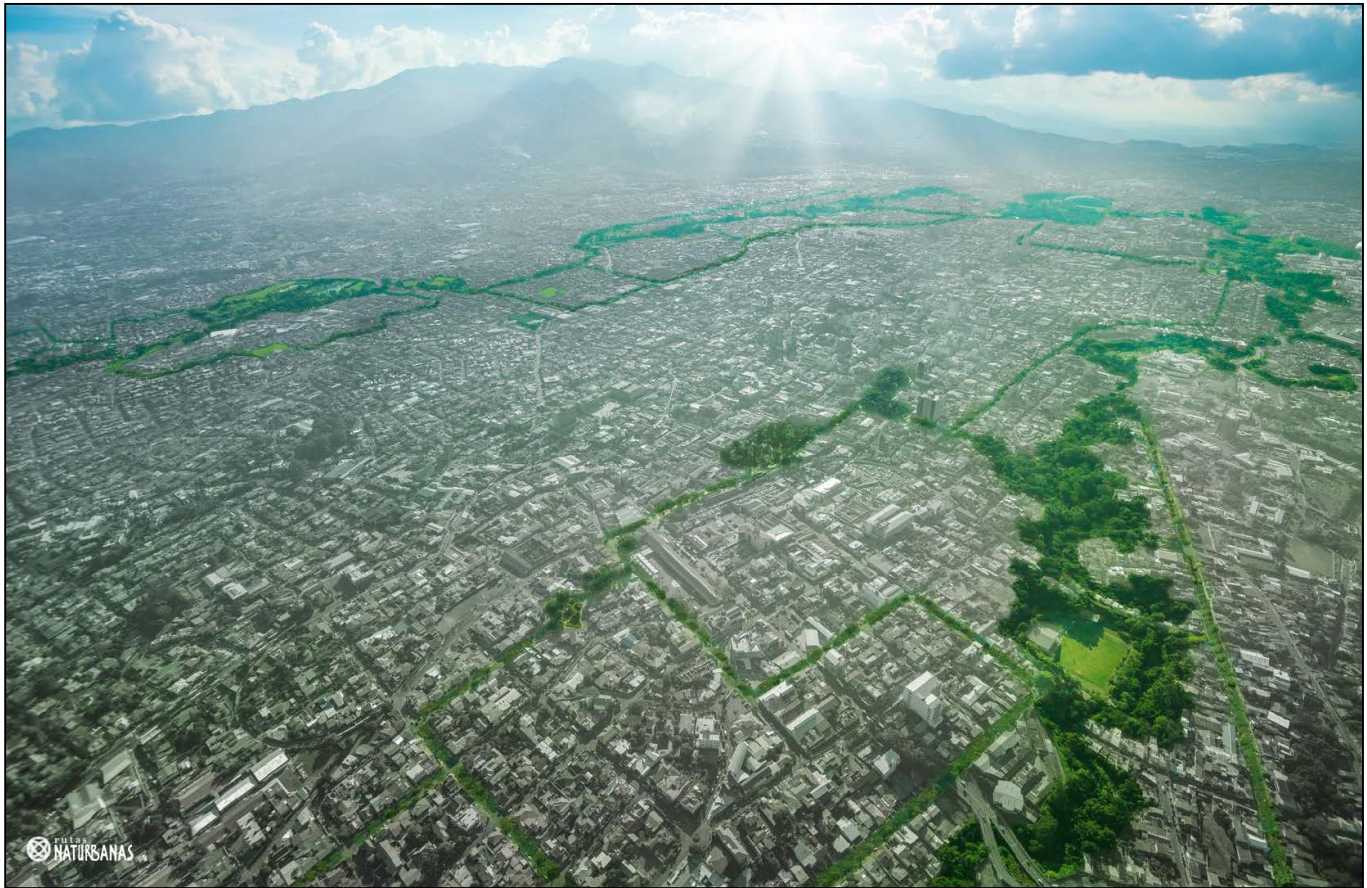


Examining the Development of Nature-Urban Routes in San José, Costa Rica



The vision: A city better connected to nature and to its people.
Image courtesy of Rutas Naturbanas, 2016

Submitted on:

May 2, 2016

Submitted by:

Cara Bereznai, Bryce Kaw-uh, Benjamin Parent, and Catherine Souza



Examining the Development of Nature-Urban Routes in San José, Costa Rica

An Interactive Qualifying Project Submitted to the Faculty of WORCESTER POLYTECHNIC INSTITUTE in partial fulfillment of the requirements for the Degree of Bachelor of Science

Submitted on:

May 2, 2016

Submitted by:

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Submitted to:

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Sponsor:

Rutas Naturbanas
Federico Cartín Arteaga

Abstract

A clear contradiction exists between Costa Rica's eco-friendly international image and its domestic urban realities. Sewage contaminates the rivers of its capital, and insufficient transportation infrastructure hinders movement through the city. This project aimed to assist Rutas Naturbanas, a non-profit foundation working to collectively resolve these issues, by examining how its proposed nature-urban routes could meet the needs and desires of the people of San José. To do so, we surveyed members of the public, interviewed professionals and activists, and reviewed research in relevant fields. We found that to ensure the most positive impacts, the routes should link residents and local organizations through engagement initiatives while balancing public safety with environmental protection.

Acknowledgements

We would like to acknowledge a number of people who were instrumental in assuring the success of our project over the past four months:

Our sponsor, **Rutas Naturbanas**, for providing us the opportunity to work on this project;

Federico Cartín Arteaga, founder and director of Rutas Naturbanas, for his indispensable support, passion, and knowledge;

Our advisors, **Professor Melissa Belz, PhD** and **Professor Derren Rosbach, PhD**, for their insight and guidance throughout the course of this project;

The coordinators for the San José, Costa Rica project site, **Jimmy and Marcela Music**, for their crucial role in helping arrange this opportunity; and

Our numerous **interviewees and survey respondents** for taking the time to contribute their perspectives and experiences.

We are incredibly grateful for their assistance.

Executive Summary

Did you know?

In San José, Costa Rica only 5.6% of space is designated as parks, playgrounds, plazas, and stadiums (Rutas Naturbanas, 2016)

One of the city's major rivers is contaminated at more than 17,000 times the sanitary limit (Calvo & Mora, n.d.)

The third leading cause of death in San José is vehicular accidents (Informe, 2011)



Parque de La Paz

Purpose

Every day, the people of San José – especially those living in the city's more marginalized communities – must contend with the negative impacts of insufficient public space, highly contaminated waterways, and inadequate transportation infrastructure. Our sponsor, Rutas Naturbanas, wants to collectively address these challenges by creating nature-urban routes along two of San José's rivers, the Río Torres and the Río María Aguilar. These routes would encompass 25 kilometers, connecting dozens of communities to nature and to each other. By coming to Costa Rica, we hoped to make people's voices heard in a project that is meant to benefit them. Through our efforts, we found a number of potential ways to keep the communities of San José represented and engaged in the establishment of these nature-urban routes.

Background

In the midst of a bustling urban setting, green spaces such as parks and gardens can serve as ecological refuges for both wildlife and people alike. Green spaces are commonly used for a variety of recreational and cultural purposes and can transform an urban area characterized by gray infrastructure into a beautiful and welcoming environment. Green spaces also provide a number of benefits for people, the environment, and the economy.

Improving the city's access to nature could positively affect its economy by creating opportunities for urban ecotourism. Ecotourism is an important source of revenue for Costa Rica. Tourists are typically interested in the country's biodiversity, which



Tour of the María Aguilar river basin

accounts for 4% of the entire world's biodiversity (Biodiversity, 2014). Within the city of San José itself, however, the natural beauty of the country is not always evident.

San José is home to a number of marginalized communities that often suffer from a lack of access to large urban parks. Connecting

green spaces would encourage more active means of transportation, such as walking, running, and cycling. It would also provide safer routes for these activities, which is important since one in three people in San José do not use bicycles to get to work because they believe the current infrastructure is unsafe

(Encuesta, 2015). The implementation of nature-urban routes to connect green spaces and encourage physical activity could drastically change the state of the city.

Project Objectives

We aimed to assist Rutas Naturbanas in the establishment of safe and sustainable nature-urban routes that encourage community engagement in the city of San José. In order to achieve this goal, we satisfied four objectives:

1. Identify and consider the concerns of marginalized communities along the Río Torres and Río María Aguilar regarding the routes;
2. Examine the scope of crime and violence both in communities along the proposed



Parque La Sabana

routes and in San José as a whole;

3. Explore how to foster a symbiotic relationship between the routes and their surroundings by determining potential positive and negative environmental impacts of the routes;
4. Investigate ways to encourage community participation throughout the design, use, and maintenance of the routes.

Methods

To gather the opinions of local people, we conducted anonymous surveys with park-goers and community members on topics such as public safety, the environment, and community engagement. We visited 5 different urban parks in order to gather responses from a more diverse set of park-goers, and we visited the marginalized communities of La Carpio and Cristo Rey to gather the perspectives of lesser-heard voices. Since the proposed nature-urban routes will pass near these parks and communities, it was valuable to understand the needs of these areas so that Ru-



Interview with Beatriz Fernández de Hütt at Polideportivo Aranjuez

tas Naturbanas could better plan the routes.

While public opinions are important to consider, we also obtained information from people who are experts in their fields: local activists and professionals from the Municipality Police, the University of Costa Rica, and several non-profit organizations. Finally, to supplement the information we gathered from our surveys and interviews, we examined a variety of relevant academic and governmental materials.

Outcomes

Safety: Through our 43 community and 50 park-goer surveys, we discovered that people's perceptions and the actual realities of crime in San José closely align. Fortunately, the generally positive relationship between police officers and residents of San José creates opportunities for collaboration to make the nature-urban routes safe spaces. The presence of police, in addition to other security features, may improve feelings of safety among route visitors.

Environment: We found that the highly contaminated states of the Río Torres and Río María Aguilar contribute to community skepticism of the proposed nature-urban routes. Additionally, implementing the routes may exert pressure on the local environment through the disturbance of natural habitats, intensification of sound pollution, and implementation of artificial lighting. However, we did discover that the proposed nature-urban routes would reduce reliance on motorized transporta-



Surveying in La Carpio

tion throughout the city and prompt the cleaning of the rivers.

Community Engagement: We learned that a considerable amount of people in San José are interested in helping maintain the routes and would like to use them for cultural expression. This interest could encourage individuals to become involved with the work of existing community organizations. Additionally, the proposed routes would bring public green spaces to urban areas that currently have few to none. Lastly, the routes could provide nearby businesses with more customers. In these

ways, the routes can act as catalysts for socio-economic growth and community engagement throughout the city.

Recommendations

Through careful analysis of our outcomes, we formulated five key recommendations for Rutas Naturbanas:

1. Include ample police presence, lights, and emergency call boxes for security purposes along the routes. Community members and park-goers ranked police personnel and lights as their two most valued safety features

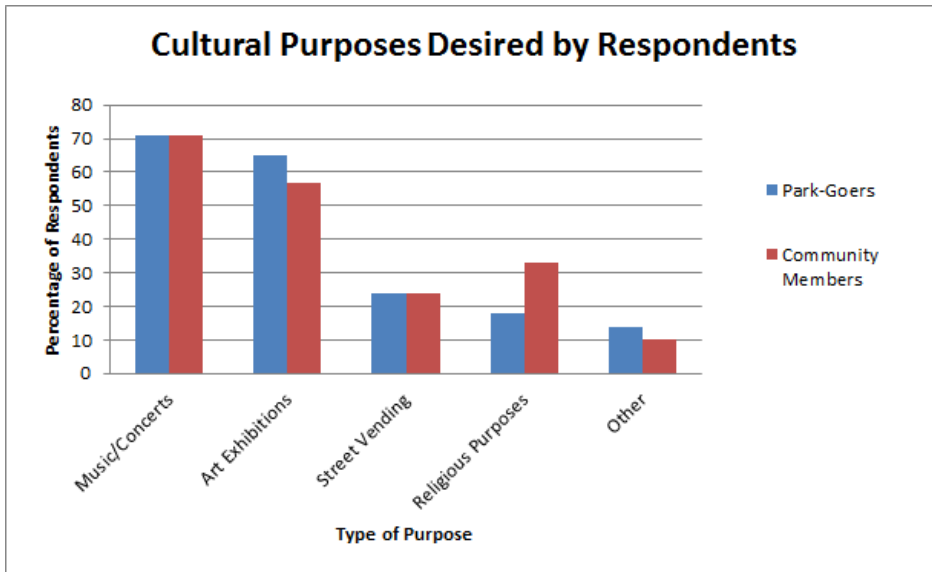
of a public space, and incorporating emergency call boxes along the routes would provide a greater sense of security for route visitors.

2. Collaborate with local organizations to increase community engagement in the cultural purposes of the routes. Working with organizations that promote community engagement, such as GAM Cultural, SIFAIS, and Río Urbano, would help connect Rutas Naturbanas with community members and facilitate the use of the routes for musical and artistic purposes.



Emergency Call Box

3. Begin a bicycle-sharing system along the proposed nature-urban routes. Many survey respondents said they would use the nature-urban routes to commute through the city. A bicycle-sharing system could facilitate this, thus reducing reliance on motorized transit in San José. Therefore, Rutas Naturbanas should partner with bicycle companies and organizations in the area, such as Chepe-Cletas, to explore the feasibility of such a system.
4. Partner with the Public Transport Council and the Ministry of Public Works and Transportation to create new bus stops at key locations along the nature-urban routes. Fewer people may use the routes to commute if they do not live and work within walking distance of them. Creating bus stops at key locations along the routes would connect people to the routes and facilitate their use for commuting purposes by city residents.



Bar graph from survey results



5. Establish an “Adopt A Route” program to help fund route maintenance and promote local businesses and organizations. Not all route maintenance activities will necessarily be performed by community members who volunteer their time. By establishing an “Adopt A Route” program that allows for the sponsorship of specific segments of the routes in return for advertising on route signage, Rutas Naturbanas could acquire funds to pay for additional route maintenance.

Conclusion

Through the expansive urban development of San José, people across the city have lost connection with nature. To this end, we examined aspects of the proposed nature-urban routes such as public safety, environmental impact, and community engagement to help Rutas Naturbanas address several challenges that the city currently faces.

By coming to Costa Rica, we hoped to make people’s voices heard in a project that is meant to benefit them. It is our hope

Above and Right: Murals in La Carpio

and the hope of Rutas Naturbanas that, one day, the people of San José will live better connected to each other and nature. The nature-urban routes cannot solve the city’s problems alone, but, through our work and the work of Rutas Naturbanas, they will serve as the foundation for many other positive environmental and social changes in the future.



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1.0 Introduction Chapter

Prospective visitors to Costa Rica are apt to discover a number of travel resources that advertise the country as a place of biodiversity, aesthetic landscapes, and environmental sustainability. Costa Ricans themselves support and take pride in their country's environmental protection and preservation efforts (Bower, 2012). However, despite these dominant cultural narratives, the reality in the country's capital city of San José does not fully demonstrate this eco-friendly and sustainable image.

As demonstrated in other rapidly-developed areas of Costa Rica, the prevalent urbanization of San José has led to a variety of problems (F. Cartín, personal communication, February 2, 2016). For example, increased pollution threatens local wildlife and poses health risks to city residents. This is especially true along the Río Torres and Río María Aguilar, which are heavily contaminated with litter and wastewater. Furthermore, heavy traffic and insufficient pedestrian infrastructure hinder the movement of city residents throughout the municipality. One solution to collectively address these issues is the establishment of accessible green spaces throughout San José.

In the midst of a bustling urban setting, green spaces such as parks or gardens can serve as ecological refuges within the city for both wildlife and humans alike. These spaces are commonly used for a variety of recreational and cultural purposes. Although the presence of green space is beneficial for a number of reasons, one of its most basic functions is to beautify the city. Making native flora more accessible and increasing the number of trees in a city setting can transform an urban area characterized by gray infrastructure into a beautiful and welcoming environment (Rowland, 2014).

Green spaces offer many ecological, personal, and public health services to the urban community as well. Such areas improve ecological health through air purification, noise reduction, and the promotion of greater biodiversity. Urban green spaces also improve the personal health and overall well-being of people by providing a low stress environment for many forms of recreation (Maas, Verheij, Groenewegen, De Vries, & Spreeuwenberg, 2006). These benefits, in addition to increased social interaction, collectively contribute to the importance of urban green spaces for public health (Maas et al., 2006).

