerous spaces. Such changes are not only ecological but also social — the memories of what the river was are gradually being forgotten. Rivers that were once centres of community life are now perceived as barriers or even threats to safety and well-being.<sup>3</sup>

## The Ecological and Social Context

Environmental and social issues are deeply connected so addressing one inherently involves considering the other. Both locally and globally, evidence increasingly shows that many human–environment interactions have become entrenched in unsustainable patterns.<sup>4</sup> These unsustainable trends underscore the importance of tackling both ecological and social dimensions together. From a social ecology approach, a holistic social analysis will help clarify how environmental issues stem from social problems and interactions within and with the environment, leading to more effective integrative solutions, increased social well-being, and ecological quality. There is a growing emphasis on intentionally transforming these integrated social-ecological systems (SEs) to secure long-term well-being for both people and the ecosystem services they rely on.<sup>5</sup> Aligned with this idea, our case study considers the intersection between the pollution of an urban water ecosystem and hierarchical social issues including governance and vulnerability.

- 1 Per Olsson, Carl Folke, and Fikret Berkes, “Adaptive Comanagement for Building Resilience in Social-Ecological Systems,” *Environmental Management* 34, no. 1 (2004): 75–90.
- 2 Diana Paola Gómez Monreal and Lourdes Marcela López Mares, “Producción socio-natural de los ríos urbanos: planeación comunitaria en el río Paisanos, San Luis Potosí, México,” *Sociedad y Ambiente* 24 (2021): 1–29.
- 3 Andrés Bailao, 2019
- 4 Will Steffen, Åsa Persson, Lisa Deutsch, et al., “The Anthropocene: From Global Change to Planetary Stewardship,” *Ambio* 40, no. 7 (2011): 739–761.
- 5 Michel-Lee Moore, Ola Tjornbo, Elin Enfors, et al., “Studying the Complexity of Change: Toward an Analytical Framework for Understanding Deliberate Social-ecological Transformations,” *Ecology and Society: A Journal of Integrative Science for Resilience and Sustainability* 19, no. 4 (2014).



**Figure 2.** Arroyo Seco's current deteriorated state

## SES Co-Management

Co-management involves shared decision making between the state and local communities (or other interest groups) about how to manage natural resources.<sup>6</sup> Specifically, adaptive co-management depends on the collaboration of various stakeholders at different levels — ranging from local users to municipal, regional, and national organizations, and even international bodies. The concept brings together adaptive management and co-management, resulting in successive cycles of participation, learning, and doing. This approach requires sharing management authority and responsibilities across multiple institutions, including user groups, government agencies, and nongovernmental organizations.

In Latin America, many cities still operate under hierarchical, multilevel management systems,

where top-down government approaches dominate, often with little local community input.<sup>7</sup> This persistent political clientelism and neglect of marginalized areas creates significant hurdles for effective urban management and contributes to various social-ecological challenges.

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## Arroyo Seco: Urban and Environmental Challenges

Arroyo Seco, located in Monterrey, Nuevo León, is a clear example of misaligned management with different motivations for both social and environmental problems. The stream faces significant challenges as a result of complicated government management, poor infrastructure, and continued neglect in the industrial sector. The stream originates in the mountain ranges of

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6 Alfonso Peter Castro and Erik Nielsen, "Indigenous People and Co-management: Implications for Conflict Management," *Environmental Science and Policy* 4, no. 4 (2001): 229–39.

7 Richard Child Hill and Kuniko Fujita, "The Nested City: Introduction," *Urban Studies* 40, no. 2 (2003): 207–17.

the Monterrey summits. Its route of 5.6 kilometres crosses two municipalities of the Monterrey Metropolitan Area (MMA) — San Pedro, and Monterrey — to finally discharge into the La Silla River, located in the municipality of Guadalupe, one of the most important rivers in the MMA because of its biodiversity and because it is the only riverbed with a constant flow of water all year round.

The Campana–Altamira District and the Tec District were established around the stream as part of the region’s urban development. However, along its route, inconsistent management and pollution significantly affect the river’s value, highlighting the need for more robust governmental policies and public strategies to ensure its sustainable management and environmental protection. Even its name, which means “dry river,” misrepresents its true ecological role — a point of water absorption that promotes ecosystem functionality and stability situated within a metropolitan area with severe pollution and lack of water. Since 1989, the stream has suffered significant alterations to its natural runoff as a result of government actions, including narrowing and channeling. Multiple private organizations have worked to remediate these damages including the Arroyo Vivo (“living stream”) initiative. Focused on restoring the Arroyo Seco stream in Monterrey, Arroyo Vivo promotes inclusive recycling practices and fosters community involvement through environmental education and awareness campaigns.

## Community History

Irregular settlements began to appear in the Campana–Altamira district in the 1960s. Irregular housing, as well as risks stemming

from the sloping terrain of two mountains and the passage of the Arroyo Seco, prompted the municipal government to designate it as a “non-urbanizable area.” This designation made it available to migratory flows of people seeking an economically accessible place to live. However, changes to the natural runoff that feeds the stream have increased risks for local residents, such as flooding, soil erosion, and unstable ground. These dangers are made worse by poorly built infrastructure like unsafe stairs, streets, and even homes constructed by local developers and informal builders, with little oversight from authorities.

