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**Application of the Thriving Cities Initiative's methodology
for the creation of the "City Portrait" in Cuenca for the
period 2019-2021**

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DEDICATION

To my parents, Blas and Johana, for their infinite love and dedication to encouraging me to dream big. For always looking at me with eyes full of pride and giving me the confidence to never waver.

To Dome for encouraging me to meet all the goals I set for myself. You are my reason for being better every day.

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Finally, to all those who work hard to build a fairer society and an ecologically safer world.

Ma. Salomé Garzón Rojas

DEDICATION

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ABSTRACT

This investigation aims to adapt the City Portrait tool, promoted by the Thriving Cities Initiative and based on the Doughnut Economics, in Cuenca, Ecuador. The study focuses on the compilation and analysis of statistical data, environmental and social indicators of the city, and semi-structured interviews with experts and local authorities. Through this methodology, it is evaluated the sustainable management of Cuenca, considering the challenges of the socio-environmental crisis that humanity faces in the 21st century.

Keywords: international cooperation, socio-environmental crisis, doughnut economics, urban management, sustainability.

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INTRODUCTION

Cities have become the epicenter of significant social inequalities and a source of pollution worldwide. Consequently, these urban centers have assumed the commitment to address global challenges from the responsible management of their locality. In this sense, an avant-garde tool to meet these new challenges is the City Portrait, based on the Doughnut Economics model. With it, this investigation aims to apply this methodology in the city of Cuenca.

The methodology for this research has a qualitative approach. The information required to develop the theoretical model of the City Portrait proposed by the Thriving Cities Initiative are two. On the one hand, the investigation, compilation, and analysis of statistical data as well as environmental and social indicators of the city of Cuenca. On the other hand, qualitative information obtained through surveys with experts and local authorities that, considering the local context and reality, will allow the selection and evaluation of the dimensions that make up the lenses of the Portrait of Cuenca.

The structure of the present research consists of three chapters. The first one presents a background account of climate change, the earth system, and related problems. Subsequently, the evolution of cities and how they came to today's management models are summarized. In addition, nations' efforts and the global agenda on social and environmental issues are evidenced, as well as setbacks in achieving the 2030 Sustainable Development Goals due to the COVID-19 pandemic.

The second chapter summarizes the general data of the canton of Cuenca and presents an analysis of its state by systems: biophysical, socio-cultural, economic, and institutional political. This is a prior study to the development of Cuenca's City Portrait, which is carried out to examine the city's main problems and identify those related to the Portrait dimensions.

Finally, the third chapter details the methodology for creating the City Portrait tool. It exposes the theoretical foundations on which this tool is based: the Doughnut Economics and the Planetary Limits. Then, it closes the analysis with the presentation and exposition of the findings identified from the Portrait of Cuenca, Ecuador.

CHAPTER I

State of the Art

1.1. Background: Historical review of climate change evolution and resulting social problems

1.1.1. Importance of climate

Throughout history, the climate itself has been a natural and continuous phenomenon, independent of the existence of species such as humankind. The system's temperature works in a complex and interconnected way between the atmosphere, the Earth's surface, the oceans, and the cryosphere¹. What determines that temperature is the difference between the amount of heat entering the planet and leaving it. The balance between the heat that enters and that which escapes from the Earth, known as the radiative balance, is necessary for the flourishing of life on the planet (Fahey et al., 2017, pp. 74 -75).

Approximately 30% of the heat is expelled back into space thanks to the reflectivity of land surfaces, clouds, atmospheric particles, and oceans. The earth system absorbs the remaining energy to maintain its normal functioning. Additionally, certain compounds in the atmosphere retain radiation and prevent its release, including gases such as carbon dioxide, methane, or water steam. These gases, known as *Greenhouse Effect Gases* (from now on GHG), are partly responsible for global warming; since the infrared energy reflected by the earth's surface is absorbed by GHGs, resulting in the heating of the atmosphere and the surface (Fahey et al., 2017, pp. 74-75).

According to Patrick Galloway, this climatic equilibrium mechanism results in the formation of historical cyclical processes of long-term climatic fluctuations (1986, p. 6), which has had repercussions on the formation of civilizations and their disappearance. In addition, Galloway affirms that population fluctuations over time respond to climatic cycles that, in their hottest stages, have led to population growth and, in their coldest cycles, have limited it (1986, p. 3). Likewise,

¹ Cryosphere: water on the planet in a solid-state.

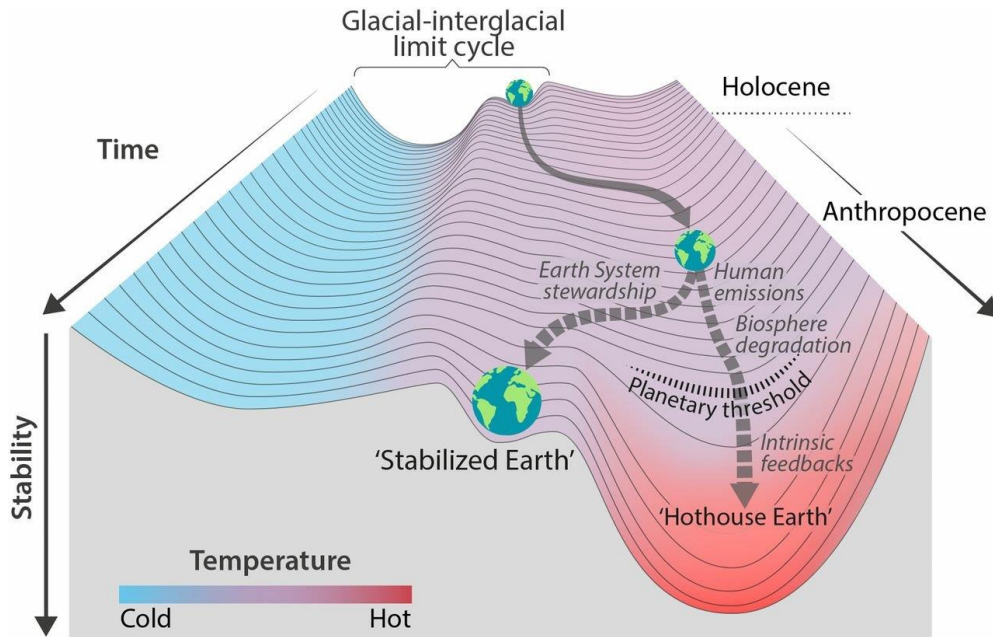
the evolution of the first stable human communities and the appearance of the first cities also depend on climate stability (García and Molina, 2017, p. 58).

As the last ice ages ended, humans moved from a nomad life model to one in which climatic conditions allowed them to grow food, which led to the development of agriculture (García and Molina, 2017, p. 58). However, these agriculture-dependent societies also became highly susceptible to climatic events that affected food production and availability. Such was the case of the Akkadian Empire (2340 BC – 2200 BC), an agricultural and trading civilization that collapsed due to the reduction in the amount of food available. According to García and Molina, this could have been caused by the decrease in rainfall and vulcanization, leading to intense and prolonged droughts in the lands they used for agriculture (2017, p. 59).

These natural cyclical processes have occurred for millions of years without the human species having a relevant influence. However, at the start of the Industrial Revolution at the end of the 18th century, humans and their activities managed to have a global impact on nature and the climate system (Steffen et al., 2004, p. 81). This unprecedented incidence of humanity on the climate has meant a change in the planetary geological era, passing from the *Holocene*² to the beginning of a new geological era: the Anthropocene, a time that “recognizes that human beings have massively transformed nature” (Arias, 2020, p. 20) (see Figure 1).

² Holocene: the period of the geological scale between the year 10,000 BC and the 18th century AD. This stage experienced environmental conditions that favored the development of humanity. However, with the beginning of the Industrial Revolution, human activity in the climate system gave way to a new era known as the Anthropocene (Meteorología en red, 2022).

Figure 1:
Earth trajectories



Note: From “Trajectories of the Earth System in the Anthropocene” (p.8254) by Steffen et al., 2018 Proceedings of the National Academy of Sciences, 115(33), 8252-8259 (doi:10.1073/pnas.1810141115)

The Industrial Revolution led to a population explosion from the 18th century to today, from around one billion people in 1800 to an estimated nine billion by 2050 (Steffen *et al.*, 2004, p. 81). That constantly growing population began to demand more products and food, so industries had to produce like never before to meet the demand. These industries needed to use an energy source to run their factories, so they opted for burning fossil fuels such as coal and oil; since their use was less expensive in economic terms (Steffen *et al.*, 2004, p. 82). What was not considered at that time was the climatic cost of this form of production, since the burning of these fossil fuels and the consequent release of greenhouse gases are the leading causes of global warming and putting the earth system at a critical point (Garcia and Molina, 2017, p. 61).

After recognizing that humans are the main ones responsible for the change in the climate system, the current concern focuses on a very particular and complex event that challenges the dynamics and the daily activities of modern society: accelerated global warming due to the emission of greenhouse gases. Human activity as the main problem is widely accepted by the

scientists from the *Intergovernmental Panel on Climate Change* (referred to as IPCC), whose reports and results since 1990 have provided valuable information on the current situation of the planet (IPCC, 2013).

The report *Climate Change 2013: Physical Basis*, prepared by the IPCC, concluded that human influence and activities were the fundamental cause of the warming that had affected the planet since the mid-20th century.

The human influence on the climate system is evident (...) human influence has been detected in the warming of the atmosphere and the ocean, in the global water cycle alterations, in snow and ice reductions, in the global elevation sea level and changes in some extreme weather events (IPCC, 2013, pp. 15-17).

Given the scientific evidence presented by the IPCC regarding climate change as a problem of global dimensions and anthropogenic origins, most governments around the world have met this problem with their local agendas. Nevertheless, the actual absence of a commitment to reduce GHG emissions has been manifested, for example, in the failure to comply with the provisions of the *Kyoto Protocol, 1997*. The primary objective of the Protocol established the reduction of emissions by 5% compared to 1990 levels for the period 2008-2012 (United Nations Framework Convention on Climate Change, 2008). However, the period between 1995 and 2005 was when “the highest GHG growth rate was presented with respect to that observed in the period 1970-1994” (Damián, 2015, p. 192).

Similarly, the IPCC report *Climate Change 2007* noted that the *Organization for Economic Co-operation and Development* (OECD) member countries were responsible for 46% of greenhouse gas emissions, with China and India being the countries with the highest growth rates (2007, p. 37). Generally, the economy is why countries do not achieve these objectives. On one side, they say that “the lack of compliance with these agreements is due to the high cost that, according to the companies, would imply modifying the technology to achieve such an objective” (Damián, 2015, p. 192). On the other hand, governments such as India postpone their

environmental responsibilities arguing that “they still have to deal with their development programs and poverty eradication” (BBC News Mundo, 2021).

Consequently, the sixth and last IPCC Assessment Report, entitled *Climate Change 2021: The Physical Science Basis*, prepared by 234 authors from 66 countries, presents the information and scientific evidence to date to understand the current situation of climate change. As in previous reports, this group emphasizes the human influence on global warming (IPCC, 2021, p. 4). In addition, it concludes that the actions taken by governments around the world are not enough to meet the goal of limiting the increase in temperature below 2 °C, much less below 1.5 °C, qualifying it as an almost unattainable goal (IPCC, 2021, pp. 4-5). It also ensures that, in the last 40 years, each new decade has been hotter than the previous one (IPCC, 2021, p. 5), demonstrating that the increase in temperature has not been controlled, even when agreements and international commitments have been signed.

The report points out that GHGs resulting from human activity have led to a temperature increase of 1.1 °C since 1850, and they expect that by 2040, this range will exceed 1.5 °C (IPCC, 2021, pp. 4-5). The report also declares that the human influence on the increase in global temperature will have multiple repercussions in all regions of the planet, resulting in climatic phenomena such as floods, cyclones, rising sea levels, extreme heatwaves, and the shortening of cold seasons. This situation could also bring critical consequences for health and agriculture (IPCC, 2021, p. 8).

Similarly, the climate crisis is not an isolated phenomenon since its consequences affect and coexist in parallel with a series of inequalities and unsatisfied social needs that truncate human well-being. As Damián states: “inequality is the manifestation of power imbalances within society” (2015, p. 172), and this condition has increased in recent years. For example, in 1820, the wealthiest 20% of the population had three times more than the poorest 20%, 11 times more in 1913, and 74 times more in 1997 (Damián, 2015, p. 172). In addition to this, the global economic crisis of 2008 did nothing but increase the inequality gap.

In addition to inequality, Damián (2015, p. 173) indicates that there is also a high rate of poverty in the world, resulting from several centuries of exploitation, in which a small percentage of the population appropriated natural resources and land. According to World Bank estimates, in

2017 (before the COVID-19 pandemic), the percentage of extreme poverty - those who live with less than \$1.90 a day - was around 9.2% of the world population; that is, 714 million people (World Bank, 2020). However, some authors criticize this estimate and mention that this percentage does not consider the poorest in the wealthiest countries, who live with more than \$1.90 a day, but still suffer from hunger and poverty (2015, p. 174).

Finally, hunger is another unsatisfied need that, worldwide, causes the death of thousands of people every day (DW, 2021). The *Food and Agriculture Organization of the United Nations* (from now on FAO) defines hunger as insufficient dietary energy consumption, especially when this situation is frequent, which prevents leading an everyday life (FAO, 2021). According to the *2019 Global Report on Food Crises*, more than 113 million people worldwide suffered from chronic hunger during that year (Food Security Information Network, 2019, p. 15). This situation is directly related to the problem of inequality and poverty; since, as pointed out by David Beasley, director of the United Nations World Food Program, to end hunger in the world, it would be necessary to have only 0.36% of the assets of the 400 wealthiest people in the United States (Beasley, 2021). Damián mentions that it is almost paradoxical that “while wealth remains concentrated in a few hands, deaths from hunger continue at very high levels” (2015, p. 182).