In order to address many of the societal and environmental challenges that San José is currently facing, planning has begun for the development of nature-urban routes. This endeavor will provide green spaces that connect city dwellers to existing natural landscapes in San José through the use of accessible recreational pathways. Rutas Naturbanas is a non-profit foundation that is planning these routes along the Río Torres and Río María Aguilar. Since Costa Rica globally advertises its sustainable practices, it is important to design sustainable infrastructure that better encourages positive ecological practices within the capital city. By improving the connection of the city and its existing green spaces, this infrastructure will also provide residents of both marginalized and more affluent neighborhoods alike with greater opportunities to interact with nearby communities.

In the interest of developing a successful design, Rutas Naturbanas asked our team to assist in the establishment of safe and sustainable nature-urban routes with an emphasis on community engagement. To accomplish this, we focused on identifying and considering community concerns, examining the scope of crime and violence in San José, exploring how to foster a symbiotic route-nature relationship, and investigating community participation opportunities. Our team compiled and analyzed data from survey responses, professional interviews, case studies, and public records.

From this information, we found that the relationship between community members and police officers is generally positive in San José, and that a variety of opportunities exist for ensuring the security of people along the routes. However, we also discovered that a clear conflict exists between the protection of people and the protection of the environment when it comes to public green spaces. Additionally, we learned that although many initiatives are already in place to foster community involvement, the greater public attention provided by the routes could increase awareness of the rivers and improve community engagement.

The following background chapter provides information that sets the scope of our project, such as the impacts of urban green spaces, the effects of ecotourism in Costa Rica, the current conditions in San José, the vision of Rutas Naturbanas, and our project goals. The subsequent methods chapter explains our overarching goal and objectives and our means of achieving them. Chapter Four discusses our analysis of the data we collected and offers recommendations to Rutas Naturbanas. We then conclude with a few closing statements.

2.0 Background Chapter

The concepts of eco-friendliness and sustainability play a large role in Costa Rican society. In addition to global recognition for the nation's achievements, Costa Ricans themselves support and take pride in their country's environmental protection and preservation efforts (Bower, 2012). However, this characterization is part of a significant contradiction that exists between Costa Rica's international image and its domestic urban realities. While Costa Rica remains a global destination for ecotourism, its increasingly urbanized capital city of San José faces significant challenges with river pollution, green space accessibility, and inadequate social and economic mobility.

This background chapter begins by discussing the positive ecological and human impacts of green spaces in an urban setting. We then describe the status of Costa Rican biodiversity and ecotourism while placing San José's contemporary urban situation in context. Lastly, the chapter provides an overview of our sponsor, Rutas Naturbanas, and introduces the goals and purpose of our project.

2.1 Green Spaces

2.1.1 Impacts of Urban Green Spaces on the Environment

As urban areas continually expand, the preservation of natural ecosystems becomes increasingly important. Properly functioning green spaces provide ecosystem services, such as decreased air pollution, noise, heat stress, and stormwater runoff (Derkzen, van Teeffelen, & Verburg, 2015). Such ecosystem services are characteristics of a thriving green space.

Additionally, green spaces are “diverse” with “species richness” (Wolch, Byrne, & Newell, 2014, p. 234). One way to provide for biodiversity in a city is through the connection of green spaces. If connectivity is not provided, habitat fragmentation occurs, and species become prone to extinction (Kong, Yin, Nakagoshi, and Zong, 2010). However, green space networks and corridors discourage this isolation and provide a means of “migration, dispersal, and recolonization,” thus improving biodiversity (Kong et al., 2010, p. 16). Green spaces allow for biodiversity to thrive, even in an urban setting that is otherwise characterized by gray infrastructure and buildings. These spaces are necessary ecological refuges in an urban setting.

Because of the increased presence of vegetation, green spaces have the ability to “filter air” and “remove pollution,” which is especially important in cities (Wolch et al., 2014, p. 235). In their journal article, Wolch et al. state that “trees in urban areas may reduce air pollution by absorbing certain airborne pollutants from the atmosphere” (2014, p. 235). A study conducted on the tree canopy of the Greater London Authority yielded an estimate of 852 to 2,121 tons of particulate matter removed annually (Tallis, Taylor, Sinnett, & Freer-Smith, 2011). Additionally, green spaces can receive and store rainwater, which significantly reduces the amount of runoff (Yao, Chen, Wei, & Sun, 2015). Coupled with permeable manmade surfaces that allow for the filtration of water, sustainable green space design can prevent oil, grease, toxins, and other pollutants from reaching nearby waterways (Dunn, 2010). Green spaces are important because of their ability to improve the quality of life through pollutant minimization and runoff absorption.

2.1.2 Impacts of Urban Green Spaces on Health

The presence of urban green spaces improves the quality of health for nearby people and communities. Park visitors interact with each other, which can reduce stress and loneliness as well as improve mental health (Maas et al., 2006). Stress is also alleviated through participation in

physically active transportation. For example, "cyclists are 40% less stressed than other commuters" (Telegraph, 2015). Additionally, walking improves both cardiovascular and mental health (Cooper & Hancock, 2012). When green spaces are present, people gain health benefits through the reduction of pollution and the availability of public spaces for communication and physical activity (Wolch et al., 2014). In a case study performed by Maas et al., a correlation was found between the amount of green space available and how healthy the residents felt. The percentage of residents that felt unhealthy decreased from 15.5% in areas that had 10% green space available to 10.2% in areas that had 90% green space available (Maas et al., 2006).

2.1.3 Impacts of Urban Green Spaces on Society

The full potential of a community is not realized through the mere presence of human beings – the social interaction of neighbors also matters. According to researchers from the University of Illinois Urbana-Champaign, improving the social interaction of community members can help develop a greater sense of collective identity and engagement (Kuo, Sullivan, Coley, & Brunson, 1998). One method for achieving such an improvement in social interaction is the establishment of accessible urban green spaces. A variety of academic works substantiate this idea, contending that providing greener neighborhood spaces improves the likelihood that residents will connect with one another and develop social ties outside their homes and workplaces (Coley, Sullivan, & Kuo, 1997; Kuo et al., 1998; Sullivan, Kuo, & DePooter, 2004).

Institute Park in Worcester, Massachusetts further demonstrates the potential for urban green spaces to increase social interaction among community members. In addition to providing the local community with aesthetically-pleasing scenery, the park facilitates a variety of social and educational opportunities (Department of Public Works and Parks, 2007). Institute Park's pathways and open spaces allow for both active and passive recreation, as well as public events

such as concerts and festivals (Department of Public Works and Parks, 2007). The nearby Worcester Polytechnic Institute also makes use of the space for club activities and campus-wide events such as the annual Freshman-Sophomore Rope Pull.

However, the social impacts of urban green spaces are not limited solely to increases in community interaction and social cohesion. While “the largest reductions in crime will come from strategies that address the factors underlying crime,” green spaces facilitate greater social ties and community bonds that may discourage criminal activity through the increased presence and awareness of community members in public spaces (Sullivan & Kuo, 2001, p. 363; Sullivan et al., 2004). Thus, not only do urban green spaces provide a more aesthetic cityscape – they can also improve the safety and collective identity of nearby communities.

The full realization of these benefits depends on the perceptions of community members. Multiple studies conducted throughout Australia, Canada, Scotland, South Africa, Spain, and the United States suggest that the use of urban parks is often impeded by a fear of crime (Fleming, Manning, & Ambrey, 2016). Thus, it is insufficient for a public place to merely be safe – it must feel safe as well. Without this sense of safety, community members’ avoidance of urban green spaces may cause them to miss out on the other benefits these spaces have to offer.

Fortunately, the appropriate implementation of park infrastructure can mitigate this fear. The Greater Toronto Area’s greenway system provides a great example of safe infrastructure practices (Luymes & Tamminga, 1995). Upon initial discussion of its creation, citizen groups expressed concern about security, which prompted a study of public safety in urban greenways (Luymes & Tamminga, 1995). The study showed that “design of parks, levels of use, communication, lighting and surveillance” in addition to “citizen involvement, programming and maintenance, and enforcement” are all factors that contribute to the safety of public areas (Luymes

& Tamminga, 1995, p. 394). The design aspects of common spaces, such as lighting, signs and maps, vegetation management strategies, pathway options, and policing, are central to the safety that they convey (Luymes & Tamminga, 1995, p. 397). All of these aspects can improve the perception of safety in urban green spaces. These factors will attract additional visitors who will benefit from green space environments.

2.1.4 Impacts of Urban Green Spaces on the Economy

While the establishment of accessible urban green spaces may improve the quality of life for nearby city residents through the introduction of ecosystem services, health benefits, and a greater sense of community, they also have the potential to increase local housing costs. These community improvements may make the surrounding neighborhoods more desirable places to live and subsequently contribute to an increase in the costs of rent and home ownership (Wolch et al., 2014). This can lead to gentrification, which Wolch et al. define as “the displacement and/or exclusion of the very residents the green space was meant to benefit” (2014, p. 235).

To mitigate the potential negative consequences of such development, Professor David Murrasse and M.P.A. Jaclyn Bliss from Columbia University suggested that urban planners recognize the current socio-economic states of their communities and identify the potential gentrifying nature of any proposed changes (2006). Additionally, encouraging community involvement in the planning stages of urban development is important for ensuring that the eventual changes meet the needs and desires of local residents (Murrasse & Bliss, 2006). Because the availability of affordable housing is a crucial factor for avoiding displacement in urban communities undergoing development (Murrasse & Bliss, 2006), working with locals to guarantee that existing residents retain access to housing is a potential strategy.

Additionally, the development of attractive areas throughout the city can increase the number of tourists (Maitland, 2014). This may cause the creation of more local markets and businesses. While the economy may improve because of this, it is also possible that the large amount of attention given to these areas will cause disruption and displacement to occur in surrounding locations. Therefore, urban planners should carefully balance the various economic benefits and complications of their proposed actions (Maurrasse & Bliss, 2006).

2.2 Ecotourism and Biodiversity in Costa Rica

Costa Rica attracts many tourists due to its high diversity of flora and fauna. The biodiversity in the area accounts for four percent of the entire world's biodiversity, with over 500,000 species in its territory (Biodiversity, 2014). Many tourists are interested in the conservation efforts of the country and enjoy the idea of an industry that is green (Biodiversity, 2014).

Ecotourism holds a major role in the economy of Costa Rica. From the early 2000s to the present, the ecotourism industry has brought millions of visitors and more than \$21 billion worth of foreign currency to the country (Anuario Estadístico de Turismo 2014, n.d.). The creation of new biological corridors within San José would broaden the extent of ecotourism from Costa Rica's natural landscapes to the city as well. The country at large benefits from the ecotourism efforts, but the positive effects do not always translate to its capital city.

2.3 Urban Context of San José

Tourism is a major source of income for San José since Costa Rica's primary airport, Juan Santamaría International Airport, is located eighteen kilometers west of the downtown district. Due to the proximity of this international gateway, the city sees many short-term visitors. Despite the extensive number of tourists contributing to San José's economy, however, approximately 17%

of households in the Central Region of Costa Rica live in poverty and 4.5% in extreme poverty (Índice de Pobreza Multidimensional, 2015).

The history of San José's growth sheds some light on its current economic divisions. Before the rise of ecotourism in Costa Rica, the coffee industry dominated the country's economy and supported rural incomes (Englehart, 2003). When coffee prices dropped, newly unemployed Costa Ricans moved to San José seeking more profitable jobs (Low, 1997). Additionally, for the past three decades, Costa Rica's fairly stable economy and politics have been especially appealing to Nicaraguans looking to flee from their country and take root in San José (Sandoval García, 2004). As of 2004, lower-income urban populations have increased in number due to the economic crisis and political polarization in Nicaragua (Sandoval, 2004).

2.3.1 Communities

To better understand the setting of our project, it is important to recognize the differences in the types of communities that exist in San José. The primary division lies between communities that are marginalized and those that are more affluent (F. Cartín, personal communication, March 29, 2016).

The marginalized communities can be separated into two categories: formal and informal (F. Cartín, personal communication, March 29, 2016). Unlike formal marginalized communities, informal ones do not have an officially established connection to roads, electricity, water, and sewage (Velazquez, 2008). Informal communities also often experience overcrowding and suffer from limited resources (Ley, 2016). These communities are unregulated "in terms of land occupation, layout of sites, shelter construction, and infrastructure provisions" (Ley, 2016, p. 15). As a result, informal communities are often located in areas that the city has classified as inappropriate for construction due to hazards such as flooding, landslides, or other risks (Gencer,

2013). At the moment, neither type of marginalized community described in this section has adequate economic opportunities or access to the city (F. Cartín, personal communication, March 29, 2016).

2.3.2 Environmental Justice

In order to truly provide equal opportunity to all people in San José, city planning must attempt to offer access to all public amenities. This equality is difficult to attain, as seen in many cities across the world. In studies conducted in cities in the United States and the United Kingdom, “racial/ethnic minorities and low-income people have less access to green space, parks, or recreational programs than those who are White or more affluent” (Wolch et al., 2014). Furthermore, the parks that these communities have access to are falling apart due to the government's lack of maintenance (Wolch et al., 2014). In contrast, parks used by the more affluent communities are functional, clean spaces (Wolch et al., 2014). In order to encourage social justice and the well-being of city residents, city planners must incorporate inclusive parks that satisfy the needs of the surrounding communities.

San José already has many public green spaces. La Sabana is the largest park and is modeled after Central Park in New York City and the Bois de Boulogne in Paris, France (Diaz, 2013). La Sabana is located just west of the heart of the city and is home to the National Stadium, athletic facilities, and massive expanses of land used for passive recreation. Additional green spaces such as butterfly gardens and other parks can be seen upon viewing aerial images of San José. Although these areas exist, they are not well-connected, thus deterring neighborhood integration. Additionally, even though some of these spaces are located along the Río Torres and the Río María Aguilar, the amenities these rivers offer often remain untapped due to their inaccessibility.

Improving the accessibility of these green spaces would potentially increase pedestrian traffic and ecotourism in the areas along the rivers. Businesses near these areas could take advantage of the increase in visitors and thus create and expand economic opportunities for local residents (Dunnett, Swanwick, & Woolley, 2002; Saraev, 2012). This would potentially provide an influx of money that could enhance the economic standing of these often marginalized areas.

2.3.3 Health and Safety

Making urban green spaces more accessible could be beneficial to San José because, according to a governmental analysis published in March 2014, more than 50% of the population of San José is sedentary and presents increased risks of cardiovascular disease (Ministerio de Salud, p. 35). The establishment of nature-urban routes would provide more areas for people to safely carry out exercises such as walking, running, cycling, and various other activities.

This is important because one in three people in San José do not use a bicycle to get to work because they believe it is unsafe due to a lack of infrastructure (Encuesta, 2015). As seen in the urbanization of other cities, the existing street layouts may not safely allow for non-motorized traffic (Martín, 2004). With the high amounts of traffic and minimal protection methods for non-motorized travelers, navigating through the city without a car can be dangerous. In Costa Rica as a whole, 69 cyclists have died in road accidents in only the past two years (Arias, 2016). Providing alternative means of bypassing dangerous traffic would allow pedestrians to more safely commute through San José.

The quality of green spaces also impacts the health and safety of nearby residents. Currently, high levels of pollution affect every river in the canton of San José, and the pollution levels of the Río Torres and Río María Aguilar both increased from 2010 to 2013 (Today News, 2013). Pollution in these rivers includes trash, fecal matter, mercury, and oil, but people continue to bathe

in these bodies of water (Pomareda, 2014). An increase in accessible urban green spaces could improve both the health and safety of the people living in San José.

2.4 Rutas Naturbanas

Rutas Naturbanas is a non-profit foundation that plans to collectively address these challenges by creating nature-urban routes along two of the rivers of San José, the Río Torres and Río María Aguilar. Working with other organizations and businesses in the San José area, Rutas Naturbanas intend to connect the people of the city with nature through biological corridors and paths. Rutas Naturbanas aims to promote culture, mobility, citizenship, and a sustainable environment while benefitting the city as a whole (F. Cartín, personal communication, February 2, 2016).

Through the achievement of five main aspects, Rutas Naturbanas intends to improve the use and accessibility of walkways in San José. First, the organization is working toward creating nature-urban routes that not only connect people of the community but are also aesthetically pleasing, safe for users, and environmentally-friendly for the animals that live in the area. The second aspect of its project focuses on the sustainability of the routes with respect to the environment. Rutas Naturbanas wants the proposed routes to be used for many years to come, and in order for this to be possible, the routes need to work symbiotically with the environment. Consequently, the routes should be durable over time, include materials that do not harm the environment, and protect the biological richness of the area. Additionally, Rutas Naturbanas hopes the routes will bring awareness to the current contaminated states of the Río Torres and Río María Aguilar, thus motivating the public to take better care of the rivers.