In 2010, these conditions of vulnerability and irregularity in the area facilitated the establishment of organized crime groups. By 2014, more than half of the homes had at least one resident who had been a victim of violence or crime.<sup>8</sup> As of 2020, the area had 19,875 inhabitants, with a density of 117,79 inhabitants per hectare, double the metropolitan average of 59 inhabitants per hectare.<sup>9</sup>

## Socioeconomic Context and Vulnerability

Labour instability, marked by the lack of formal contracts and precarious conditions, is closely tied to the economic irregularity affecting the areas around the stream. Many residents work in jobs like construction or factory labour, where wages are low and social benefits are not always guaranteed. This employment uncertainty, combined with higher costs for goods and services compared to other parts of the city — a basic basket of food is 32.2 per cent more expensive — makes it even harder to meet basic needs. Although most people are employed,

8 “Diagnóstico Integral Intervenciones Sociourbanas de Inclusión y Atención a la Pobreza en Zonas Urbanas” [Comprehensive Diagnosis of Socio-Urban Interventions for Inclusion and Attention to Poverty in Urban Areas], Government of Mexico, 2014.

9 Alejandro Carpio, Roberto Ponce-Lopez, and Diego Fabián Lozano-García, “Urban Form, Land Use, and Cover Change and Their Impact on Carbon Emissions in the Monterrey Metropolitan Area, Mexico,” *Urban Climate* 39 (2021): 100947.



their monthly wages — around CAD 327 dollars — are not enough to surpass the economic well-being threshold, leaving over 80 per cent of families in a state of constant vulnerability.<sup>10</sup> The combination of informal jobs, low wages, and high living costs perpetuates a cycle of poverty where even those who are employed struggle to escape precariousness.

We aim to understand the effects of unsustainable urbanization on urban rivers like Arroyo Seco and to evaluate how public, private, and community sectors can collaboratively employ adaptive co-management to improve the sustainability and resilience of socio-ecological systems in rapidly growing urban areas.

## About Our Research

We sought to understand the main stakeholders' perceptions, motivations, and interventions, as well as how their collaboration has affected the stream's condition. After carrying out research on relevant concepts and similar case studies, our fieldwork was conducted from February to June 2024 and included a series of in-depth interviews, field observation visits, as well as a focus group. We conducted five interviews with community members who live near the stream, two with government agents involved in its management, three with academics and members from organizations that work directly in its benefit, as well as a focus group with members of a local football team. The interviews and focus group were held both in person and through

*Before people can commit to active participation, they need to be equipped with the skills and understanding necessary to collaborate effectively.*

Zoom meetings. We used a careful qualitative methodology for data analysis and framework evaluation.

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## The Community and the River: Motivations and Perceptions

### Motivations

The low level of civil society collaboration in addressing community problems is not a challenge specific to Campana-Altamira but is emblematic of a broader issue in Mexico. Mariela Rivas, the former director of the Arroyo Vivo initiative, highlighted how the lack of participatory culture and community engagement makes it difficult to build momentum for

change. Misael, one of the individuals we interviewed, emphasized that this issue is compounded by the absence of adequate pedagogical frameworks for fostering community involvement. The result is a significant gap between the desired and actual levels of neighbourhood

participation. "Maybe they [Arroyo Vivo] came a little early to want to do the social promotion of this activity," he suggested, implying that the initiative may have assumed a higher degree of readiness among residents for collective action.

Before people can commit to active participation, they need to be equipped with the skills and understanding necessary

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10 "Proyecto del Programa Parcial de Desarrollo Urbano Distrito Campana-Altamira 2020–2040" [Project of the Partial Urban Development Program for the Campana-Altamira District 2020–2040], Gobierno de Monterrey, 2021.

to collaborate effectively. We interviewed an official from Comprehensive System for Ecological Management and Waste Processing (*Sistema Integral para el Manejo Ecológico y Procesamiento de Desechos* or SIMEPRODE) — a governmental agency responsible for waste management in the state. The interviewee told us that ecological culture is important not only in schools but for all ages. “[Pollution] is a cultural issue. I have said a lot that environmental education not only has to work with children in schools — for me, the focus should also be to educate adults.”

Although there are neighbourhood committees focused on addressing specific community issues — such as the risk prevention group that aims to bring local concerns to the public agenda — there are not enough leaders to effectively tackle the range of problems people face. As a result, the same small group of neighbours end up shouldering the responsibility for nearly every community activity.

Given the socioeconomic context of the community, the active residents not only face a tight agenda because of their work to solve other community problems but also because they live with their own financial struggles to meet their basic needs. People in the community share lives that involve struggle and work, and often that work is precarious, absorbing, and with inadequate remuneration. Even so the few residents involved have shown a genuine commitment to the goal of the Arroyo Vivo initiative by participating in all the brigades.

Likely, the low-level community involvement in initiatives is also rooted in the community’s reluctance to recall and preserve the historical memory of what the river was once. Because the settlements were established under irregular conditions and residents still face the threat of displacement by the government, the residents have hidden their history — hidden how they were established and the difficulties and risks