1.1.2. Aggravation of environmental and social problems due to the COVID-19 pandemic

In addition to the challenging global situation, 2019 presented an additional component that made it even more complex: the COVID-19 pandemic. This highly contagious disease is caused by a coronavirus called SARS-CoV-2 (World Health Organization, 2021). This new virus was detected for the first time in Wuhan, China, in December 2019 (Domínguez and Amador-Bedolla, 2020, p. 7), and it triggered a global pandemic for which no country was prepared. Although countries were aware of the possibility of a pandemic like the one that occurred, none were actually prepared to adequately respond to the challenges that it would pose (UN News, 2021a).

These kinds of crises are usually considered a catalyst toward a change in social, political, and economic matters; however, the *2021 Sustainable Development Goals Report* showed that the few efforts and progress made in achieving the goals of the *2030 Agenda* were scarcely successful, as well as unequal and inequitable (United Nations, 2021a, p. 2). According to the same report,

although progress had been made before the pandemic on poverty reduction, health, sustainable energy, and gender equality, all these efforts suffered a setback for years and even decades due to the health crisis. Even worse, hunger, social and economic inequality, and GHG reduction suffered even more critical setbacks (United Nations, 2021a).

Thus, two years after the first recorded case of COVID-19, the world continues to face the ravages of a pandemic whose effects have been catastrophic for the lives of millions of people. Around the world, more than 5 million people died (Our World in Data, 2021), and 26 million people lost their jobs in Latin America and the Caribbean (International Labour Organization, 2021). Likewise, the inequality gap widened, and the world economy fell by 4.3%, more than during the 2008 financial crisis (Economic Commission for Latin America and the Caribbean, 2021). In other words, this crisis has had unprecedented consequences, both economically and environmentally and, mainly, in the human sphere.

The issues that have suffered the most setbacks have been hunger, inequality, and GHG emissions. The *2021 Sustainable Development Goals Report* notes that, in 2020, 120 million people fell into extreme poverty, and several million suffered from chronic hunger, as the income of 1.6 billion informal workers decreased due to job losses caused by the pandemic (United Nations, 2021a, p. 3). In the case of inequality, it intensified both within and between countries. For example, the uneven distribution of vaccines worldwide; as of March 2022, the percentage of vaccinated in regions such as North America or Europe is around 77% and 69%, respectively, compared to 17% of vaccinated in Africa (Statista, 2022).

Inequality and gender-based violence also increased, with women bearing the highest unemployment rates and a heavier burden of housework. Additionally, indicators of domestic violence against women increased significantly (United Nations, 2021a, p. 3). These adverse effects are not an exclusive consequence of the pandemic itself since they reflect persistent problems in society. Many of them result from insufficient social protection systems and inefficient public health systems.

After hunger and inequality, the climate crisis was another aggravated problem. Despite the slight and temporary decrease of 4.5% in carbon dioxide emissions in 2020, due to the confinements, 2021 meant a much more severe rebound than those registered before COVID-19.

Additionally, the *2021 Emissions Gap Report* forecasts that carbon dioxide emissions will increase by 4.8% during 2021 (United Nations Environment Programme, 2021, p. 5). The emission reduction in 2020 could have been zero, but for this to take effect, this trend should be sustainable over time.

The global economic slowdown caused by the health crisis led to a temporary drop in carbon dioxide (CO₂) emissions; however, the regularization of the demand for goods and products has projected recovery in world trade. The World Trade Organization (WTO) estimates an increase of 8% in 2021, after a sharp drop of 5.3% in 2020 (WTO, 2021). Nonetheless, organizations such as the United Nations refer to this new rebound in trade and production as a missed opportunity since “countries had the possibility to use the fiscal rescue and recovery spending from COVID-19 to stimulate economies, while promoting a shift towards low carbon emissions” (UN News, 2021b), but that was not the case.

In addition to the environmental indicators that have shown the increase in temperature and GHG emissions, there are also doubts and questions surrounding the work carried out by governments to mitigate the effects of climate change. *Nationally Determined Contributions (NDCs)* are key to measuring the success of the *Paris Agreement*. The quantification and evaluation of the efforts detailed in each of the NDCs allow us to know if the climate measures taken by the different member countries of the Agreement are sufficient to achieve its objectives. However, everything seems to indicate that these efforts are not enough.

The information obtained from the NDCs presented up to September 2021 has shown the commitments and contributions for GHG mitigation for 2030. Even though they have a minimal effect, the impact is not relevant to fulfilling the goals of the Paris Agreement. The *2021 Emissions Gap Report* notes that the efforts outlined in the NDCs will only reduce emissions by 7.5% by 2030 when what is needed to reach the goal of limiting warming to below 2°C is to reduce emissions by 30% by 2030, and 55% by 2050 (United Nations Environment Programme, 2021, p. 4-5). It would be necessary to quadruple the joint work to achieve the objective in question, which seems increasingly distant and difficult. If the same projections continue, the temperature increase for this century is estimated to be 2.7 °C, which would have even more devastating consequences than what we see today (United Nations Environment Programme, 2021, p. 4).

1.2. Responses to climate change at the global, regional, national and local levels

Climate has been a leading factor in the development of humanity. Their presence has been key to the rise and fall of different pre-industrial civilizations. Likewise, it has modeled how they relate to each other, some of their central social dynamics, in their forms of commerce, agriculture and economy (Garcia and Molina, 2017). At present, our civilization is suffering the effects of a substantial increase in the Earth's temperature, reaching the highest temperature levels ever recorded in recent years. Among the most important consequences are droughts, the melting of glaciers that causes the rise in sea level, floods, the disappearance of species, forest fires, and severe effects on agriculture, mainly impacting countries that have a significant dependence on it (IPCC, 2021, pp. 4-9).

Although there is an almost generalized consensus within the scientific community about climate change, its causes, and consequences, it is crucial to know how the study of the impact of human activities on the climate system has evolved and their responses. Below, it is presented a historical and chronological summary of the primary political efforts adopted in climate matters globally, then in the Latin American region, Ecuador, and Cuenca.

1.2.1. Global milestones and commitments on climate change

1.2.1.1. Limits to Growth, 1968 – 1972

In 1968, more than 30 people from different disciplines - economists, teachers, scientists, researchers, public servants, and international organizations staff - met at *the Accademia Dei Lincei*, Rome, to discuss global issues. This diverse group of professionals founded the *Club of Rome*. This non-profit organization was born with “the purpose of contributing to improving our society, through the identification and active debate about problems of a global nature and with the conviction that each individual can contribute to this improvement” (Club of Rome, 2021).

This new organization sent an invitation to a team from the *Massachusetts Institute of Technology (MIT)* to conduct a study on the present and future of the Earth. In 1972, the team

published a report called *Limits to Growth*, which studied “the five basic factors that determine, and ultimately limit, growth on planet Earth: population, agricultural production, natural resources, industrial production, and pollution” (Mayor, 2009, p. 10). Similarly, this research sought to generate interest and unanimity regarding the consequences of focusing only on economic growth and excessive and infinite consumption.

The report’s main conclusion declared that if the growth trend did not change - concerning world population, industrialization, pollution, food production, and the exploitation of natural resources - the limits of growth of the Earth would find limits during the next 100 years. It added that there was the possibility of avoiding that scenario as long as the growth trends change, giving ecological stability the same importance as economic stability and creating a sustainable system that satisfies the needs of each human being (Meadows, Meadows, Randers, and Behrens, 1972). The document had a significant impact at the international level due to its presentation during the first major world conference on the environment: the 1972 *United Nations Conference on the Human Environment*, held in Stockholm, Sweden.

1.2.1.2. Stockholm Declaration, 1972

The *Stockholm Declaration* and the *Stockholm Action Plan for the Human Environment* resulted from the first large-scale conference held within the United Nations. It discussed issues related to the environment for the first time, positioning the debate in a higher range of importance. The Conference participants adopted the Stockholm Declaration, which contained 26 principles that put environmental issues at the top of international concerns (UN-Habitat, 1972). In addition, it started the conversations on economic and environmental issues between industrialized and developing countries. Parallel to the Declaration’s adoption, this conference resulted in the creation of the *United Nations Environment Program (UNEP)* (United Nations, 2012).

1.2.1.3. Intergovernmental Panel on Climate Change, 1988

The *Intergovernmental Panel on Climate Change (IPCC)* was created in 1988 by the *United Nations Environment Program (UNEP)* and the *World Meteorological Organization (WMO)*. This group of experts and scientists was created to research climate change, offering a clearer and more rigorous vision of its causes and consequences. It is an intergovernmental institution of which any

member of the United Nations can be part. However, it does not conduct its scientific research but instead is responsible for collecting, reviewing, and evaluating the latest literature on climate change (IPCC Secretariat, 2013).

1.2.1.4. The Rio Declaration, 1992

The *Rio Declaration* resulted from the second major international conference on the environment, the *United Nations Conference on Environment and Development* (also called the *Earth Summit*) of 1992, held in Rio de Janeiro, Brazil. They constitute the first two milestones in the development of international environmental law. The *Earth Summit* and its Declaration resulted from the growing, and global interest in the environment since the first conference held in Stockholm served only to establish basic parameters around the environmental debate. Therefore, during the Rio Conference, “the task of the international community consisted in systematizing and reaffirming the existing expectations in terms of environmental policy, and enunciating the legal and political foundations of sustainable development” (Handl, 2012, p. 1).

The *Rio Declaration* (1992) reaffirmed and expanded the principles established in the *Stockholm Declaration* (1972). This document contemplates 27 principles that group issues such as the prevention of environmental damage, the right to development within the framework of respect for the environment, the needs of present and future generations, precautionary measures, and an essential principle of international environmental law: ‘common but differentiated responsibilities.’ This principle makes some distinctions in the degree of responsibility each country has regarding environmental degradation since each contributed in different ways and intensity. For this reason, the developed countries - which have more accountability for environmental damage - would recognize the greater responsibility they have for protecting the environment.

1.2.1.5. Agenda 21, 1992

The *Agenda 21* (also called *Program 21*) is an agreement born at the *World Conference on the Environment and Sustainable Development*, held in Rio de Janeiro in 1992. This agreement includes tools and strategies that seek to reduce the effects of environmental deterioration,

supporting the construction of a long-term sustainable development model. The ‘Agenda’ has three leading topics: environmental sustainability, social justice, and economic balance. It has a significant domestic policy component since it encourages national and local governments to carry out programs to limit the global consequences of climate change. In other words, it is a tool with global strategies that are applied locally (Marban, 2006).

1.2.1.6. United Nations Framework Convention on Climate Change, 1994

The *United Nations Framework Convention on Climate Change* (UNFCCC), the *United Nations Convention on Biological Diversity*, and the *Convention to Combat Desertification* are the three conventions that emerged from the 1992 *Earth Summit*. The Convention entered into force in March 1994. Its second article establishes that its fundamental objective is “the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (United Nations, 1992). In addition, it established a goal for the year 2000: to limit greenhouse gas emissions and reduce them to the levels recorded in 1990. Finally, it created a protocol that would allow nations to carry out an ‘emissions inventory’ to monitor their GHG mitigation programs (United Nations, 1992).

1.2.1.7. The Kyoto Protocol, 1997

The *Kyoto Protocol* is an international agreement approved in 1997 that 192 party countries have currently ratified. This agreement encourages industrialized countries to reduce their GHG emissions according to the established individual goals. The first paragraph of its third article establishes as its primary objective the reduction of emissions by 5% concerning 1990 levels for the period 2008-2012 (United Nations, 1998). By recognizing the principle of common but differentiated responsibility, this agreement places a more significant commitment on developed countries in efforts to combat climate change.

This protocol has had two periods of compliance. Although this agreement was approved in 1997, the first compliance period consisted of 2008 and 2012. The second period was approved for 2013-2020 in Doha. These two periods ensured a certain continuity of the treaty; however, the approval of a third compliance period from 2021 to 2031 was expected during COP 26 in Glasgow,

allowing this mechanism to work parallelly with the Paris Agreement. However, it did not happen, so the future of this agreement is pending (Alcaráz, 2021).

1.2.1.8. The 2030 Agenda for Sustainable Development, 2015

La *2030 Agenda for Sustainable Development* is an action plan to achieve the *17 Sustainable Development Goals (SDGs)*. This series of commitments aimed to strengthen world peace and access to justice, ensuring the well-being of people and the environment. In turn, this program recognizes that one of the main challenges of the contemporary world, in addition to climate change, is the fight to end poverty, since only without poverty it would be possible to achieve a sustainable development system. Those countries that adopted this program will assign the necessary resources to contribute to achieving these objectives during the next 15 years. In addition, among the 17 objectives are issues related to education, health, gender equality, food, economic growth, peace, justice, and energy, which makes this agenda one of the broadest in the quest to achieve sustainable development (United Nations, 2018a).

1.2.1.9. The Paris Agreement, 2015

Finally, the most ambitious and famous agreement is the *Paris Agreement*. One hundred ninety-seven countries adopted the agreement during the *Conference of the Parties 21 (COP21)* held in Paris, France, in 2015. Its second article describes its three main objectives. First, countries will keep “global average temperature rise well below 2°C above pre-industrial levels” (United Nations, 2015, p. 2), limiting the increase to 1.5 °C. Second, it seeks to “increase the capacity to adapt to the adverse effects of climate change and promote climate resilience” (United Nations, 2015, p. 2). Third, it seeks to align investments and financing to achieve the environmental goals established in the agreement.

1.2.2. Regional milestones and commitments on climate change

Latin America has incredible biodiversity and a wide variety of ecosystems and natural parks. For that reason, to protect them against the threat posed by human activity, this region has been at the vanguard in implementing public policies to protect the environment. Such is the case

of countries like Ecuador and Bolivia, which recognize nature as a legal person from their constitutional framework, taking a step beyond the anthropocentrism that governs environmental law (Iacovino, 2020). Hereunder, some of the most important regional milestones in environmental and climate matters will be reviewed.