Development is the third aspect of the Rutas Naturbanas project. The organization aims to increase social and economic opportunities for low-income communities along the proposed routes

and allow for greater social interactions within these communities. For the fourth aspect, appropriation, Rutas Naturbanas aims to include the community in the planning and implementation process as much as possible. The final aspect of the project is to incorporate culture into the routes by providing publicly accessible spaces for art, music, dance, and other forms of expression.

As described above, the project aims to benefit the community in many ways: creating a space for people to interact with each other and nature, expanding opportunities for economic and social growth, increasing the involvement of the communities, and providing an open space for all people to come and enjoy. By connecting one green space to the next with nature-urban routes, there will be an overall increase in accessibility throughout the city as well as an increase in biodiversity due to an expanded and interconnected ecosystem.

2.5 Our Project Goals

In order to assist Rutas Naturbanas in its efforts, we planned to investigate ways the proposed routes could provide social and economic mobility for nearby city residents while also achieving a balance between public safety and environmental design. If nature-urban routes increase access to local businesses and communities, local economies and marginalized groups would benefit from this new integration. Proper design strategies would improve public perceptions of the routes' safety as well as potentially reduce the actual risk of criminal activity along the routes. At the same time, because Rutas Naturbanas aims to preserve undeveloped natural habitats surrounding the rivers, a balance should be met between safety measures and environmental protection (F. Cartín, personal communication, February 2, 2016). Finally, we wanted to determine how Rutas Naturbanas could engage with local communities and incorporate their needs and desires into the development of the routes.

2.6 Summary

Despite Costa Rica's concerted efforts to transform itself into an environmentally-friendly country, a great deal of work remains in order to fully apply this mentality to the capital of San José. Establishing a series of nature-urban routes throughout the city would be an important step toward achieving this goal. The creation of these routes would provide a comprehensive means for improving the health and well-being of residents, reducing reliance on an already-burdened transportation system, connecting fragmented green spaces, and revitalizing neglected urban areas. Our team worked with Rutas Naturbanas to explore several social and environmental complexities surrounding this urban development initiative.

To accomplish this, we surveyed community members and park-goers to learn how their opinions and desires could be incorporated into the project. We also interviewed a variety of professionals and community activists to gain expert opinions on public safety, environmental protection, and community engagement. Finally, we examined governmental publications and academic sources from relevant fields to provide greater context for the information we gathered from our surveys and interviews. Through our work, we were able to identify a number of actions Rutas Naturbanas could take to ensure the success of the nature-urban routes. The following chapter explains the methods we used to fulfill the purpose of our project.

3.0 Methods Chapter

The goal of our project was to assist Rutas Naturbanas in the establishment of safe and sustainable nature-urban routes that encourage community engagement in the city of San José, Costa Rica. In order to attain this goal, our team satisfied four objectives:

- 1) Identify and consider the concerns of marginalized communities along the Río Torres and Río María Aguilar regarding the routes;
- 2) Examine the scope of crime and violence both in communities along the proposed routes and in San José as a whole;
- 3) Explore how to foster a symbiotic relationship between the routes and their surroundings by determining potential positive and negative environmental impacts of the routes;
- 4) Investigate ways to encourage community participation throughout the design, use, and maintenance of the routes.

This chapter explains the approach we used to achieve our project goal, using the above objectives to guide our research. In the following sections, we discuss the objectives in detail while outlining the use of surveys with park-goers and community members, interviews with local professionals and activists, and information from relevant academic and governmental materials. By accomplishing our four objectives, we were able to supply Rutas Naturbanas with valuable information for the design and implementation of its proposed nature-urban routes.

3.1 Objective 1: Identify and Consider the Concerns of Marginalized Communities along the Río Torres and Río María Aguilar Regarding the Routes

With this objective, we sought to better understand local sentiment pertaining to the proposed routes and examine the reasons behind the given opinions. Recognizing the levels of support and opposition associated with the project helped determine where Rutas Naturbanas may meet resistance when working with the communities that reside near the proposed nature-urban routes.

3.1.1 Surveys with Community Members

To measure local opinions, we conducted anonymous written surveys with individuals living in two marginalized communities along the proposed routes. These communities, La Carpio and Cristo Rey, were suggested by our main contact Federico Cartín. Anonymity was important because it encouraged participation and was useful for gaining honest responses, especially when the topics were sensitive issues (Berg & Lune, 2012). Additionally, we determined that written surveys would be an appropriate means of data collection due to Costa Rica's high literacy rate of 97% (Central Intelligence Agency, 2016). We could not assume that everyone would be able to successfully complete a written survey, however, so prospective participants were given the option to take the survey verbally upon request.

Conducting written surveys allowed us to collect primary source data that had the potential to be more powerful than interviews, since it compiled a high volume sample and bypassed interviewer inabilities and biases (Vilela, 2015). We opted against in-depth interviews for this objective because they require a large amount of time as well as the interpretation of various social cues (Opdenakker, 2006). Translating and properly responding to social cues from a broad range of respondents would have proven more difficult for us, and using written surveys was consequently a more effective data collection method for this objective.

Our surveys were divided into three sections: safety, environment, and community engagement. We placed the safety section first to ensure that its responses were not influenced by the other two sections. Furthermore, we did not expect every respondent to finish the entire survey. To ensure the last two sections would receive an equivalent number of complete responses, we chose to alternate the order of the environment and community engagement sections.

When conducting our surveys in La Carpio, we worked with volunteers from SIFAIS to connect us with potential survey respondents. SIFAIS is a community initiative in La Carpio for promoting education, art, and music. We performed some surveys in the SIFAIS community center and others by visiting individual residences.

Before conducting our surveys in Cristo Rey, we coordinated with the Municipality Police to arrange for police escorts at the recommendation of multiple employees of the Municipality. The two officers who accompanied us helped us acquire responses from a diverse set of participants while visiting individual residences and local businesses in the northern part of the community.

The environment section of the community member survey was most important to **Objective 1**. In addition to other questions, this section asked participants about their use and opinions of the Río Torres or Río María Aguilar, whichever was closer to the survey location. We also inquired about their impressions of the construction of nature-urban routes along the river. The questions we prepared for this part of the community member survey are located in **Appendix A, Section 2**.

3.2 Objective 2: Examine the Scope of Crime and Violence Both in Communities along the Proposed Routes and in San José as a Whole

In order to understand what the neighborhoods along the proposed routes were experiencing in terms of public safety, we needed to know the community members' perceptions of crime and violence in certain areas as well as what crimes were actually being committed. Our team considered this information when determining how to make recommendations for routes that both feel safe to the community and keep actual crime and violence away from the routes. We conducted written surveys, interviewed police professionals, and examined relevant academic and governmental publications to gain information about the above aspects.

3.2.1 Surveys with Park-Goers and Community Members

We surveyed park-goers and local residents in communities near the proposed routes about their perceptions of crime and violence in the area. Surveying people in both of these areas was important for determining whether the perceptions of crime align with the actual extent of crime in San José. **Section 3.1.1** describes how and where the community member surveys were conducted.

As recommended by Mr. Cartín, the parks we surveyed included La Sabana, Parque de La Paz, Parque de Francia, Parque Morazán, and Parque España. These parks are proposed sections of the nature-urban route network. Our park-goer surveys were formatted in mostly the same way as our community member surveys described in **Section 3.3.1** but asked only about safety and community engagement topics. Our rationale for opting to conduct surveys in this manner was the same for parks as it was for communities. To carry out these park-goer surveys, we approached a diverse set of potential respondents and introduced ourselves and our purpose. If the respondents were willing to participate, we then read our preamble and conducted the survey.

The safety section of each survey was the most important part for **Objective 2**. We asked park-goers and community members about topics such as the prevalence of crime, their perceptions of safety, and their opinions on which aspects of public spaces would make them feel most secure. The questions we used in these surveys are included in **Appendix A, Section 1** and **Appendix B, Section 1**.

3.2.2 Interview with Police Professionals

We conducted an interview with two members of the Municipality Police, Carmen María Edgell and Amado Rosabal. Mr. Cartín put us in contact with an employee of the Municipality of San José, who in turn connected us with Ms. Edgell and Mr. Rosabal. In the interview, we asked questions regarding the current state of crime in the city. We also asked these officials about what measures could be taken to improve safety along the proposed nature-urban routes. Conducting an interview with these knowledgeable individuals was beneficial to us because it allowed us to engage with and learn from professionals who are passionate about their fields (Berg & Lune, 2012). Additionally, the interview format allowed them to more freely elaborate on various topics and permit us to ask new questions in response to their statements. The interview was recorded using voice capture, as were all interviews we conducted, and we later reviewed the audio to take notes on the most important themes and concepts. The questions that we asked in the interview are found in **Appendix C**.

3.2.3 Examination of Published Crime Statistics

Additionally, we reviewed governmental and non-governmental sources to gain a greater understanding about the realities of crime in San José. During our interview with the Municipality Police officials, we asked Ms. Edgell and Mr. Rosabal how we could obtain official crime statistics for the city. They showed us how to access a website that provided statistics from the Costa Rican

Judicial Investigation Agency. We were able to access statistics based on the time frame, the specific location in the country, and the type and target of the crime. We also retrieved further information regarding drug-related crime in San José from an article published by InSight Crime. We aimed to identify what crimes typically occur in San José in order to help us understand the types of crime that may occur along the routes and to better provide suggestions for safety feature implementation.

3.3 Objective 3: Explore How to Foster a Symbiotic Relationship between the Routes and Their Surroundings by Determining Potential Positive and Negative Environmental Impacts of the Routes

It is essential that any negative environmental effects caused by the routes' man-made infrastructure are as minimal as possible. We obtained information from a variety of sources to accomplish this task. First, we conducted interviews with professionals in fields such as civil and forest engineering. Second, we conducted surveys with residents of communities located along the proposed nature-urban routes. Finally, we examined academic and governmental publications that provided relevant environmental information.

3.3.1 Surveys with Community Members

To better understand how local residents in San José would interact with the natural environment surrounding the routes, we conducted anonymous written surveys with residents of La Carpio and Cristo Rey. The surveys were formatted in the same way as our community member surveys described in **Section 3.1.1**, and our rationale for conducting surveys in this manner was the same as well. The environment section of these surveys was the most relevant part for **Objective 3**.

By completing these surveys, residents had the opportunity to freely express their ideas on litter prevention and environmental protection. We sought to learn the opinions that the communities held toward their environment and if they knew who to contact if they saw someone harming the environment. Understanding these points allowed us to provide better suggestions on how Rutas Naturbanas could minimize environmental impacts. The survey questions used to obtain this information are found in **Appendix A, Section 2**.

3.3.2 Interviews with Environmental Professionals

We conducted interviews with three professionals in different fields to gain a greater understanding of how the proposed nature-urban routes could impact their surrounding environment. Mr. Cartín put us in contact with the three professionals via email, and we used this opportunity to arrange the interviews. Our first interview was with Sara Ramirez, a forest engineer working with Árboles Mágicos, a supporting organization of Rutas Naturbanas. Our second interview was with civil engineer Luis Zamora and architect Karla Barrantes. Mr. Zamora is the coordinator of the Sustainable Urban Development Investigation Program (ProDUS) at the University of Costa Rica, and Ms. Barrantes also works for ProDUS. In these interviews, we asked questions about topics such as the impact of artificial lighting on local wildlife and how Rutas Naturbanas could mitigate these effects. Each interview was recorded and later reviewed, as stated in **Section 3.2.2**. The interview questions that were asked are found in **Appendix D** and **Appendix E**.

3.3.3 Examinations of Relevant Academic and Governmental Publications

In an effort to better understand the potential environmental impacts of the nature-urban routes, we reviewed several academic and governmental sources. By searching online, we found a study published by the Municipality of San José that documented the types of animals that lived

along the Río María Aguilar as recently as 2001. We also found a number of academic journal articles that describe the potential impacts of increased anthropogenic noise and light pollution. Additionally, we used a document from the United States National Park Service that described interim lighting guidelines for its National Parks. By examining these academic and governmental sources, we learned about methods Rutas Naturbanas could use to mitigate the negative impacts of artificial lighting and sound pollution on wildlife living along the nature-urban routes.

3.4 Objective 4: Investigate Ways to Encourage Community Participation throughout the Design, Use, and Maintenance of the Routes

To fulfill this objective, we needed to collect data that we could use to successfully incorporate local communities' ideas into the development of this project. Conducting this research was important because it helped determine which components were highly desired by the local communities.

3.4.1 Surveys with Community Members and Park-Goers

In order to obtain the information we needed to fulfill **Objective 4**, we compiled opinions and observations from residents who live along the proposed routes as well as people who use urban green spaces. We obtained this qualitative data by surveying the communities described in **Section 3.1.1** and the parks described in **Section 3.2.1**. Our rationale for conducting surveys in this manner was the same as in the sections described above. The community engagement section of these surveys was the most important for **Objective 4**.

This section focused on three main areas of the project's timeline: design, usage, and maintenance. Through our questions, we sought to gauge respondents' opinions on existing green spaces, as well as what events and amenities they would like to see along the nature-urban routes.

Additionally, we wanted to determine whether the respondents would be interested in various route maintenance activities. The questions we used in these surveys are included in **Appendix A, Section 3** and **Appendix B, Section 2**.

3.4.2 Interviews with Community Engagement Professionals and Activists

To gain insight into how the routes could promote the involvement of the community, we interviewed some prominent members of community engagement organizations that are supporting Rutas Naturbanas's project. These members included Alonso Briceño from Río Urbano, Beatriz Fernández De Hütt from Polideportivo Aranjuez, Maris Stella Fernández from SIFAIS, and Carlos Velasquez and Robert Faulstich from Amigos del Torres. We inquired about their involvement in these organizations, the potential impacts of route implementation, and how Rutas Naturbanas could encourage community engagement and stewardship along the routes. Each interview was recorded using voice capture, and we later reviewed the audio to take notes on the most important themes and concepts. The questions asked in each interview are found in **Appendix F, Appendix G, Appendix H, and Appendix I**.

3.5 Survey Processing

We used online services from Qualtrics to analyze the data we received from our park-goer and community member surveys. We used the company's services to create two separate Qualtrics surveys: one to input the park-goer responses and the other to input the community member responses. Once all of the responses were input, Qualtrics automatically generated basic numerical reports for each question. We examined these reports for both park-goers and community members separately to discover patterns and trends. Additionally, we manually performed basic arithmetical calculations to create cross-tabulations and collective data that included responses from both park-

goers and community members. Lastly, we went through the results of our data collection to help formulate our findings, which are discussed in the following chapter.

4.0 Results and Discussion Chapter

Our findings cover three main themes related to the development of the proposed nature-urban routes: visitor safety, environmental impacts, and community engagement. Visitor safety includes the perceptions and realities of crime, the relationship between the community and the police, and safety amenities along the routes. Environmental protection discusses river pollution, environmental effects of the routes, and transportation. Finally, community engagement addresses a variety of topics related to the current involvement of the public along the rivers as well as amenities and methods that can encourage involvement in the future. The discussion of our findings is followed by our recommendations and limitations.

4.1 Findings

4.1.1 Safety

Finding 1: Perceptions of crime closely align with the actual realities of crime in the city of San José.

Since the proposed nature-urban routes will be public spaces, it is important to understand both the realities and perceptions of crime in order to implement appropriate measures that will make the public both feel safe and be safe. As shown in **Figure 4.1**, assaults and thefts are more highly prevalent in San José than robberies (Organismo de Investigación Judicial, 2015). Theft and robberies both involve the taking of property, but unlike robberies, thefts do not involve person-to-person interaction (King, 2015). In San José, one assault occurs approximately every 3 hours and 7 minutes, one theft occurs approximately every 4 hours and 5 minutes, and one robbery occurs approximately every 16 days and 17 hours (Organismo de Investigación Judicial, 2015). Drug activity in the city is common as well. Between January and September 2015, 77 murders occurred due to drug-related issues (Daugherty, 2015).