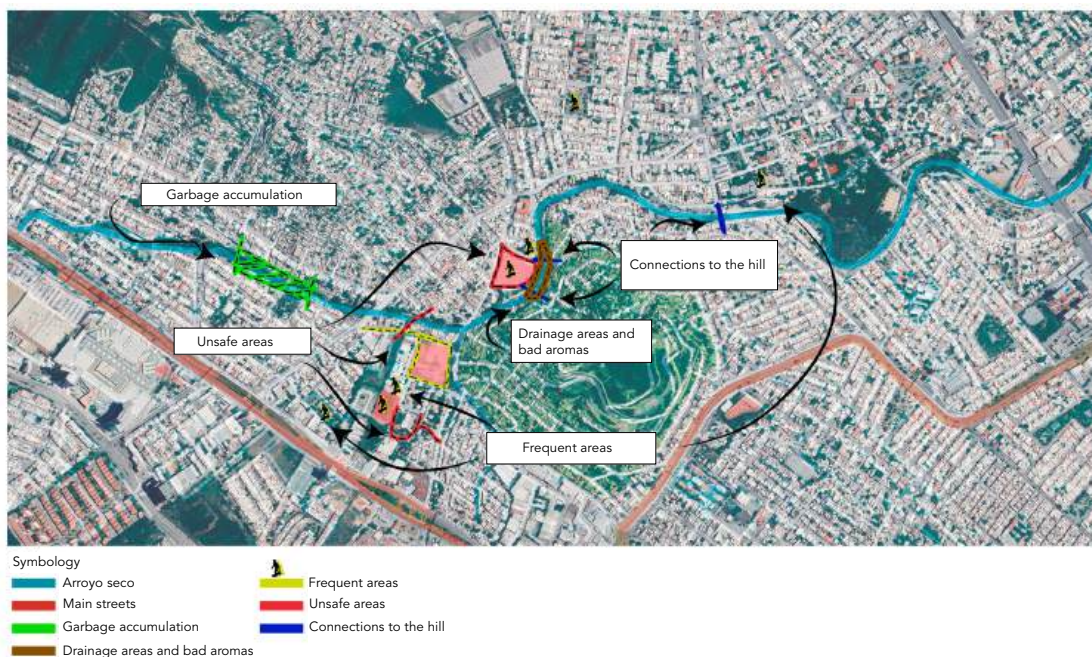
that irregularity implies. Many have chosen to conceal their history, keeping hidden how they came to settle there, and the difficulties and risks associated with living in these conditions. This secrecy, reinforced by the stigmatization of the area, has led to a sense of shame rather than pride.

One man told us he thought younger generations are not interested in knowing what Arroyo Seco was like before. But without a memory or a vision of how it could be, the river won’t be restored. In the words of a collaborator with Arroyo Vivo, “the generational change, [the youth] are raised and are living with the older generation, who do not promote and promulgate these type of activities ... The first filter of the youth are the adults of today, who are the ones who can give them permission or are the ones who discourage this type of action.”

## Perceptions

When we asked people to describe the river, they often used words like *polluted*, *dirty*, and *dry*. They pointed out its foul smell, and how dead animals such as fish, tortoises, and dogs have been found in the river. When asked about their experience living along the riverbanks, an interviewee described how “It has been a completely horrible experience. In one word, horrible can completely describe it. It is a horrible site — and to see that people have died because the river has taken them and has also taken houses.”

The river is currently associated with dirtiness, bad smells, fear, and danger. These perceptions have been shaped by the stream’s poor conditions but also the stream’s current state has been normalized. For many of the younger members of the community, a clean stream has never been a reality. The case is different for older people who value the stream based on its past, which they recall with melancholy.



**Figure 3.** A map of perceptions about Arroyo Seco created with members of the Campana – Altamira community

The dire situation of the river has also become associated with the people who live near it. When asked about the main contaminating agents of the stream’s ecosystem, most of the interviewees talked about the community itself in a pejorative manner. “They are pigs —people without culture — they are the ones who contaminate the stream.” This stigmatization associates members of the community with the undesirable conditions of their environment. The youth who reside alongside the stream’s most polluted areas are jokingly taunted for its foul smell. Consequently, the community is considered unworthy of living in a desirable and cleaner environment. This self-perceived unworthiness is a significant disincentive for collaborating on restoration, and no one considers the source of external polluting agents.

The community’s geographical characteristics make transit across the river indispensable for everyday activities because it provides crucial

access to the hill, where most of the settlements are located. The difficult accessibility to the highest points of the Campana sector, which is partly surrounded by the Arroyo Seco stream, forces Campana’s inhabitants to circulate the stream’s banks to obtain basic goods, get to work or school, and carry out daily activities. But the community perceives some areas as relatively unsafe and therefore to be avoided.

As Figure 3 indicates, the stream’s surroundings include multiple areas that are crucial for the community’s social, cultural, and economic well-being. Certain zones are also negatively affected by the stream’s poor conditions with unpleasant odours and garbage accumulation. The prevalent feeling of unsafety around the stream encompasses issues of infrastructure and violence. For example, almost half of the streetlights malfunction, which accentuates the perception of insecurity at night.<sup>11</sup> This leads to a vicious cycle where the perception of insecurity

11 “Diagnóstico Integral Intervenciones Sociourbanas de Inclusión y Atención a la Pobreza en Zonas Urbanas” [Comprehensive Diagnosis of Socio-Urban Interventions for Inclusion and Attention to Poverty in Urban Areas], SEDESOL, 2014.

leads to a lack of movement and circulation, which then perpetuates insecurity and crime.

## Uses

Because of the area's geographic conditions and inefficient infrastructure, its inhabitants do not have access to many of the basic services that others in the MMA area have. The community itself is responsible for schools, social relations, festivities, and work activities. Its most important economic activities are mobile markets, food establishments, and automotive services which correspond to the most common pollutants in the Arroyo (textiles come from mobile markets, disposables are cast off by inns and grocery stores, and tires and oil are waste from automotive services). In other words, pollution derives from the pragmatic use that the stream has acquired.

To make matters worse, garbage collection services don't reach many parts of the community because of its inaccessibility and challenging geographical conditions so residents look for practical ways to get rid of waste. They typically burn garbage, throw it in the river, or hire someone to make it "disappear" in the stream. An Arroyo Vivo collaborator told us that certain neighbours do not like being told that it's wrong to burn garbage or throw it in the stream and they react violently when someone attempts to correct them. This common response inhibits a culture of waste collection.

