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Manual of Sustainable Urban Practices Towards Long-term Conservation

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MANUAL OF SUSTAINABLE URBAN PRACTICES TOWARDS LONG

TERM CONSERVATION

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Dr. Andrea Narvaez

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Abstract

This paper analyzes how urban living and design can be detrimental to the surrounding ecosystems and how it is directly affecting the biodiversity loss of an area. To answer this question, I first did extensive background research on urbanization, climate change, and biodiversity loss as it relates to urban ecosystems. Then, the public's perceptions were collected through surveys and interviews in order to make meaningful suggestions in the construction of an interactive, biological corridor map. The results showed that increasing the biodiversity of an urban area can help to mitigate many of the common environmental challenges associated with living in an urban environment, such as lowering temperatures, boosting overall well-being of the residents, decreases in frequency of extreme weather events, and much more. The results of the surveys showed that the majority of the public did not fully understand what mitigation tools such as green infrastructures like green roofs and pollinator gardens, can do for the public. Thus, leading to the conclusion that the best way to mitigate such challenges is through educating the public on how to take action by increasing the biodiversity in easy ways. This led the type of information that would be released to the public. From an environmental perspective, it was surprising to learn how much of a difference increasing the biodiversity of an urban space can make. Additionally, the results of the surveys and interviews were unexpected because of how the willingness to change their lives for a better environmental future switched after gaining the education necessary to fully understand the challenges in this urban situation.

Problem Identification

The deliverable report and its manual address the challenge of unsustainable urban living, planning and development as it relates to biodiversity loss and its subsequent consequences. With at least 50 percent of the global population living in what is considered an urban environment, it is crucial to make the adaptations necessary to make urban living, also sustainable living (Satterthwaite, 2007, p.6). The planning and development of a city is not necessarily built with sustainability in mind, and urban areas tend to be very restrictive on the species that can survive in its environment (Obaco, 2018, p.6; Jauregui, n.d., p.4). For example, urban areas are often found to have little to no green spaces, and the green spaces that are present, regularly have nonnative/ invasive species, and things like turf grass based on the aesthetics it provides the city (Hilty, 2012, p.144). In substitution for healthy and helpful green spaces the surfaces that are predominantly established are found to be more often than not, hard, and impenetrable by plants and other species that play vital roles in an ecosystem, therefore impeding on the biodiversity potential of the area (Uttara, 2012, p.1637). Urban living and planning does not have to be this way. This project provides the necessary tools to facilitate a more sustainable living in urban Ecuador and elsewhere.

There are solutions being used right now across the world, it just requires a sort of "reworking" and expansion of the spaces offered in a city, utilizing every inch of space with helpful, native greenery in mind. When looking at urban design and living, working with nature instead of against nature will increase the quality of life for residents of the city, boost biodiversity, and overall ecosystem functioning of the surrounding areas. Taking these global solutions together to put into practice in Quito, Ecuador is the key component of this project.

This is important to address because while there are benefits to living in an urban area, the environmental issues caused by urban living affects both rural and urban residents worldwide (Neiderud, 2015, p.2). Urban environments often feature highly dense population numbers in compacted modified landscapes with impenetrable surfaces and shifted ecosystems (Peng, 2011, para.3). The impenetrable surfaces and modified landscapes can cause major biodiversity loss, which can, and has, caused extensive damages and changes in daily life for wildlife and humans (Uttara, 2012, p.1637). This can include fluctuations in nutrient cycles, average temperature imbalances, increase of extreme weather events, rises in pollution levels, changes in weather conditions, lowered ecosystem services, biodiversity loss, and food web shifts (Seress, 2015, p.373). Enhancing biodiversity un urban areas aids in the mitigation of these negative consequences, which means putting in greater efforts to improve biodiversity conservation.

Deliverable

The deliverable for this project is a manual of sustainable practices aimed at mitigating the increases of climate change's impacts in urban environments through improved conservation and biodiversity. The manual of sustainable practices main goal is to work toward long term conservation in Ecuador. This includes extensive research on the many different elements that are involved in increasing urban biodiversity, as well as the practices needed to put this into action, which extends from the importance of maintaining biodiversity to types of green infrastructure and its supporting elements such as bat boxes. This involves going into detail on the many different types of green infrastructure that could be easily integrated into urban environments around the world. Using the information from around the world in places with further along climate mitigation programs as role models for what Ecuador could grow to be.

The manual defines "green infrastructure" as an ecological support system consisting of green spaces built with conservation and ecological-human connection in mind (Benedict, 2012, p.3). "Green spaces" are defined as any open, natural area whether that be a park within a city or something else (Benedict, 2012, p.2). Green spaces are an especially meaningful key factor in the manual because it is fundamental to the research, suggested practices and sought-after benefits. This is important to note because while this encompasses green spaces like green/walls, urban farming, and rain/pollinator gardens, it undoubtingly leaves a few things out. There are other mitigation tools that are not technically green infrastructures, like bird or bat boxes, but when used in combination with traditional green infrastructures will increase the security of the benefits provided (Fairbrass et al., 2018, p.28). To achieve the goal of increasing biodiversity while also combating climate change, the already existing green spaces in a city need to be reevaluated and put to better use. For example, using the manual will tell you that adding native plants to existing green spaces will increase their utility and benefits beyond mitigation.

Lastly, the manual will include facts about the health benefits of green spaces in an urban area, pollinator campaigns, and then how to put this all into practice in the real world by collecting data about the residents' personal perception of climate change and green infrastructure. For example, a map of Quito's green spaces has been added to show where there are actual misused/unused spaces to put these suggestions into action. This will be given to the Great-Leaf organization, an NGO located within Ecuador as they will follow through on the suggested practices. The suggestions are based off of the public perception and previous research done by other authors. This organization will be adding or reworking the green spaces on the map created for the manual as well as providing the manual to local people who are interested in working together in support of reducing climate change impacts.

Background

Large urban areas around the globe often share similar challenges within sustainability and climate change. For example, many cities in South America, often face issues dealing with poverty, social inequity, food/water insecurity, impacts from climate change without mitigation plans, urbanization at the price of environmental health, population growth, and biodiversity loss (Jauregui, n.d., p.4.; Uttara, 2012, p.1638). Ecuador is a country that borders the Pacific Ocean and is located within the northern region of South America. In total, accounts for just 0.2 percent of the world's surface area, making it a quite small country. Its capital, Quito, is located in the highlands of Ecuador at around 2815m in elevation (Zalakeviciute, 2018, p.3). Even with its small size, almost 10 percent of all plant species found across the globe call Ecuador home, with places like the Amazon rainforest residing in the country; thus, making it the sixth most biodiverse place in the world (Bazrkar, 2015, p.1977). According to the Standard of Living Index, the quality of life in Ecuador is labeled as a country with a moderate quality of life represented by a score of 116.75 by the quality-of-life index. This takes into account the cost of living, income ratio, healthcare, safety, pollution, and climate of the area (2018). This score could account for the number of residents living in poverty, for example, in 2014 a study showed that at least 35 percent of residents living in urban Ecuadorian environments were living in slums (Obaco, 2018, p.42).

Some of the issues Ecuador's urban residents face are common in other parts of the world as well. Some of the issues can be due to lack of infrastructure, inconsistent climate campaigns, insufficient education and understanding, poor monitoring, and inadequate use of natural resources (Obaco, 2018, p.1). The challenges listed above are not specific to just Ecuador, many

urban centers of the world have the same problems. Many in South America, like Quito, are especially vulnerable to the impacts of urban living and climate change in general, such as more frequent flooding, heatwaves, biodiversity loss and so much more (Dornhoff, 2019, p.2). The issue itself is rooted in the sustainability of urban living and planning. "Sustainability's fundamental building blocks" are defined by Purvis (2019) as being composed of three pillars: social, environmental, and economics; all of which cannot stand on their own. A problem with urban living and planning is that it does not usually keep sustainability in mind, let alone all three pillars (p.681). Living in an urban area does not have to be so unsustainable, sometimes the solutions are found through simple mitigation techniques such as increasing biodiversity and educating the public on the current challenges at hand and then giving the tools to take action on their own (Fairbrass et al., 2018, p.3).

Advancement without sustainability in mind is a large global problem connected to many of the challenges Quito faces and is the motivation for the project. "Urbanization" is the process of urban area growth along with population growth (Uttara, 2012, p.1637; Vlahov, 2002, p. S1). There is a distinction made by Vlahov (2002) in which "urbanization" is the change in growth in an urban area, but the "urbanicity" is defined as the effects of living in an urban environment, both are explored in this project (p.S4). This, for example, can be the cause of environmental degradation, high levels of air and water pollution, major biodiversity loss, weather changes, increases in poverty numbers, all of which are an issue in Ecuador (Vlahov, 2002, p. S6.; Gasper, 2011, para.1). Urban areas typically involve land use changes such as for the construction of buildings, have fewer green spaces, and in general, an environment that is inhospitable to most species which leads to the challenges just mentioned (Vlahov, 2002, p.S7). Getting changes done

at a local level is crucial to mitigating any impacts from urban living but has been difficult due to lack of infrastructure and little to no support from the governments (Hardoy, 2011, para.3).