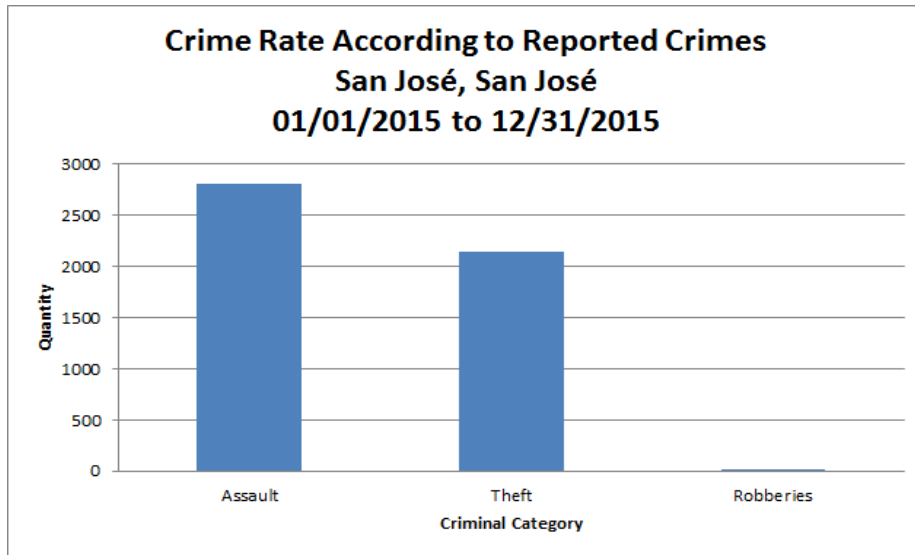


Figure 4.1 This graph provides the number of assaults, thefts, and robberies that occurred in San José in 2015.

These crimes are committed in a variety of places throughout the city. Luis Zamora, the coordinator of ProDUS, indicated that the areas along the Río Torres and Río María Aguilar tend to be dangerous because there is a high population of indigents who often commit thefts (personal communication, April 14, 2016). Crime occurs in established parks as well. In Polideportivo Aranjuez, a green space and sports center in San José, vandalism and drug activity are common (Beatriz Fernández De Hütt, personal communication, April 7, 2016).

City residents are familiar with these realities of San José’s crime. A majority of both the park-goers and community members we surveyed were aware of crimes committed in the city. Assaults and robberies were the most widely-known crimes among park-goers. Among community members, most knew of assaults but at least 63% were aware of both the distribution and use of illegal substances, robberies, and vandalism. These results are shown in **Figure 4.2**. It is possible that survey respondents were unaware of the difference between thefts and robberies and indicated an awareness of robberies when they actually meant thefts. The most concerning crimes to community respondents were those related to illegal substances. Although these statistics do not

represent the actual percentages of crimes committed, they indicate that there is a wide knowledge, awareness, and concern of a variety of crimes throughout the city. Residents' perceptions of crimes in San José seem to align with the numbers of crimes reported.

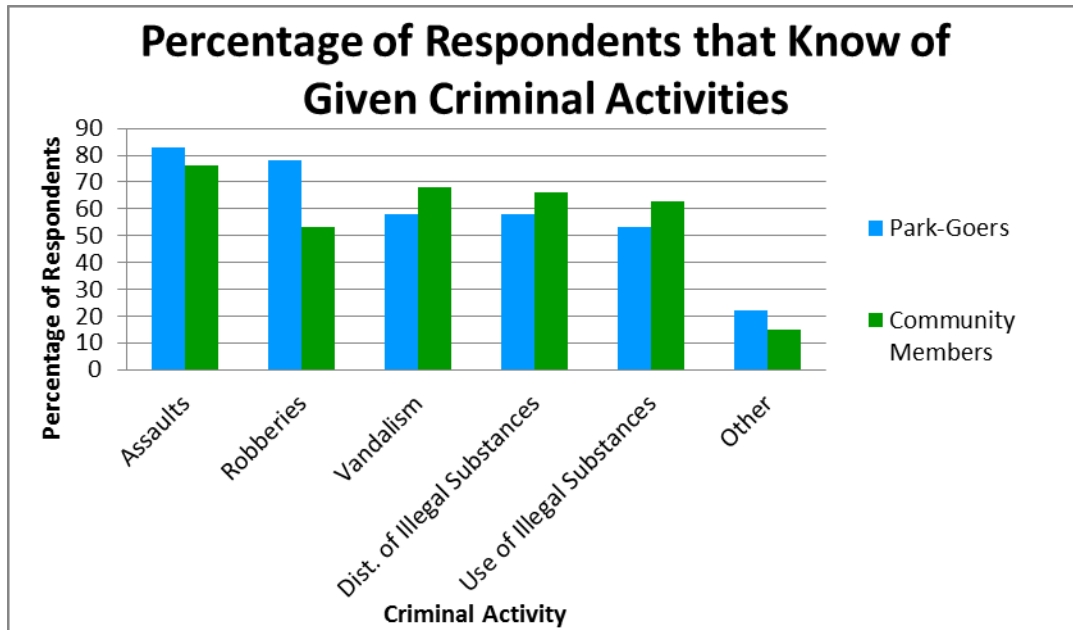


Figure 4.2 This graph shows the percentage of park-goer and community member respondents who knew of the given crimes.

We also asked survey respondents about how safe they feel in their communities on a scale of 1 (very unsafe) to 10 (very safe). The average response of 41 community members was 6.15. In general, this shows that people do not feel incredibly safe. Additionally, we asked community members to indicate where they felt the most safe and least safe in their community. Twenty-nine of 41 respondents expressed feeling the safest in their homes, and 15 of 42 respondents expressed feeling the most unsafe in the streets. Since the routes will likely resemble streets, route security features must minimize actual crimes and increase people's sense of security.

Finding 2: The generally positive relationship between police officers and residents of San José creates opportunities for collaboration on route safety measures.

Both Ms. Edgell and Mr. Rosabal told us in an interview that there is a positive relationship between the city's communities and the police (personal communication, April 13, 2016). Ms.

Edgell indicated that this is in part due to excellent communication between the two entities (personal communication, April 13, 2016). This relationship would be essential for the routes so that a collaboration on safety measures could exist. To obtain additional opinions about the relationship, however, we surveyed San José residents about their opinions regarding police officers and safety.

In our surveys, park-goers and community members were asked to rank a variety of safety features for public spaces in order from most important (1) to least important (7). Police presence, lights, access roads, alternative entrances and exits, open space, sidewalks, and other people were ranked, allowing us to gain a better understanding of the most important security aspects to people. As shown in **Figure 4.3**, the results of our surveys with 33 park-goers and 20 community members indicate that police presence makes people feel the safest. Many parks are already frequently monitored by police, and these survey responses indicate clear support for this practice. Residents of San José have a confidence in the police force that further suggests the positive relationship the police described.

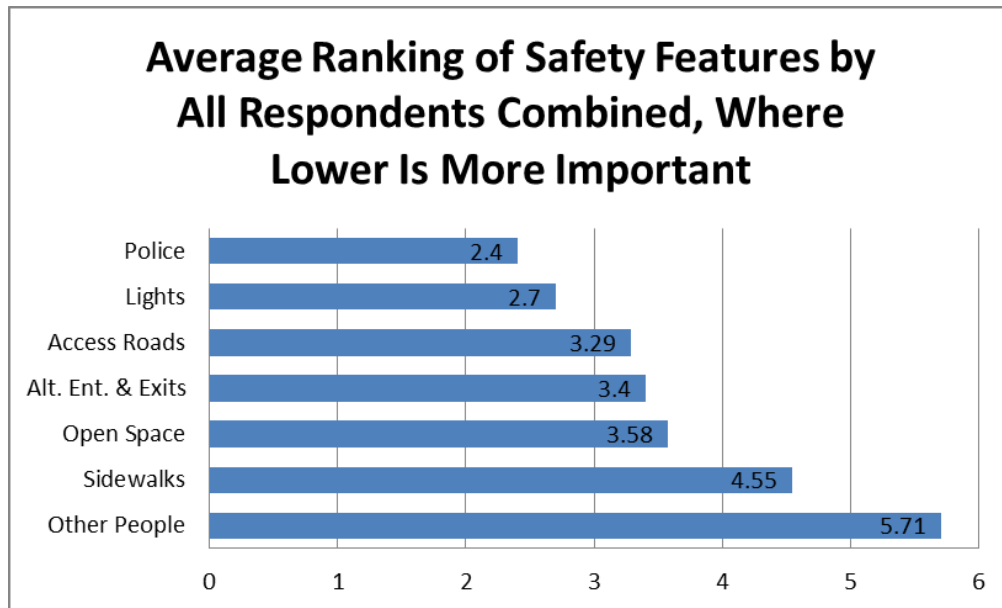


Figure 4.3 This graph shows the average ranking of safety features by both park-goers and community members combined. In this case, a lower average ranking indicates greater importance for safety and a higher average ranking indicates lesser importance.

However, police officers alone cannot ensure safety, and the presence of other people, especially to inform police officers of incidents, is a necessary security aspect to consider. In our surveys, “Other People” was ranked overall as the least important security aspect out of the seven provided, as indicated in **Figure 4.3**. This suggests that the presence of other people may not stand out as a significantly important aspect to people, though it is not necessarily “unimportant” either. In fact, the concept of “safety in numbers” is a widely-accepted idea. A similar theory is the “co-presence” of people in public places, which means always having at least one other person in visual contact for security purposes (Hillier, 2004).

In any public space, it is important both to see others and to be seen (L. Zamora & K. Barrantes, personal communication, April 14, 2016). When more people are around, a place is livelier and is therefore more secure (L. Zamora & K. Barrantes, personal communication, April 14, 2016). SIFAIS has existed for only five years but has seen the disappearance of three drug

distribution centers in that time (M. S. Fernández, personal communication, April 11, 2016). This did not happen because of police but instead because of the presence of so many people (M. S. Fernández, personal communication, April 11, 2016). Community involvement activities can help ensure that people will be around (L. Zamora & K. Barrantes, personal communication, April 14, 2016).

Ms. Edgell and Mr. Rosabal said that the police cannot be everywhere and that they rely on citizens to be their eyes and ears, so with more people around, there is more opportunity for this to occur (personal communication, April 13, 2016). In each district of San José, there is an organization consisting of one representative from every neighborhood within that district (C. M. Edgell & A. Rosabal, personal communication, April 13, 2016). This organization acts as a liaison between the community and the police (C. M. Edgell & A. Rosabal, personal communication, April 13, 2016). Additionally, the police have a WhatsApp group chat with more than 80 residents of San José to inform them of instances of crime throughout the city (C. M. Edgell & A. Rosabal, personal communication, April 13, 2016). In their opinion, community involvement initiatives such as neighborhood watches, group chats, and other forms of communication are crucial to maintaining security (C. M. Edgell & A. Rosabal, personal communication, April 13, 2016). Mr. Velásquez, the president of Amigos del Torres, had the same idea. He told us, “[The route] needs constant patrol – I mean, whether it’s by police or by community watch. We want to involve the community because that’s the only way to do it” (personal communication, March 31, 2016).

Together, police officers and city residents have the power to create a sense of security in San José. An increased presence of police officers, in addition to the safety in numbers and neighborhood watch mentalities, can minimize the potential for crime.

Finding 3: The provision of certain features such as police presence and sufficient lighting may improve feelings of safety as well as actual security among route visitors.

As described above, park-goers and community members were asked to rank a variety of safety amenities for public spaces in our surveys. Park-goers and community members ranked police presence and lights as the top two most important features for safety, as shown in **Figure 4.3**. This data suggests that the public would like to see more police and lights present on the routes and in public spaces. Providing lights should make people feel safe along the routes by evening out places of shadow and brightness to create a feeling of safety while ensuring actual safety through increased visibility (Luymes. 1995). Lighting can also improve surveillance at night, which can improve the feeling of safety in the area (National Recreation and Park Association. 2016). However, park-goers ranked access roads as one of their top three preferred safety features, as shown in **Appendix J**, whereas community members chose open spaces, or places that do not have visual obstructions. The reason for this difference may result from the different areas in which the surveys were conducted. Park-goers already have open space in parks, but they may not have access roads. Community members may already have access roads in their communities but do not have a lot of open space. Each place along the routes may want different features for safety to be implemented in their area based on what they already have and what could be useful and important to them. Park-goers and community members would likely use the routes more often if these amenities were in place (B. Fernández De Hütt, personal communication, April 7, 2016).

4.1.2 Environment

Finding 4: The highly contaminated states of the Río Torres and Río María Aguilar contribute to community skepticism of the routes.

The Río Torres and Río María Aguilar are significantly contaminated by blackwater and garbage (A. Briceño, personal communication, April 6, 2016; B. Fernández De Hütt, personal communication, April 7, 2016). Numerous articles published by Costa Rican news agencies have

reported on the situation. One from La Nación stated that four rivers within the Grand Metropolitan Area of Costa Rica, including the Río Torres and Río María Aguilar, received approximately 104,951.4 cubic meters total of untreated sewage water per day (Soto, 2013).

A wastewater treatment plant capable of processing the sewage of 1,070,000 people was opened in 2015 in an attempt to mitigate this significant cause of river pollution (Otárola, 2015). However, despite this recent development, not everyone has the infrastructural access necessary to dispose of wastewater correctly (B. Fernández De Hütt, personal communication, April 7, 2016). As a result, contamination continues to pose a serious threat to the Río Torres and Río María Aguilar.

With this in mind, it is unsurprising that according to Mr. Briceño, founder and director of Río Urbano, people generally associate urban rivers with contamination, risk, and death (personal communication, April 6, 2016). The data we collected from community members in La Carpio and Cristo Rey corroborate his perspective. When asked whether they visit the river closest to their community, 73% of 40 community member respondents said they do not. We then asked why they do not visit the river, and 54% of 24 respondents described the river as dirty, contaminated, or dangerous, leading them to stay away. An additional 13% of respondents simply indicated that they do not like the river, an opinion that may be due to the current degraded states of the Río Torres and Río María Aguilar.

These views of the rivers appear to impact how the community members perceive the proposed nature-urban routes. In our surveys, we asked community members to indicate how they felt about the creation of the routes along the rivers on a scale from 1 (very negatively) to 10 (very positively). Out of the 29 respondents who did not mark 'unsure,' the average value was 6.10. This indicates that the communities as a whole have mixed feelings about the idea. When provided a

chance to elaborate in their own words on how they felt about the creation of nature-urban routes, respondents used commentary that was similar to their descriptions of the rivers. A number of the respondents wrote statements characterizing the rivers as dirty, contaminated, or a sewer. Since these respondents view the rivers so negatively, they may not see the point in creating routes so close to an undesirable location. In this way, the perceptions of the rivers as highly contaminated contribute to community skepticism of the proposed nature-urban routes.

Finding 5: Implementing the proposed nature-urban routes may exert pressure on the local environment through the disturbance of natural habitats, intensification of sound pollution, and implementation of artificial lighting.

While the creation of nature-urban routes along the Río Torres and Río María Aguilar would offer a number of environmental benefits to the area, it would also be an act of urban expansion that could have negative impacts on local wildlife. Several of our interviewees described that although the two rivers are perceived as highly contaminated, many animals still live along them (A. Briceño, personal communication, April 6, 2016; L. Zamora & K. Barrantes, personal communication, April 14, 2016). An official inventory of wildlife published by the municipality of San José supports this claim through its documentation that a wide variety of insects, amphibians, reptiles, birds, and mammals inhabited the Río María Aguilar and its riverbanks as recently as 16 years ago (Municipalidad de San José, 2001).

However, plants that many of these animals rely on for nourishment would be removed during the construction of pathways and other human infrastructure (S. Ramirez, personal communication, March 30, 2016). Additional measures that could make the routes safer and more usable for people, such as clearing vegetation to improve visibility, would reduce natural habitats and have other negative impacts (L. Zamora & K. Barrantes, personal communication, April 14, 2016). The rivers are currently protected areas where people cannot build according to Costa Rican

forest law (A. Briceño, personal communication, April 6, 2016; Ley Forestal, No. 7575). By expanding the presence of built infrastructure in these river areas, their status as a refuge for wildlife in an otherwise-urban setting would be diminished unless a balance is met between human need and environmental protection.

Furthermore, the construction and eventual use of the nature-urban routes would increase the amount of anthropogenic noise near the rivers. Long-term exposure to anthropogenic noise can cause animals to experience "chronic effects, including elevated stress levels and associated psychological responses" (Blickley & Patricelli, 2010). Other impacts may include reduced foraging efficiency, decreased reproductive success, and lower rates of survival (Francis & Barber, 2013). These disturbances would disrupt the natural cycles of many animals, some of which may migrate to other areas as a result (Francis & Barber, 2013; S. Ramirez, personal communication, March 30, 2016).

Once the nature-urban routes are complete, the local wildlife that remain will experience the presence of artificial lighting in an area that was not previously as illuminated at night. Such lighting can negatively impact local fauna and affect changes in their circadian rhythms and niche partitioning (L. Zamora & K. Barrantes, personal communication, April 14, 2016; Gaston, Bennie, Davis, & Hopkins, 2013). However, the extent of the effects depends on the brightness, coloration, directionality, and schedule of the lighting (L. Zamora & K. Barrantes, personal communication, April 14, 2016; Gaston, Bennie, Davies, & Hopkins, 2012).