The community is made up of those who settled there decades ago as well as waves of migrants who still arrive there. The newest residents tend to neglect the spaces. An interviewee from SIMEPRODE insisted that "We have 111 per cent of the floating migrant population that does not care where they leave their garbage."

However, Kevin Berrios, a contributor to Arroyo Vivo, explained that the lack of a waste collection culture is not the community's unique

problem, nor is it related to a particular group's socioeconomic status but rather it is a problem of Mexicans in general. A SIMEPRODE official told us that generating culture involves generating awareness: "The issue with communities of this type is that people bring bad habits. And it is not an issue because of their socioeconomic situation, but it is an issue of awareness."

Some residents collude with external agents, such as companies that receive payment for accepting debris and industrial and construction waste. State regulations make it clear that this waste must be disposed of in special deposits outside the city, but paying for transportation to these deposits can be more expensive than paying a neighbour in Campana–Altamira to accept it.

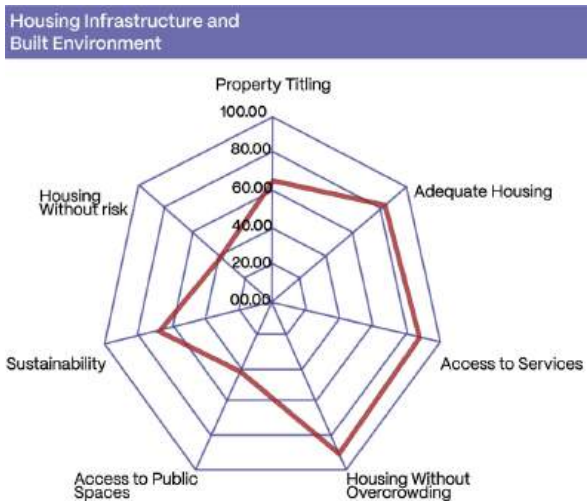
Some garbage collectors use their garages, others monopolize areas around the river to create dumps, and still others dump waste directly into the stream. The benefits these residents acquire are so significant that they have even used weapons to oppose people who want to clean up the river and improve the basin's management.

There is a strong relationship between the stream and criminal activity. We heard several testimonies related to gang and criminal activities, explaining that the river was a space that was safe from authority involvement. For example, Amelia told us:

In our family, we had an awful experience. One of my daughters used to take the bus every day. It was 6:00 in the morning and that day she left by herself — the stop was only a block away. She came back and wouldn't stop crying. "An old man tried to attack me, Mom. He pulled his pants down and wouldn't stop saying stupid things," she said. So I left quickly for the police station which used to be near the bus station. They took the data of the man and what he looked like

and spent around two hours looking for the man in the patrol. The police never looked in the stream. Two hours later the man emerged from the river because the police never looked there.

As the conditions of the stream have changed over time, so have the main uses and benefits that it provides to the community. In some sectors of the Campana–Altamira polygon, the stream area has become a dwelling zone (see Figure 4). Households there are often irregular and informal settlements. That is, they are unauthorized and not in compliance with legal, urban, and environmental guidelines. Consequently, these dwellings are excluded from public service provision and vulnerable to household risks that derive from being built with precarious materials and unstable construction. The latest research conducted by the Ministry of Social Development (*Secretaría de Desarrollo Social* or SEDESOL) in the Campana–Altamira polygon determined that 33.73 per cent of households are irregular.<sup>12</sup>



**Figure 4.** Seven pressing issues regarding housing in Distrito Campana–Altamira according to data from SEDESOL

12 Ibid.

13 Angélica Lozano, “El Tejido Social y su Fortalecimiento” [The Social Fabric and Its Strengthening], Subsecretaría de Prevención y Participación Ciudadana, 2011.

The irregular households around Arroyo Seco face significant risks that come from natural disasters, such as hurricanes, tropical storms, landslides, and floods. Inclement weather such as rain, floods, and related rockslides affect 61 per cent of the homes in the area.<sup>13</sup> In her interview, Amelia, who lived for five years on the river’s margins, recalled how during Hurricane Alex (a category 2 Atlantic hurricane that hit Mexico in June 2010), she was urgently evacuated with her family. “We were taken out of there with ropes because the river was so filled up. They had to take us out from the water through the roofs of our houses.” She was able to move a block further away from the stream shortly after, but this is rarely the case. Generally, people who live along the river’s banks face multiple stigmas that result in being overlooked, inappropriately assessed, or prematurely dismissed.

These stigmas are strongly linked to their socioeconomic conditions. For low-income families living in irregular settlements, involvement with government authorities threatens their livelihood and the economic viability of moving is low. Because weather catastrophes happen sporadically, these families assume the risks of living along the stream, even though multiple community members confirmed there have been at least four deaths caused by drownings there.

## Private Sector As Both Polluters and Cleaners

According to the State Secretary of the Environment, construction companies are the region’s biggest polluters. Arroyo Seco has become a clandestine dumping ground for

construction companies that find it cheaper to dump their debris there rather than take it out of the city. Tons of construction waste have accumulated there.

However, there are also private-sector actors who have contributed to cleaning the stream. Tecnológico de Monterrey stands out as an academic actor that has influenced the university's surrounding areas thanks to a trust for work to plan, maintain, and enhance the spaces around the institution. It has given birth to various projects such as DistritoTec (an urban regeneration initiative that takes care of the 24 neighbourhoods surrounding the school), the Campana–Altamira initiative (a program for the regeneration of the Campana–Altamira polygon), and Arroyo Vivo. These three initiatives affect the lives of more than 50,000 people in the communities they include.