Take Ecuador for example: over 63 percent of the entire Ecuadorian population lives in an urban environment, with a growth rate of almost two percent (Schreurs, 2018, p.517). While there is limited information Quito specifically, the capital of Ecuador, has a population of around 2,239,191 and is expected to continue to grow at a rate of 2.2 percent in 2010 (Instituto Nacional n.d.; PACQ 2020). Population growth is one of the major issues within urbanization in Ecuador and around the world, with the urban centers containing larger clusters of lower income residents of the city (Schreurs, 2018, p.517; Rojas, 2011, p.60). In order to keep up with such a rapid population growth rate, cities have had to expand, and more natural resources are used, continuing the challenges faced in Quito and other urban areas across the world (Nagdeve, 2007, p.2). Population increases have led to the worsening of climate change impacts such as food scarcity, temperature changes, water/air/noise pollution, excess greenhouse gas emissions, and soil erosion (Mittal, 2013, p.1.; Nagdeve, 2007, p.1).

The overconsumption of natural resources, many of which are non-renewable, has been an increasing concern throughout the globe according to Mittal (2013). Natural resources being expended at a rapid rate include clean drinking water and land for agricultural and residential usages. The demand for land has increased with the population growth because there will always be a demand for somewhere to live and something to eat (p.2). Land use changes like from grasslands to urban landscapes, or to agricultural land, causes degradation of habitats and forests that are vital to other species, plants, and animals (p.3). These natural resources are vital to human life, so as the population increases so does the demand for life sustaining resources, but the challenge is the overconsumption (p.1). If natural resources continue on the trend of over-

consumption, this will not only further contribute to climate change's impact on ecosystems but put such a strain on the environment that it will be unable to sustain human life (Nagdeve, 2007, p.17).

With the increase in rapid urbanization and population growth, challenges such as food insecurity, average temperatures rising, low biodiversity, higher numbers of extreme weather events, and decreases in pollinator populations are on the rise as well (Fairbrass et al., 2018, p.10). The increase in higher average air temperatures in cities have been linked to urbanization (Fairbrass et al., 2018, p.33). A way to mitigate this are to increase tree coverage over streets, and even increasing green infrastructures within the city. Increasing green infrastructures in a city, not only will start to lower the average air temperatures, but also increase biodiversity and boost over moods and well-beings of residents (Fairbrass et al., 2018, p. 11).

As for food security, it has been said that over 80 percent of low-income neighborhoods in Quito have experienced some sort of food insecurity (Diehl, 2019, p.5). There is a program in Quito called the AGRUPAR, which supports urban farming initiatives by providing training and resources for families wanting to start their journey (Diehl, 2019, p.5). This supports the manual's suggestions that addresses the need for additional biodiversity through green infrastructure such as, urban farming and vegetable patches, which is identified as a helpful practice according to Diehl (2019, p.2). Increasing the amount of fresh food available helps strengthen food security, reduce carbon footprint, and create a healthy social environment.

Weather changes such as increased frequency in extreme weather events like flooding, and higher temperatures are common problems within climate changes found in urban environments (Gasper, 2011, para.1). While climate change has been shown to increase the frequency in extreme weather events such as flooding, rising temperatures can cause the Urban

Heat Island effect to worsen, therefore increasing heat related challenges, which have been found

to be a problem in Quito and Guayaquil (Palme, 2016, para.1; Baño, 2018, para.1). The

mitigation techniques suggested in the manual and by many studies incorporate the use of

beneficial green spaces, filled with native plants to increase biodiversity, and help the impacts of

urbanization (Seress, 2015, p.378). By providing useful green spaces throughout the city, such as

green walls and green roofs, this can help alter the albedo of the city and provide much needed

shade, subsequently lowering the average air temperature, and even noise and air pollution levels

(p.374). Then, to mitigate extreme weather events, green infrastructures like rain gardens are

helpful at reducing flooding by absorbing the storm runoff water and reestablishing the water

cycle in a city (Gasper, 2011, para.1, Whitehorn, 2019, p.157; Environmental Protection Agency,

2022, para.7).

What can increasing urban biodiversity do for these challenges? Expanding urban green

spaces, boosts the biodiversity of the area which can mitigate impacts, like mentioned above,

from climate change (Gutiérrez Chacón, 2020, p.187). "Urban biodiversity" is defined, in the

manual from Cleland (2011), as the richness and variability of species in an area or ecosystem

(para.1). Cities that have less biodiversity tend to have lower levels of ecosystem functioning that

are vital in combating climate change and the effects of urbanization (Seress, 2015, p.382). With

Ecuador being home to multiple biodiversity hotspots, it requires sustainable solutions from all

three pillars otherwise it will continue to be in danger of major losses, which could be

detrimental to the county, and the world (Purvis, 2019, p.683).

Biological corridors have been a suggested solution to start mitigating the challenges of

living in an urban area such as biodiversity loss and the Urban Heat Island effect for instance

(Cushman, 2013, p.397). A biological corridor is a way to provide connectivity from humans to

wildlife within urban environments (Loro, 2015, para.3). In addition to providing connectivity, biological corridors are shown to boost the biodiversity, and ecological functioning of urban spaces, which leads to the long-term conservation of all ecosystems, even rural (Gutiérrez Chacón, 2020, p.195). This is crucial to pollinator population maintenance and growth, which is a large factor in a healthy ecosystem (Gutiérrez Chacón, 2020, p.188). While there is not much information or research done about biological corridors in South America, let alone Quito, the information found across the globe has helped form parts of this project.

Boosting biodiversity of urban areas through an improvement of green spaces, making them more functional in order to mitigate all different types of challenges that may be found from living in an urban environment, such as higher temperatures, high land use changes, and habitat fragmentation. The challenges could be a consequence of climate change or human impacts but all need to be taken into account. Although urban spaces are not designed in the most sustainable ways, it can be easily changed by adding different types of green spaces and supporting structures.

Research and Methods to Develop the Deliverable Intervention

There were multiple methods employed to gather the information and data about sustainable practices for long term conservation of urban environments in Quito. This included extensive research through literature reviews, surveys, interviews, mapping of green spaces, and the creation of digital campaigns. Literature reviews were used for each chapter as a basis of information for the reader and future suggestions within the manual. The surveys and interviews were used only in chapter three to gather information about the residents of Quito. The digital campaigns were used as education tools for the general public to have access to.

The first method used was a database literature search of information to support the claims and challenges discussed. This involved a comprehensive search for real world examples from countries with more developed urban sustainability programs, especially those relating to the conservation of biodiversity. This was done in order to make informed decisions on what, why, and how these programs could benefit being put into place in Ecuador. Using previously established databases and carefully formulated search terms was a crucial part of the project. The databases most used were Google Scholar and the SIT online library. Within said databases, the research was fueled by numerous search terms, phrases, and words which were as follows; biodiversity in urban areas, why are urban areas important for biodiversity, urbanization, climate change impacts in urban areas, biodiversity, and climate change. Using background research from preceding government publications and peer reviewed studies were the main forms of information gathered throughout the project as a whole.

A challenge that arose during the initial research and continued to be a problem through the duration of the project, started off with not finding much information regarding sustainability and practices overall, and those relating to more specific concerns such as, urban green infrastructure and the mitigation of climate change through biodiversity in studies specific to Ecuador, then to South America as a whole. This caused a shift in the goals and orientation of the manual itself. The goal and subsequent practices were shifted to resemble a funnel-like approach to the problem. This meaning, the project and deliverable itself was slightly changed to address the issues and concerns from a more global perspective, then putting this new perspective into practices and suggestions into more regional specific solutions, with the worldwide research and information found acting as a role model of sorts for Ecuador.

Thus, bringing the project into its next goal of getting the public's opinions and thoughts on climate change as a whole, then sustainable practices backed by the initial research mentioned above. In order to get information specific to Ecuador to supplement the database research, structured surveys and interviews were conducted with a small sample of the residents from Quito. Ten interviews that ranged between 45 to 60 minutes in length, were done over video chat. Each survey or interview was structured with 13 questions each. The initial background research done was used to formulate the research questions and objectives, but the interviews and surveys were used to adjust the scope of the project. Adding to the funnel-like approach, both the surveys and interviews were able to deviate the research points in order to come up with solutions that would actually benefit the residents of the city and their surrounding environs. This was critical to the flow of the project, allowing the global information to seamlessly be intertwined in order to analyze the findings together as subsequent information that feeds off each other.

In order to produce useful and relevant solutions to Ecuador's sustainability issues, the initial research and survey information was analyzed together to create an interactive map of Quito's green spaces. The map was created using the previously established mapping programs from Google Earth. The goal of this approach was to give the capital region of Ecuador, Quito, specific suggestions on how to put the research into practice. For Quito, the solution was to build a biological corridor between major parks in the area. This was done by first mapping all the green spaces in between the three major parks in Quito: Parque Rumipamba, Parque la Carolina, and Guanguiltagua. Mapping all the green spaces in between turned out to be a huge time commitment and was not very effective in working towards the goal. So, the focus of the map shifted on creating the most direct link between all three parks. Afterwards, the lines and shapes

were created, color-coded, and labeled in order to inform what kind of space is being reviewed, how large the space was, and what category that could fall into.