Wildlife living along the Río Torres and Río María Aguilar are already familiar with urban sights and sounds, and they may become accustomed over time to the changes caused by the proposed nature-urban routes (Blickley & Patricelli, 2010; S. Ramirez, personal communication,

March 30, 2016). Nevertheless, these changes still have potential to negatively impact the wildlife currently living along the urban rivers of San José.

Finding 6: The proposed nature-urban routes would reduce reliance on motorized transportation throughout San José.

In our surveys, we asked community members and park-goers two main questions about transportation. The first inquired about the types of transportation that the respondents use on a daily basis, and the other asked if the respondents would use the proposed nature-urban routes to commute throughout the city if the routes connected them to places they wanted to go. We discovered that 91% of the 88 respondents to the first question use some form of motorized transportation on a daily basis.

However, this current high usage of motorized transit among respondents may change significantly once the nature-urban routes are complete. Of the respondents who answered both transportation questions, 91% of those who said that they use motorized transportation on a daily basis also claimed that they would use the proposed routes to commute throughout the city. This indicates that a vast majority of our respondents would reduce their reliance on motorized transit if the routes were constructed in a way that encourages this behavior.

The children of La Carpio are one group of people whose reliance on motorized transit may decrease if the routes connected them to a desired destination. In La Carpio, students need to take a public bus to high school once they reach the sixth grade (M. S. Fernández, personal communication, April 11, 2016). If the nature-urban routes were to pass close enough to the high school these children attend, they could reduce their reliance on motorized transit while preserving their ability to achieve a higher education (M. S. Fernández, personal communication, April 11, 2016).

While the usage of the proposed nature-urban routes for transportation purposes is dependent on the routes connecting city residents to places they want to go, the data discussed in this section demonstrate the significant potential of the routes to reduce reliance on motorized transit. This would lead to a reduction in both air and noise pollution throughout the city of San José.

4.1.3 Community Engagement

Finding 7: Existing organizations could take advantage of public interest in helping maintain the nature-urban routes.

In our surveys, 50 park-goers and 36 community members indicated that they would be interested in cleaning the routes or cleaning the rivers, as shown in **Figure 4.4**. This widespread interest could feasibly be used to facilitate participation in community engagement endeavors, since these actions are already performed by existing community engagement organizations in San José. Through this public involvement, people would gain a sense of ownership and responsibility for the routes (B. Fernandez. personal communication. April 7, 2016).

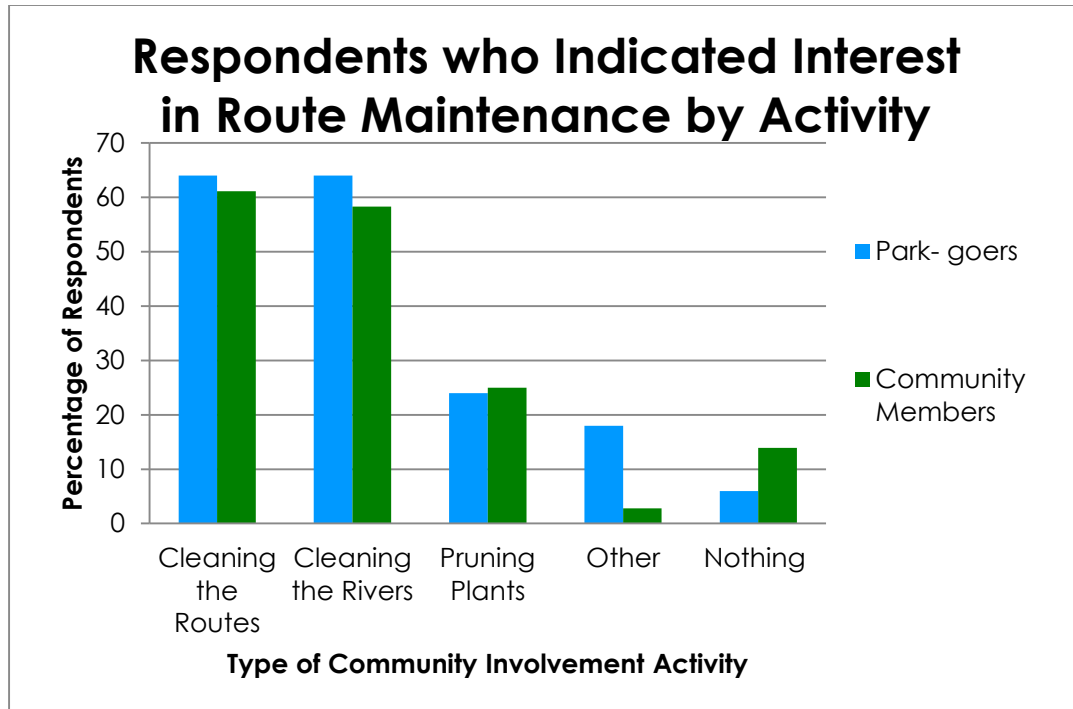


Figure 4.4 This bar chart displays the percent of respondents for both park-goers and community members who would like to become involved with the specified route maintenance activity.

Many community activists and environmental professionals believe community engagement opportunities can educate people to increase stewardship along the routes (R. Faulstich & C. Velásquez, personal communication, March 31, 2016, M. S. Fernández, personal communication, April 11, 2016, B. Fernández De Hütt, personal communication, April 7, 2016). When asked to describe how to reduce littering on the nature-urban routes, 29% of 34 community member respondents wrote about education or changing the community mindset. This demonstrates that residents of San José recognize that people must be taught how to live sustainably in order to fully maintain a beautiful space. Ms. Fernández De Hütt explained that it is important to teach that the Río Torres starts clean at its source but becomes increasingly polluted as it passes through communities in San José (B. Fernández De Hütt, personal communication, April 7, 2016). Current human practices pollute the city’s rivers, but through community

engagement programs, residents could learn that the rivers can easily be kept clean when people help to protect the environment.

As mentioned in **Finding 4**, residents throughout San José view the rivers as garbage dumps. From our surveys with members of both La Carpio and Cristo Rey, 73% of 40 respondents indicated that they do not visit the river closest to their community. To change this, different governmental and civil organizations already coordinate programs that reveal the problems the rivers face while using fun activities to teach solutions (A. Briceño, personal communication, April 6, 2016).

For example Río Urbano is a local community organization that focuses on changing the relationship between people and the rivers. This organization hosts an event called Paint Your River that focuses on participatory action where communities create murals of their ideal river (A. Briceño, personal communication, April 6, 2016). In addition to Paint Your River, Río Urbano hosts river clean-up events to remove litter and revitalize the space, which teaches communities that their visions can become reality if sustainable practices are followed (A. Briceño, personal communication, April 6, 2016). By using the spaces along the proposed nature-urban routes, community engagement organizations can bring river awareness and education to more of the surrounding communities.

Finding 8: The inclusion of desired amenities at specific points along the proposed nature-urban routes would provide opportunities for stewardship.

Including desired recreational features along the routes would increase the value of the space for many and thereby encourage greater community engagement and stewardship. We asked park-goers and community members to rank amenities for user satisfaction to see which three would be most enjoyed in a public green space, as shown in **Figure 4.5**. Respondents could also offer their own suggestions, which we display as ‘Other’ in the figure. Notably, both park-goers

and community members ranked containers for recycling and composting as one of the three most important amenities on the routes. However, park-goers ranked water fountains and places to sit as the other two of their three most important amenities, while community members ranked playgrounds and bike-friendly surfaces as their other two.

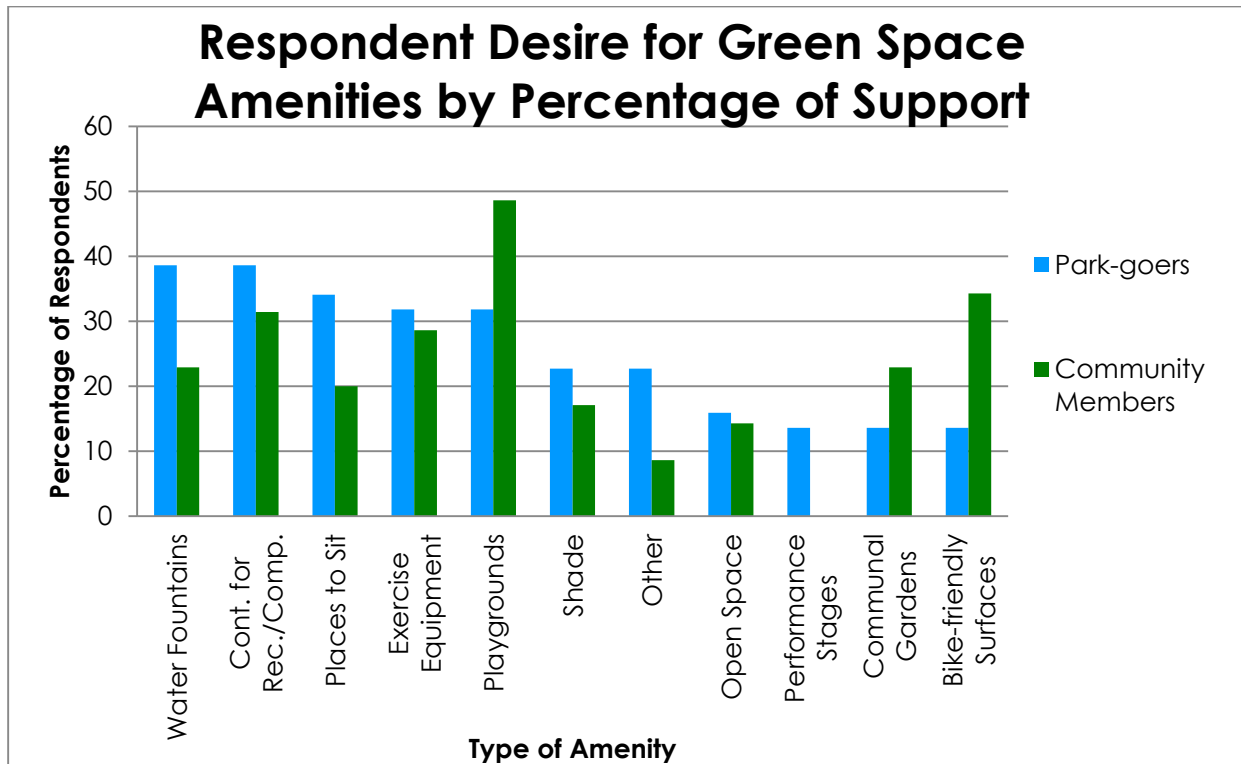


Figure 4.5 This bar chart displays the percentage of both park-goer and community member support for the inclusion of the specified amenities in green spaces.

A discrepancy exists between park-goers and community members in the features they value. The communities may express a greater desire for playgrounds because there are many kids in the area and few existing playgrounds at this time. Exercise equipment may be desired because other places to exercise may be too far away or too expensive for community members to access. Visitors to parks may already have access to playgrounds or exercise equipment that is not available in communities that do not have parks. People would likely visit a green space more often if it has amenities they desire.

Feelings of appreciation for desired amenities could also help establish a sense of ownership among community members. Ms. Barrantes and Mr. Zamora expressed that it is very important to get the community involved with the design process and the creation of the routes (personal communication, April 14th, 2016). This concept is furthered by Mr. Briceño, who has said that the best type of initiative that exists is the kind where people want something (A. Briceño, personal communication, April 6, 2016). Because the community wants something, such as containers for recycling and composting, water fountains, playgrounds, and other features, it is more likely that they will take care of these amenities (A. Briceño, personal communication, April 6, 2016).

Finding 9: The public would like to see the nature-urban routes used for art exhibitions and musical purposes.

We asked survey respondents for which cultural purposes they would like to see the routes used. Respondents received the choices of art exhibitions, music and concerts, religious purposes, street vending, and ‘other,’ where respondents could write their own option. Respondents expressed the greatest interest for music and concerts as well as art exhibitions, as shown in **Figure 4.6**. By providing the community with multiple uses of the routes, more people would likely use the routes and feel a sense of ownership (B. Fernández, personal communication, April 7, 2016).

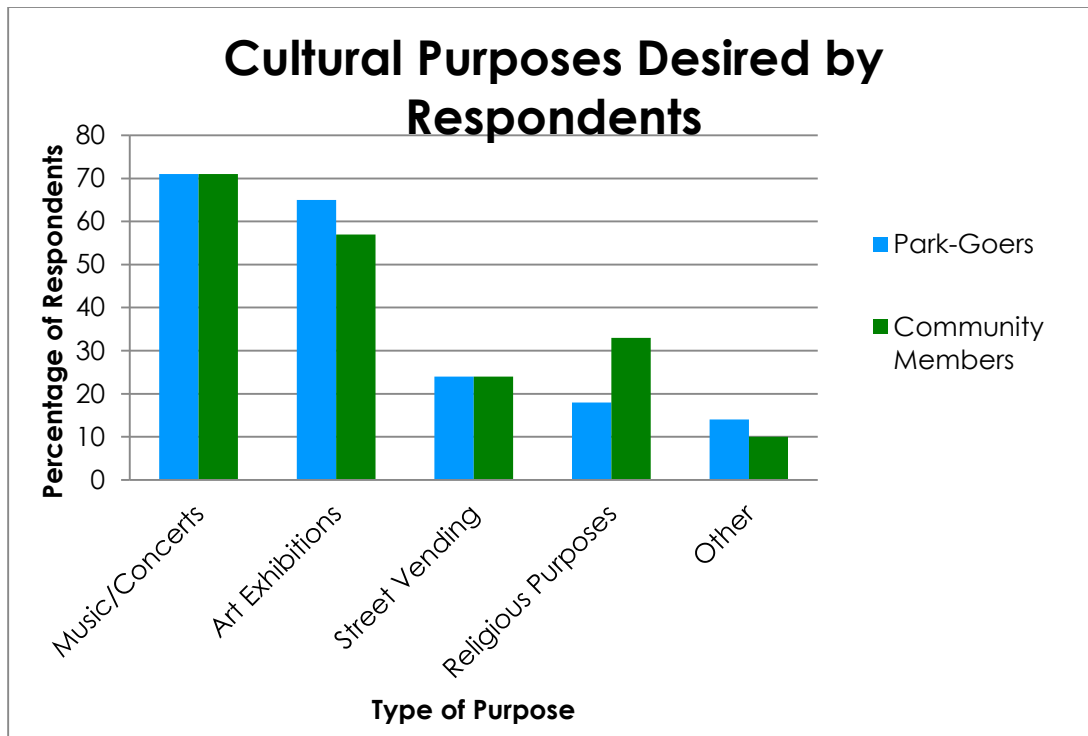


Figure 4.6 This bar chart displays the percentage of park-goer and community member support for the use of the routes for the specified purposes.

Finding 10: The proposed nature-urban routes would bring public green spaces to communities that currently have few to none.

In our community surveys, 86% of 35 respondents reported that there are not any green spaces in Cristo Rey and La Carpio. This is a great disadvantage to these communities since they cannot receive the major health and societal benefits green spaces provide. The proposed nature-urban routes, however, are expected to turn the degraded landscapes near these communities into working green spaces, connecting people to both the rivers and other neighborhoods in the process.

Some of the green spaces that do exist along the rivers have successfully encouraged community engagement and stewardship (A. Briceño, personal communication, April 6, 2016). For example, Polideportivo Aranjuez is a public space that borders the Río Torres to the north and has playground equipment, sports facilities, benches, and walking paths for active and passive recreation. The district in which Polideportivo Aranjuez is located has also installed an anti-drug

facility on the property to encourage healthy life choices in the area (B. Fernández De Hütt, personal communication, April 7, 2016).

Furthermore, many community organizations request space for their events at Polideportivo Aranjuez (B. Fernández De Hütt, personal communication, April 7, 2016). ChepeCletas, another organization already affiliated with Rutas Naturbanas that promotes the use of bicycles in San José, hosts bicycle tours of the Río Torres that end at this public space. Río Urbano has hosted other events such as Picnic del Río, which aims to highlight both nature and the community (A. Briceño, personal communication, April 7, 2016; B. Fernández De Hütt, personal communication, April 7, 2016). Additionally, an artisanal farmer's market called Feria Verde is held at Polideportivo Aranjuez every Saturday to highlight local skills and products. Organizations and community members both benefit from this green space. Since Polideportivo Aranjuez has had great success with engaging communities, it is possible that the nature-urban routes may have similar results, especially in communities that do not have green spaces.

Finding 11: Local business groups may help with route maintenance since the nature-urban routes may bring additional income into their communities.