1.2.2.1. The Network of Environmental Funds for Latin America and the Caribbean (RECLAC), 1999

This network aims to finance conservation and environmental protection projects. REDLAC has been an essential support for the declaration of more than 500 protected natural areas in the region and has been part of around 5,800 conservation projects. This network relates to the *Environmental Funds Systems* (EFS), characterized by raising capital and reinvesting it in programs of governmental and non-governmental entities (Biffi, 2016, p. 227).

1.2.2.2. The First Regional Conference on Renewable Energies, 2003

This conference was held in Brazil in 2003 and organized by the *Economic Commission for Latin America and the Caribbean* (ECLAC). It urged countries to use at least 10% renewable energy to meet their energy consumption demand. It was the first big conference on renewable energy organized in the region. Finally, the 21 countries' participants agreed to achieve this goal by 2010, although not all have done it to date (Biffi, 2016, pp. 243-244).

1.2.2.3. Cancun Agreement and creation of the Green Climate Fund, 2010

During the celebration of the *COP16* in Mexico (2010), they launched a financial mechanism called the *Green Fund for Climate*, the entity in charge of the finances of the Convention. In addition, this fund would conduct the necessary money for the proper performance of programs, projects, and policies that require such support (Biffi, 2016, p. 284).

1.2.2.4. Escazu Agreement, 2018

The *Regional Agreement on Access to Information, Public Participation, and Access to Justice in Environmental Matters in Latin America and the Caribbean* is a regional treaty adopted

in Escazú, Costa Rica, in 2018. The Agreement entered into force in April 2021 and sought to guarantee people's rights to environmental information. Besides, "this treaty aims to fight against inequality and discrimination and guarantee the rights of all people to a healthy environment and sustainable development" (United Nations, 2018b, pp. 5-6).

1.2.2.5. The Andean Environmental Charter

The *Andean Environmental Charter* is a regional instrument that aims to establish joint regional goals to accelerate the implementation of the 2030 Agenda and the Sustainable Development Goals. Also, it seeks to improve and work with other international agreements on climate change and biodiversity such as the Paris Agreement or the United Nations Framework Convention on Climate Change (Ministerio del Ambiente, Agua y Transición Ecológica, 2021). It was signed by the Andean Community of Nations (ACN) countries.

During the *XXV Ordinary Meeting of the Andean Council of Foreign Ministers*, they adopted the *Andean Environmental Charter Declaration*, which raises eight common objectives to achieve sustainable management. Also, the member countries of the ACN agreed to include six significant issues in the plans of the Andean Integration System: comprehensive management of water resources, conservation and sustainable use of biodiversity, prevention and response to disasters, fight against illegal mining, promotion of the circular economy, and strengthening of the management of chemical substances and waste (Comunidad Andina, 2020).

1.2.3. Ecuadorian commitments and legal instruments to environmental matters

1.2.3.1. Ecuadorian constitutional framework

The international community has urged countries to guarantee the needed conditions to balance economic and social welfare while respecting nature. Aligned to that idea, the Republic of Ecuador has a constitution that considers the biodiversity it contains within its territory. Due to the relevance of the biophysical environment in which Ecuadorian citizens live, the Ecuadorian Constitution recognizes in its tenth article that nature itself has rights granted by the Constitution (Asamblea Constituyente, 2008).

Similarly, article 66, in its numeral 27, adds that: “people will be guaranteed the right to live in a healthy environment, ecologically balanced, free of pollution and in harmony with nature” (Asamblea Constituyente, 2008). However, the Constitution is not limited to granting rights to ‘nature’ in its broadest and most generic form. Nature is protected considering it “as a complex and systemic whole, and consecrates protection to each of the elements that compose it” (Bustos, 2019, p. 16); which means that it provides specific protection and regulation for each of its components.

An important matter of this constitutional norm is that it recognizes not only the rights of nature, but also the rights of people. Its article 14 states that: “It is recognized the right of the population to live in a healthy and ecologically balanced environment that guarantees sustainability and good living, *sumak kawsay*” (Asamblea Constituyente, 2008). *Sumak Kawsay* is an important principle in the Constitution of Montecristi since the conception of nature changes completely, from just a resource for the use of the human being to “a space that reproduces and realizes life” (Biffi, 2016, p. 273).

This new paradigm on nature and its new normative conception can also have a more critical reading on the current development system. The main goal of this conception seeks to achieve “*el buen vivir o Sumak Kawsay*” [good living], which includes improving people’s quality of life in harmonious coexistence with nature. Despite maintaining the human being as the primary beneficiary, this development model pairs the relevance of nature against that of people themselves.

1.2.3.2. National Development Plan and its alignment with International Commitments

Article 280 of the Ecuadorian Constitution defines the *National Development Plan* (PND, in its Spanish acronym) as a guide that all public policies, projects, and development plans must follow. In addition, this document includes the assignment of public resources and the form of execution of the General State Budget. Finally, it details the attributions of the State and the Decentralized Autonomous Governments (GAD, in its Spanish acronym) (Asamblea Constituyente, 2008). The same article also highlights that the guidelines of the National Development Plan are mandatory for any action and decision taken by the public sector. It is

essential that the international commitments -mainly those related to environmental protection- are under the guidelines established in the PND.

Since this work includes 2019-2021, the PND to be reviewed will be the *Plan Nacional de Desarrollo 2017-2021 - Toda una Vida [National Development Plan – Toda una Vida 2017-2021]*. This document includes the National Development Objectives, divided into three areas: rights for all for a lifetime, economy at the service of society, and more society, better State. Each of these areas comprises three specific objectives, covering a wide range of issues like economics, interculturality, rights of nature, productivity, citizen participation, transparency, and sovereignty (Secretaría Nacional de Planificación y Desarrollo, 2017, p. 9).

Considering that the key objectives of the international commitments acquired by Ecuador are related to the protection of nature, the reduction of GHG emissions, and the long-term construction of a sustainable development model, these are framed and justified in two main National Objectives:

a. **Objective 1: To guarantee a decent life with equal opportunities for all people**

This objective aims for the State to articulate the necessary tools so that all its citizens can enjoy a decent life with equal opportunities. It is the primary objective since only through its realization could our country achieve an actual model of sustainable development that guarantees the conditions that promote well-being. These conditions include health, housing, food, education, work, security, and “other issues considered essential for a human being to survive and develop physically and psychologically, in autonomy, equality and freedom” (Secretaría Nacional de Planificación y Desarrollo, 2017, p. 53).

b. **Objective 3: To guarantee the rights of nature for current and future generations**

This objective results from a milestone reached by the Constitution of Montecristi since nature is now a subject of rights, so achieving this goal is key to measuring the degree of success of the progress of environmental rights. This objective recognizes the importance of ecosystems, mainly those most fragile and in a state of vulnerability, so their protection and care are necessary by creating a bioethical framework. However, this would imply changing the current economic

model -which depends mainly on a system of exploitation of mineral and fossil resources- towards a more friendly and respectful one toward the environment (Secretaría Nacional de Planificación y Desarrollo, 2017, p. 64).

1.2.4. Normative framework for the adoption of environmental policies from the cities of Ecuador

A series of regulatory frameworks support and justify decentralized action from cities, which allows them to carry out plans and projects of territorial organization. The *Territorial Planning and Development Plan* (PDOT, in its Spanish acronym) is the primary tool that guides actions from the municipalities.

1.2.4.1. Constitution of the Republic of Ecuador

In the first place, the Ecuadorian Constitution organizes its territory through the figure of the *Decentralized Autonomous Governments* (GAD). Article 238 states that: “decentralized autonomous governments are constituted by rural parish councils, municipal councils, metropolitan councils, provincial councils and regional councils” (Asamblea Constituyente, 2008), and they will have political, administrative and financial autonomy.

Besides, the Constitution also details a regulatory framework regarding the powers of the GADs mentioned above. Article 241 states that: “Planning will guarantee territorial ordering and will be mandatory in all decentralized autonomous governments” (Asamblea Constituyente, 2008). Likewise, article 264 states that one of the powers of the GAD is the planning of “cantonal development and formulate the corresponding land use plans, in coordination with national, regional, provincial and parish planning, in order to regulate the use and the occupation of urban and rural land” (Asamblea Constituyente, 2008).

1.2.4.2. Organic Code of Territorial Organization, Autonomy and Decentralization (COOTAD)

The *Organic Code of Territorial Organization, Autonomy and Decentralization (COOTAD)* regulates the activities, prerogatives, and powers of the Decentralized Autonomous Governments.

In this way, the literal ‘e’ of article 54 of this norm details their powers concerning planning, indicating that the GADs are responsible for: “Preparing and executing the cantonal development plan, the land use plan and public policies (...) and carry out permanent monitoring and accountability on the fulfillment of the established goals” (COOTAD, 2010). Likewise, article 55 details the specific powers of the cantonal GADs, indicating that they have the capacity to plan the development of the cities they manage (COOTAD, 2010).

1.2.4.3. Organic Code of Planning and Public Finance

This norm also refers to municipal powers concerning planning. Its article 43 indicates that *Territorial Planning and Development Plans* (PDOT) are planification tools to harmonize development strategies, economic and productive activities, and natural resource management, among other aspects (Ministerio de Finanzas, 2010).

1.2.4.4. Organic Code of the Environment (CODA)

Finally, the *Organic Code of the Environment* (CODA, in its Spanish acronym) regulates issues related to adequate environmental management. This code, approved in 2017, also contains a series of powers related to environmental management that correspond to the Decentralized Autonomous Governments. Article 144 of the CODA indicates that the cantonal GAD: “will have the powers of planning, regulation, control, management and coordination with the competent governing bodies in the fields of health, research, education, environment and agriculture” (Asamblea Nacional, 2017). The powers of the cantonal GAD detailed in this code are complementary to those provided for the *Constitution of Ecuador* and in the *Organic Code of Territorial Organization, Autonomy and Decentralization* (COOTAD).

1.3. Role of cities in the fight against climate change

The urban phenomenon is not recent but historical and complex. Demographers, sociologists, and historians have dedicated themselves to studying the evolution of simple social units, such as towns or villages, to the creation of complex organizations, such as the cities or

metropolises that we know today. This subsection exposes the etymological origin of the ‘city’; as a preamble to the analysis of the urban evolution. It illustrates and justifies the role that cities currently play at a global level, not only as entities that contribute to the environmental crisis but also as leading actors in the mitigation and control of its effects.

1.3.1. The etymological origin of the word city

‘City’ comes from the Latin word *civitas*, which derives from *civis*, whose meaning is citizen or group of citizens (Royal Spanish Academy, 2021). In Ancient Rome, this term made it possible to distinguish Roman citizens -those residents who enjoyed rights- from *peregrini* (foreigners) and *servi* (slaves) (González, 2021a). Over time, this word was modified until it became ‘*ciudad*’ in Spanish, ‘*cit *’ in French, and ‘*city*’ in English (Ram rez, 1998).

On the other hand, ‘city’ has also been understood as *urbs* -a term used by Romans- to refer to the physical space in which the *civitas* develop. The Romans changed the words from *civitas* to *urbs* when they referred to the city as a physical structure (Ram rez, 1998). The Greeks conceived of the ‘city’ as a political-administrative unit which they called *polis* (Capel, 2003, p. 10).

This reflection allows to understand the city as an entity in which three dimensions converge: physical, social, and political-administrative. Together, each edge contributes to creating a space that contributes to the development and well-being of its inhabitants. These three elements are of the utmost importance when analyzing urban planning since it is not enough to address the sphere of the physical space organization in which it extends. However, it is necessary to cover the basic demands of citizens and see politics as a tool to guarantee social equality in public administration.

1.3.2. Historical review of the evolution of cities

Hereunder there is a recount of the most relevant milestones in the evolution of cities, from simple organizational units to converging into complex urban systems, emphasizing the influence they have gained, throughout history, as global interest actors.

The first forms of human settlement, with records, were consolidated thanks to man sedentarization. The first civilizations developed in strategic places, which allowed them to control

the terrain to defend themselves from enemy attacks, hostilities from the environment, or have access to water sources. Over time, agricultural occupations were perfected, which allowed them to establish permanent residence sites. The evolution of the city continued in Greek and Roman times. During this period, order began to be established to use the land within the walls, setting the limits of ancient cities. Additionally, trade took center stage within the cities since they were seen as a meeting space for exchanging goods (Caves, 2005, p. 30).

Progressively, the population of the cities grew, and the overcrowding conditions within the walls caused diverse health problems, pollution, crime, and poverty. Concerns about living conditions created the first forms of government responsible for issuing rules, codes, and regulations to organize life within towns. This fact gave way to the consolidation of urban architecture with roads, aqueducts, and sewers, characteristic elements of the cities up to the present. Although it should be noted that, despite improvements in the water and drainage system, health problems in urban areas were increasingly evident (Caves, 2005, p. 30).

After the fall of the Greek and Roman empires comes the period of feudalism, consolidating the so-called city-states. The number of cities continued to increase during the Middle Ages. However, they were small settlements, very congested due to the little infrastructure around the castles, limited by walls. The development of gunpowder and other weapons marked the end of the walls that protected these cities, causing populations to begin to decentralize and bring the experience of ancient cities with them to new areas. During the Renaissance and Baroque, changes within cities continued. The arts became relevant, so designers and planners appeared who sought to establish order within these spaces (Caves, 2005, p. 31).

The Industrial Revolution would be a historical milestone that would mark numerous changes in cities. This period was characterized by the transition from an agricultural and rural economy to an urban and industrial economy. Technological innovations in production processes led to factories and assembly plants within cities (Caves, 2005, p. 32). This dynamic caused changes in settlement patterns due to the wave of migration from rural areas to industrialized urban centers.