The categories that the green spaces were separated into were as follows: misused green spaces, sidewalk green spaces, potential green spaces, establish parks, unknown green spaces, and smaller established parks. The darker yellow shapes represent the three major parks as the basis for this solution. Then orange was used to indicate smaller established parks in between, these were excellent for reworking into the native biodiversity of Quito as they are already established green spaces and need less work. Then, there are green lines and shapes for unknown areas on the map which were not visible by Google Street View, or it was not obvious from above what the space was. Pink is used to indicate misused green spaces. This could mean grassy areas around parking lots or even soccer fields, or plazas and empty green spaces not utilized at all. Next are blue lines and shapes, which indicate already established sidewalk green space. To be classified as blue, or sidewalk green space, there had to be at least one tree or other "greenery" in the area. Otherwise, the space would be labeled as potential green space, and marked white. Potential green spaces could be sidewalks with enough space for greenery but are none, or larger spaces of maybe concrete that can be reworked into something useful for the city. A screenshot of each type of green space available or potentially available was added to the description of the map in order to lessen confusion and increase readability (please see study's manual).

The next task or approach taken was to release information of the anonymized and compiled information to the Quito public for educational purposes. Through my practicum organization, a digital campaign was used to relay information to residents of the city. A set of 14 posts were created through the Canva website and the Instagram app. The photos were

sourced from Great-Leaf organization and Nativus project (allied with Great-Leaf), or from my own travels and experiences within Ecuador. Then, the photos were selected jointly with the Great-Leaf organization based upon which felt the most relatable to the issues addressed above or which lined up the best with the information provided within the first chapter of the manual. The photos were edited using previously created editing platforms such as the Instagram application and the Canva website. The photos were edited to add text and graphics in order to make them more engaging to the public. The photos will be distributed once a week for ten weeks on social media platforms such as Instagram, Facebook, and Twitter, only after the completion of the project and research.

A series of 10 interviews and 30 surveys were taken in order to maximize the public's involvement in the research and creation of the manual. The questions were created together with the partner Great-Leaf organization. The interviewees were randomly chosen by the Great-Leaf organization. The interviews then took place over several weeks and were around 45 minutes to an hour in length. This allowed ample time to create a connection with the interviewee, which seemingly helped in the confidence of the answers given. The questions for the interviews and surveys were the same, with the only variations coming from the interviews where I, as the interviewer, felt it was necessary. For example, in the first interview, the interviewee was confused about the question relating to the personal belief of the main causes of climate change, so an additional question was asked about their own perceptions of climate change in the world around them. In another interview, an interviewee did not know how to answer a question regarding implementing one, or any types of green infrastructures at their own home. So, a question was added about the believed benefits of green infrastructures overall. This technique

helped with the realization that the interviewees might not have known enough about green infrastructures to answer the questions to the fullest extent.

A total of 30 surveys were taken, with roughly the same questions as the questions asked in the interviews. The surveys were distributed and taken over several weeks by the Great-Leaf organization themselves to random individuals. The survey was first drafted on a document and then a Google Forms was created with questions. This created an easy, user-friendly way to ask the questions, answer the questions, gather the information, and analyze the data. The surveys seemed to gather a lot of data and the Great-Leaf organization stated to me that the surveys were believed to be more useful as the people were more open and honest with their answers. This could be due to anonymity or the lack of time constraints as they could fill out the form without judgment or did not have to coordinate schedules together with an interviewer.

The information gathered from both the interviews and the surveys taken were consulted and used when forming the real-life solutions given within the manual. Since the research involving surveys and interviews was associated with a partner organization and people from a Spanish speaking country, it was originally thought that a translator would be necessary for any and all interviews and surveys that took place concerning someone who did not speak English. In the end, all of the people interviewed had sufficient English language skills to respond to the survey and interview prompts. The surveys were different as a translated version was created and approved by the advisor at the organization and myself. The translated, Spanish version of the survey was provided to those who did not speak English and those participants who did have English speaking skills were provided with both the English and Spanish version just to cover all bases.

The methods that worked the best were not always the first ideas tried. The research went a long, much more smoothly when it was not dependent upon such a strict set of guidelines. Creating the funnel-like approach to the research ended up being the most useful method. Easing the restrictions on what to research, ended with more useful information found and used. For example, when the research terms were changed to less specific search terms, it allowed the information to guide itself.

Starting with what is biodiversity, what in an urban green space, and letting the information found dictate the next information searched to create a succinct line of information that was easily integrated into all other methods and sections of the research. When creating the digital campaigns, using the actual Instagram app was the most beneficial to creating posts and adding creative flairs to the archive of photos. This was due to the fact that the app was created to make sharing information and pictures much easier and accessible to everyone. Since the photos would end up on the application in the end, it was most useful to use their templates and design features as then every aspect added was guaranteed to work properly.

The Canva website was used for creating the digital campaign posts, and it worked fine, but it was more difficult to use as it was required to create an account, upload photos, then add flairs to it. This was not as guaranteed as the Instagram app as it would always have to be downloaded from the Canva website and uploaded to Instagram. Using the Instagram application was also more useful in the prevention and minimization of formatting issues and challenges that arose. This was due to the fact that the way the Instagram application automatically formats the pictures is the way they are presented to the world, vertically instead of horizontally fits best with more social media platforms than the Canva website. The website named Twitter was used to create threads of information that will be spread to the public. This is helpful as it further

expands the reach of the project, involving people who have accounts on different social media platforms.

Deliverable and Technical Aspects

The idea of the manual was discussed and created based on the wants and needs of the Great-Leaf organization. Alternatives suggested but ultimately not chosen were based on the creation of climate change policy reforms and grant applications. Grant applications and format was discussed previously as an alternative because in order to create the biological corridor that is described in chapter two, the Great-Leaf organization would need a substantial grant in order to pay for all associated costs. Any reference to chapters in the paper will be referring to the corresponding manual as it is categorized into chapters instead of sections. Chapter one engages in information about the background on elements and practices that are apart of sustainable increases in urban biodiversity. Chapter two involves the mapping of green spaces in the Quito area in order to plan for a way to increase biodiversity. Then chapter three deals with the public perception of climate change and green infrastructures. The digital campaigns that were created to be released to the public will also be found in chapter three. The manual is divided into chapters to create a more user-friendly reference source for residents and organizations. Chapter two refers to the blueprint for the construction of a biological corridor in Quito.

The biological corridor suggested would cover a large amount of Quito, meaning there will be a considerable number of changes with a sizable chunk of money needed. This was suggested in order to help alleviate the impacts from urbanization such as biodiversity loss, temperature rises, water/air pollution, food scarcity, and increase overall well-being of residents (Vlahov, 2002, p.S6). While some of the mitigation techniques are budget friendly, the suggested project as a whole will be costly. For example, Porsche (2013), states the prices of green roofing

will be less expensive in South American countries like Brazil, it will still cost at least $313 per

m ^{2} for even the most basic green roof (p.466). While green roofs are one of the most

expensive mitigation techniques recommended, they are not recommended on a large scale.

There are also smaller mitigation tools such as bat boxes or rain gardens that would cost a lot less

time and money and are accessible for everyone. The higher costs do not necessarily mean

higher benefits, all of the green infrastructures advised will help in some way to alleviate low

biodiversity and subsequently impacts of climate change (Fairbrass et al., 2018, p.4). In order to

receive the funds to commence and fully establish the biological corridor, the Great-Leaf

organization will need to apply for a grant from the government. This grant will cover all

associated costs from the changes made to the city, and to the salaries of those employees

involved.

This alternative intervention was ultimately not chosen because the Great-Leaf

organization and I both felt it was important to have the background research and coordinating

suggestions, like the interactive map of the potential biological corridor, done first. A biological

corridor was chosen due to its list of benefits that tend to outweigh the disadvantages. For

example, a biological corridor can be the difference between an isolated unhealthy green space,

and a flourishing biodiverse space that allows for higher ecosystem functioning as well as a

decrease in habitat fragmentation (Fairbrass et al., 2018, p.26; Patel, 2021, para.8). The

advantage the idea of a manual has over the grant application is that it first does the background

research necessary, then creates awareness to the public of the issue that first created the

biological corridor idea. By letting the public in on this information before it is put into practice

adds to the strength and support needed to get this project completed. Additionally, the

awareness created during and after the construction of the project will hopefully extend to higher

amounts of actions being taken by residents as the real-life results from the biological corridor construction and benefits progresses.

As for the policy reform, this was discussed based on the challenge at hand, urban living, design, and planning is not sustainable. This would have been a direct route to change the policies from the inside, and make sure that sustainable practices are required by law. Policy amendments and reform was not chosen because we felt the opinion of the public needed to be heard first and the problem can be mitigated in another way more effectively. The advantage the manual has over the policy creation and amendments is that it allows us to create suggestions based on the publics' needs and gaps in knowledge. The surveys of the public let the residents of the city decide what was most needed to be researched and explained, letting the manual be derived from the gaps of knowledge and actions the residents of the city make on a day-to-day basis.

The creation of a manual was chosen because the benefits outweigh the disadvantages. Starting with the first chapter, which is all about clearly laying out a substantial amount of information concerning the elements and practices for increasing biodiversity of urban areas in one place, laying the framework for the rest of the manual, and therefore allowing for easy readability. For instance, the chapter gives headings/subheadings and descriptions of what can be found in each of the sections in order to increase the readability and ease of access. The second heading says, *Section 2, What is biodiversity, how does it differ between regions and landscapes, how does it change when cities are built*. Thus, allowing the reader to know what the section is about by giving clues. Possibly giving the chance to pick and choose what sections to read based on the reader's interests or needs.