The nature-urban routes are expected to benefit local economies because the routes would bring people to the rivers and promote urban ecotourism (B. Fernández De Hütt, personal communication, April 7, 2016, A. Briceño, personal communication, April 6, 2016). As people walk the routes to commute or view the river scenery, they may also be interested in visiting nearby businesses. Currently, many of these businesses do not have a large consumer base, but the nearby presence of a heavily-visited route would give them greater publicity and therefore more customers (A. Briceño, personal communication, April 6, 2016). This is supported by our surveys, which show that 62% of 84 survey respondents would visit local businesses more often if the venues were located by nature-urban routes. The increase in visitors would create and expand economic

opportunities for local businesses (Dunnett, Swanwick, & Woolley, 2002; Saraev, 2012). Thus, the presence of nature-urban routes could promote economic growth and provide additional income to local businesses. As a result of this positive change, local business owners may become stewards of the nature-urban routes since maintaining and improving the routes would likely draw more customers into their communities.

4.2 Recommendations

Recommendation 1: Include ample police presence, lights, and emergency call boxes for security purposes along the routes.

As described in **Finding 3**, police personnel and lights are the top two features that park-goer and community member respondents ranked as the most important for safety. We recommend that Rutas Naturbanas works with the Public Force Police to incorporate the routes into the officers' typical patrols.

Lights should be implemented in such a way that a person's face can be recognized from a distance of 25 meters (Luymes & Tamminga, 1995). Light Emitting Diodes (LEDs) may be a viable light source option because they consume less energy and produce more light than commonly used halogen lamps (LED, 2014). As shown in **Figure 4.7**, the directionality of the light should be focused mainly on the route paths so the light does not filter into the surrounding environment and disrupt animals (Rich & Longcore, 2013). To further reduce the amount of light pollution, one potential lighting system that could be implemented is motion/heat sensing lights. However, animals may be startled by this irregular lighting (S. Ramirez, personal communication, March 30, 2016). In order to prevent any negative impacts on the local wildlife, a more comprehensive study should be conducted to determine both the appropriate type of light source

as well as the optimal color and brightness ranges for the animals living along the Río Torres and Río María Aguilar (L. Zamora & K. Barrantes, personal communication, April 14, 2016).

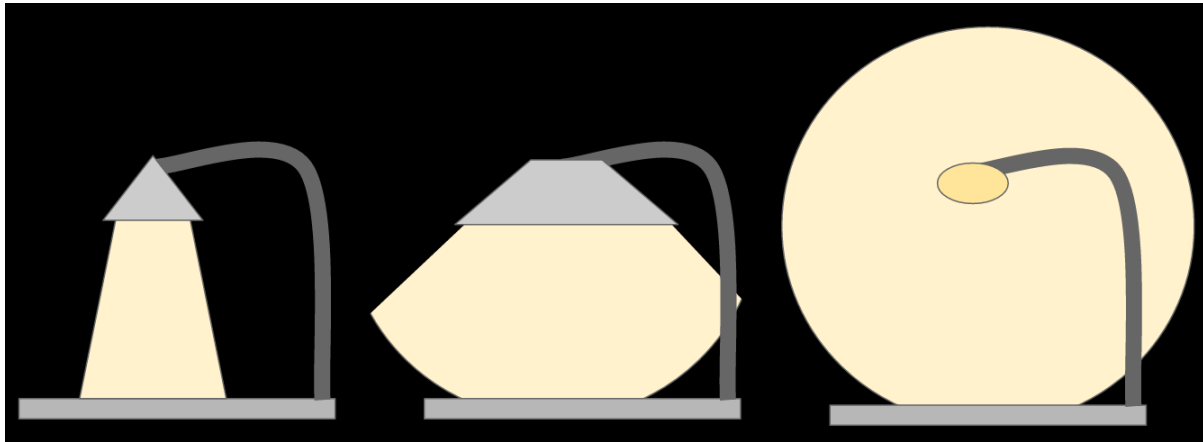


Figure 4.7 Depiction of good (left), acceptable (center), and bad (right) lighting directionality.

In addition to police presence and lighting, emergency call boxes, such as the blue light system, are another safety feature that could be implemented along the routes. The blue light system is a series of alarm stations used to contact and dispatch responders in the case of an emergency (Blue Light, 2015). The system is widely used on college campuses throughout the United States, and the San José campus of the University of Costa Rica (UCR) currently uses it as well. A call box on UCR's campus is shown in **Figure 4.8**. When asked if this could be a viable safety option along the nature-urban routes, Ms. Edgell and Mr. Rosabal had nothing but positive comments about the system (personal communication, April 13, 2016). Mr. Rosabal said that it would be a quick way to contact emergency officials (personal communication, April 13, 2016). The system also has the potential to assist in community watch initiatives because route users could take responsibility to report any emergency incidents they see occur themselves.



Figure 4.8 This figure shows one of the blue light call boxes and its use description on UCR’s campus.

On college campuses, the system contacts campus police. To implement the system along the routes, a connection would need to be made between the call boxes and the Public Force police. Additionally, descriptions about how to use them should be provided alongside the boxes because the system will likely be a new concept to many users.

Contact information for distributors of the system in the United States is provided in **Table 4.1**. UCR uses the Code Blue system, so Code Blue is a viable option within Costa Rica. A variety of system models exist, so Rutas Naturbanas should carefully review the types offered on the company websites to determine which will work best along the routes. Rutas Naturbanas should also contact UCR’s Office of General Services at 2511-4500 or servicios.osg@ucr.ac.cr for more information regarding the implementation process. The specific locations of the modules will depend on the physical attributes of the nature-urban routes, but we suggest placing modules such

that two are visible from any location on the routes. This would provide more emergency access and create a greater sense of security.

Table 4.1 Blue Light System Distributor Information

| Blue Light System Distributors | | |
|--------------------------------|--------------|---|
| Company | Phone Number | Website |
| Code Blue | 800-205-7186 | http://codeblue.com/ |
| Rath Security | 866-850-8854 | http://www.rathsecurity.com/ |
| Talkaphone | 773-539-1100 | http://www.talkaphone.com/ |

Recommendation 2: Begin a bicycle-sharing system along the proposed nature-urban routes.

As previously mentioned, one in three people in San José do not use bicycles to commute to work since they believe the lack of infrastructure makes it unsafe (Encuesta, 2015). However, as noted in **Finding 6** a large number of our survey respondents said they would use the nature-urban routes to commute throughout the city. Furthermore, as seen in **Figure 4.5**, community members ranked bicycle-friendly surfaces as their second most important green space amenity, suggesting interest in bicycle use. Additionally, the nature-urban routes would provide bicyclists with a safer means for recreational and commuting travel. For these reasons, we recommend that Rutas Naturbanas implements a bicycle-sharing system on the nature-urban routes to facilitate bicycle use and further reduce reliance on motorized transit in San José.

Many cities, such as Mexico City, Mexico, have initiated bicycle-sharing systems (“What’s ECOBICI?”, 2016). In these systems, bicycles are available for the public to rent from automated hubs throughout the city, as seen in **Figure 4.9** (“What’s ECOBICI?”, 2016). Typically, the hubs require a credit card to rent a bicycle and the user is charged per unit of time until the bicycle is returned (“What’s ECOBICI?”, 2016). This ensures that the bicycle is returned since the user is held accountable.

On the nature-urban routes, the hubs could be placed at each route entrance to make the bicycles readily available to visitors. Users can then return the bicycles to a nearby hub when they leave the routes. This bicycle-sharing system could require a credit card or personal identification card to allow for the same accountability seen with other systems. Since theft is common in San José as discussed in **Finding 1**, we suggest that bicycles be secured at night, perhaps in enclosed garages or sheds along the routes, to prevent theft and vandalism. The hubs could then be opened in the morning by a worker or volunteer for the bicycle-sharing system. During the day, we hope the high presence of route visitors will prevent criminal behavior since more people will speak out against such acts.



Figure 4.9 Example of a bicycle-sharing hub in Medford, Massachusetts. We do not endorse New Balance or Hubway. Photo by Edwin Nicholas McGlew IV.

To begin the bicycle-sharing system, Rutas Naturbanas could work with ChepeCletas since they are already affiliated with the organization and ChepeCletas has a source of bicycles for its bicycle tours. ChepeCletas may have a limited amount of bicycles to provide, but they may be able to coordinate with other local bicycle rental businesses such as BICI Subasta Costa Rica, Centro Cultural Comunitario de la Bicicleta, and RentaCletas. These businesses could supply bicycles to the bicycle-sharing system and host hubs along the routes for visibility. All bicycles used for the bicycle-sharing system should have a defining feature such as a flag, decal, or select color scheme to differentiate them from personally-owned bicycles. This would be both a means of bicycle theft prevention and an advertisement for the program. While many businesses can contribute to the bicycle-sharing system, the system should be unified, allowing all bicycle users to pick-up and drop-off bicycles at any hub along the routes regardless of which company owns the bicycle. This will provide for a more seamless user experience.

Since Rutas Naturbanas is concerned with providing equal opportunities to marginalized communities, the system does not necessarily need to be automated like the system in Mexico City. Since it is possible that some of the people in these communities do not have credit cards or personal identification cards, users could pay with cash to use the bicycle system. A worker from either the bicycle share system or the individual supporting businesses could man each hub to collect money from renters and unlock the bicycles for use. Since a worker would be at each route entrance, they could ensure the bicycles do not leave the routes.

One potential way to uphold accountability and thus ensure the return of the bikes would be to require a cash deposit before the users can rent a bicycle. A worker could give the user a receipt with the time the bicycle is taken out. The user could then present this receipt to the worker

to whom they return the bicycle. The worker could then refund the user with their deposit. By having the incentive of being refunded, more people would be likely to return the bicycles.

Regardless of whether the bicycle-sharing system is automated or manned, this program would likely raise awareness and revenue for companies who contribute to the initiative, decrease the need for motorized commuting, and offer a fun recreational activity for route visitors.

Recommendation 3: Include amenities specific to community desires in key locations along the routes.

As discussed in **Finding 8**, the residents we surveyed in La Carpio and Cristo Rey valued the same amenities the most. Our community member respondents expressed a high desire for water fountains, playgrounds, and containers for recycling and composting. Rutas Naturbanas should aim to satisfy these desires through the construction of such amenities along the segments of the routes near La Carpio and Cristo Rey. This inclusion of desired amenities would improve community ownership and use of the routes.

However, their desires differed from those of our park-goer respondents. This indicates that other communities throughout San Jose – the ones where the park-goers live – may value different amenities the most. Therefore, before route amenities are put into place, Rutas Naturbanas should consider determining which amenities are most highly valued by each community along the proposed nature-urban routes. This proactive research would increase the future community ownership and stewardship of the routes.

This could be efficiently accomplished by distributing brief surveys in each area of interest that ask respondents about the amenities they would like to see implemented in their area. The surveys should come with a pre-paid envelope addressed to Rutas Naturbanas so as to reduce the effort required from respondents in order to return the surveys. This approach would provide

community-specific data regarding what people would want to see in their area. It would also require far fewer man-hours than attempting to conduct every community member survey in person.

Once the most important amenities for that area are determined, those features can be put in place nearby. This will improve community engagement because the people living near the routes will want to take care of the amenities that they indicated they desired.

Recommendation 4: Create bridges and elevated pathways that are designed as points of interest.

Rutas Naturbanas has proposed the creation of additional bridges along the Río Torres and Río María Aguilar (Rutas Naturbanas, 2016). The organization may already intend to construct elevated pathways along the routes as well. While these new infrastructure would aim to improve visitor mobility and reduce the negative environmental impacts described in **Finding 5**, it is also possible to make them points of interest.

For instance, some of the new bridges and elevated platforms could emulate the hanging bridges that exist in Costa Rica's Monteverde and Arenal National Parks. Incorporating metal grating into the flooring and railing of these infrastructure would allow visitors better views of the scenery below. This may seem a counterintuitive proposition, since providing this feature would make potentially unappealing and polluted river areas more easily visible to visitors. However, Rutas Naturbanas already seeks to increase public awareness of the contaminated states of the Río Torres and Río María Aguilar through the creation of their nature-urban routes. Constructing such bridges and elevated platforms would further help heighten public awareness of the contaminated states of the rivers, and potentially lead people to act. Additionally, these bridges and elevated platforms would offer views of cleaner and better-maintained river areas once the states of the Río

Torres and Río María Aguilar improve. Thus, these infrastructure could additionally serve as investments for the future. Rutas Naturbanas should examine which points along the routes, if any, may serve as appropriate places for this type of design by determining which locations would provide the most appealing sights in the future. Such metal flooring may be more practical in bridges or in elevated platforms built along steeper banks, as they may provide better views.

Rutas Naturbanas could also make the new bridges and elevated platforms points of interest in a more affordable manner by following the example set by the Bridge Beautification Project of Amigos del Torres. Since 2015, the Bridge Beautification Project has taken steps toward making several bridges more attractive to potential visitors, including planting flowers along the bridges (Robert Faulstich & Carlos Velásquez, personal communication, March 31, 2016). Rutas Naturbanas could also coordinate with local architecture schools, such as the Costa Rica Institute of Technology's School of Architecture and Urban Planning, to organize design contests that would help determine the appearances of the new bridges while encouraging community involvement in the route development process.

A primary goal of Rutas Naturbanas is to connect people to each other through nature (Rutas Naturbanas, 2016). By designing elevated pathways and new bridges in a way that stimulate public interest, Rutas Naturbanas can promote this interconnection of people and nature by making these connectors points of attraction.

Recommendation 5: Collaborate with local organizations to encourage community engagement along the routes.

Collaborating with other organizations would provide Rutas Naturbanas with further opportunities for engaging with the communities of San José. For example, festivals and community clean-up days could be scheduled every month to increase excitement about

maintaining and designing the routes. By dedicating a day to cleaning and maintenance, the whole community could work together to maintain the routes. Río Urbano and Amigos del Torres already work on similar initiatives. For example, as mentioned previously, Río Urbano hosts an event called Paint Your River, and Amigos del Torres runs the Bridge Beautification Project. Collaborating further with organizations such as these would provide more opportunities for community engagement with the design and maintenance of the routes.

Bins for recycling and composting, which were highly desired amenities among survey respondents as shown in **Finding 8**, could be painted to encourage usage of the bins and discourage littering along the routes and in public green spaces. For example, an event for children to help paint these bins would create an opportunity for community engagement and education. An example of what the bins could look like if a project such as this were implemented is included in

Figure 4.10.



Figure 4.10 Possible recycling center in a park with bins painted from a community engagement project.

Many respondents indicated that they would like music, concerts, and art exhibitions to be included along the route, as discussed in **Finding 9**. GAM Cultural is an organization that is

collaborating with Rutas Naturbanas in the creation of the nature-urban routes. This organization could work to select local artists to participate in both musical and artistic events. SIFAIS, as an organization that works to involve residents of La Carpio in the arts, could connect Rutas Naturbanas with members of its community to participate in such events as well. A variety of other opportunities exist for Rutas Naturbanas to collaborate with cultural organizations, nearby neighborhoods, local schools, and individual residents of San José.

Recommendation 6: Partner with the Public Transport Council and the Ministry of Public Works and Transportation to create new bus stops at key locations along the nature-urban routes.

As shown in **Finding 6**, survey respondents indicated that they would use the nature-urban routes to commute throughout the city if the routes connected them to places they wanted to go. However, it is not guaranteed that a respondent’s home, workplace, or other destinations of interest would all be located within walking distance of the routes. As a result, fewer individuals may use the routes for commuting purposes unless they could use another means of transportation to and from the routes. To this end, creating bus stops at key locations along the nature-urban routes may facilitate their use for commuting purposes by city residents. Rutas Naturbanas should thus work with the appropriate governmental agencies, such as Costa Rica's Public Transport Council (CPT) and Ministry of Transportation and Public Works (MOPT), to explore the feasibility of implementing this proposal.

Recommendation 7: Establish an “Adopt A Route” program to help fund route maintenance and promote local businesses and organizations.

In **Finding 7**, we showed that significant public interest exists in helping maintain the proposed nature-urban routes. However, not all route maintenance activities will necessarily be

performed by unpaid volunteers. By establishing an “Adopt A Route” program that allows local businesses and organizations to sponsor specific segments of the routes, Rutas Naturbanas could acquire funds to pay for additional route maintenance.

This program would be similar to the Adopt A Highway program that exists in the United States, where businesses and organizations can pay a monthly fee that covers the cost of maintenance for a specific section of highway (Adopt A Highway Maintenance Corporation, n.d.). In return, the Adopt A Highway program places signs along the highway indicating the sponsorship (Adopt A Highway Maintenance Corporation, n.d.). This provides the sponsoring business or organization with visibility and the appearance of corporate responsibility.