Marginal neighborhoods emerged on the outskirts of the cities due to the concentration of workers in areas with precarious infrastructure and limited or non-existent essential services. The

development of means of transport, such as trams or private cars, was another factor that contributed to the expansion of cities. Thanks to the ease of mobility, people, especially workers, chose to live on the outskirts of cities, accelerating the transformation of surrounding rural areas into commercial and residential places. Consequently, this growth was poorly planned and with no consideration of the impact on the environment (Davis, 1945, 1955; Glissant, 1985; Weissmann, 1965).

As the 21st century arrived with the impact of globalization and the accelerated growth of urban areas, cities have been studied from an urban age perspective. Pacione (2005) argues that this new orientation shows that the character of today's urban environments is the result of interactions between a series of forces: environmental, economic, technological, social, demographic, cultural, and political, that operate on a variety of scales that range from the global to the local.

Over the last several decades, there has been an accelerated expansion of urban centers, giving way to the emergence of megacities which are cities with more than 10 million inhabitants. Currently, they are considered megacities: Tokyo with more than 37 million inhabitants, Delhi with 31 million, Sao Paulo with 22 million, and Dhaka or Cairo with 21 million, to list a few cases (United Nations, 2018a; Harrouk, 2021; Gill, 2021). Megacities have become strategic economic growth and social development centers, contributing to 60% of world GDP. However, they are also responsible for 70% of global carbon emissions and more than 60% of resource use (United Nations, 2021a). Megacities have become strategic economic growth and social development centers, contributing to 60% of world GDP. However, they are also responsible for 70% of global carbon emissions and more than 60% of resource use (United Nations, 2021a). Consequently, the responsibility of cities in the environmental crises, and their impact on the world, have been added to the urban planning debate agenda.

1.3.3. Urban Management

To recapitulate the most outstanding points of the previous analysis: cities have consolidated as strategic centers for economic and social activity at a global level. However, cities also face challenges that must be urgently addressed in the coming years. Currently, it is estimated that 55%

of the population, about 4.2 billion people, live in cities. It is predicted that by 2050, 7 out of 10 people will be part of the global urban population. Added to this is the expansion of urban land, which today exceeds population growth by up to 50%, and it is expected that in the next thirty years, 1.2 million km² will be added to the urbanized area (World Bank, 2020). In this sense, the pace and magnitude of urbanization must be managed to meet citizens' demands for a decent life while considering the biophysical limits of their environment.

1.3.3.1. Urban planning in Sustainable Development

Urban planning, understood as the tool that studies the distribution of urban space, is key to managing the structure and functioning of cities (Ornés, 2009). Nevertheless, it has been highlighted that urban planning must be sustainable to promote efficient and responsible administration of natural resources, thrive in ecological balance, and guarantee the equitable intra- and intergenerational distribution of resources.

Sustainable development is a concept that arises from the concern of seeking alternatives to the economic model based on capital and growing linear development. Gallopín states that in the “classic economist conception, the system that matters is the economy, and nature is relegated to the role of provider of natural resources and services and a sink for waste produced by human activity” (2003, p. 13). This sustainability vision, where only the human system is considered, has changed to a notion based on an integral socio-ecological system.

Several authors have analyzed the concept of sustainability and ‘sustainable development’; however, the first time that ‘sustainable development’ was formally defined is found in the *Report of the World Commission on Environment and Development of the United Nations Organization* in 1987. This document highlights the need to reconsider the meaning of ‘development’ - until now seen as a process that only involves the social-economic sphere - by integrating the environment as an essential element to achieving it. The report proposes that:

Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs. The concept of sustainable development does imply limits - not absolute limits but

limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities (...) sustainable development requires meeting the basic needs of all and extending to all the opportunity to fulfil their aspirations for a better life. (United Nations, 1987, p. 23).

In this paradigm shift towards an environmental conservation and social equity approach, numerous experts have proposed that it is necessary to integrate efforts at a global level, working from the local level to achieve development in sustainability (Sachs, 2014). Although various instruments promote sustainable development, the ones that stand out the most are the *2030 Agenda for Sustainable Development* and the *Sustainable Development Goals* (SDGs). These instruments propose a route to face development challenges by designing, implementing, monitoring, and evaluating public policies that simultaneously integrate the economic, social, and environmental dimensions on various scales: global, regional, national, and subnational. (Economic Commission for Latin America and the Caribbean, 2019). In this way, it is clear that the required strategies, although they must be aligned with global consensus, must mainly respond to each territory's specific situations and problems.

The *New Urban Agenda*, established by the *United Nations Conference on Housing and Sustainable Urban Development* in 2016, reaffirms the global commitment to sustainable urban development as a decisive step to achieving progress in an integrated and coordinated manner worldwide. Likewise, this agenda contributes to the implementation and localization of the SDGs, particularly to achieving Goal 11: to make cities more inclusive, safe, resilient, and sustainable (Habitat III, 2017).

Since cities are the first battlefield in the fight against social inequalities and climate change, emphasis is placed on the global transformation towards *sustainable cities*. This urban development concept is established in the *Local Agenda 21*, a plan derived from the United Nations *Program 21*, approved at the Rio de Janeiro Conference in 1992.

The *local Agenda 21* is a guide that allows the integration of social justice, economy, and environment to achieve a sustainable balance from local governments to generate global impacts.

The decentralization, analyzed earlier in this chapter, has made the transition process towards sustainability viable. In this sense, local governments such as municipalities are in charge of supervising urban planning and establishing economic, social, and ecological policies that, in turn, contribute to the execution of national and international plans and commitments. The proximity of local governments to citizens is a key factor to educating and encouraging them, from all sectors, to actively participate in the implementation of actions aimed at achieving sustainable development (Rieznik and Hernández, 2005).

1.3.4. International and regional networks of cities

At the same time that local governments are concerned with domestic management, they seek to participate in the international sphere by organizing themselves in cities networks. In this respect, the international governance of environmental and socioeconomic issues requires that cities play a leading role in debate forums. Hence, through these networks, cities have found a space to exchange experiences, seek support among their peers and face common challenges from cooperation (Calvo and Ufarte, 2021). According to estimates made by Acuto and Rayner (2016), the number of city networks is expected to exceed 200, of which 21% are regional, and 29% are international (pp. 1148 - 1152).

A brief chronological account of the most relevant city networks in the international concert is outlined below. Particular emphasis is put on the networks of the Latin American region since it is the area of study of this research work. Likewise, those networks of cities whose focus is to promote sustainable development in the social, economic, and ecological axis are prioritized.

1.3.4.1. International Union of Local Authorities (IULA), 1913

The *International Union of Local Administrations* (IULA) was established in 1913 as the first international organization of cities (Fernández de Losada and Abdullah, 2019). IULA was born to promote local government as a cornerstone of democracy (Economic and Social Commission for Western Asia, 2020). In addition, it fostered international information exchange and cooperation between local governments in Europe. In 2004, this network merged with the

World Federation of United Cities (UTO) to form the *World Organization of United Cities and Local Governments* (UCLG) (Union of International Associations, 2021e).

1.3.4.2. World Federation of United Cities (UTO), 1957

The *World Federation of United Cities* (UTO) was born in France on April 28, 1957. Its objective was to develop cultural, social, economic, and technical exchanges between English and French-speaking peoples through town twinning and other forms of international cooperation. The issues it addressed were aimed at responding to social problems such as immigrants, disabled, women's access to public office, peace, environment, water, sanitation, and transportation (Union of International Associations, 2021k). Over time it would give way to the creation of the *World Organization of United Cities and Local Governments* (UCLG), which is currently one of the most important networks of cities worldwide.

1.3.4.3. Latin American Federation of Cities, Municipalities and Associations of Local Governments (FLACMA), 1981

The *Latin American Federation of Cities, Municipalities, and Associations of Local Governments* (FLACMA, in its Spanish acronym) was founded in Quito, Ecuador, on November 17, 1981. The organization's objectives are to strengthen Latin American municipalities and the decentralization of governments. (Union of International Associations, 2021d).

FLACMA is one of the most critical organizations in Latin America and the Caribbean, as it brings together and represents 16,360 municipalities and local governments in the region. This body operates under a *Consultative and Development Council*, established in 2018. It is in charge of establishing agreements and alliances with academic and financing entities to create projects in the network municipalities. Finally, this network operates in 33 Latin American and Caribbean countries; likewise, it has been the promoter of several global agendas, such as the 2030 Agenda, the New Urban Agenda, the Paris Agreement on Climate Change, the Sendai Agreement, and others (FLACMA, 2021).

1.3.4.4. The Union of Ibero-American Capital Cities, UCCI, 1982

In Madrid, Spain, the *Union of Ibero-American Capital Cities* (referred to as UCCI in its Spanish acronym) was founded on October 12, 1982. After two meetings, 21 mayors of the Ibero-American capitals signed a twinning agreement, thus marking the beginning of a close link between the associated municipalities (Union of International Associations, 2021i).

The UCCI was born to foster cooperation between the Ibero-American peoples. Over time, it has been established as a space for dialogue to solve common problems faced by member cities. In 1989, due to its outstanding work and commitment, the United Nations Organization granted the UCCI the member and consultative status of the Economic and Social Council. The network currently includes 29 cities from 24 Ibero-American countries (UCCI, 2021).

1.3.4.5. Association of the Major Metropolises (Metropolis), 1985

The *Association of the Major Metropolises* (after this Metropolis) was founded in April 1985; its objective is to connect metropolitan political leaders to improve their performance when addressing local and global challenges (Union of International Associations, 2021i). This network has a significant impact at the international level due to more than 140 metropolitan areas associated, whose population density amounts to more than 608 million people (Metropolis, 2021).

Metropolis members and the secretariat team work hard to create prosperous, inclusive, and sustainable metropolitan areas. The network has made *the Strategic Action Plan 2021 – 2023* to face challenges on an urban scale, especially in light of the COVID-19 pandemic that has particularly affected metropolitan spaces. Finally, its members have the opportunity to forge strategic alliances with other networks of cities, local governments, and other collaborating entities; in order to implement projects of sustainability, social cohesion, economic development, and gender equality to improve the inhabitant's quality of life (Metropolis, 2021).

1.3.4.6. Local Governments for Sustainability (ICLEI), 1990

Local Governments for Sustainability (ICLEI) was created on September 8, 1990, in New York, United States. Its founding Charter was adopted during the *World Congress of Local*

Governments for a Sustainable Future, sponsored by the *United Nations Environment Program* (Union of International Associations, 2021f).

To network belongs more than 2,500 local and regional governments of more than 125 countries around the globe. Its objective is to promote local action for low-emission urban development based on nature, equity, resilience, and circularity. In addition, they are committed to creating sustainability policies at a national and global level, serving the interests of local governments and their communities. To do this, it establishes alliances with international organizations, federal governments, academic and financial institutions, civil society, and the private sector (ICLEI, 2021a).

Finally, it may be noted that this is one of the most relevant local governments networks worldwide. The member's inhabitants represent more than 20% of the world population and more than 25% of the global urban population (ICLEI, 2021a). Therefore, it is committed to promoting concrete actions to achieve sustainable development and improve the residents' quality of life in coordination with local governments. These actions and strategies are summarized in various documents and reports, such as *the ICLEI Compendium in the Urban Age*, *ICLEI Malmö 2021-2027*, and *the ICLEI Malmö 2021-2024 Action Plan* (ICLEI, 2021b).

1.3.4.7. Eurocities, 1991

Originally named the *European Association of Metropolitan Cities*. The network of European cities or *Eurocities* was formally created in 1991 as a product of the 1986 Rotterdam Conference and the 1989 Barcelona Conference (Union of International Associations, 2021c). This regional network of cities has positioned itself as a global example for its environmental and social issues efforts. In addition, it has emphasized improving the inhabitants' quality of life through planning mechanisms and information exchange among its members.

Currently, it is a network of more than 200 cities belonging to 38 countries that have committed to reducing carbon emissions to zero, welcoming migrants and refugees, and governing through dialogue with their residents. Among its powers, it stands out: representing the member cities at the European Union level, presenting reports, and facilitating the exchange of knowledge and good practices between cities to improve urban decision-making (Eurocities, 2021).

1.3.4.8. Medcities Network, 1991

The *Network of Mediterranean Cities* (from now on, Medcities) emerged on November 25, 1991, in Barcelona, Spain, at the *Mediterranean Environmental Technical Assistance Program* (METAP) initiative. This network was born to strengthen the role of municipalities in developing local policies to protect the environment and promote sustainable development in the Mediterranean basin (Union of International Associations, 2021g). Currently, the network has 63 local governments committed to promoting sustainable urban development in the region (MedCités, 2021).

This network is one of the first local government organizations that promote environmental protection and sustainable development at the regional level. In addition, it has inspired the creation of local governments networks in other regions worldwide, which are concerned with prospering in environmental balance.

1.3.4.9. Mercociudades Network (MC), 1995

The *Mercociudades Network* (in its acronym MC) was founded on March 7, 1995, in Asunción, Paraguay. Its objective is to strengthen the integration of cities in South America to promote their development and well-being (Union of International Associations, 2021h). Currently, 364 cities are part of the network, which belong to 10 countries in the south of the continent: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela (Mercociudades, 2021).

This network has stood out for promoting experiences exchange and horizontal cooperation between the region's local governments. It offers a platform that facilitates its members to form part of other organizations with similar actions, both regionally and globally. Additionally, Mercociudades has established cooperation agreements and protocols with institutions such as UN-Habitat, Economic Commission for Latin America and the Caribbean (ECLAC), Southern Common Market (MERCOSUR), Union of Ibero-American Capitals (UCCI), Global Resilient Cities, Inter-American Development Bank (IDB), Cités Unies France, ICLEI, among others (Mercociudades, 2021).

1.3.4.10. Cities Alliance, 1999

Cities Alliance was founded on May 19, 1999, by the World Bank Group and the United Nations Human Settlements Program, known as UN-Habitat. It was born to be a world association to reduce urban poverty and support cities to achieve sustainable urban development (Union of International Associations, 2021b).