Since the manual has been made in digital form, this accommodates the reader giving the ease of readability for information that could be otherwise hard to reach, physically and mentally. Thus, making sure it can reach the greatest number of people possible. The advantage of being completely online is that it grants the ability to reach large amounts of people, all from different and diverse backgrounds. Moreover, having such a substantial amount of information at so many different peoples' fingertips digitally, increases the ability to search for information specific to the reader's situation. Information can range from 7.3 percent of all vertebrate species are found within Ecuador to, human actions can cause bees to behave differently, even make them more competitive with each other (Dornhoff, 2019, p.2; Le Conte, 2008, p.504). Or, If the reader wants to search for more specific information on pollinators, for instance that green spaces filled with native flowers have been shown to increase pollinator populations in India and the United Kingdom, all that is required is to follow the table of contents and turn to that page, or a simple typing of the word pollinators in the search bar will bring up everything in the manual that mentions the topic (Komala, 2021, p.8). Or, on the other hand, if the reader wants to share the information found, it would be as easy as sending an email.

The advantage of this chapter is that it gives the background of the information and then follows it with real life examples. So, by providing a detailed background on sustainable practices for urban areas globally, this will allow for the educational goals of the manual to be maximized, increasing accessibility overall. For instance, the definition of "biodiversity" is clearly defined as variability in all living organisms from all sources, and then is described in more detail through examples such as, species richness (Gaston, 2013, p.3). This engages the reader and is important because if the reader is confused at the beginning of the manual, they

more than likely will not continue on to discover the rest, thus making the readability of the information crucial to getting all the desired information across.

The first item found in the manual is a background on the issues within urban living, like how the expansion of cities has a considerable effect on the biodiversity of the surrounding ecosystem and how urban living in general does not always keep sustainability of those ecosystems in mind. After laying the framework for the reader and then immediately giving examples, supports the reader in contextualizing the large amount of information given easily. For example, after the main ideas of the sustainable elements and practices for increasing biodiversity, the chapter goes directly into how this can be seen in real life. This is shown in Bilgili's (2012) study where places such as Turkey and Greece have used plants native to their own areas, the Spartium Junceum in Turkey, and the Pignolia trees in Greece, to increase the biodiversity of the area (p.179). Going from the issues to what can be done through things like, the installation of green infrastructures and then how that can be seen in pollinators. (source). Devoting time and space to the promotion of pollinators gives real life examples of what can happen if the biodiversity of an urban area is increased. The example given in the. Manual is from a study down in Stockholm where when the biodiversity of the urban environment was increased, pollinator sightings multiplied (p.761). Real life examples provide the reader with a sense of accountability within the issues at hand and help leave the reader hopeful instead of discouraged at the number of challenges ahead.

An additional benefit of the first chapter is the use of information and tactics on a global level. Using information on a global level instead of on a regionally specific position expands the reach of the manual as a whole. This can be illustrated through the examples given in the chapter. For instance, the urban farming subsection in chapter one provides examples from

multiple cities within the Netherlands, while the green roofs subsection provides examples from Toronto, Canada, Japan in Ottawa, and multiple states within the American Midwest and West, such as Michigan, Portland, and Oregon, then takes this information and relates it to South American countries like Brazil (Oberndorfer, 2007, p.828; Porsche, 2013, p.461; Jonker, 2021, p.143).

If the chapter was written on a regionally specific location, it would severely diminish the relatability of the manual as a whole, leaving it only accessible to people living in that area. The way the chapter is laid out allows for people from all over the globe to find useful information and tips, even if the other chapters are not so relatable. This global approach can then lead to the empowerment of people all over the world through their own education, actions, and beliefs. Furthermore, a lot of the information given in this chapter can actually be useful to those living in an urban environment as well as a rural setting. For example, the types of green infrastructure listed are not restricted to urban settings, like rain gardens, green walls, pollinator gardens, vegetable patches, insect hotels, and even bird or bat boxes (Kabisch, 2016, p.2).

The disadvantages of this chapter are not as prevalent as the advantages, but nonetheless are seen. The disadvantage that is most predominantly seen is focused on the length. This chapter is quite long, with a lot of information. The reader could become overwhelmed with information, issues, solutions, specificities, etc. Or perhaps the reader will notice the amount of information at hand and not fully read and therefore understand the manual as a whole. The first chapter is critical to the rest of the manual, and also is over 26 pages, so without it the information would be confusing and therefore not give the full benefits and goals of the manual. It can be time consuming to read long documents, the reader would have to set aside time dedicated to reading even just this first chapter. The other disadvantage to this is that it does not allow for social

connections or discussions to be made in response to the information given. Even though the chapter is online, there is no way for readers to provide feedback and opinions, not allowing for growth through peer-to-peer discussions.

The disadvantages of this chapter are not easily mitigated. Take the length of the background information and examples given, the information given has been deemed crucial to the goals and targets of the manual as a whole and would not be as beneficial to the Great-Leaf organization that will be utilizing this afterwards. Perhaps the mitigation could happen through the separating of sections within the chapter, creating easier places for the reader to stop and come back to later. An example solution could be in the creation of a new chapter by taking some of the information and separating it into a shorter chapter where the reader can provide enough focus to the subjects at hand, therefore unloading some of the overwhelmingness of the substantial amount of information listed. For instance, combining two green infrastructures to make their own chapter. The research could include green roofs potential being seen in the 20 to 25 percent of global urban surface areas being found as roofs could be combined with research about green walls being a great mitigation tool indoors and outdoors for the impacts of climate change (Besir, 2018, para.1; Mustonen, 2017, para,7).

Another possibility could be changing the formatting of the information given. Instead of having the information in a formal, essay format, create a more inviting and interactive way to give the reader the same amount of information while still maximizing the educational benefits that come with the manual as it is now. This would then mitigate more than one of the disadvantages listed above. An alternative solution for the social disconnect challenges present is to leave my own contact information such as email of the Great-Leaf organization or even my own. This would allow for readers to ask questions about the materials and information listed,

thus ensuring that every reader has a full understanding of the topics. As for the lack of social, peer to peer reviewing, making discussion board posts for the purpose of allowing readers to leave comments, questions, suggestions, that are not necessarily directed at the creator of the manual or the organization who is utilizing it. This provides a safe space for people to tell their opinions and add personal growth to their own learning goals.

Moving on to the second chapter, which takes the information and research from the previous chapter and puts it into practice. The ultimate advantage to this chapter is that the map was constructed with the Great-Leaf organization in mind. This chapter will serve as a roadmap for Quito to become more biodiverse. Increasing biodiversity has many benefits, as described in other chapters, such as being helpful at mitigating climate change's increase in temperature, boosting the moods of urban residents, and even increasing wildlife (like pollinators and more) in an urban environment (Cleland, 2011, para.7). Increasing biodiversity is one of the top goals of this project as a whole. The map engages the advantage of having this key target in mind and then actually doing something about it. The suggestions and solutions given can be easily monitored once established as the spaces are clearly defined with each space having its own goal, precise measurements, and located within city limits.

After the completion of this project, the Great-Leaf organization will use this map as a preplanned design to follow and adhere to. The result is an easy-to-read blueprint for real life challenges Quito has in sustainable urban living and planning. Information and solutions suggested in the second chapter will be used for the benefit of an organization and city cooperatively. The benefits of creating a biological corridor are included in the chapter as, building bridges between humans and wildlife, and enhance standards of living in the area (Patel, 2021, para.5). This chapter will use the research as fuel for the spearheading of sustainable

development in Quito. This is important to note as it validates and justifies the actions suggested and puts them within reach, with the benefits of the chapter starting to be seen within the next couple of years.

This making one of the largest assets of the chapter its usage of global information to make an impact on a city in real life. Having a global perspective on urban biodiversity is extremely important to the maximization of benefits provided due to the lack of research done in Ecuador itself. Taking a global perspective and putting it to use in Quito, Ecuador is done by creating a map of green spaces in a specific area of the city and how to connect them through the creation of a biological corridor. The biological corridor is given as a way to materialize the suggestions and solutions provided in the first chapter. Materializing the research given helps put the challenges into a real-life problem, therefore allowing the public to see the issue in a familiar setting and at the same time giving suggestions on how to fix it. Therefore, increasing the understanding of the topic while in theory, increasing the amount of action taken to combat the many challenges involved in strengthening the sustainability of an urban environment.

The information presented in previous chapters is important, but the impact of it can be severely limited if not understood fully. Chapter two has the advantage of breaking down that large amount of research by giving examples so specific that if the reader wanted to go in person and walk the suggested route, the street names are easily found. Allowing for actions to be taken not only by businesses or organizations but everyday people work to add a sense of togetherness in finding solutions for sustainable urban living. A few mitigation suggestions given in the manual that are accessible for the general public to achieve include bird/bat boxes, insect hotels, and pollinator gardens (Kabisch, 2016, para.2). While the issue at hand is in fact urgent, having a sense of togetherness has the possibility of modeling accountability for everyone.

Sketching an archetype that is not only specific to readers' own lives, but also easily accessible online gives a huge advantage to the chapter and manual altogether. Online accessibility of the map ensures the challenges and solutions will reach the greatest number of people. Putting the map in an online format also allows for the map to continue to hold its interactive abilities, which is another considerable benefit of the chapter. The online interactive abilities are completely user-friendly, using a familiarly seen layout on Google Earth which permits the reader to indulge in the specificities of the map easily and without conflicts. An additional benefit to the user-friendly design is that if the city layout changes, or something structural is changed based on the recommendations of the manual, the map format will change automatically as Google does, and if the changes have to do with the map of green spaces that was constructed for this project, then it can be changed as easily as it can be found.