While the establishment of nature-urban routes could bring more people to businesses near the routes as described in **Finding 11**, local businesses may also appreciate the increased recognition that would come from being advertised in signs along the routes. Thus, by establishing an “Adopt A Route” program, Rutas Naturbanas can acquire funds for maintenance while promoting the visibility of local businesses and organizations.

Recommendation 8: To improve public reception of the proposed nature-urban routes, Rutas Naturbanas should incorporate new outreach efforts into their public relations campaign.

As noted in **Finding 4**, a number of community member survey respondents expressed skepticism towards the proposed nature-urban routes. Furthermore, Rutas Naturbanas anticipates some measure of opposition and concern from property owners who live along the rivers (F. Cartín, personal communication, February 2, 2016). To proactively address these challenges, Rutas Naturbanas should perform public outreach that aims to improve public awareness and

understanding of its project. In doing so, Rutas Naturbanas should be sure to reach a variety of audiences.

As part of this initiative, public hearings and meetings should be held in communities near the Río Torres and Río María Aguilar to convey the purpose of the routes and both solicit and respond to community feedback. These events would directly inform community members about the routes, thus resolving misunderstandings and increasing general support for the Rutas Naturbanas project. Billboards, pamphlets, posters, and online advertisements could be used to reach other city residents such as park visitors or people who have liked the “La Sabana Metropolitan Park” page on Facebook.

Additionally, a public relations initiative modeled after the aspirational “If...” campaign to advance Worcester Polytechnic Institute could capture public imagination for the routes by leading people to consider how the rivers could be in the future (If...The Campaign to Advance WPI). This could involve route-supportive organizations adding a Rutas Naturbanas theme to their regular activities. For example, Río Urbano could host a special Paint Your River event that would focus on painting the Río Torres as it would appear with nature-urban routes. In the end, a comprehensive public outreach initiative could significantly assist Rutas Naturbanas in raising awareness and support for the nature-urban routes throughout San José.

4.3 Limitations

First, confusion among survey participants led some to give answers that differed from the expected format for a number of questions, thus reducing the available sample of valid responses. Additionally, while we sought to attain a representative sample of respondents in both communities and parks, we were unable to visit every part of each community. Thus, there may be opinions and experiences that are not included in our data set. This is important to note because

different parts of the same community could hold different perspectives. Future research should ensure that a larger sample size is taken from within each community in order to gain a more accurate view of community sentiment. Lastly, survey respondents who were not sitting alone would often collaborate on their responses. While discussion with others could have clarified the meanings of confusing questions, the occurrence of discussion means that the responses are not necessarily representative of the individual's beliefs. Therefore, a bias could be present in our data. Future researchers may consider communicating to respondents that the surveys should be completed individually, not collaboratively.

5.0 Conclusion Chapter

Every day, the people of San José – especially those living in the city’s more marginalized communities – must contend with the negative impacts of insufficient public space, highly contaminated waterways, and inadequate transportation infrastructure. Even in a country so widely-known for its environmental consciousness, the people of San José have lost their connection to nature. Our sponsor, Rutas Naturbanas, wants to collectively address these challenges by creating nature-urban routes along two of San José’s rivers, the Río Torres and the Río María Aguilar. Encompassing 25 kilometers, these nature-urban routes would improve the livelihoods of dozens of communities and the city as a whole.

By coming to Costa Rica, we hoped to make people’s voices heard in a project that is meant to benefit them. To this end, we spoke with activists, professionals, and residents throughout the city to both gain expert knowledge and empower traditionally-unheard voices. We examined how the proposed nature-urban routes could impact important themes such as public safety, environmental protection, and community engagement in our efforts to assist Rutas Naturbanas in their work.

With our recommendations, Rutas Naturbanas can build upon its existing plans and further encourage the establishment of the routes as focal points for community, culture, and environmental consciousness. By partnering more fully with the people and organizations of San José, Rutas Naturbanas can actively gauge community needs and desires while ensuring diverse groups remain represented and engaged in the development, use, and maintenance of the routes. Additionally, through further examining the needs of species living along the Río Torres and the Río María Aguilar, Rutas Naturbanas can determine which lighting specifications would best protect the local environment.

It is our hope and the hope of our sponsor that, one day, the people of San José will live better connected to each other and to nature. The proposed nature-urban routes cannot solve the city's problems alone, but, through our work and the work of Rutas Naturbanas, they will serve as the foundation for many other positive environmental and social changes in the future.

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Appendices

Appendix A: Survey for Community Members

We are a group of students from Worcester Polytechnic Institute (WPI) near Boston in the United States. We are carrying out surveys with member of communities in San José to learn more about their opinions and experiences related to various themes. Our final objective is to offer recommendations to a nonprofit organization that is working to establish nature routes for walking, riding bicycles, etc. along the Río Torres and Río María Aguilar in the city of San José that are safe and sustainable. Your knowledge and perspective would be extremely useful.

Your participation in this survey is completely voluntary and anonymous and you can withdraw at any time. If you are interested, a copy of our results can be provided to you at the end of our project. You only have to send us an email at ruta-d16@wpi.edu. We appreciate your participation very much.

Demographic Information

1. Please indicate your age range:
<18 18–25 26–35 36–45 46–55 56–65 66+
 2. Please indicate your gender:
Male Female Other
 3. In what community do you reside?
-

Section 1: Questions about Crime and Security

1. What is your opinion of crime in your community?

2. Community Safety:
 - a. How safe do you feel in your community on a scale of 1 (not safe at all) to 10 (extremely safe)?
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 or Unsure
 - b. Where do you feel safest in your community?

- c. Where do you feel the most unsafe in your community?

- d. Please rank the following features in order of their importance to making you feel safe in a public space, with 1 being the most important, 2 being the second-most important, and so on.
- ___ Access Roads
 - ___ Alternative Entrances/Exits
 - ___ Lights
 - ___ Open Space
 - ___ Other People
 - ___ Police Officers
 - ___ Sidewalks
 - ___ Other: _____
3. Do you know of any crimes that are committed in your community?
Yes, No, Unsure, or Other: _____
- a. If yes, please circle all that apply.
- i. Assault
 - ii. Distribution of Illegal Substances
 - iii. Use of Illegal Substances
 - iv. Robberies
 - v. Vandalism
 - vi. Other: _____
- b. Of your selections in part 3a, which is the most concerning to you?

Section 2: Questions about the Rivers and the Environment

About the closest river, Río Torres or Río María Aguilar

1. Do you visit the river?
Yes, No, or Unsure
- a. If you visit the river, how often do you visit? (Circle one.)
Daily Weekly Monthly Yearly Other: _____
2. Why do you or do you not visit the river?

3. Regardless of whether or not you visit the river, what would cause you to visit the river more often?

4. How would you feel about the creation of nature-urban routes along the river, on a scale from 1 (negatively) to 10 (positively)?

1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 or Unsure

a. Why do you feel this way?

5. In your opinion, would the creation of the nature-urban routes change the local area? If so, in what ways?

6. What do you think would be the best way(s) to discourage littering along nature-urban routes?

7. How do you typically react if you see someone harming the environment?

a. If you saw someone harming the environment, would you contact anyone? If so, who?

Section 3: Questions about Community Engagement

1. Green spaces are places of grass, trees, or other plants. Generally, these places are used for recreational and aesthetic purposes. Are there green spaces in your community?

Yes, No, or I don't know

a. Do you visit green spaces in this area? Why or why not?

2. What are your favorite and least favorite parts of the green spaces you have visited?

a. Favorite parts:

b. Least favorite parts:

3. What would you like to see in a nearby green space? (Circle all that apply.)

a. Bike-friendly Surfaces

b. Community Gardens

c. Drinking Fountains

- d. Exercise Equipment
- e. Open Space
- f. Performance Stage
- g. Places to Sit
- h. Recycling/Composting Bins
- i. Shade
- j. Youth Playgrounds
- k. Other:

4. Of the options you circled in question 3, which are the most important to you? Please rank them from 1 (most important) to 3 (third-most important).

1: _____

2: _____

3: _____

5. What means do you use for transportation on a day-to-day basis? (Circle all that apply)

- a. Walking/Running
- b. Biking
- c. Bus
- d. Taxi
- e. Personal Vehicle
- f. Carpool
- g. Train
- h. Other:

6. If nature-urban routes were constructed close to local businesses, how would the frequency of your visitation to local businesses change? (Please circle one answer.)

- a. The frequency of my visits would increase
- b. The frequency of my visits would not change
- c. The frequency of my visits would decrease
- d. Unsure

7. How would you use nature-urban routes for recreation, if at all?

8. Would you use the nature-urban routes to commute through the city if they connected you to places that you wanted to go? Yes, No, or Unsure

9. In terms of community events, what would you want the routes to be used for? (Circle all that apply.)

- a. Art Exhibits

- b. Music/Concerts
 - c. Religious Purposes
 - d. Street Vending (Food, Clothing, Jewelry, etc.)
 - e. Other:
-
-

10. Which, if any, of the following route maintenance efforts would you potentially be interested in assisting with? (Please circle all that apply.)

- a. Path Clean Up
- b. Plant Pruning
- c. River Clean Up
- d. None
- e. Other: _____

Appendix B: Survey for Park-Goers

We are a group of students from Worcester Polytechnic Institute (WPI) near Boston in the United States. We are carrying out surveys with visitors of some parks in San José to learn more about their opinions and experiences related to various themes. Our final objective is to offer recommendations to a nonprofit organization that is working to establish nature routes for walking, riding bicycles, etc. along the Río Torres and Río María Aguilar in the city of San José that are safe and sustainable. Your knowledge and perspective would be extremely useful.

Section 1 contains questions about security.

Section 2 contains questions about parks and urban development.

Your participation in this survey is completely voluntary and anonymous and you can withdraw at any time. If you are interested, a copy of our results can be provided to you at the end of our project. You only have to send us an email at ruta-d16@wpi.edu. We appreciate your participation very much.

Demographic Information

1. Please indicate your age range:
<18 18–25 26–35 36–45 46–55 56–65 66+
2. Please indicate your gender:
Male Female Other
3. In what community do you reside?

Section 1: Questions about Security

1. What is your opinion of crime in public green spaces?

2. Community Security
 - a. How safe do you feel in your community on a scale of 1 (not safe at all) to 10 (extremely safe)?
1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 or Unsure
 - b. Please rank the following features in order of their importance to making you feel safe in a public space, with 1 being the most important, 2 being the second-most important, and so on.

- ___ Access Roads
- ___ Alternative Entrances/Exits
- ___ Lights
- ___ Open Space
- ___ Other People
- ___ Police Officers
- ___ Sidewalks
- ___ Other: _____

3. Do you know of any crimes that are committed in public green spaces?

Yes, No, Unsure, or Other: _____

a. If yes, please circle all that apply.

- i. Assault
- ii. Distribution of Illegal Substances
- iii. Use of Illegal Substances
- iv. Robberies
- v. Vandalism
- vi. Other: _____

b. Of your selections in part (a), which is the most concerning to you?

Section 2: Questions about Parks and Urban Development

1. Green spaces are places of grass, trees, or other plants. Generally, these places are used for recreational and aesthetic purposes. Why did you visit this green space today?

2. What are your favorite and least favorite parts of the green spaces you have visited?

a. Favorite parts:

b. Least favorite parts:

3. What would you like to see in a nearby green space? (Circle all that apply.)

- a. Bike-friendly Surfaces
- b. Community Gardens
- c. Drinking Fountains
- d. Exercise Equipment
- e. Open Space
- f. Performance Stage

- g. Places to Sit
 - h. Recycling/Composting Bins
 - i. Shade
 - j. Youth Playgrounds
 - k. Other:
-
-

4. Of the options you circled in question 3, which are the most important to you? Please rank them from 1 (most important) to 3 (third-most important).

- 1: _____
- 2: _____
- 3: _____

5. What means do you use for transportation on a day-to-day basis? (Circle all that apply.)

- a. Walking/Running
 - b. Biking
 - c. Bus
 - d. Taxi
 - e. Personal Vehicle
 - f. Carpool
 - g. Train
 - h. Other:
-
-

6. If nature-urban routes were constructed close to local businesses, how would the frequency of your visitation to local businesses change? (Please circle one answer.)

- a. The frequency of my visits would increase
- b. The frequency of my visits would not change
- c. The frequency of my visits would decrease
- d. Unsure

7. How would you use nature-urban routes for recreation, if at all?

8. Would you use the nature-urban routes to commute through the city if they connected you to places that you wanted to go? Yes, No, or Unsure

9. In terms of community events, what would you want the routes to be used for? (Circle all that apply.)

- a. Art Exhibits
- b. Music/Concerts
- c. Religious Purposes
- d. Street Vending (Food, Clothing, Jewelry, etc.)

e. Other:

10. Which, if any, of the following route maintenance efforts would you potentially be interested in assisting with? (Please circle all that apply.)

- a. Path Clean Up
- b. Plant Pruning
- c. River Clean Up
- d. None
- e. Other: _____

Appendix C: Interview Questions for Carmen Edgell & Amado Rosabal

We are a group of students from Worcester Polytechnic Institute (WPI) near Boston in the United States. We are carrying out interviews with police professionals in San José to learn more about their opinions and experiences related to crime and security in the city. Our final objective is to offer recommendations to a nonprofit organization that is working to establish nature routes for walking, riding bicycles, etc. along the Río Torres and Río María Aguilar in the city of San José that are safe and sustainable. Your knowledge and perspective would be extremely useful.

Your participation in this interview is completely voluntary and anonymous and you can withdraw at any time. If you are interested, a copy of our results can be provided to you at the end of our project. You only have to send us an email at ruta-d16@wpi.edu. We appreciate your participation very much.

1. What are your roles with the Municipal Police?
2. The work you do is very different from the work of the Public Force Police?
3. Is there an organization for cooperation between the community and the police in each neighborhood or in certain regions?
4. Do you think that a good relationship exists between the communities and the police?
5. What do you know of the crime that occurs in La Carpio and Cristo Rey?
6. Is narcotrafficking the primary cause of violence and crime in San José in general or in communities like La Carpio and Cristo Rey?
7. Is there a place like a website where we could look for more information about statistics of San José?
8. What could be done to improve the security of the routes?
9. Do you think that the involvement of the community is very important for the security of roads?
10. We have surveys for members of Cristo Rey. It has been recommended that we visit the community with police officers. Would it be necessary?
 - a. Could you help us organize security to visit Cristo Rey?
11. What suggestions do you have for the creation of a secure public space?
12. Syracuse, New York implements something called a blue light system. They describe the system as “a series of emergency alarm stations strategically located throughout the campus to provide assistance to anyone in distress. A blue beacon is positioned above each alarm station. When an individual presses the alarm button, they can communicate directly with the communications center at the Department of Public Safety, to notify the dispatcher of the emergency. An officer or an emergency team will be dispatched to respond effectively to the situation” (Blue Light and Phone Alarm System, 2015). Is a blue light system a viable option?

13. We do not want the routes to be used for drug transportation. Is it possible to do something to prevent this?
14. The nature routes are going to be for pedestrians and non-motorized traffic. Are there installations or things that could be made so that police and paramedics are able to help people on the routes if necessary?
15. We want to interview members of the Public Force Police as well. Do you have any contacts in the Public Force who we could interview?
16. Do you have any questions for us or anything else you want to tell us?

Appendix D: Interview Questions for Sara Ramirez

We are a group of students from Worcester Polytechnic Institute (WPI) near Boston in the United States. We are carrying out interviews with environmental professionals in San José to learn more about the impacts of infrastructure on the environment and what could be done to mitigate those impacts. Our final objective is to offer recommendations to a nonprofit organization that is working to establish nature routes along the Río Torres and Río María Aguilar in the city of San José that are safe and sustainable. Your knowledge and perspective would be extremely useful.

Your participation in this interview is completely voluntary and anonymous and you can withdraw at any time. If you are interested, a copy of our results can be provided to you at the end of our project. You only have to send us an email at ruta-d16@wpi.edu. We appreciate your participation very much.