## Arroyo Vivo

Arroyo Vivo has worked to reduce waste around the Arroyo Seco stream and prevent clandestine dumps. Its name says it all. “Living Stream” was born in 2022 with funding from the National Oceanic and Atmospheric Administration of the United States (NOAA) to prevent microplastics from reaching the Gulf of Mexico by remediating the stream through inclusive recycling. Nowadays, it belongs to CFC (Centre for the Future of Cities at Tec de Monterrey). The organization has carried out significant research on several economic, social, and environmental issues as a first stage of involvement in the community. They have used quantitative indicators to make the project replicable in other urban stream systems.

Intending to decrease the community's marginalization, the organization has made multiple efforts to raise awareness of the area's prevalent issues through cleaning campaigns where they have removed up to 15,500 kilograms of solid waste from the riverbed, and 87 tons of

debris from the banks. However, because their focus has been research, their interventions have not been sustainable or included the community because they depend on external actors. This has caused certain groups to be reluctant to collaborate.

The project has formed 22 alliances with government and private actors and mobilizes 400 volunteers. Due to the limited participation from local residents, the initiative relies on university students and employees from partner companies to support its brigades, where they help remove waste like textiles and plastics from the stream. A collaborator with Arroyo Vivo mentioned that most of these volunteers don't participate because of an ecological conscience but because of a commitment to their company or school. “[Arroyo Vivo uses] hauling. To put it in a more friendly, but also pejorative way — the hauling of students and volunteer initiatives of the companies who are the participants, the real workforce of this type of journey. They are voluntold — people who are ‘volunteered’ more out of pressure than genuine personal interest.”



**Figure 5.** Volunteers at an Arroyo Vivo brigade

The initiative expects that this first investigation phase will soon end to move on to a stage of

more far-reaching interventions on the stream, where the causes found in the first phase will be addressed. Phase 2's strategy is expected to involve greater collaboration from the public authority. "Sustainability is not built in one or two years but believe me, in 10 years it will have an impact," Mariela Rivas told us.

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## Public Sector

In Mexico, the government is structured in three levels; federal, state, and municipal, each with its own responsibilities. The federal government oversees national affairs; each of the 32 state governments oversees local matters; and each municipal government oversees the distribution of public services and specific community needs. When it comes to watersheds, the distribution of responsibilities among the three levels of government can span multiple states and municipalities. Therefore, based on the National Water Law, watersheds in Mexico are organized by Governmental Basin Agencies, led by the head of the National Water Commission, and supported by Basin Councils.

Basin Councils act as coordination bodies between the National Water Commission, the three levels of government, as well as users and nongovernmental citizen organizations, depending on the watershed in question. Arroyo Seco is part of the Río de San Juan sub-basin and the Rio Bravo macro-basin, making it subject to the Rio Bravo Basin Council (in Monterrey, Nuevo León). Consequently, the federal government, states, municipalities, and their involved institutions must collaborate in the management of the watershed, each fulfilling their respective obligations.

The public sector includes federal, state, and municipal governmental institutions and agencies related to waste and water management. At a federal level, the Secretary of the Environment

and Natural Resources (SEMARNAT) and the National Waters Commission (CONAGUA) are the main stakeholders involved in the watershed — they ensure sustainable water use and water quality. At a state level, the Comprehensive System for Ecological Management and Waste Processing (*Sistema Integral para el Manejo Ecológico y Procesamiento de Desechos* or SIMEPRODE) and the State Environmental Secretary of Nuevo León are involved in waste and water management.

For any particular community, municipal institutions are responsible for fulfilling their needs. For those located near a stream as in the case of Campana–Altamira, there are institutions working on the stream's conditions such as the Secretary of Sustainable Urban Development (SEDUSO), Civil Protection of Monterrey, and Water and Drainage of Monterrey, as well as others focused on the well-being and the distribution of public services for the community such as the Traffic and Transportation Council, the Secretary of Public Services, the Civil Force of Monterrey, and the Subsecretary of Prevention and Human Security.

## Motivations

Political interests are deeply embedded within institutions and have a profound influence on their decision making and actions. It is common to see that governmental candidates or agents address marginalized communities with clear objectives, promising policies or giving benefits in return for their support during campaigns. Politicians tend to make brief appearances within communities to distribute food, water, household items, t-shirts, medical supplies, and quick medical check-ups, among other gestures, with the sole purpose of securing votes and cultivating a good image for their political parties. In this respect, they are quickly identified by their branded clothing and accessories.

Misael, a Campana–Altamira community member, told us how “many political leaders make ephemeral campaign speeches about improving the neighbourhood to win votes.” When it comes to support for Arroyo Seco, community members told us that “when politicians do something for the river, they always bring their environmental campaign flags.”

Environmentally oriented governmental actions often aim at projecting a positive image globally. A SIMEPRODE public official described how the government is starting to take action to clean up the city of Monterrey in anticipation of the upcoming 2027 football World Cup. In other words, efforts emerge when there is pressure but not until then. So, it’s no surprise that politically oriented interventions are stigmatized within the Campana–Altamira community — seen as acts of self-interest rather than long-term commitment. People are not against these interventions because they benefit from them. But they are also aware of the underlying interests behind them.

## Perceptions

Given political influence in governmental agencies, administrative changes often disrupt continuity in priorities, budget allocation, and program development. During interviews, we heard from a public official from a department involved in Arroyo Seco who was unaware of its existence. “I don’t know the location. I haven’t visited Arroyo Seco.” This is a clear example of how institutions with constant administrative changes often don’t share a direct and continuous connection with communities.