The changes will be concise but simple, only take a few, very simple edits of outlining and measuring, of which the formatting is already pre saved into the map. The reader can zoom in, out, find the dimensions of each green space in question, and even click to see different viewpoints, from the normal above view to the street view, and lastly a 3D version of the map is available for the reader. The reader then has the opportunity to research their own areas of residence and see how it stands up against its counterparts on the map. An additional benefit to this is that the reader can come back to the map at any point and time; if they are reading the next chapter or are confused about something, it will always be online as a resource for the reader.

Some disadvantages of chapter two are more related to the limiting aspects of its formatting and online abilities. For example, it would be difficult to put this chapter into any other form like print or even pictures. It would be almost impossible to put this into print as it would lose almost all of its beneficial qualities. On paper it would not be able to be interactive,

therefore it would be harder to see each individual space (some spaces are quite small) that is being highlighted and harder for the map to support the other chapters in the manual. This also prevents all the information being spread out in one place as the measurements for each space mapped out in the city are located under the description of each individual space. This would need to be moved to a separate paper as the spaces are too small to write it on top of a paper map. The only solution to this disadvantage would be to either print out the map as it is and lose the other favorable qualities, or perhaps to design a QR code for readers to scan that can be placed around the specific space or area in question so the public can see the plans, but then it is still online for the most part.

Furthermore, the map does not include every possibility of a connection between the three parks, it only chooses the most direct route. The straightest and most direct route was chosen while passing over other areas due to harder planning and following implementations. The pathways and spaces chosen were not done with which areas were in the most need for sustainable action plans, for example maybe the parts of the city that has to cope with rain or even landslides more frequently than other areas in the city. This overlooks crucial needs of local people in said areas. A solution to this disadvantage would be to reconstruct the map with this problem in mind. That would include doing research prior to maybe rainfall levels or extreme weather event occurrences, where they happen, why they happen, and which solutions suggested in the first chapter would fit best.

The suggestions that the interactive map gives as a mitigation tool does not take into account the costs of each green infrastructure or other solution. The map actually only takes how much green roofs cost compared to multiple places around the globe. But what is left out are the majority of other solutions that would be a possibility to normal citizens, so it has the possibility

to limit the number of actions taken as a response to the chapter and manual. As the map will be used to further the sustainability of life in Quito, it is important to think about where the responsibility lies within each mitigation resolution that has been suggested. A way to fix this would be to try and calculate estimated costs for each type of green infrastructure or supporting element so there is an expected cost upfront and more time would not have to be wasted in the future. Porsche's article would be of help for calculating the costs of green infrastructures, but the Fairbrass (2018) article makes important stipulations as not all costs are monetary. Sometimes costs can be mitigating the increase of pollen every year due to the growth in biodiversity (p.1). The second chapter will make a bigger impact if the costs were calculated beforehand.

An additional factor not mentioned is the ownership of the land or space that is under consideration. Taking into account the ownership of the space is important because if it is one of the areas that are labeled as an unknown green space, then it could possibly halt all movement forward because it would have added requirements such as locating the owner of the space and then negotiating permissions. Water's (2017) insinuates that the land ownership is not the only roadblock to development in an Ecuadorian urban environment. In fact, leaving out the portion of local peoples who do not directly reside in the city, but do commute or participate in the urban economy in some way (p.50). So, land ownership would need to be taken into account as well as the opinions of everyone involved in, or around the city. If permissions were not granted by the owner, then the project would have to stop and find another direct route for the connection of green spaces to become a biological corridor. The mitigation of this would be to search for public records containing land ownerships so the route of the biological corridor can be solidified in real time.

Chapter three is all about the social awareness and consciousness of the information in the other chapters of the manual. One of the most considerable advantages of this chapter is that it allows for the voices of the public to be heard in their own words by gathering public opinion in one place. The voices of the public are heard in different ways such as through interviews, surveys, and online in social media. The use of multiple social media platforms allows participation in the manual and related activities to those outside of the organization. Thus, building a safe space for public discussion as well. People can express their thoughts and opinions on each and every one of the posts on social media, further adding to the number of public voices seen and heard. Extending the reach of the manual to people in all walks of life, enabling the information to be as far reaching as possible. Reaching the most people possible is important because without the residents of the city and others being involved, there is a lot less of a chance for anything to be improved and changed. This is important because the goal of this project is not to just boost urban biodiversity, it is also to increase public action and awareness. Gathering the publics' opinions on important topics like climate change and urban sustainable living lets the public know the Great-Leaf organization recognizes the value in their thoughts and actions, letting them know that we cannot make an impact without them, therefore allowing the public to have an increased confidence in the whole manual. By highlighting the importance of public action, the overall influence of the manual is increased.

Awareness and engagement are generated and supported in many different ways in chapter three, therefore bringing more and more advantages. First, digital resources are used to explain large amounts of information that may be difficult to understand otherwise. By using visuals within the chapter like graphs and digital campaigns, allows for the information to be broken into easier to read and understand segments with visuals to help support the concept as a

whole. The digital resources are not limited to one content type and each one is very cost effective since social media platforms are without license, which further allows for the information to be spread and fully understood by the public depending on the content type.

Content types include videos, Instagram reels, series of pictures, graphs, tweets on Twitter, posts on Facebook, and more. The inclusion of many content types allows for the research and other information to be easily digested in a fun, and exciting way. As found out from the interviews done, sometimes information and research related to climate change can be quite negative and discouraging. So, by using enjoyable or entertaining visuals/content to explain the situation at hand, grants the public the feeling of encouragement, like they can be optimistic about the circumstances because it again, highlights the importance of public action.

The information not gathered or provided through social media platforms was accumulated through interviews and surveys. The largest benefit to the survey was that it was a short and easy way for people to give their opinions on the topic of climate change and mitigation techniques, again as described above allowing for their voices to be heard in a meaningful way. The survey took less than 10 minutes to take, giving the added benefit of not taking up too much of the participants' free time outside of work. The interviews were a little longer, around 45 minutes to an hour, but provided a more detailed insight to the issues the public is most concerned about. The results of both are one of the most considerable advantages of the chapter. The results are laid out in different graphs and charts that are fun and inviting colors, then each chart is discussed and thoroughly explained. The detail this chapter goes into in order to analyze the public's thoughts and opinions, adds to the understanding and perspective of the project. The reader will be able to compare their own thoughts on the topic with those of their peers and neighbors in an easy to view and comprehend format.

Chapter three's main disadvantage is that it almost solely relies on access to the internet. Of course, the results of the surveys and interviews are easily put into print as they are not interactive, the rest is not the same. It adds to the disadvantage of not being able to put this manual in print form, as talked about above for previous chapters as well. Not being able to put this in print limits the manual's audience. Another way the audience of the manual is limited through the reliance on internet access is that the surveys and interviews only gather information from those who have access to the internet or social media. This leaves out a large group of people who do not have any accounts on social media platforms such as Twitter, Instagram, Facebook, etc. Those who do not have access to sites such as these need their voices to be heard too. Or perhaps some of those who do not have internet access all together such as communities in far out places will not have the opportunity to add their opinions and values to the research or public discussion.

The mitigation of this disadvantage would be to expand the audience of the interviews and surveys through another format that does not rely on access to the internet. Having the interviews done over the phone would be a possible solution but would not be very cost effective as international calling rates are usually pretty high. Since all of the participants of the surveys and interviews were found through the Great-Leaf organization, setting up a table in a busy location and having a paper print out of the survey gives the opportunity not only to increase the diversity of the surveys taken, but also allows for interviews to be done without reliance on the internet by doing them in person right there. This could also increase the awareness of the Great-Leaf organization's own social media platforms, therefore enlarging the reach of the manual and pertinent information.

Reflections and Lessons Learned

After the experience of creating such a large manual, I gained the background and knowledge necessary to work alongside an organization for the betterment of a city. The manual was constructed based on the experience of living in an urban environment and how that can be improved through sustainable practices. This required extensive research to be done and more than that the public's opinion to be heard in order to create solutions for a city like Quito, that would actually be able to be put into practice. The most important takeaway from this experience is that urban living does not have to be unsustainable, it just takes time, and deliberate actions that work towards putting long term sustainability in the day-to-day practices of your average local person (Jauregui, n.d., p.4).

When creating the manual and supporting elements, everything was done online, including research, meetings, and construction of the manual. Even though I was not physically in-country during the construction of this project, I had just previously lived in Quito. This gives the advantage of knowing the area and specifically, allowing for more proactive suggestions to be made instead of just guessing based upon what Google Earth tells me an area looks like. But, since I was not in-country for the project, I could not make the level of connection to those working for Great-Leaf organization because I did not see them every day. Maybe there would have been less confusion and the project would have been done more quickly, but I coordinated with the advisors at Great-Leaf, who are residents of Quito, to make sure everything aligned. This included definitions of important terms such as biodiversity, urbanization, and sustainability. There was much discussion about these topics, back and forth, to tweak the wording in order to thoroughly define the terms based on their perspectives as locals. This enabled the manual to have a somewhat local people's perspective. Perhaps the manual could

have used a more regionally specific definition for base terms like sustainability, taking into account the daily activities of residents, but that would have required a lot more time to be put into this process.