1. What are some of the responsibilities of your work?
2. In general, what do you think would be some positive and negative impacts of these routes along these zones that are relatively undeveloped?
3. What impacts on species are caused by constructed infrastructure?
4. Could artificial structures be installed to attract more wildlife?
5. What types of soft infrastructure could be used to minimize the negative impacts of the routes?
6. What materials could be used that are more permeable to water?
7. What types of lights would have the least environmental impact?
8. If there were lights that only turned on when people were close, how would they affect the environment and the animals?
9. What types of soft infrastructure, if any, could be implemented to:
 - a. Prevent landslides?
 - b. Lessen the impacts of flooding?
 - c. Lessen the impacts of runoff?
 - d. Reduce sound pollution?
10. What would be some impacts of sound pollution on current and future animals?
11. Are there many cases of this type of sound pollution or contamination in national parks?
12. Bamboo is not natural here, right?
13. Are there animals that use it?
14. What is the best way to encourage plant development and a natural ecosystem in a place that could experience a lot of passage of people?
15. What methods could be utilized to avoid the compaction of soil in places where people could walk away from the route?
16. What methods could be utilized to ensure soil fertility?

17. When plants are initially introduced, what infrastructure could guarantee that they are transplanted and grow successfully?
18. How could we help the development of beneficial microbes and other life in the soil?
19. Would it be possible or reasonable to implement public composting along the routes?
20. How would composting be implemented?
21. What plants would have more success in a new community garden along the routes?
22. What role could the neighboring communities play in supporting environmental regeneration?
23. What positive experiences do you know of that include community involvement in supporting and continuing these processes?
24. Many people who go to parks like clean parks. Is it better to leave dead leaves and branches on the ground or to remove them for a more beautiful space?
25. In North America, we use a lot of compost, but the climate is very different here. Is the method of composting different here?
26. In national parks, do they use a lot of containers for trash so that visitors do not put trash on the ground?
27. To create compost, it is necessary to have a lot of water. During the summer in Costa Rica, there is not much rain. How is it possible to create compost in this case?
28. Why do they use bamboo? It is not native. Does it have other impacts?
29. In parks that I have visited in North America, they use a lot of mulch. Do they use mulch in Costa Rica?
30. Do you have any questions or anything else you would like to say?
31. Do you think lights that turn on when people are close or lights that are on all the time are better for the routes and national parks?
32. If there are lights that turn on when people are around, would it surprise the animals?
33. Are there a lot of animals close to the rivers now?

Appendix E: Interview Questions for Luis Zamora and Karla Barrantes

We are a group of students from Worcester Polytechnic Institute (WPI) near Boston in the United States. We are carrying out interviews with environmental professionals in San José to learn more about the impacts of infrastructure on the environment and what could be done to mitigate those impacts. Our final objective is to offer recommendations to Rutas Naturbanas, a nonprofit organization that is working to establish nature routes along the Río Torres and Río María Aguilar in the city of San José that are safe and sustainable. Your knowledge and perspective would be extremely useful.

Your participation in this interview is completely voluntary and anonymous and you can withdraw at any time. If you are interested, a copy of our results can be provided to you at the end of our project. You only have to send us an email at ruta-d16@wpi.edu. We appreciate your participation very much.

1. What are your roles with ProDUS in UCR?
2. What are some of the responsibilities of your work with ProDUS?
3. What are your opinions about how the routes and people on the routes could affect the areas in the zone?
4. What could be done to encourage the participation of the communities close to the routes?
5. There is a lot of contamination in the rivers, but there are still a lot of animals along the rivers?
6. Where could we read this information?
7. Do you know of any methods to ensure safety through the environment?
8. What types of lights would have the least environmental impact?
9. Is there any importance in the color of the lights in San José?
10. There are a lot of animals in San José like birds in particular. They live in a city with a lot of light. Would they care about the lights close to the rivers when there is a lot of light in other places in the city?
11. What types of infrastructure, if any, could be implemented to reduce sound pollution?
12. What are some more impacts that you could tell us about, especially the negative impacts of the routes on the environment?
13. Is it very important that there is free space of a certain size for elevated roads?
14. Is there anything more you would like to tell us?

Appendix F: Interview Questions for Alonso Briceño

We are a group of students from Worcester Polytechnic Institute (WPI) near Boston in the United States. We are working with Rutas Naturbanas, an organization that is working to establish nature routes along the Río Torres and Río María Aguilar in the city of San José that are safe and sustainable. We are carrying out interviews with professionals to learn more about the impacts of the routes on the environment and the communities. Our final objective is to offer recommendations to Rutas Naturbanas, Your knowledge and perspective would be extremely useful.

Your participation in this interview is completely voluntary and anonymous and you can withdraw at any time. If you are interested, a copy of our results can be provided to you at the end of our project. You only have to send us an email at ruta-d16@wpi.edu. We appreciate your participation very much.

1. What is your role with Río Urbano?
2. What are some of the responsibilities of your work?
3. Are there other people who are working with you in Río Urbano?
4. Is the organization formal in any way or only informal in structure?
5. What types of community participation efforts is Río Urbano involved in, if any?
6. Are there other projects that Río Urbano has now?
7. Could you tell us more about the relationship between Rutas Naturbanas and Río Urbano?
8. How would you describe the actual state of the Río Torres?
9. In the past, did the rivers have more uses for people or more accessibility?
10. And people today do not use the rivers much?
11. Is there a possibility that the routes of Rutas Naturbanas could negatively impact the animals along the routes?
12. Do you think it is a good idea to limit access to the routes at night to protect nocturnal animals?
13. Are there other things that could be implemented or utilized to protect the animals and the natural plants?
14. What are some things that could encourage the appropriation of the routes in the community?
15. What could help the routes provide opportunities for local businesses?
16. What do you think of the possibility of small local businesses using the routes to sell their products, such as food, art, or something else?
17. What are some of the impacts that the routes could have on local businesses in the communities close to the routes?
18. What physical characteristics could encourage the participation of the communities along the routes, if any?

19. What are your best ideas to promote good management of the routes or the rivers in the future?
20. Do you know of any specific roles that neighboring communities could play in supporting the regeneration of the rivers?
21. We know about Río Urbano and Amigos del Torres, but is there an organization for the Río María Aguilar?
22. What specific things do you know of that has had success for improving community involvement along the Río Torres?
23. In general, what do you think are some of the positive or negative impacts of the routes along zones that are relatively undeveloped by humans?
24. Do you have anything else you want to tell us or ask us?

Appendix G: Interview Questions for Beatriz Fernández De Hütt

We are a group of students from Worcester Polytechnic Institute (WPI) near Boston in the United States. We are working with Rutas Naturbanas, an organization that is working to establish nature routes along the Río Torres and Río María Aguilar in the city of San José that are safe and sustainable. We are carrying out interviews with professionals to learn more about the impacts of the routes on the environment and the communities. Our final objective is to offer recommendations to Rutas Naturbanas. Your knowledge and perspective would be extremely useful.

Your participation in this interview is completely voluntary and anonymous and you can withdraw at any time. If you are interested, a copy of our results can be provided to you at the end of our project. You only have to send us an email at ruta-d16@wpi.edu. We appreciate your participation very much.

1. What is your role with Río Urbano?
2. What is your role with Amigos del Torres?
3. What types of community participation efforts are Río Urbano and Amigos del Torres involved in?
4. Are there any specific projects of Río Urbano or Amigos del Torres?
5. Is Polideportivo Aranjuez officially connected to any organization or only the municipality? How does Polideportivo function?
6. What are the uses of Polideportivo Aranjuez besides sports and the Feria Verde?
 - a. How did the Feria Verde start?
7. What are some of the successes of Polideportivo Aranjuez?
8. What are some things that Polideportivo Aranjuez could improve?
 - a. The employees are organized volunteers?
9. Why is there an antidrug facility here?
10. What types of security does Polideportivo Aranjuez use?
11. What do you think are the best ways to have security?
12. Are there things that you would want to see to improve the security of Polideportivo?
13. How would you describe the actual state of the rivers?
14. Are there the same problems with communities that have more money or more resources?
15. Are there any programs that are trying to resolve this problem?
16. Is there sufficient infrastructure from the municipality to prevent people from throwing residual water in the rivers?
17. In your opinion, how would the routes improve or possibly negatively impact the rivers?
18. Are there any problems that you think could occur with the routes with the communities or the environment?

19. What are some things that could encourage the appropriation of the routes in the community?
 - a. What are some impacts that the routes could have on local businesses and surrounding communities?
 - b. What do you think of the idea of giving permission to vendors to sell things along the routes?
 - c. What physical characteristics could encourage community participation along the routes, if any?
20. What are your best ideas for promoting management along the rivers?
21. What role could the neighboring communities play in supporting environmental regeneration?
22. Do you have anything more you would like to say?

Appendix H: Interview Questions for Maris Stella Fernández

We are a group of students from Worcester Polytechnic Institute (WPI) near Boston in the United States. We are working with Rutas Naturbanas, an organization that is working to establish nature routes along the Río Torres and Río María Aguilar in the city of San José that are safe and sustainable. We are carrying out interviews with professionals to learn more about the impacts of the routes on the environment and the communities. Our final objective is to offer recommendations to Rutas Naturbanas. Your knowledge and perspective would be extremely useful.

Your participation in this interview is completely voluntary and anonymous and you can withdraw at any time. If you are interested, a copy of our results can be provided to you at the end of our project. You only have to send us an email at ruta-d16@wpi.edu. We appreciate your participation very much.

1. How would you describe SIFAIS?
2. What is your role with SIFAIS?
3. The volunteers of SIFAIS are from outside of the community or are members of the community?
4. SIFAIS has the orchestra project. Are there other projects that SIFAIS has and if so, could you talk about them?
5. What are some things that could encourage the appropriation of the routes in the community?
 - a. What physical characteristics could encourage community participation along the routes, if any?
6. What role could the neighboring communities play in supporting environmental regeneration?
7. In general, what do you think will be some positive and negative impacts of the routes along zones that are relatively undeveloped?
8. What are your best ideas to promote good management along the rivers?
9. Do you think that it is possible to create a program like SIFAIS in the center of San José?
10. What do you think La Carpio will be like in 5 years?
11. La Carpio is located very close to the landfill of San José, but does the problem with trash in the streets exist in La Carpio?
12. To prevent trash in the streets or to clean the streets, do you think that it is better to first improve the situations of the people in the community than to focus so much on trash?
13. We have surveys for community members of La Carpio. It has been recommended that we visit the community with a guide who works in the community. Would this be necessary?
14. Do many of the people in the community have the ability to read?

15. Could we go to La Carpio to do our surveys this week? And you are going to put us in contact with someone?
16. Do you have anything more that you would like to tell us?

Appendix I: Interview Questions for Robert Faulstich & Charlie

Velásquez

We are a group of students from Worcester Polytechnic Institute in Massachusetts, USA. We are conducting interviews with professionals to learn more about community engagement and environmental protection. Our ultimate goal is to provide recommendations to a non-profit organization working to establish safe and sustainable nature-urban routes, or river paths, in the city of San José. Your insights would be extremely useful.

Your participation in this interview is completely voluntary and you may withdraw at any time. If interested, a copy of our results can be provided at the conclusion of the study by emailing ruta-d16@wpi.edu. Your participation is greatly appreciated.

1. Could you tell us more about your professional backgrounds?
2. What does Amigos del Torres do now and how was it developed?
3. Does the wastewater treatment plant only clean water that is going to the Río Torres or is it for all of San José?
4. Are people of La Carpio still upset about the sewage treatment center implementation?
5. When it rains, does the landfill make matters worse for La Carpio?
6. What sorts of community outreach efforts is Amigos del Torres involved with right now?
7. Is La Carpio as far west as Amigos del Torres goes in terms of its work?
8. Could you tell us a little bit more about the reforestation efforts in Los Cipreses?
9. Are you willing to tell us a little more about the relationship between Rutas Naturbanas and Amigos del Torres?
10. Have you done any official preliminary estimates for how many people might come by or how much money the routes would give to the communities?
11. Federico has mentioned green bonds to us. Do you work with those or have you in the past?
12. What sorts of impacts, positive or negative, do you think the routes would have on businesses besides higher flow of traffic and more people stepping inside?
13. In general, what do you think are some positive impacts of the routes on the communities?
14. Do you think that Rutas Naturbanas could do anything to help encourage some of those positive economic impacts in the communities?
15. So if Rutas Naturbanas puts routes in place, they need to be conducive enough for other organizations to take part in?
16. What are your thoughts and concerns about the environmental impacts of these routes?
17. Do you think there is anything that could be done along the routes, such as the implementation of specific features, that would really help encourage communication or connection with nature?
18. Are there any questions that you have for us about our project or anything else?

19. Is there anything else you would like us to ask you about?

20. Is there anyone you could put us in touch with or you know we could talk to?

Appendix J: Average Ranked Amenities for Safety by Park-Goers and Community Members

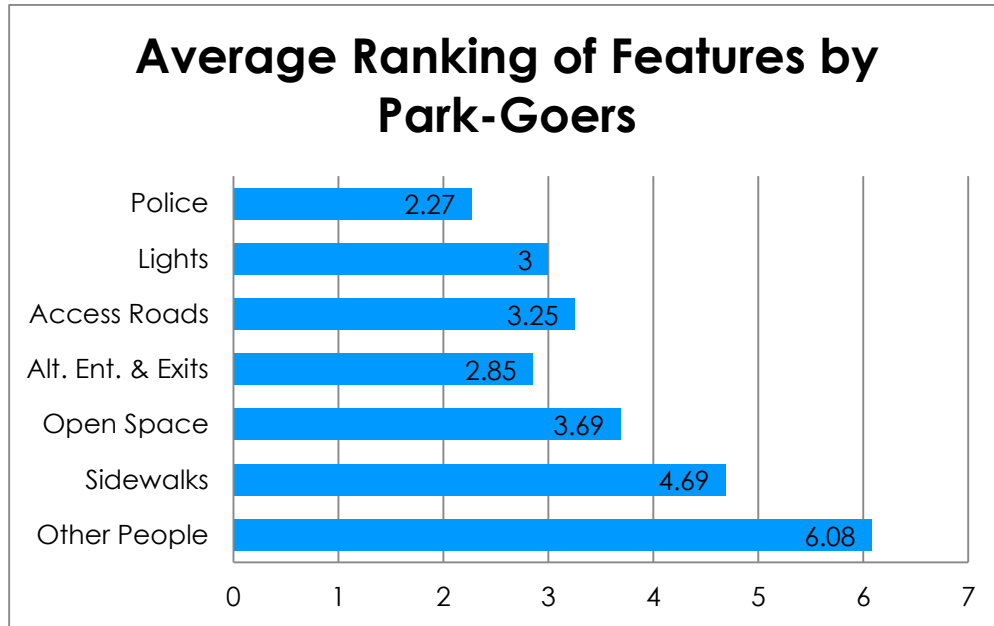


Figure A1 This bar chart displays data of the average ranking of amenities for safety by park-goers. In this case a smaller number indicates a greater importance and a larger number indicates a lesser importance.

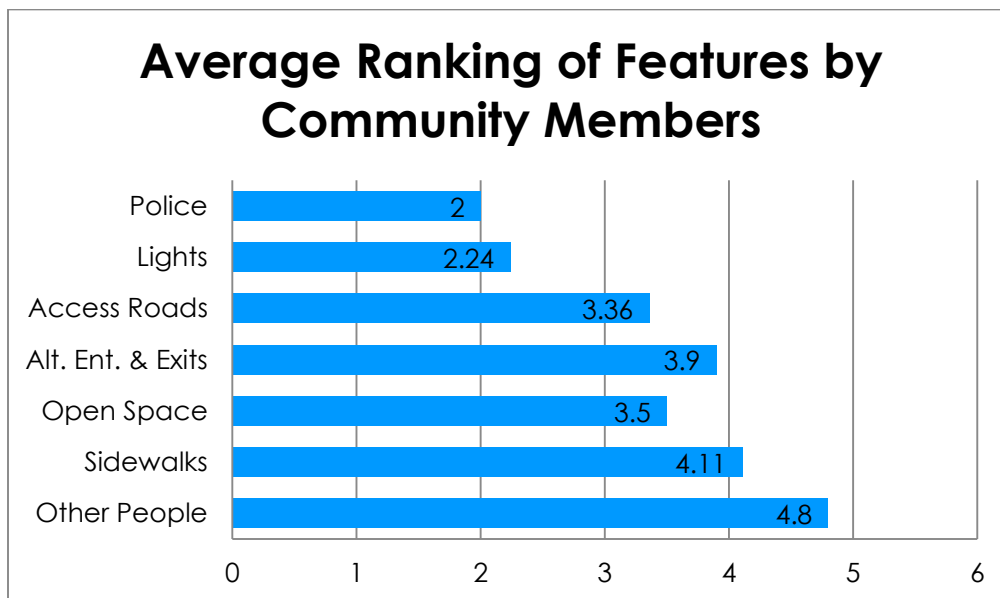


Figure A1 This bar chart displays data of the average ranking of amenities for safety by community members. In this case, a smaller number indicates a greater importance and a larger number indicates a lesser importance.