The importance of this alliance lies in the fact that, by the year 2030, it seeks to serve more than 60 million poor people who live in 200 cities located around 20 countries. Additionally, Cities Alliance comprises 29 organizations that actively participate in the direction of strategies. Members include eleven governments from the Americas, Europe, and Africa; five Local Authorities such as C40 Cities, Commonwealth Local Government Forum (CLGF), Metropolis, World Organization of United Cities and Local Governments (UCLG), and ICLEI; five non-governmental organizations; four Multilateral Organizations; two private sector foundations and two university research centers (Cities Alliance, 2021).

1.3.4.11. World Organization of United Cities and Local Governments (UCLG), 2004

The World Organization of United Cities and Local Governments (UCLG) was born on May 5, 2004, in Paris, France, by the merger of the IULA and UTO Networks (Union of International Associations, 2021m). It is essential to emphasize that UCLG is currently established as the world's largest local and regional governments organization.

The UCLG's structure is decentralized. This network comprises seven regional sections, a metropolitan section, and a regional governments section. Each unit is autonomous in establishing its policies and organized as follows: Africa Section (UCLG-Africa), Asia Pacific Section (UCLG-ASPAC), Eurasia Section (UCLG-Eurasia), Europe Section (Council of European Municipalities and Regions - CEMR), Middle East and Western Asia section (UCLG-MEWA), Latin America Section (Coordination of Local Authorities in Latin America for unity in diversity – CORDIAL), Mercociudades, North America section (UCLG-Noram), Metropolis section (Metropolis) and the Forum of the Regions (UCLG regions) (UCLG, 2021).

This organization seeks to promote a fair, sustainable, and supportive society; based on local democracy, autonomy, and decentralization. Its objective is to strengthen the role of local

authorities in solving current challenges and achieve recognition within the international system. It mainly promotes the participation of cities in decision-making for the establishment of global agendas. In short, it aims to encourage local governance through dialogue and cooperation between local and regional governments worldwide (United Cities and Local Governments, 2021).

1.3.4.12. C40 Cities, 2005

In London, the C40 network was born in October 2005 during the World Leadership Summit on Climate Change in Cities (Union of International Associations, 2021a). This network comprises mayors from nearly 100 of the world's leading cities, collaborating to take action on the climate crisis.

C40's mission is to halve the emissions of its member cities over the next decade. In addition, they seek to build equitable and resilient communities by driving the debate on climate action. The essential plan of this network -to achieve climate, social and economic justice- is reflected in the Global Green New Deal. This global ecological agreement was launched in 2019 during the C40 World Mayors Summit, held in Copenhagen (C40 Cities, 2021).

1.3.4.13. World e-Governments Organization of Cities and Local Governments (WeGO), 2010

The *World e-Governments Organization of Cities and Local Governments* (WeGO) was established in September 2010 in Seoul, Republic of Korea. This organization was born in Seoul at the *World Forum of Mayors on Electronic Governments* initiative in 2008 (Union of International Associations, 2021j).

WeGO is an international organization of cities and local governments that seeks solutions through technological resources. It bases on the electronic government to transform urban centers into innovative and sustainable cities. It currently has more than 200 members worldwide: 157 local governments, 34 corporations, and 19 institutions. The seat of the secretariat is in Seoul, and the network has regional offices in Africa, East Asia, Eurasia, the Mediterranean, and Latin America (WeGO, 2021).

This city network promotes the transformation of urban policies by using digital technology to improve the residents' quality of life, public services, and economic prosperity. In short, this new development perspective is based on innovation and improvement of digital capacities to consolidate smart and sustainable cities.

1.3.4.14. Euro-Latin American Alliance for Cities Cooperation (AL-LAs), 2013

The *Euro-Latin American Alliance for Cities Cooperation* (AL-LAs) has been working since 2013 to promote relations between local governments in Latin America and Europe. The main objective pursued by the alliance is to encourage horizontal cooperation among peers, boost social inclusion and sustainability, participate in international forums, and establish strategic partnerships with institutions such as the European Union, UCLG, and Mercociudades, among others (Euro-Latin American Alliance of cities cooperation, 2021). AL-LAs is one of the most significant networks promoting local governance in Latin America.

1.3.4.15. Global Resilient Cities Network (GRCN), 2019

The *Global Resilient Cities Network* (GRCN) is one of the newest networks in the international arena. The GRCN was born on September 1, 2019. It emerged as a legacy of the *100 Resilient Cities Program*, both initiatives promoted by the Rockefeller Foundation. Their central objective is to boost urban resilience to overcome the vulnerabilities caused by climate change and other social and economic challenges facing urban communities. Currently, the organization includes 98 cities from 40 countries, which were members of the 100 Resilient Cities initiative. Nevertheless, it is expected that between 2020 and 2022, some ten new members will join the network (Rockefeller, 2020; Resilient Cities Network, 2021).

1.3.5. The New Urban Governance

The evolution analysis of the organizations presented previously shows that city networks have been reconfigured to address increasingly relevant issues within international agendas, such as climate change. Today, the city networks' focus is on cooperating and coordinating efforts to create sustainable cities. In this sense, rethinking the international ecosystem of city networks

poses challenges and opportunities, especially in light of the economic, social, and health deterioration caused by the COVID-19 pandemic.

Undoubtedly, the COVID-19 aggravated the already existing inequalities and deficiencies in the infrastructure and urban management. At the same time, it highlighted the cities' vulnerability in providing an effective response to the health crisis, which was exacerbated by the overcrowding and unhealthy conditions of certain urban areas that do not have appropriate public services. For this reason, the United Nations has urged local governments to provide public sanitation infrastructure to mitigate health risks, given that "health should become a new guiding principle of urban planning and governance" (World Report of Cities, 2020).

In this context, national and international organizations -mainly city networks- promote resilience and innovation in urban management as an opportunity to rethink the structure of cities and achieve sustainable development so desired for decades. However, the proposed solutions will generate value only if a wide range of sectors are included in the discussion table. In other words, its success depends on the participation and commitment of traditional actors -governments and international organizations- and civil society, the private sector, and the academy

1.3.5.1. Main cities promoted actions to face the COVID-19 pandemic

National, regional, and international organizations have proposed numerous initiatives that urge the post-COVID-19 urban management recovery and reconfiguration. However, it is worth stressing some proposals by global networks and organizations, which have served as an anchor point for coordinating solutions from the cities.

a. C40 Mayors' Agenda for a Green and Just Recovery

C40 Cities is one of the city networks most committed to developing plans and recommendations for the COVID-19 pandemic recovery. Proof of such efforts is the publication of the *C40 Mayors' Agenda for a Green and Just Recovery*, which describes bold actions for equitable and sustainable recovery of the pandemic from the urban centers. Among the agreed measures, C40 (2020) highlights the creation of green jobs, the protection of workers' rights,

innovation in green industries, accessibility to public services, and the reduction of polluting gas emissions, among others.

b. Decalogue for the post COVID-19 era

UCLG is another network that supports the creation of transformative responses to face the health crisis. In May 2020, they launched the Decalogue for the post-COVID-19 era. This document includes the commitment of local governments to transform the urban management model. The impetus for creating said Decalogue lies in the pandemic spotlighted the need to improve the health system, reduce the digital divide between citizens, ensure access to adequate housing, and guarantee quality essential services. The ultimate goal of this declaration is to provide decent living conditions for city residents, particularly in the most vulnerable sectors that live in informal conditions (United Cities and Local Governments, 2020).

c. Cities 4 Global Health

Another noteworthy initiative in this area has been creating the Cities4GlobalHealth platform. This proposal is co-directed by several networks such as Metropolis, UCLG, AL-LAs, and supported by Mercociudades, Medcities, C40 Cities, ICLEI, Global Resilient Cities Network, WeGO, among others. *Cities4GlobalHealth* is a collaborative platform that brings together policy models and action plans from local and regional governments worldwide that respond to the COVID-19 challenges. So far, the experience of more than 105 cities worldwide has been shared, which have implemented around 700 plans and actions to deal with the aftermath of the pandemic and contribute to the reconstruction of more sustainable and ecologically responsible cities (Cities for Global Health, 2021).

d. Thriving Cities Initiative

Finally, one of the most ambitious proposals, and the central axis of this research work, is the Thriving Cities Initiative. This initiative collaborates with various actors such as C40 Cities, Donut Economics Action Lab, and Circle Economy, and the KR Foundation funds it. In the third chapter of this document, this initiative has more details. However, as an introduction, the Thriving Cities Initiative seeks to foster collaborative action toward socially just and ecologically safe cities.

In light of the ravages caused by COVID-19, this initiative has joined efforts to recover healthy, sustainable, and resilient cities. Through a holistic vision, it promotes methods to meet the needs of people within planetary boundaries, for example, the City Portrait methodological tool (C40 Knowledge, 2021).

The common point of the initiatives described above -and many others proposed- is that they see the COVID-19 crisis as an opportunity to innovate and develop healthy and sustainable cities. In this sense, the urban model of sustainable development has become a key element in restructuring cities and promoting resilience to face future challenges.

The criteria set forth by international organizations -such as UN-Habitat, the European Commission, the World Health Organization, the World Economic Forum, C40, or ICLEI- show six main axes that must be considered to achieve cities' sustainability in the post COVID era. They are: working on accessible, sustainable, and active mobility; planning green, healthy, and resilient cities; addressing climate change action; being energy efficient cities; encouraging sustainable construction, and thinking of urban health as global health (Moreno and De la Colina, 2021, pp. 14-49).

1.3.6. Intermediate Cities in the new urban agenda

The New Urban Agenda is a guide that redirects cities' planning, administration, management, and development. It is based on urban and territorial sustainable development to achieve prosperity. Similarly, it recognizes that humanity faces a historic opportunity to take advantage of the cities' key role in promoting sustainable urban development (Habitat III, 2017). In this sense, although the largest cities -metropolises or megacities- have a leading role in debate forums on sustainable urban management. In recent years, the growth patterns have changed, especially in the global south, shifting attention to the development of *intermediate cities*.

According to the Inter-American Development Bank: “the greatest transformations of the urban space are no longer taking place (and perhaps will not take place anymore) in the large metropolises, but rather in cities with less than two million inhabitants with high growth rates: the so-called ‘emerging cities’” (2016, p. 26). For that reason, cities with lower demographic and territorial density are gaining more and more attention at the international level. Especially

considering that these urban centers are good places to execute actions that contribute to sustainable urban development.

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1.3.6.1. Definition of Intermediate City

Although there is no consensus on the conceptualization of intermediate cities, there are several criteria that allow a theoretical approach. In the first instance, the term *intermediate* arises among academic circles in the 1980s to broaden the meaning of *medium-sized cities*. That terminology responded to a classification based exclusively on demographic size to categorize cities (Hoeflich and Llop, 2015). This change from *medium* to *intermediate cities* does not imply a mere terminological transformation but a more profound conceptual change.

Even though the definition of intermediate cities is still linked to a quantitative feature -cities with between 50,000 and 1,000,000 inhabitants (UCLG, 2021)- this connotation is increasingly imprecise, given that the historical, social, and demographic circumstances vary considerably among territories. For example, what would be considered an intermediate city in Europe or Latin America, if only the population size is considered, could be seen as a small city in another sociodemographic context such as China or India (Hoeflich and Llop, 2015, p. 9).

Consequently, the functionality criterion -the role of intermediate cities- is gradually becoming more relevant when defining them. In this way, Bellet and Llop (2002) argue that:

The intermediate city cannot be defined only by the population it houses. Just as or more important is the city’s role in its more or less immediate territory, the influence and relationship that it exercises and maintains within it, and the flows and relationships that it

generates abroad. Aspects, the latter, much more qualitative of the concept of “intermediate city” (...) it is preferred to highlight as a fundamental part of the concept the intermediation functions developed by this type of city between the local, its territories, and the global. (p.14)

The intermediation characteristic, presented in the previous paragraph, refers to the functional role these cities play between the territorial cores -metropolises- and the rural producing areas. For this reason:

The intermediate city must be understood as that central place, nucleus, pole, a knot that generates a double relationship with its surroundings: on the one hand, of centrality — attraction, gravitation of people, goods, communications—, and on the other, of polarization —provision of educational, health, commercial services—. This conceptualization puts us in front of the rural-urban intermediary role. (León, 2010; cited in Otero and Llop, 2020, p. 3)

1.3.6.2. Justification to promoting sustainability from intermediate cities

Intermediate cities are undoubtedly highly relevant actors within the traditional hierarchy of cities based on the number of inhabitants. However, even if their demographic significance contributes to said notoriety, it is not the only reason that justifies its influence. As previously described, these urban centers facilitate the connection between smaller cities, the rural world, and the large metropolises; which in turn encourages the establishment of more interconnected urban systems, as well as decentralization and collaborative governance within the territory (Hoeflich and Llop, 2015, p. 10).

Their proximity to the urban-rural reality facilitates the location and materialization of national and international agendas on sustainable urban management. That is why intermediate cities have strategic value. Not to mention that intermediate towns, due to their scale, facilitate governance and citizen participation, which are crucial to promoting urban planning for sustainable development (Punsola, 2013).

A further factor that makes intermediate cities attractive for sustainable planning is their domestic economy since it facilitates the adaptation of more sustainable models such as the circular economy. In addition, the topographical characteristics of short distances in intermediate cities - the population is concentrated within an average radius of four kilometers- can encourage sustainable mobility habits (Llop, Iglesias, Vargas, and Blanc, 2019).

As shown, intermediate cities have a greater capacity to design and implement high-value strategies to achieve sustainable development based on the proximity between local governments and social agents. In addition, intermediate cities are the majority in the global urban system. According to Llop, Iglesias, Vargas, and Blanc (2019), “for every city with more than one million inhabitants, there are almost 18 cities with a population between 50,000 and one million inhabitants” (p. 28). All the presented factors allow understanding the growing interest of academics and specialized organizations in promoting intermediate cities as crucial agents in localizing sustainable development agendas since they are suitable spaces for a successful transition to a sustainable model.