Even though continuity is essential to secure the community’s trust, external actors, particularly from the public sector, are characterized by lacking continuity in their actions within the community. However, this is not the case for every institution. A member of the Subsecretary of Prevention and Human Security expressed disapproval of political interests intervening in a

governmental institution’s actions and insisted that his own institution has played a intermediary role between community members and authorities to facilitate the communication of their needs. “The programs and initiatives must be enduring. What’s the point of giving a workshop or organizing a collection and saying you helped several people? The key is to make high-impact changes for the community.”

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## Barriers for Collaboration

### Private Sector and Community: Future Ideals

There is a big difference between what external actors want and what the community itself wants for Arroyo Seco’s future. For example, one person from the CFC, a private actor involved in long-term projects with the stream, said “in the long term, it will be a biological, clean, and biodiverse corridor.” It’s a common view from external actors whose interventions focus on waste issues, water, and climate change, so that the river can once again be free of anthropogenic pollution.

The community itself shares this ideal but only to a certain extent. Even for those people who took advantage of the river’s “services” during their lives, this ideal does not address the community’s current realities, and the opportunity cost of achieving a clean river is very high. For people living near the river their needs surpass their desire to have a body of water in good condition. For them, the stream is currently a risk to their homes, safety, health, and general well-being. Their pressing concerns for safety and well-being lead some community members to opt for more pragmatic approaches to rehabilitation, such as the implementation of infrastructure that facilitates mobility, including bridges, boardwalks, and paving the riverbed, even if that means sacrificing future benefits that might eventually





**Figure 6.** Efforts by the private sector and external members of the community to restore Arroyo Seco

emerge from a full environmental revitalization process.

People in informal settlements on the river margins are also concerned about the costs involved in restoring and protecting the river as a natural environment. For them, a project of this kind would mean their households’ relocation to the city’s peripheries, negatively affecting their families’ economic stability, current employment, and way of life.

**Private and Public Sector: Lack of Continuity**

The private sector on its own doesn’t have the capacity to address all the issues, especially in areas that require governmental oversight, regulations, and policy frameworks. A strong collaboration between the public and private sectors is fundamental to addressing social and environmental issues. And when the private sector gets involved — including universities and companies — the public sector often relinquishes their obligations. As a member of CFC told us

“The government often says, if it is a project from a private university, let them do it by themselves — they have the resources.”

With constant administrative changes accompanied by political rather than the community's interests, the Mexican government lacks continuity in its actions. Every change of political party in power tends to make changes that benefit their interests, rather than following through on previous governments' commitments or for society's best interests. So, distribution of resources and programs made by each administration are susceptible to change all the time. But the private sector also faces frequent changes in leadership as well as administrative personnel.

As a result, the lack of continuity in both sectors can lead to significant consequences for their mutual collaboration as well as their relationship with the community.

Frequent administrative changes mean instability. Administrations struggle to maintain knowledge on working methods, current and upcoming issues, programs, and the already existing collaborations between them. And because the lack of continuity results in short-term interventions, the community's trust in institutions and authorities has weakened.

## Government and Community

To prevent crimes that cause ecological damage to bodies of water the state of Nuevo León's penal code regulates and sanctions with fines and even imprisonment a series of illegal acts

committed in urban rivers and basins. For instance, it's illegal to discharge industrial, commercial, service, or agricultural wastewater into waters under state or municipal jurisdiction. The disposal of chemical liquid waste, debris, and urban solid waste into rivers or water bodies is also against the law. However, these laws aren't enforced.

The current state of the Arroyo Seco, including the waste all over the area and the lack of proper infrastructure, converts what should be an ecological corridor into a key hiding place that permits people to commit illegal environmental and other crimes with a low probability of being seen. Consequently, insecurity in the area has increased drastically.

*Residents feel they can't make demands of the government because they reside illegally in the area. Any governmental help could lead to their forceful eviction from irregular housing.*

Community members are afraid to report illegal acts committed on the Arroyo Seco. Misael, a community member, spoke of this fear “because someone would attack you in the act. This sector has historically been known to be conflictive because

there have indeed been organized crime cells there. So they say out there that you never know who you're messing with. You never know who you're going to deal with.” But even when people decide to take the risk and report an offender, there is still a series of obstacles that prevent justice from being served.

Mexico is a country with a high level of insecurity. Homicides, shootings, and kidnappings, among other high-gravity violent crimes, occur every day. Authorities who distribute human capital and resources often prioritize the pursuit of those crimes that put lives, public security, and social order at risk, rather than the environment. According to our CFC interviewee, “There are

limited resources. And you prefer to go against a shooting, a situation of robbery or violence, than go to see if someone threw debris ... the issue of security in Mexico is very complex.”

Because of how violence predominates, the environment hasn't been able to reach the government's agendas. Cases of known polluters or other crimes either take a long time to get to investigators' attention or no one ever arrives. As Betty and Amelia told us, “The thieves get into the river and there is no one who can get them out.”

The authority's inefficiency disincentivizes community members to report or act on a crime. Arroyo Seco community members who consider reporting or intervening in an illegal act are conscious of the risk they face of being hurt by criminals. They also know that it's highly unlikely an authority will arrive in time or at all, and the likelihood of an arrest is low.

Because residents can't trust the authorities, few civil complaints have been made. Misael described this distrust:

What will be better? That nothing happens or that you constantly see police presence? ... I may be aware that they will never arrive and well, indeed, there are times when they never arrive. So, it is a mixture of apathy from knowing that the actions of the authorities are very slow, as well as fear from knowing that something could happen to me. Although it is said that they are anonymous complaints, I insist, you never know. If for some reason you have a corrupt person there who is going to vent that you did this ... I think there is not an adequate culture of reporting in my sector.