The initial process of constructing the manual through specific research was difficult because there wasn't much information available about Ecuador looking for solutions to change the ways of current urban living. While the information found was not specific to Ecuador, the same challenges were found to be researched worldwide; urban living, planning, and development has created an unsustainable environment that does not allow for native biodiversity to flourish (Pena, 2017, p.2; Satterthwaite, 2007, p.30; Mittal, 2013, p.3). Therefore, lowering the functioning of surrounding ecosystems and quality of life for all involved, humans, plants, animals, insects, everyone (Muller, 2010, p.86). The research found allowed the manual to have a solid foundation with no question about the challenges at hand and provided the worldwide inquiries to be instilled in everyday people worldwide. For example, the research uncovered the same urban challenges were being experienced in Sweden, the Netherlands, Japan, and America as in Ecuador and Brazil (Oberndorfer, 2007, p.828; Porsche, 2013, p.461; Jonker, 2021, p.143). This changed the positioning of the argument, because while Ecuador is a biodiversity hotspot that needs to be conserved, long and complicated solutions are not always necessary (Dornhoff, 2019, p.2).

An additional specific example of a time where there were challenges during the process of creating the manual was in the final chapters, where the public perceptions and information to be released for the public would be found. Trying to find a way to prepare residents of the city with a wealth of information while also connecting with them in a positive way was a bit difficult part of the process sometimes because often the research can be a little disheartening.

Looking at the pollinator campaign for example, some of the facts such as the percentage of the food we rely on to sustain life can be detrimental altered if pollinator populations decline, and that can be really discouraging (Buchmann, 2012, p. 12). I used this roadblock as a way to connect my current experiences in building a manual for sustainable urban living to my prior working experience with teaching. When teaching, it is best not to use so many negative comments when talking about anything. So instead of saying something like we will lose a large portion of our food sources due to the impacts of urbanization, what was said in one post was "Pollinators let us have our favorite foods!", then went on to talk about how pollination occurs. Then after setting the background knowledge of pollination another post goes into how important pollinators are to crops and how that is affected by saying "At least 90 percent of flowering plants are dependent on the actions of pollinators", and further dive into the types of foods that are only made possible by pollinators like avocados, vanilla beans, and even spices like star anise. This got all the pertinent information across, while also being encouraging and letting the reader know that there is something they can do to help.

Over the course of the construction of the manual, the chapters were decided based upon discussions had with the partner organization. The second chapter became crucial to the rest of the manual because it created a tangible link from the research found to the real people living in Quito. It was quite helpful that I had personal experience in the exact places being mentioned as it gave me a real picture in my mind to create solutions for the green space mapping. For example, being able to imagine and see what the La Carolina Park looked like from the inside and the surrounding areas gave me a better grasp on what exactly was missing and how the biodiversity was being misrepresented. This personal insight accommodates the gaps found when using the well-known and pre-established database of maps on Google Earth because sometimes

you can only look at a bird's eye view of say a street or a specific area because the street view is not also clear or available. The research from the first chapter was indispensable to the mapping process. Without the global research on green infrastructures and basic information on biological corridors, there could not have been such specific solutions given to the areas between the three major parks. The mapping process began with finding all the green spaces between the three major parks, keeping the research in mind in order to come up with labels and dimensions for each green space or potential green space available. Then, the research and information found aided in the types of solutions given for each space. For example, in Bazrkar's (2015) article, it was stated that urban environments are often found to have higher temperatures, even describing the urban heat island effect as a major problem in many cities (p.279). Then further research suggested that mitigation of this in as specific of a way as possible, could be as easy as making the streets lined with trees, which give much needed shade and therefore, lower the average temperature of the surface air (p.695).

As the manual was being developed, it was important to the outcome of the project to look at how other countries faced the challenges of unsustainable urban living since there is not much information and research done in regard to Latin American countries like Ecuador. The research was found to be encouraging and affirmative to the outcomes of the project. An example of suitable studies or articles that supported the manual's research and outcomes but did not necessarily speak about Ecuador specifically was Whitehorn's study in (2019), which states that the significance of biodiversity extends further than just ecosystem services, it affects the economy and the well-being of residents from any country. The author then goes into detail about the substantial weight each country, governments, and other organizations, has to develop a plan for increasing biodiversity, and how detrimental that would be if the challenges are left

with no real-life solutions (p.157). This is important to note because it supports the core ideas of this project; biodiversity loss is a topic of utmost importance which should have some level of priority. Otherwise, the challenges of urban living that are listed will only worsen. Moving to literature that supported the more specific claims in the project, was in Morash's research from (2019), where the usefulness of rain gardens as mitigation tools within urban environments is explored and found to be successful at reviving ecosystem functioning such as in the hydrological aspects of an ecosystem becoming stronger and shown to collect excess storm water runoff that often includes harmful pollutants (p.1). Having research support the specific mitigation approaches that are recommended such as rain gardens, provides additional confidence for the reader and allows them to see this is being done worldwide with positive effects, giving meaningful ways for them to help the cause.

Additionally, there are articles that provide backing to the second chapter's biological corridor solutions but also mentions the negatives so the reader can decide if this is the best option for the area in question. For example, Laurance (2004, p.9) goes into detail about how biological corridors look in many different parts of the world, adding biodiversity, promoting movement between species, contributing habitats for animal and plant species, and more. But what is interesting about this paper is that it goes into detail that the manual does not, such as analyzing the costs of corridors, how the width affects the outcomes, and how it can increase the mortality of some species due to increases in ease of disease spreading or closes access to cars or roads (p.82). This is an important paper to look at afterwards as it communicates and uncovers what was left out or missed due to time constraints, budgets, etc. Laurance explicitly explains that it is better to do something, even just have small amounts of beneficial green spaces than none at all, even against all the negatives listed (p.30). This is why the article would be a great

article to base future renovations of the project foundations in order to make sure all efforts planned are thoroughly thought out, so the benefits gained from mitigation techniques such as this are maximized to the fullest extent. This provided the manuals ability to be able to take such a broad concept and narrow it down to something that can actually provide a real solution to the residents of Quito and even abroad.

      The outcome of this project is definitely based upon how it reaches the public, and how far reaching it is. The use of social media is of course, helpful with who the information from the manual reaches, but that wouldn't be put into effect until after the completion of the manual. Getting the public's opinion through surveys and interviews allowed the manual to have the gaps of knowledge or confusions identified and taken into account when creating solutions and suggestions presented for the Great-Leaf organization to demonstrate to the public. The experience has led to the conclusion that the public's opinion and voices are important to the outcome of the project.

      In theory, the manual will be used for the Great-Leaf organizations next steps in increasing the sustainability of Quito through the construction of a biological corridor, but if the public does not understand what or why the changes in their city are happening it could lead to pushback. The influence of other people's perceptions on the harm urban living brings to the environment gave an insight on the actual solutions needed to mitigate the challenges of living in an urban area. For example, the data from the interviews and surveys showed that a majority of the participants did not know the full capacity of benefits that green spaces could bring to a city, which was shown in question eight of the survey regarding the benefits believed to be brought by a green space. The full capacity of benefits including but not limited to the mitigation of climate change and urbanization, which can be seen as lowering of average temperatures, increase in

ecosystem functioning, boosts in not only biodiversity, but pollinator populations, and overall well-being of residents (Kabisch, 2016, p.4; Fairbrass et al., 2018, p.3). This question also enlightened the research on the fact that every participant believed that green spaces bring some sort of benefit to themselves and the surrounding areas, even if they are unsure of what those benefits actually are. While the outcome of the manual was ultimately determined by the research, collecting local people as participants, and gathering their opinions helped provide backing and support for the recommended mitigation techniques given in the manual.

 At the end, there was a lot of information that was put into a manual, in many different forms. As mentioned previously, there was not much research specific to conditions in Ecuador and it did not affect the outcome, just changed the project into a funnel like approach. This meaning, the global research was done in a broad introspective manner, then the information from a global approach was narrowed down and used to create real life mitigation solutions for Quito. By allowing the global approach to partner with the residents of Quito and using this to help dictate what was most needed is the best approach that could have been taken in the circumstances given because it attempts to understand issues from all viewpoints in order to construct the very best solutions that can actually be used to benefit the people. On the other hand, some areas could have used more connections and some disadvantages were overlooked and not fully explained when compared to the benefits, like as described above within chapter two and the mapping of the biological corridor. Overall, while there are things that can be improved, the value of the actions still stands, it is better to take action now as soon as possible than to leave it until it is too late.

Conclusions and Recommendations

The manual was developed with increasing the sustainability of urban living in mind. Which has come together as a manual of sustainable urban living. The manual clearly states the challenges involved with urban living such as higher average temperatures, excess exposure to pollution, changes in albedo, and overconsumption, just to name a few. All of the challenges and issues that have been identified in urban environments across the globe, have been suggested to be mitigated through the increase of biodiversity in urban environments. This is seen through the increase of helpful green spaces throughout a city, like Quito. Thus, allowing for the challenges to be alleviated simply and by everyone in the public, taking into account the many diverse backgrounds and upbringings residents may come from.

The manual includes interactive maps for this reason. It was designed to lead the specific solutions and accommodations in real life, for the capital city of Ecuador, Quito. The map itself is backed by extensive research with the goal of directly helping a non-profit improve the lives of Ecuadorian residents who live in an urban environment and the species within that very specific ecosystem. To improve the sustainability of urban living is also to improve the negative impacts of climate change and urbanization through the education and empowerment of Quito residents to take actions. Increasing biodiversity in a helpful way, for example wit native plants instead of plots of turf grass, has been demonstrated to soften the negative effects of urban living and design.