In this context, the next chapter analyzes the case of Cuenca, Ecuador, as a model of sustainable management from the vision of an intermediate city. The following section presents general characteristics that justify Cuenca as an intermediate city and briefly shows how it participates in the international sphere through cities networks. Additionally, it offers a preliminary diagnosis of the city by systems: biophysical, sociocultural, and institutional, which is a prelude to the study and application of the *City Portrait methodology*, which gives a visual and holistic evaluation of the integral management of Cuenca.

CHAPTER II

Cuenca, prelude to case study

As previously supported in the first chapter, the organization, planification, and administration of Ecuador's territory are decentralized. Moreover, the Decentralized Autonomous Governments (GAD for its acronym in Spanish) are the institutions that make up the State's territorial organization (ECLAC, 2021). The GAD can be regional, provincial, cantonal, and parochial, and develops instruments for local management. Within its competencies is the formulation of the Development and Land Use Plans (PDOT in its Spanish acronym). A technical and regulatory instrument that guides the public administration to promote local development (Secretaría Técnica Planifica Ecuador, 2019).

In this regard, the 2011 Cuenca PDOT and its upgrades in 2015 and 2021 will serve as a primary reference for the analysis of the following sections since these documents contain a general diagnosis of the territory's situation and population. The present chapter is divided into two subsections. The first section presents the key elements that make Cuenca an intermediate city and shows how it participates in the international scene through networks of cities. The second section offers a preliminary diagnosis of various city systems such as biophysical environment, sociocultural, economic, mobility, energy, connectivity, political-institutional, and citizen participation.

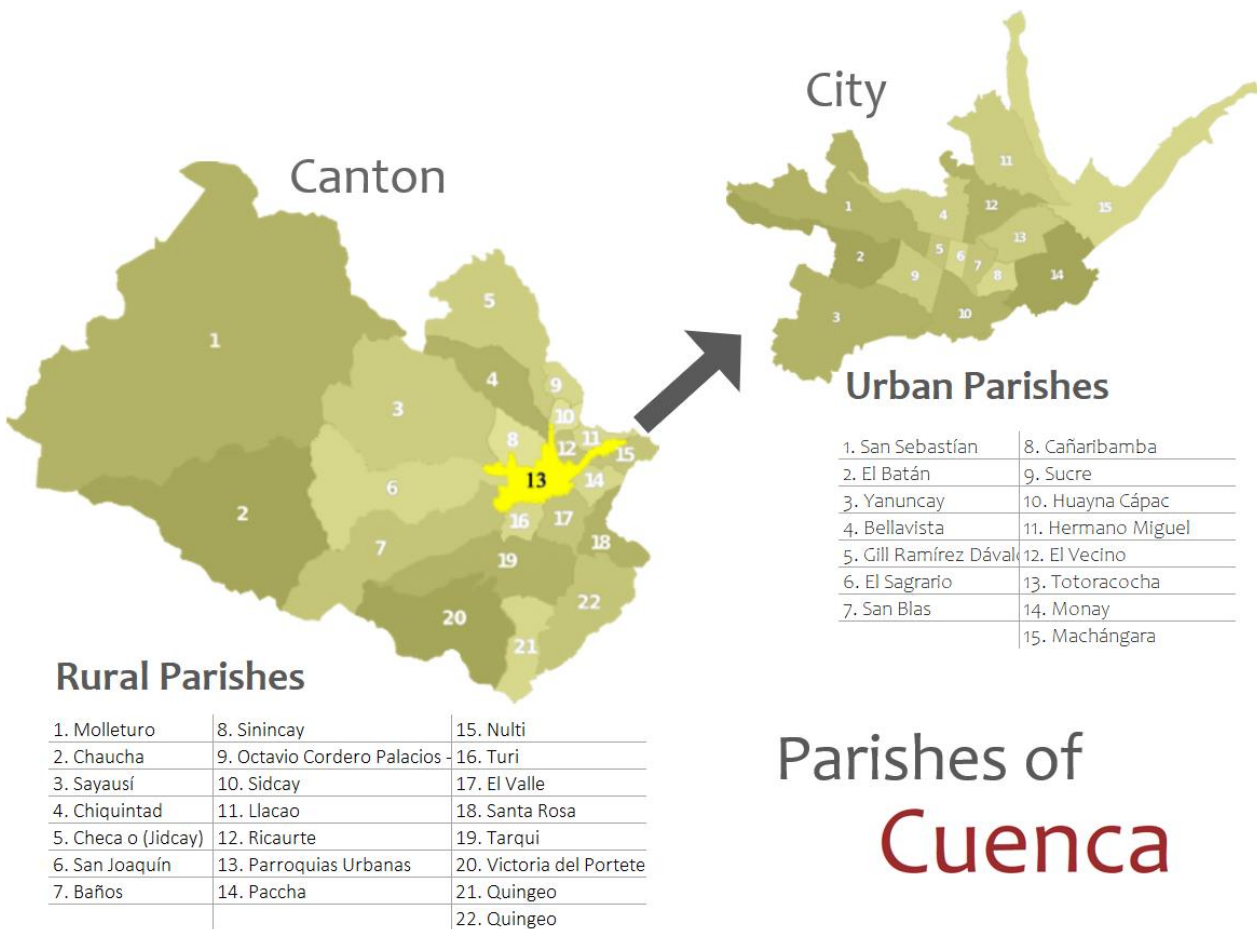
2.1. General information of Cuenca

The canton of Cuenca is located in the province of Azuay, the south-central region of the Republic of Ecuador. This canton represents about 44% of the province's area with 3,665.32 km² and is divided into 15 urban and 21 rural parishes (Dirección de Planificación, 2021a, pp. 33 - 34) (see Figure two). The city, and cantonal head, is officially named Santa Ana de los Ríos de Cuenca and has a territorial extension of 8,639 km² (CIDEU, 2020).

Cuenca was founded at 2,500 MASL³ on April 12, 1557, and its independence took place on November 3, 1820. As a result, the canton of Cuenca is the oldest political-administrative jurisdiction in the region's south (Dirección de Planificación, 2021a, pp. 33 - 37).

Figure 2:

Map of urban and rural parishes of Cuenca



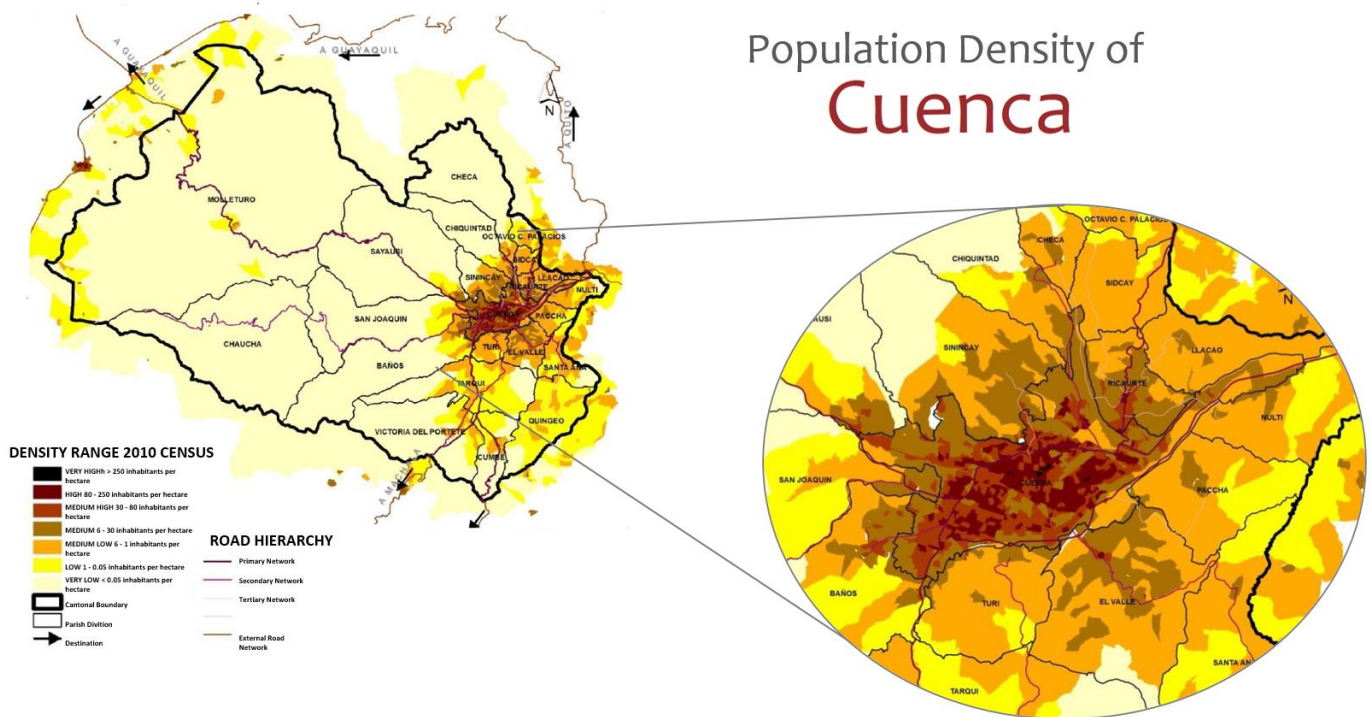
Note: The image was adapted from GoRaymi International Touristic Platform (2021). https://www.goraymi.com/es-ec/azuay/cuenca/mapas/parroquias-cuenca-ac13tbfu#google_vignette

³ MASL: meters above sea level

2.1.1. Population

According to the 2010 census -carried out by the *National Institute of Statistics and Censuses* (in the future referred to as INEC)- the population of the Canton of Cuenca stood at 505,585 inhabitants. Some 66% of the population lived in the cantonal capital, which is urban, and 34% was distributed in the rural area (GAD Municipal Cuenca, 2015, p.20) (see Figure 3). For 2020, the projected population of the canton was 636,996 people, representing 5.02% of the national population. Additionally, around 410,786 inhabitants reside in the urban area and 214,989 in the rural area, which means that the distribution estimated in 2010 has been preserved (Dirección de Planificación, 2021a, p. 300).

Figure 3:
Population Density of Cuenca - 2010 Census



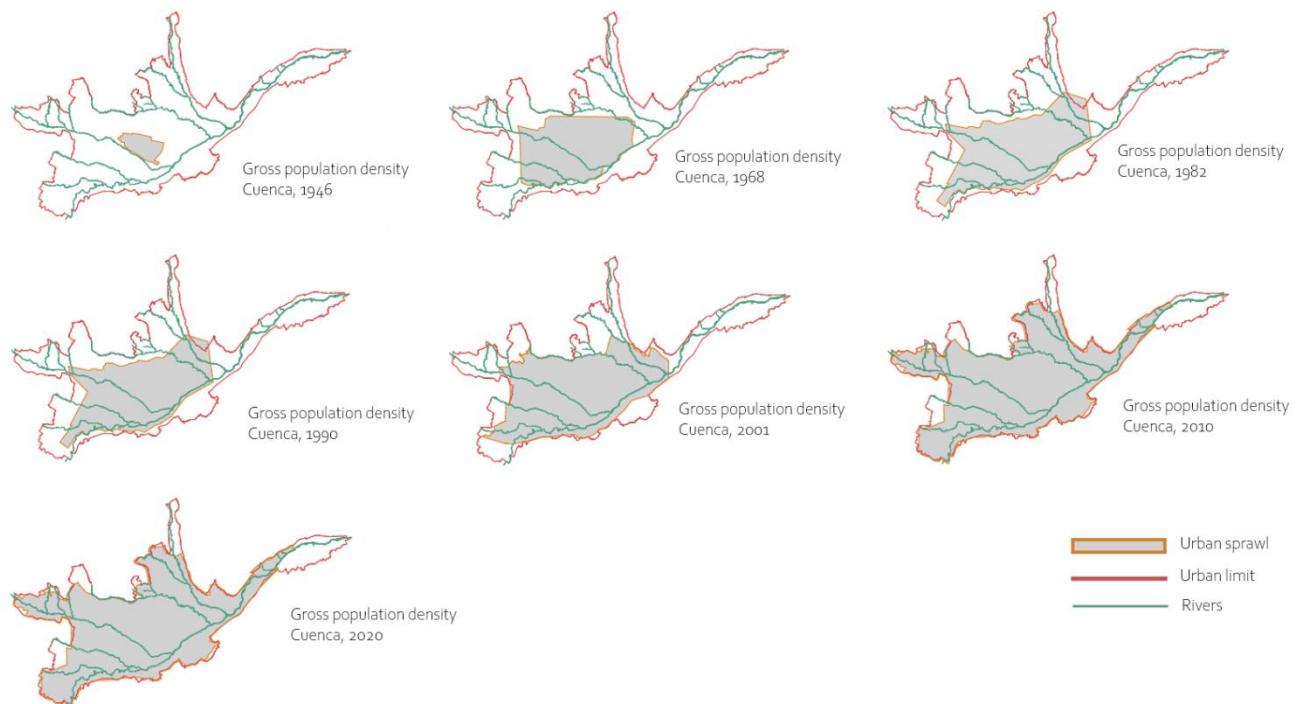
Note: The image was adapted from “Plan de Desarrollo y Ordenamiento Territorial del Cantón actualización 2015” [Development Plan and Territorial Planning of the Canton, updated 2015] by GAD Municipal Cuenca (2015).

2.1.1.1. Urban Evolution

According to a study that analyzes the variation of gross densities in the urban area of Cuenca since 1950, the city's urban sprawl has been growing at a dizzying pace since the middle of the previous century (Hermida, Hermida, Cabrera, Calle, 2015) (see Figure 4).