Community members settled illegally in irregular households or businesses often prefer not to involve authorities when they receive

deficient public services or see illegal activities happening in their areas. By avoiding authorities' involvement, they mitigate the risk of eviction, fines, penalties regarding their illegal status, or even the possibility of being displaced. Mariela told us “It is preferable to live with that risk than to go to the periphery because of the conditions that arise when these replacement homes are assigned by the government.”

Facing the government's inefficiency, as well as their neighbours' limited complaints and petitions, community members are often forced to solve issues themselves. As Goyo put it,

When I had a drainage problem, they came from Agua y Drenaje [water and drainage] to address it. But they only put one rock in the drainage system, and it kept clogging. I felt sorry for people because where I live there is a ramp where dirty water is dumped, creating a mess. On two occasions, the blockage became so severe that the drainage system overflowed, and wastewater spilled out onto the ramp. Oh, my goodness! I went to get canisters of water to take it out and take it out, but it didn't get clean.

In very sensitive cases where pollution and violence are intertwined, the state police intervene. However, the municipal police do not enter because it is a very closed area, and people are distrustful of government intervention in community problems. The neighbourhood thinks that sometimes police are even in collusion with offenders. Betty, for example, wondered “Why? Why don't the police get down? The police don't get down to the river. They never get down — they leave them there and we can interpret it that way. The police were with them.”

## Private Sector, Government, and Community: Social Fabric Damage

The social fabric of a community refers to the relationships, norms, and structures that sustain the cohesion and stability of society.<sup>14</sup> In Arroyo Seco that fabric has deteriorated because of the lack of continuity of public actions, clientelism, and institutional distrust. A resident told us how neighbours try to solve their problems individually because they perceive that the government lacks capacity. Mariela said this situation is compounded when residents feel they can't make demands of the government because they reside illegally in the area. Any governmental help could lead to their forceful eviction from irregular housing.

The community has also experienced the private sector extracting and intervening without generating relevant solutions. We encountered instances where several community groups opted to not cooperate with our research, citing frustration over being merely subjects of research with promises of action devoid of tangible impact. Mariela Rivas, who has worked first hand with the community, said that "Campana–Altamira is exhausted. Its staff is exhausted from attending to students, from attending to us. The problem is that if you come with projects that are done from the school that do not have a direct impact on the people, there is a wear and tear on the staff."

Even when the private sector is involved in concrete actions, there is opposition and resistance on the part of the community because their trust has eroded. They prefer to do individual actions to remediate their living space. They are individual actions because they also distrust each other. An environmental activist in the community told us about "an offending neighbour that I caught on the site doing that — I

limit myself to saying that. I take care of what's mine and don't be nosy." Living day to day with economic hardships, residents also experience violence between neighbours, so to survive they individualize their interests and don't have the time to consider community integration activities. Compounded by the distance between neighbours because of geographical issues on the hill, residents are wary of any outsiders or "others" in the community.

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## Recommendations

### Explicit Agenda Between Public and Private Sectors

Given the problems in continuity in public projects when the current administration ends, as well as flawed communication between municipalities or between different government department, private and public sectors need a plan for effectively managing urban basins. An entity outside government agencies and private actors could guarantee the plan's impartiality.

In the specific context of the Monterrey Metropolitan Area (MMA), Consejo Nuevo León deals with problems found in the integrated management of ecosystems. This council is an impartial, nonpartisan, institution of the State of Nuevo León that is responsible for planning and evaluating solutions concerning problems of the MMA. It is composed of public, civil society, and academic and private actors. As an effort to facilitate more effective coordination among the various stakeholders of the MMA, it could be made responsible for the proposed plan to work with Arroyo Vivo.

Given that the stream crosses the Campana–Altamira polygon and the DistritoTec

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14 Ibid.

neighbourhood polygon, Arroyo Vivo has the potential to be that participatory link to generate organized civil society groups between both communities and the public sector. And the Nuevo León Council can support the project so that citizens can call for tangible results.

The stream also needs a comprehensive social-memory plan to ensure that the histories and experiences of the local communities are preserved and integrated into the restoration efforts. Such a plan would involve actively documenting and highlighting the collective memory of what the stream used to be, how it has changed over time, and the role it has played in the residents' lives. This would not only acknowledge the environmental value of the stream but also emphasize its social and cultural significance to the community. In this sense, a well-crafted social-memory plan would help counteract the feelings of disconnection and marginalization that often accompany rapid urban changes. By creating a shared vision that incorporates both the environmental restoration and the preservation of local identities, Arroyo Vivo can become a model for how ecological initiatives can also serve as tools for social integration and community empowerment.

Urban basins often transcend the limits of a municipality's responsibilities. And because basins form urban ecosystems that enclose entire communities within them, having a social and collaborative focus on environmental actions is pertinent.

Although Consejo Nuevo León prepares a strategic plan focused along nine axes, one of which includes sustainable development, its objectives and actions are too general. They are not disaggregated at the municipal level or by regions. The MMA is very broad and constantly

expanding, given migratory flows. Disaggregating the objectives would allow a better delegation of responsibilities and the appropriate coordination of efforts.

## Evaluation of Water Co-management

There have been few efforts to develop indexes of the stream's conditions, and the existing ones are not useful for highlighting different changes that might have been caused by actions outside the area. For this reason, it is crucial to develop objective-led metrics of external interventions to evaluate them based on incidence and results. This would be possible by conducting periodic research that evaluates tentative improvements both in the ecological and social sphere.