Education of the public is one of the central supports of the whole project due to the importance of public action that was determined. Without public action and interest, nothing would change, and urban living will continue to become more and more sustainable. A city is constructed with human wants and needs and normally leaves other species needs and wants out. This could be seen in unhelpful green spaces filled with nonnative plants and turf grass for

aesthetics or the sheer amount of concrete and buildings that block species ability to survive. Therefore, leads to the considerable reasoning behind the unsustainability of urban life; this being due to harmful planning and design of cities which are detrimental for the level of functioning of the surrounding area's ecosystem, like large amounts of biodiversity loss for example. If the public is unaware of the impacts they are making, how can they be expected to help?

Empowering residents of the city with the information needed to change their lives for the better, then providing real-life examples from all over the world to support the changes suggested for their city, gives local people all the tools they need to succeed. After reading the manual, the reader will be able to understand the importance of boosting your local biodiversity and how that not only affects the plants and animals but their personal lives as well. Using this knowledge to get them in support of the major changes suggested, like the creation of a biological corridor in chapter two, will help the project actually come to life faster. This will enable the manual to provide direct improvements in the readers' lives, and for the partner organization's movements against climate change.

While the manual does provide direct support and access to pertinent information, there is only so much that can be done without the help of further studies. Chapter two is important to this because there is not much research done on increasing the biodiversity of urban environments in South America, let alone Ecuador. Using the map created to construct a biological corridor between the three major parks in Quito, La Carolina, Rumipamba, and Guangüiltagua, will enable further research to be done, easily and locally. Additional investigation needs to be done on the monitoring and progress so this can be applied to other cities and countries in South America. Further studies need to be done on the biodiversity of

urban environments compared to the biodiversity of rural environments since there were some discrepancies in the research regarding this. Additionally, engagement of the public needs to be facilitated in any and all future changes and projections as the local peoples will have the knowledge firsthand. This study has clearly shown that the perception of the public is quite important to the outcome of future cities, thus should be listened to more carefully.

Bibliography

Benedict, M. A., & McMahon, E. T. (2012). Green infrastructure: Linking landscapes and communities. *Island press*.

Baño, D., Salazar, J., & Delgado, M. (2018). Remote Sensing in the Design of Urban Planning Strategies, Case Study Urban Heat Island of the Metropolitan District of Quito, Ecuador. *Latin American Journal of Computing, 5(1), 17 - 26*. Retrieved from https://lajc.epn.edu.ec/index.php/LAJC/article/view/143

Bilgili, B. C., & Gökyer, E. (2012). Urban green space system planning. *Landscape planning, 360.*

Bazrkar, M. H., Zamani, N., Eslamian, S., Eslamian, A., & Dehghan, Z. (2015). Urbanization and climate change. *Handbook of climate change adaptation, 619-655*.

Buchmann, S. L., & Nabhan, G. P. (2012). The forgotten pollinators (2nd ed.). *Island Press*.

Cleland, E. E. (2011). Biodiversity and Ecosystem Stability. *Ecology, Behavior, and Evolution, 3(10), 1-14*.

Cushman, S. A., McRae, B., Adriaensen, F., Beier, P., Shirley, M., & Zeller, K. (2013). Biological corridors and connectivity [Chapter 21]. In: Macdonald, DW; Willis, KJ, eds. Key Topics in Conservation Biology 2. Hoboken, NJ: *Wiley-Blackwell. p. 384-404., 384-404.*

Diehl, J. A., Oviatt, K., Chandra, A. J., & Kaur, H. (2019). Household food consumption patterns and food security among low-income migrant urban farmers in Delhi, Jakarta, and Quito. *Sustainability*, *11*(5), 1378.

Dornhoff, M., Sothmann, J. N., Fiebelkorn, F., & Menzel, S. (2019). Nature relatedness and environmental concern of young people in Ecuador and Germany. *Frontiers in*

psychology, 10, 453.

Environmental Protection Agency. (2022). What is green infrastructure? US EPA. Retrieved July

8, 2022, from https://www.epa.gov/green-infrastructure/what-green-infrastructure

Fairbrass, A., Jones, K., McIntosh, A., Yao, Z., Malki-Epshtein, L., & Bell, S. (2018). *Green*

Infrastructure for London. https://www.researchgate.net/profile/Zeyu-

Yao/publication/334126003_Green_Infrastructure_for_London_A_review_of_the_evidence_

A_report_by_the_Engineering_Exchange_for_Just_Space_and_the_London_Sustainability_

Exchange/links/5e830dd04585150839af83de/Green-Infrastructure-for-London-A-review-of-

the-evidence-A-report-by-the-Engineering-Exchange-for-Just-Space-and-the-London-

Sustainability-Exchange.pdf

Gasper, R., Blohm, A., & Ruth, M. (2011). Social and economic impacts of climate change on

the urban environment. *Current Opinion in Environmental Sustainability, 3(3), 150-157*.

Gaston, K. J., & Spicer, J. I. (2004). Biodiversity: An introduction (2nd ed.). *Wiley-Blackwell*.

https://books.google.co.id/books?

Gutiérrez-Chacón, C., Valderrama-A, C., & Klein, A. M. (2020). Biological corridors as

important habitat structures for maintaining bees in a tropical fragmented landscape.

Journal of insect conservation, 24(1), 187-197.

Hardoy, J., & Lankao, P. R. (2011). Latin American cities and climate change: challenges and

options to mitigation and adaptation responses. *Current Opinion in Environmental*

Sustainability, 3(3), 158-163.

Hilty, J. A., Lidicker Jr, W. Z., & Merenlender, A. M. (2012). Corridor ecology: the science and

practice of linking landscapes for biodiversity conservation. *Island press*.

Instituto Nacional de Estadística y Censos. (n.d.). Instituto Nacional de Estadística Y Censos »

Población Y Demografía. https://www.ecuadorencifras.gob.ec/censo-de-poblacion-y-vivienda/

Jauregui, A. (n.d.). SDG Implementation and Challenges: The Case of Peru and Ecuador. *Localizing SDGs, 1.*

Jonker, J., & Faber, N. (2021). Impact. *In Organizing for Sustainability (pp. 139-150).* Palgrave Macmillan, Cham.

Komala, G. (2021). Declining pollinators and bee populations endanger global food and nutrition. *Department of Entomology's Just Agriculture News, pp. 1-10.*

Laurance, S. G. (2004). Landscape connectivity and biological corridors. *Agroforestry and biodiversity conservation in tropical landscapes, 1, 50-63.*

Le Conte, Y., & Navajas, M. (2008). Climate change: impact on honeybee populations and diseases. *Revue Scientifique et Technique-Office International des Epizooties, 27(2), 499-510.*

Loro, M., Ortega, E., Arce, R. M., & Geneletti, D. (2015). Ecological connectivity analysis to reduce the barrier effect of roads. An innovative graph-theory approach to define wildlife corridors with multiple paths and without bottlenecks. *Landscape and urban planning, 139, 149-162.*

Mittal, R., & Mittal, C. G. (2013). Impact of population explosion on environment. Weschool *Knowledge builder-the national journal, 1(1), 2.*

Morash, J., et. al., (2019). Increasing sustainability of residential areas using rain gardens to improve pollutant capture, biodiversity, and ecosystem resilience. *Sustainability, 11(12), 3269.*

Muller, N., Werner, P., & Kelcey, J. G. (2010). Urban biodiversity and design (7th ed.). John

Wiley & Sons. https://books.google.co.id/books?

Neiderud, C. J. (2015). How urbanization affects the epidemiology of emerging infectious

diseases. *Infection ecology & epidemiology, 5(1), 27060.*

Nagdeve, D. A. (2007). Population growth and environmental degradation in India. *International*

Institute for Population Sciences. http://paa2007. princeton. edu/papers/7192. Department

of fertility studies, Govandi station road, Deonar, Mumbai, 400, 088.

Obaco, M., & Díaz-Sánchez, J. P. (2018). An overview of urbanization in Ecuador under

functional urban area definition. *Region, 5(3), 39-48*.

Oberndorfer, E., et., al. (2007). Green roofs as urban ecosystems: ecological structures,

functions, and services. *BioScience, 57(10), 823-833*.

Ossola, A., Irlich, U. M., & Niemelä, J. (2018). Bringing urban biodiversity research into

practice. *Rout. Assoc. GSE Res*, *1*, 1-17.

PACQ 2020 | Quito Carbono neutral. (n.d.). *My Site*. https://www.quitoneutral.com/pacq2020

Palme, M., Villacreses, G., Lobato, A., Cordovez, M., Macias, J., & Soriano, G. (2016,

September). Estimating the urban heat island effect in the city of Guayaquil. *In An*

International Conference on Urban Physics. Recuperado de https://www. researchgate.

net/publication/308255787_Estimating_the_Urban_Heat_Island_Effect_in_the_City_of_Gua

yaquil.

Patel, R. (2021). Paper plans and possibility: A critical analysis of landscape conservation policy

in the Mesoamerican Biological Corridor. *Environmental Development*, *37*, 100600.

Pena, J. C. D. C., Martello, F., Ribeiro, M. C., Armitage, R. A., Young, R. J., & Rodrigues, M.

(2017). Street trees reduce the negative effects of urbanization on birds. *PloS one, 12(3),*

e0174484

Peng, X., Chen, X., & Cheng, Y. (2011). Urbanization and its consequences (Vol. 2, pp. 1-16). Paris, France: *Eolss Publishers.*

Porsche, U., & Köhler, M. (2013). Life cycle costs of green roofs. *World Climate & Energy Event, 461-67.*

Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: in search of conceptual origins. *Sustainability science, 14(3), 681-695*.