Figure 4:

Urban Sprawl evolution in city of Cuenca



Note: The image was adapted from “Supermanzanas: Modelos urbanos Don Bosco y Centro Histórico” [Superblocks: Don Bosco and Historic Center urban models] by Fundación Municipal El Barranco.

http://www.cuenca.gob.ec/?q=system/files/MODELLOS_URBANOS_CAPITULO_1_final.pdf

The population growth of Cuenca has been recorded since 1950 through censuses and municipal data. As a result, it has been possible to know the evolution of the gross density of inhabitants per hectare by dividing the total number of inhabitants by the total occupied urban area. Thus, it has been estimated that Cuenca has a population density of 45 inhabitants per hectare (see Table 1). However, with the current rate of growth and dispersion, Hermida et al. (2015) calculate

that by 2055, the gross density will be 118,88 inhabitants per hectare if the existing urban area is maintained. That means increasing the need for planning strategies that allow the city to avoid dispersed growth that negatively impacts the environmental, economic, and social levels (pp. 39-41).

Table 1:

Cuenca's Urban Density 1950 – 2055

Analysis of the Cuenca's Urban Density for the period 1950 - 2055			
Years of analysis	Population (inhabitants)	Gross Urban Area (hectares)	Gross Density (inhabitants per hectare)
1946 - 1950	39,983	288.29	138.69
1962 -1968	60,402	2,237.30	27
1974	104,470	2,317	45.09
1982	152,406	2,674.99	56.97
1990	194,981	4,580.21	42.57
2001	277,374	6,395.99	43.37
2010	329,928	7,248.23	45.52
2055	861,621	7,248.23	118.88

Note: The table was prepared by authors from the article “La densidad urbana como variable de análisis de la ciudad: El caso de Cuenca, Ecuador.” [Urban density as a city analysis variable: The case of Cuenca, Ecuador] by Hermida et al., EURE revista latinoamericana de estudios urbano regionales, 41(124), 25-44. doi:10.4067/S0250-71612015000400002

2.1.1.2. Age and sex population distribution

The population distribution by sex and age is balanced between the total of men and women who live in rural and urban areas of the canton. As detailed above, the urban area of Cuenca concentrates most of the population. According to the data provided by the 2010 census, the urban area is made up of 331,888 inhabitants, of which 52.28% are women and 47.72% are men. This trend is maintained in the rural area, with 173,697 inhabitants in the census year: 53.29% women and 46.71% men (GAD Municipal Cuenca, 2015, p. 155) (see Table 2).

Table 2:

Distribution of the Cuenca canton's population by sex

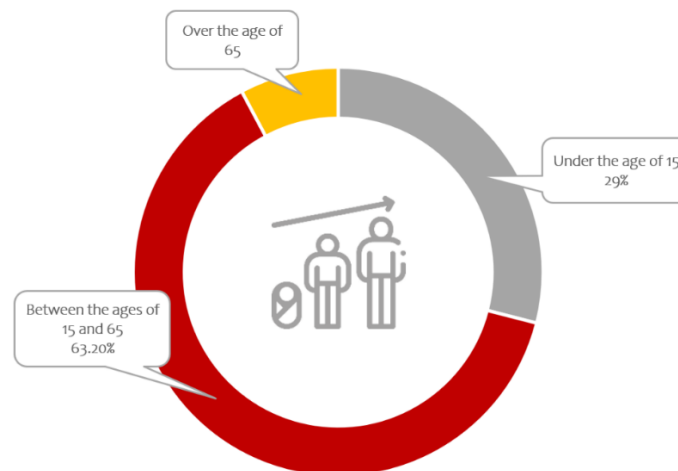
Distribution of the Cuenca canton's population by sex - 2010 Census					
Area	Women	% Women	Men	% Men	Total
Urban area	173,523	52.28%	158,365	47.72%	331,888
Rural area	92,565	53.29%	81,132	46.71%	173,697
Cantonal area	266,088	52.63%	239,497	47.37%	505,585

Note: The table was prepared by authors using information from the document “Plan de Desarrollo y Ordenamiento Territorial del Cantón actualización 2015” [Development Plan and Territorial Planning of the Canton, updated 2015] by GAD Municipal Cuenca (2015)

Regarding the distribution by age (see Figure 5), the non-dependent population -over 15 years old and under 65 years old- represents 63.2% of the canton inhabitants. On the other hand, the population under 15 years old is 29% of the canton, and over 65 years old is 7.8% of the total population. Finally, in the urban area, the majority of the population is concentrated in an age range of 20 to 24 years old, while in rural areas, the most extensive range of the population is consolidated between 10 to 14 years old (Dirección de planificación, 2021a, pp. 305-306).

Figure 5:

Population distribution by age in Cuenca



Note: The image was prepared by authors using information from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

Cuenca meets the demographic and territorial characteristics to be considered an intermediate city according to the definition developed in the theoretical framework and the statistical data previously presented. The following section will be justified how Cuenca plays the role of intermediary or connection node between the urban center and the surrounding rural areas.

2.1.2. Cuenca as a connection node

The *Municipal Foundation El Barranco* (2020) of the Mayor's Office presents a study that supports Cuenca as "an epicenter that attracts flows of inhabitants from various surrounding towns, including Azuay and other provinces such as Azogues, Gualaceo, Paccha, Molleturo, among others" (p. 8). This dynamic is primarily attributed to the fact that city of Cuenca is the provincial capital of Azuay. As such, it concentrates the area's administrative, commercial, and economic activities. Furthermore, Cuenca received the "designation as an intermediate city with an emphasis on its history, evolution and the sustained growth it has shown" (Fundación Municipal El Barranco, 2020, p. 8) within the framework of the UN gathering: Habitat III.

Finally, it should be noted that Cuenca -in addition to its administrative role- is a commercial and cultural center of significant influence for the southern zone of Ecuador (see Figure 6). In this way, it is demonstrated how Cuenca is an intermediate city that, taking advantage of its size, location, and influence, can become a model for planning sustainable urban development.

The range of internationalized cities, or ones with a high potential for internationalization, is not limited to megacities, capital cities, or cities with large economies. Nor is it limited to those located in regions with higher levels of development. This universe is being reconfigured, and Latin America is no exception. More and more examples of intermediate cities are opening up important spaces on the international scene. (Dirección de Relaciones Internacionales y Cooperación, 2021, p.15).

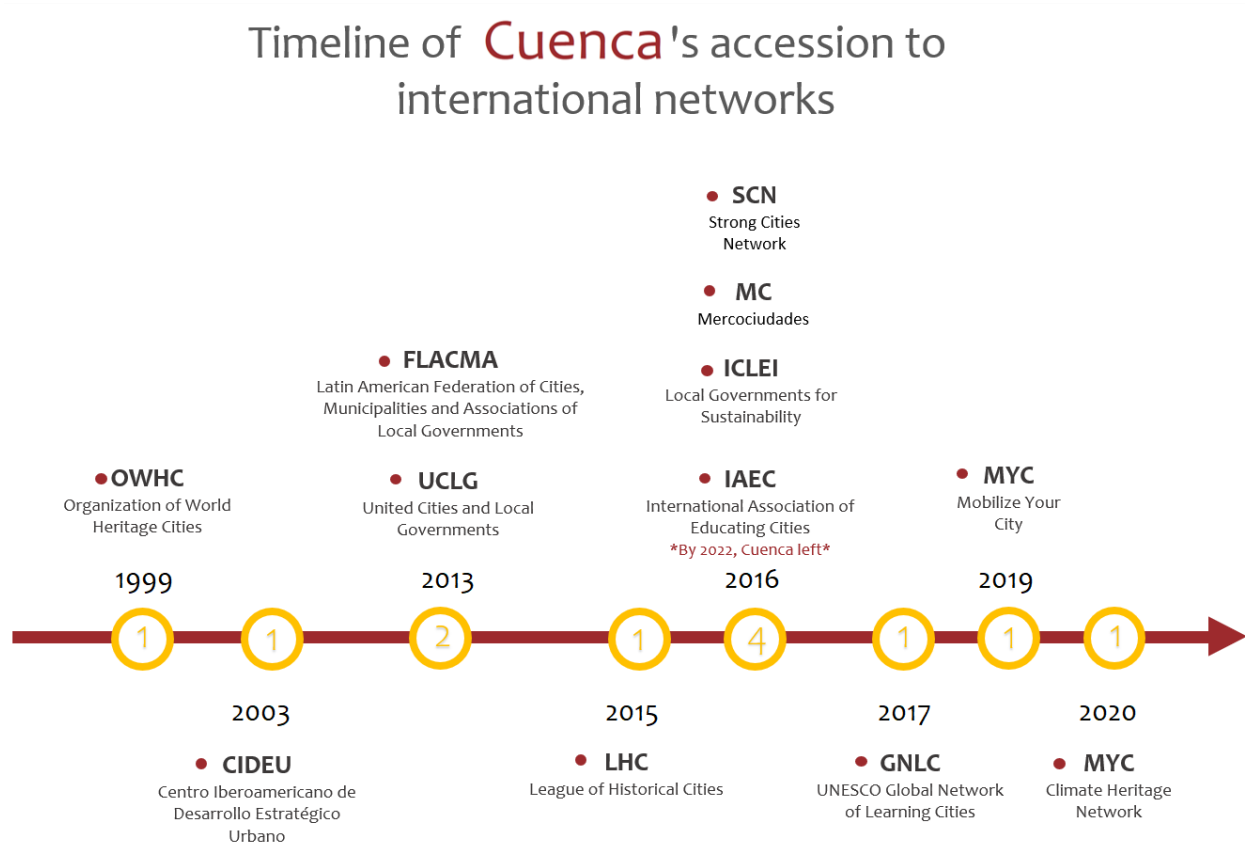
Along these lines, the previously cited document presents the Strategy's general objective: to improve Cuenca's presence at the international level through joint actions with various actors such as local government, civil society, the private sector, and academia, to find solutions to local challenges and "make Cuenca a leading actor in solving the most pressing global problems" (Dirección de Relaciones Internacionales y Cooperación, 2021, p. 17).

2.1.3.1. International networks to which Cuenca belongs

With Ecuador's legal framework, the GAD is competent to manage international cooperation to obtain non-reimbursable resources and technical assistance (Dirección de Relaciones Internacionales y Cooperación, 2021). Currently, the Directorate of International Relations and Cooperation of the Municipality of Cuenca is linked with its international peers and multilateral organizations through twinning agreements, technical cooperation, non-reimbursable funds, and other forms of cooperation. Below, in Figure 7, a summary of the international networks which Cuenca has joined in recent years is presented.

Figure 7:

Timeline of Cuenca's accession to international networks



Note: The image was prepared by authors using information from the document “Estrategia de Internacionalización de Cuenca 2021 – 2025” [Internationalization Strategy of Cuenca 2021 – 2025] by Dirección de Relaciones Internacionales y Cooperación (2021).

2.1.3.2. Cuenca's outstanding programs and projects of International Cooperation

The Cuenca Internationalization Strategy highlights a series of principles that guide the establishment of the city's international relations. These principles, summarized in *Table 3*, reflect the importance of cooperation between cities and the benefits that sharing experiences and establishing joint goals represent, both locally and globally.

Table 3:

Basic principles for Cuenca's international action

Basic principles for Cuenca's international action		
1	Local action, global reach	Local and global problems, which affect both the inhabitants of Cuenca and the international community, are often closely linked.
2	Inclusive internationalization	The importance of the connections and the international activity of the city must have as its ultimate goal the improvement of its residents' quality of life, especially the most vulnerable.
3	Cantonal perspective	Internationalization will integrate the cantonal vision in all its dimensions, providing opportunities to all parishes and the rural periphery, not only the urban area.
4	Post-COVID-19 resilience	Internationalization will integrate the cantonal vision in all its dimensions, providing opportunities to all parishes and the rural periphery, not only the urban area.
5	Improve basic services	The strategy should strengthen the quality of the municipal services provided by exchanging knowledge with other cities, both bilateral and city networks.
6	World-wide solidarity	The internationalization of Cuenca must be carried out with a vocation of solidarity with neighboring peoples and the international community.

Note: The table was prepared by authors using information from the document “Estrategia de Internacionalización de Cuenca 2021 – 2025” [Internationalization Strategy of Cuenca 2021 – 2025] by Dirección de Relaciones Internacionales y Cooperación (2021).

In this sense, and following the principles outlined, the city has linked up with strategic actors, such as the German Technical Cooperation (Deutsche Gesellschaft für internationale Zusammenarbeit: GIZ) and other networks of cities to which it belongs to manage the raising of funds not reimbursable, and technical assistance to implement environmental programs and projects oriented to conservation, circular economy, social benefit, among others. Interviews with municipal officials and representatives of organizations such as GIZ made it possible to identify a series of outstanding initiatives that Cuenca has been carrying out in recent months.

First, the Sustainable Intermediate Cities initiative, supported by GIZ, stands out. This program is part of implementing the 2030 Agenda, the Paris Agreement, and the New Urban Agenda. It has been applied in four intermediate cities in Ecuador: Cuenca, Portoviejo, Lago

Agrio, and Loja (GIZ, 2018). In Cuenca, the axis of action is urban mobility and sustainable energy. The second phase has already begun there, which focuses on climate measures and financing for the city (information provided by Pablo Osorio, Advisor at GIZ Ecuador, personal interview, January 18, 2022) (see Appendix A).

Along the same lines, Sofía Arce -Director of the Directorate of International Relations and Cooperation- in a personal interview granted on March 11, 2022, highlights that the German government has offered ten million euros as non-reimbursable funds to purchase the first fleet of electric buses for the city. In addition, she mentioned that they are working together with the Environmental Management Commission of Cuenca (CGA) and the support of GIZ in a circular economy program. Among the projects that she highlighted is the reuse of wood waste from the Cuencan company Colineal to manufacture kitchen utensils; and the recycling of tires to reinforce the safety of games in the city's playgrounds (see Appendix B).