We propose that the different sectors use the Battelle-Columbus method, which allows for both quantitative and qualitative evaluation of the impacts involved in a project. Some of the dynamics that can be measured through this method are proposed by Graziano and colleagues: trash cleaning; aquatic vegetation; wastewater management; stream water flow; socio-environmental perception; nutrient, pathogen, and toxic concentrations; flooding events; ecological and sanitary integrity; water quality; erosion; biological communities; frequency and intensity of disturbances; socioeconomic conditions; and institutional framework.<sup>15</sup>

These factors are weighed to obtain the total environmental impact. This impact matrix can help to reflect the impact that all actors have (both positive and negative) on the stream. Implementing this methodology would be useful to align the efforts of previously discussed

15 Martin Graziano, Grecia Stefanía de Groot, Laura Daniela Pilato, María Laura Sánchez, Irina Izaguirre, and Haydée N. Pizarro, "Fostering Urban Transformations in Latin America: Lessons Around the Ecological Management of an Urban Stream in Coproduction with a Social Movement (Buenos Aires, Argentina)," *Ecology and Society* 24, no.4 (2019). [🔗](#)

public and private agents to fulfill generalized common objectives regarding the stream's co-management. Finally, it would also ensure that all institutions are allocating their time and resources in the most efficient manner. Noticing that multiple current efforts in the stream have had a limited impact in its revitalization and in the community's well-being, we maintain that having key insights on the evolution of the stream's state and its social impacts is crucial to an effective co-management of the stream ecosystem.

## Legal Personality of the Arroyo Seco

In Colombia, one of the most biodiverse countries in the world, the Atrato River was recognized as a subject of rights for protection, conservation, maintenance, and restoration by the precedent T-622 in 2016, because of concerns about water management and damaging mining activity. This ruling placed responsibility on a commission composed of the Minister of Environment and members of the surrounding ethnic communities with the state acting as the river's legal representative.

Arroyo Seco needs to have its rights similarly recognized. The current lack of priority for the environment has deteriorated its conditions into a neglected urban river plagued by pollution, waste, and habitat loss. This not only directly affects the environment, but also people's fundamental rights to health protection, to a healthy environment for development and well-being, and — for those living along its banks — the right to enjoy dignified and decent housing (all of which are guaranteed in the country's fourth constitutional article).

Declaring Arroyo Seco — a non-human natural entity — a subject of rights through a constitutional protection action, with the state as its legal representative, would provide the river with legal standing in court, allowing it to

be the direct beneficiary of legal redress against contaminating and degradation activities. Also, engaging local communities can result in a more integral environmental policymaking to protect the river, ensuring both its revitalization and its cultural significance.

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## Research Team

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**Keren De los Reyes** is a second-year undergraduate student at Tecnológico de Monterrey, pursuing a double major in economics and government and public transformation. She is passionate about education, social equality, and economic development. Her research experience includes analyzing municipal financial dependency and exploring the impact of nearshoring. Currently, she is professionally engaged in measuring public opinion on various political and social issues, aiming to contribute meaningful insights to public discourse.

*“Through this research, I gained insight into my community’s challenges in equity and social redistribution. I spoke first-hand with children, youth, and adults from Campana–Altamira about their perspectives and how their problems connect to environmental issues. This experience transformed my understanding of urban environmental spaces.”*



**Carla Diaz** is a third-year undergraduate student at Tecnológico de Monterrey. She is completing a double major in economics and government and public transformation. Her personal interests include development economics and sustainability, especially from a public policy and regulatory approach. Her previous research focused on sustainable industrial policy in Mexico’s underdeveloped states and public budget efficiency. Currently, her professional work focuses on social and environmental sustainability in the financial sector.

*“Throughout this research program, I was able to learn and develop skills from my peers and mentors. I had the opportunity of immersing myself into pressing sustainability and development issues and experience their effect in the social and development spheres in a palpable way. As an important lesson, I learned about the multifaceted aspects of well-being, the importance of physical space and urban development to assure a dignified life quality, and the many challenges that are faced due to urbanization, especially in developing countries.”*



**Fernanda Martínez** is a third-year undergraduate student at Tecnológico de Monterrey’s law school. She is passionate about public speaking, policymaking, human rights, and social justice. Her previous research examined the social implications of legal frameworks and public policies. Currently, she is an intern in a law firm, interested in fiscal law and regulatory compliance.

*“Over the course of a year working on this research, I learned that environmental challenges cannot be viewed in isolation; they must be understood within broader social, cultural, and economic contexts to be effectively addressed. Visiting the Campana–Altamira community after conducting desk research was a transformative experience, revealing the significance of truly engaging with people and listening to diverse perspectives on the issue.”*



**Miguel Ortiz Diaz** is a third-year urbanism student at Tecnológico de Monterrey, passionate about regenerative urban design, public policy, and sustainable urban development. His research experience includes analyzing the impact of loneliness on urban quality of life and the perception of green spaces. He is currently working as an environmental consultant on LEED-certified construction projects.

*“During this research, I realized that connecting with a community is about so much more than just collecting data. Getting the chance to talk directly with people, hearing about the challenges they face first-hand, really opened my eyes to how environmental, built, and social issues are all connected. This made me appreciate how a qualitative approach lets you connect on a deeper level, notice things you’d otherwise miss, and see that the answers aren’t always in the numbers — they’re in the stories and experiences people share.”*



**Yacotzin Bravo** is a research professor in the Department of Law at the Monterrey Institute of Technology, Monterrey campus. Through her legal practice and anthropological research, she has collaborated with Indigenous peoples and organizations in Chiapas, Oaxaca, Morelos, Baja California, and Guerrero, as well as with local human rights nongovernmental organizations and Mexico City. Her interests are interdisciplinary law and human rights studies in territorial disputes and socio-environmental conflicts.





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