Rojas, E., & Lanzafame, F. (2011). City development. The experiences of ten World Heritage sites. *Inter-American Development Bank.* Washington DC.

Satterthwaite, D. (2007). Adapting to climate change in urban areas: the possibilities and constraints in low-and middle-income nations *(Vol. 1). Iied*.

Standard of living by country | Quality of life by country (2022). *2022 World Population by Country*. https://worldpopulationreview.com/country-rankings/standard-of-living-by-Country.

Seress, G., & Liker, A. (2015). Habitat urbanization and its effects on birds. Acta Zoologica Academiae Scientiarum Hungaricae, 61(4), 373-408.

Schreurs, E., Koop, S., & van Leeuwen, K. (2018). Application of the City Blueprint Approach to assess the challenges of water management and governance in Quito (Ecuador). *Environment, development, and sustainability, 20(2), 509-525.*

Uttara, S., Bhuvandas, N., & Aggarwal, V. (2012). Impacts of urbanization on environment. *International Journal of Research in Engineering and Applied Sciences, 2(2), 1637-1645.*

Vlahov, D., & Galea, S. (2002). Urbanization, urbanicity, and health. *Journal of Urban Health, 79(1), S1-S12.*

Waters, W. F. (1997). The road of many returns: rural bases of the informal urban economy in

Ecuador. *Latin American Perspectives*, *24*(3), 50-64.

Whitehorn, P. R., et. al. (2019). Mainstreaming biodiversity: A review of national strategies.

Biological conservation, 235, 157-163.

Zalakeviciute, R., López-Villada, J., & Rybarczyk, Y. (2018). Contrasted effects of relative

humidity and precipitation on urban PM2. pollution in high elevation urban

areas. *Sustainability, 10(6), 2064.*

Appendix

Questions from surveys and interviews

1. Have you ever heard about climate change?
   - Yes
   - No
   - Not sure

2. Which topics involving climate change have you heard about?
   - Biodiversity loss
   - Global warming
   - Greenhouse gas emissions
   - Changes in extreme weather such as flooding happens more often
   - I have not heard about any of them
   - Other not listed:
     - ……..

3. Who do you believe is most responsible for climate change? Please rate in order of importance, with 1 being the most responsible.
   - Individuals
   - Corporations and industries
   - Governments
   - International Organizations

4. In your opinion, on a scale of 1 to 5, with 5 being extremely important and 1 being not at all important, how important are each of the following issues?
   - Air pollution:
   - Temperature changes from previous years:
   - Flooding and other extreme weather events

- o Using nonrenewable resources
- o Extinction of species
- o Greenhouse gas emissions

5. What things in your day-to-day life do you think may or may not contribute to climate change? (e.g., recycling, taking the bus, using single-use plastics for shopping or eating, etc.)

6. What is your idea of a green space in a city?
- o ……………

7. How often would you say you utilize the green spaces in your city? For example, going on a picnic or playing with your kids?
- o Every day, I try to utilize green spaces in my city as often as I can, sometimes more than one per day.
- o Sometimes, I try to utilize the green spaces in my city at least once or twice a week
- o Rarely/ never, I almost never utilize the green spaces in my city

8. What benefits do you think green areas give to the city?
- To give ornament to the city
- Allow to have biodiversity
- Help to absorb rainfall
- They are recreation spaces
- Temperature regulation
- They don't have any benefit

9. How important is having green spaces in a city to you? Would you support the addition of green spaces at the cost of reworking previously unused or misused spaces?
- o Having green spaces in a city is very important to me. I would like to have as much green space in a city as possible, no matter the changes to the city I live in now.
- o Having green spaces in a city is somewhat important to me. I would not mind changes to the city I live in now as long as they are minor.
- o Having green spaces in a city is not at all important to me and I would not like any changes to be made in the city I live in now.

10. Green infrastructure refers to any vegetated infrastructure system that helps mitigate climate challenges directly or indirectly. Which types of green infrastructure below are you familiar with?
- o Green roofs
- o Rain gardens
- o Infiltration trenches
- o Green walls

- o Pollinator gardens
- o Planters
- o Green facades
- o Urban Farms
- o Others not listed
  - ▪ ….

11. How likely are you to make any sort of green infrastructure, like the ones listed in the question above, of your own at home?
- o Very likely, I would definitely make one at my house
- o Somewhat likely, I would only make a type of green infrastructure if it is easy, and convenient for me
- o Not at all likely, I have never thought about making any type of green infrastructure at my home and never will

12. Rate how you feel about the following sentence: I would be more likely to contribute and participate with my own green infrastructures if I knew it would make my life easier.
- o I completely agree, I would be interested even if it didn't make my immediate life easier.
- o I somewhat agree, I might be interested in green infrastructure if I had more information on how it could improve my life.
- o I disagree, I would not be interested in green infrastructure even if I had more information about it.

TRANSLATION

1. ¿Ha escuchado sobre el cambio climático?
- · Si
- · No
- · No estoy seguro/a

2. ¿Cuáles de los siguientes temas que involucra el cambio climático usted ha escuchado?
- · Pérdida de biodiversidad
- · Calentamiento global
- · Emisiones de gas invernadero
- · Cambios extremos en el clima (Sequías, inundaciones, etc.)
- · No he escuchado ninguno
- · Otro

3. ¿Cuál cree usted que es el sector más responsable del cambio climático?
- · Las personas
- · Empresas e industrias
- · Gobiernos
- · Organizaciones internacionales

4.   En su opinión, en la escala del 1 al 5, siendo 5 extemadamente importante y 1 siendo poco importante, ¿Qué tan importantes cree usted que son las distintas problemáticas?

· Contaminación ambiental
· Cambios de temperatura comparado con años pasados
· Inundaciones y otros eventos climáticos extremos
· Extracción de recursos no renovables
· Extinción de especies
· Emisiones de gases invernadero

5.   ¿Qué acciones del día a día considera usted que ayuda a evitar el cambio climático?

· Reciclar
· Uso de transporte público, en vez de usar automóvil particular
· Transportarse en bicicleta
· Evitar el uso de plástico de un solo uso
· Conservar espacios verdes en la ciudad
· Otras (especifique)

6.   ¿Cuál es su idea de un espacio verde en la ciudad?

7.   ¿Qué tan frecuente es su uso de los espacios verdes de la ciudad? Por ejemplo, ir a recrearse en un parque o en un espacio con plantas en la ciudad.

· Todos los días. Uso los espacios verdes en la ciudad tan frecuente como puedo, a veces más de una vez al día.

· A veces. Uso los espacios verdes al menos una o dos veces por semana

· Rara vez. Casi nunca uso los espacios verdes de la ciudad.

8.   ¿Qué tipo de beneficios cree usted que aportan los espacios verdes a la ciudad?

· Aportan ornamento a la ciudad

· Pueden albergar biodiversidad

· Ayudan a absorber agua de lluvia

· Son espacios de recreación

· Ayudan a regular temperatura

· No tienen ningún beneficio

9. En su criterio, ¿qué tan importante es tener espacios verdes en la ciudad? ¿Usted apoya la incorporación de espacios verdes en espacios residuales o en desuso?

· Tener espacios verdes en la ciudad es muy importante para mí. Me gustaría tener la mayor cantidad de espacios verdes posible, sin importar hacer cambios en la cuidad.

· Tener espacios verdes en la ciudad es algo importante para mí. No me importaría tener cambios en la ciudad, siempre y cuando éstos sean menores.

· Tener espacios verdes en la ciudad no es importante para mí. No me gustaría que la ciudad en la que vivo se hagan cambios.

10. La infraestructura verde se refiere a cualquier tipo de espacio con vegetación en las ciudades, este tipo de infraestructura ayuda a mitigar los efectos del cambio climático directa o indirectamente. ¿Qué tipos de infraestructura verde son familiars para usted?

· Techos verdes / Terrazas jardín

· Jardines de lluvia

· Zanjas de infiltración

· Jardines verticales

· Jardines de polinizadores

· Jardineras

· Paredes con enredaderas

· Huertos urbanos

· Otro (especifique)

11. ¿Qué tan dispuesto está usted a hacer cualquier tipo de infraestructura verde en su casa? (Cualquiera de las mencionadas en la anterior pregunta)

· Estoy muy dispuesto/a, me encantaría tener uno de estos elementos en mi casa.

·   Estoy algo dispuesto/a, haría una infraestructura verde si es que es fácil y conveniente para mí.

·   No me gustaría tener una infraestructura verde, nunca me ha gustado tener ningún tipo de infraestructura verde en mi casa y nunca lo haré.

12. Califique su posición de acuerdo a la siguiente oración: "Yo estaría más dispuesto/a a contribuir y participar para hacer infraestructura verde en mi casa si es que supiera que éstas incrementan mi calidad de vida u obtengo beneficios de ellas"

·   Concuerdo totalmente, estoy interesado/a a pesar de que no me provean un beneficio directo o mejoran mi calidad de vida.

·   Estoy mediantemente de acuerdo. Podría estar interesado/a en tener infraestructura si es que tuviera más información sobre sus beneficios.

·   No esto de acuerdo. No estoy interesado/a en tener infraestructura verde, a pesar de tener argumentos de sus beneficios.