Furthermore, Arce indicates that through city networks such as ICLEI, Cuenca has committed to *Cities4Forests*, promoting the conservation and protection of forests inside and outside the cities (Cities4Forests, 2020). She also stated that Cuenca is part of two initiatives framed in climate change: *Zero Carbon Cities*, through which the city has committed to electrifying public transport; and *MobilizeYourCity*, which proposes activities to improve public mobility and achieve a sustainable city (information provided by Sofía Arce, personal interview, March 11, 2022) (see Appendix B).

Finally, during the interviews carried out, the creation of the Cuenca 2070 Observatory was emphasized, which is a joint initiative between the Municipality, the Chamber of Industries, Production and Employment, and the University of Cuenca with the support of the GIZ (Cuenca 2070 Observatory, 2022). The Observatory's vision is to be a coalition of actors that make it possible to present, through a single platform, systematized, valuable and up-to-date information on different city indicators to guide public management and be a link with citizens. This initiative has not been officially launched, but it is expected to be in the second quarter of 2022 (information provided by Sofía Arce, personal interview, March 11, 2022).

In the interviews held with Arce and Osorio, the relevance of this kind of entity was highlighted since it is required to have updated data to access international financing initiatives

and programs. In particular, they emphasized that the non-reimbursable funds allocated to climate projects ask for the existence and monitoring of information and environmental indicators of their partner cities.

With the previous analysis, it can be concluded that Cuenca presents great interest in initiatives framed in environmental and social management that benefit the city's sustainable development. In this way, adopting innovative tools -such as the City Portrait promoted by the Thriving Cities Initiative that is exposed in Chapter III- could contribute to Cuenca's objective of being an international and national benchmark in sustainable development. In addition, the six basic principles of the Internationalization Strategy complement the vision of the methodology proposed in this research work (see Table 3). Further, the intention of seeking Cuenca's adhesion to the C40 Cities network (information provided by Sofía Arce, Director of the Directorate of International Relations of the Municipality of Cuenca since 2019, personal interview, March 11, 2022) (see appendix B) would facilitate the City's approach to the management model based on the Donut Economy and the City Portrait tool.

2.2. Diagnosis of Cuenca by systems

This section analyzes the city's environmental, social, cultural, and administrative conditions as a preamble to applying the methodological tool The City Portrait, developed in the third chapter. The data presented has been compiled and contrasted by the most updated versions of the official documents published by the Municipal GAD of Cuenca and academic studies that specialists in the area have carried out.

2.2.1. Diagnosis of the biophysical environment

The description of the natural environment in which the population settles is essential for analyzing the strengths and weaknesses of a territory. In Cuenca, there are a variety of climates that form the natural landscape of the area. 52% of the Canton's surface has a semi-humid mesothermal equatorial climate -frequent in the inter-Andean region characterized by fluctuating temperatures- and 34.4% of the territory has a high-mountain equatorial environment temperature fluctuates around eight °C-. Due to these characteristics, the temperature in Cuenca fluctuates

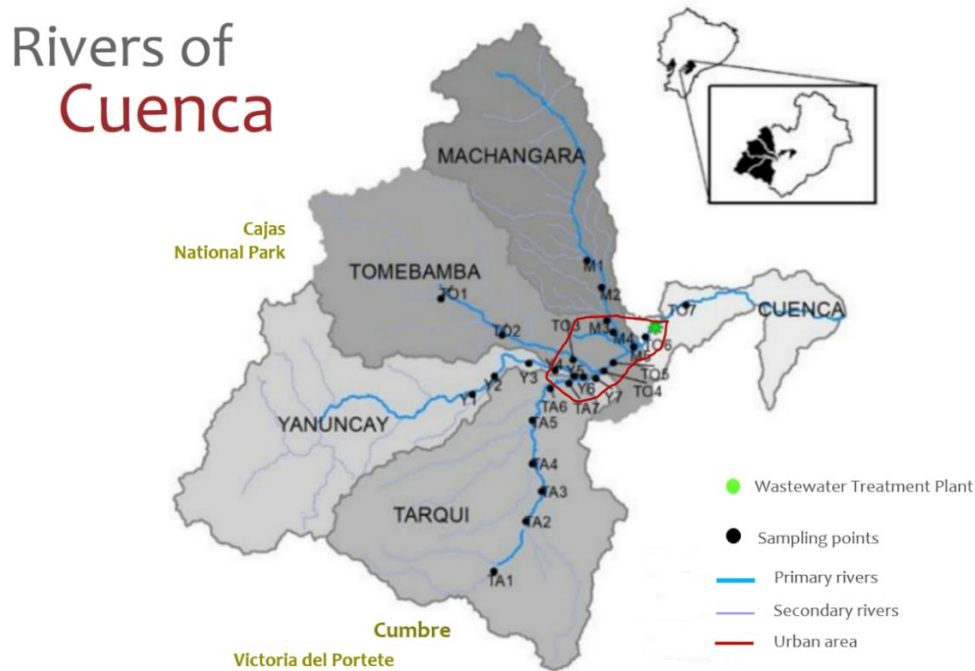
around 14.6°C (Dirección de Planificación, 2021a, pp. 168 – 169). Next, the section will analyze the natural resources degraded in the Canton to identify the areas that require more attention to achieve sustainable urban planning.

2.2.1.1. Water quality

The Canton has extensive hydrological network coverage. The primary water sources of the city are the four rivers that cross it: *Machángara*, *Tomebamba*, *Yanuncay*, and *Tarqui*. The sub-basins of the first three originate in the Cajas National Park, and the last arises in the moorland of Cumbre and Victoria del Portete (Pauta *et al.*, 2019) (see Figure 8).

Figure 8:

Map of the rivers of Cuenca



Note: The image was adapted from “Evaluación de la calidad del agua en los ríos de la ciudad de Cuenca, Ecuador” [Evaluation of water quality of the rivers of the city of Cuenca, Ecuador] by Pauta *et al.* (2019). MASKANA, 10(2), 76-88. doi:10.18537/mskn.10.02.08

A study carried out by seven researchers entitled “Evaluación de la calidad de agua de los ríos de la ciudad de Cuenca, Ecuador” [Evaluation of the water quality of the rivers of the city of

Cuenca, Ecuador] were analyzed the condition of the city's flows. There were the following conclusions:

The Tomebamba can be classified as the most critical receiving body regarding the pollution of the rivers studied. In its lower part (River Cuenca), its only possible use corresponds to the "transport and assimilation of waste." In general, in the headwaters of the rivers, the bacteriological quality is satisfactory. Still, this quality begins to deteriorate gradually from the middle part, experiencing a notable degradation in the city's urban area. This occurs with not only the bacteriological quality but also all the characteristics evaluated (...). Bacterial contamination constitutes the biggest problem in the quality of the receiving bodies, thus representing a public health problem (Pauta et al., 2019, p. 86).

Such evaluation coincides with the Planning Directorate of the Municipality of Cuenca reports. This entity points out that according to the BMWP⁴ index, even though it has been shown that most of the fluvial bodies in the area are characterized by 'immaculate waters,' specific points in the upper river basins have been affected by anthropogenic activities. This situation is evident when the watercourses cross populated areas or agricultural zones, reflecting values attributed to 'heavily polluted waters' (Dirección de Planificación, 2021a, pp. 251 - 255). For this reason, adequate urban planning is essential to ensure that wastewater for domestic or industrial use does not reach the receiving water bodies.

2.2.1.2. Air quality

For adequate air quality management, it is essential to have atmospheric control mechanisms since their study is of interest to public health. In Cuenca, since 2008, the Municipality has carried out monitoring through the Cuenca Air Quality Monitoring Network. The *Empresa Pública Municipal de Movilidad, Tránsito y Transporte de Cuenca* [Municipal Public Company of Mobility, Transit and Transport of Cuenca] (in its acronym EMOV EP, which in this study, it will

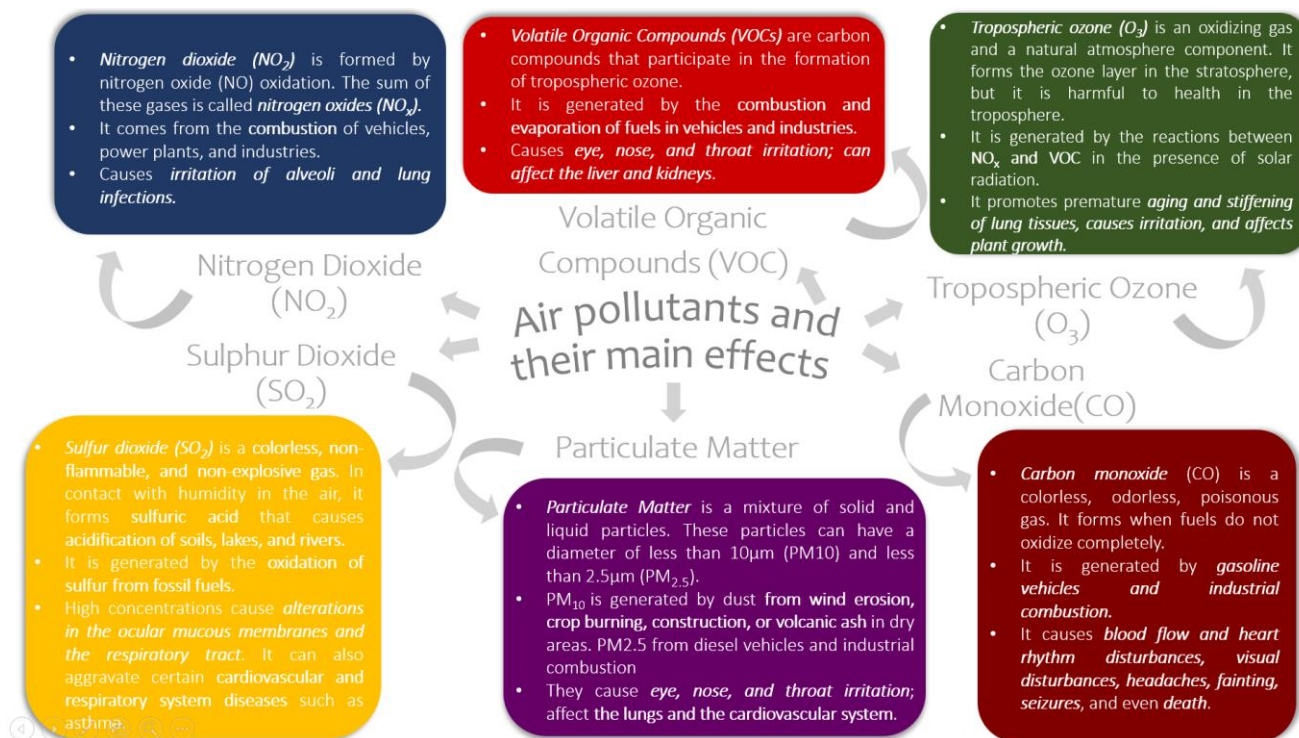
⁴ BMWP Index, Biological Monitoring Working Party, is a biological monitoring that records the presence of aquatic macroinvertebrates in a given watercourse; to which, a score is attributed according to their tolerance to organic contamination (Leaño and Pérez, 2020).

be called EMOV) is in charge of making periodic reports on air quality in the urban area of the Canton. (Dirección de Planificación, 2021a, p. 255).

The municipal agencies in charge report the presence of pollutants in the air, which adversely affects the area’s natural environment and the inhabitants’ health. Figure 9 summarizes the primary air pollutants and their impact on health. In the case of Cuenca, the primary source of pollutant emissions into the atmosphere is vehicular traffic. In this sense, the EMOV (2020) reports that vehicular traffic is responsible for the emission of 94.5% of carbon monoxide (CO), 71.2% of nitrogen oxides (NO_x), 39.6% of volatile organic compounds other than methane (NMVOC), 42.5% of fine particulate matter (PM_{2.5}) and 55.6% of particulate matter less than 10 microns (PM₁₀). Other emission sources of the pollutants previously described are thermal sources, solvents, and artisanal brickyards (p. 32).

Figure 9:

Air pollutants and their main effects on health



Note: The image was prepared by authors using information from the document “Informe de Calidad de Aire Cuenca 2020” [Air Quality Report of Cuenca 2020] by EMOV (2020).

2.2.1.3. Noise

Noise pollution is another environmental factor that affects the health of the population. Exposure to high noise levels can cause physical discomforts such as degradation of hearing or stress, anxiety, and insomnia. In this framework, the World Health Organization (WHO) has recommended that the noise level in the open air should not exceed 55dB⁵. Still, only traffic in cities produces 80dB (Martínez and Delgado 2015). For this reason, noise monitoring is essential, especially in urban centers.

The Noise Map is a tool that allows for evaluating noise pollution in urban areas and, based on the results, elaborates an action plan. With this premise, the Mayor's Office of Cuenca, through the *Comisión de Gestión Ambiental* [Environmental Management Commission] (CGA) -in collaboration with the University of Azuay and the Institute of Sectional Regime Studies of Ecuador (IERSE for its acronym in Spanish)- has developed City's environmental noise monitoring project to determine the citizens' exposure. Monitoring occurs at 31 strategic points in the city during six predefined schedules (Dirección de Planificación, 2021a, p. 264; Universidad del Azuay and IERSE, 202).

The report "Ruido en Cuenca 2012-2018" [Noise in Cuenca 2012 - 2018] of the Mayor's Office of Cuenca and the University of Azuay (2018) determines the critical times of greatest noise are at 7:00 a.m., 1:00 p.m. and 6:00 p.m. Which coincides with the peak hours of vehicle traffic (see Figure 10). Another factor that increases vehicular traffic, and therefore noise pollution, is that Cuenca is "a pole of regional development" (Alcaldía de Cuenca y Universidad del Azuay, 2018, p.7). That is why people from the neighboring provinces of Cañar, Morona Santiago, Loja, and El Oro travel daily.

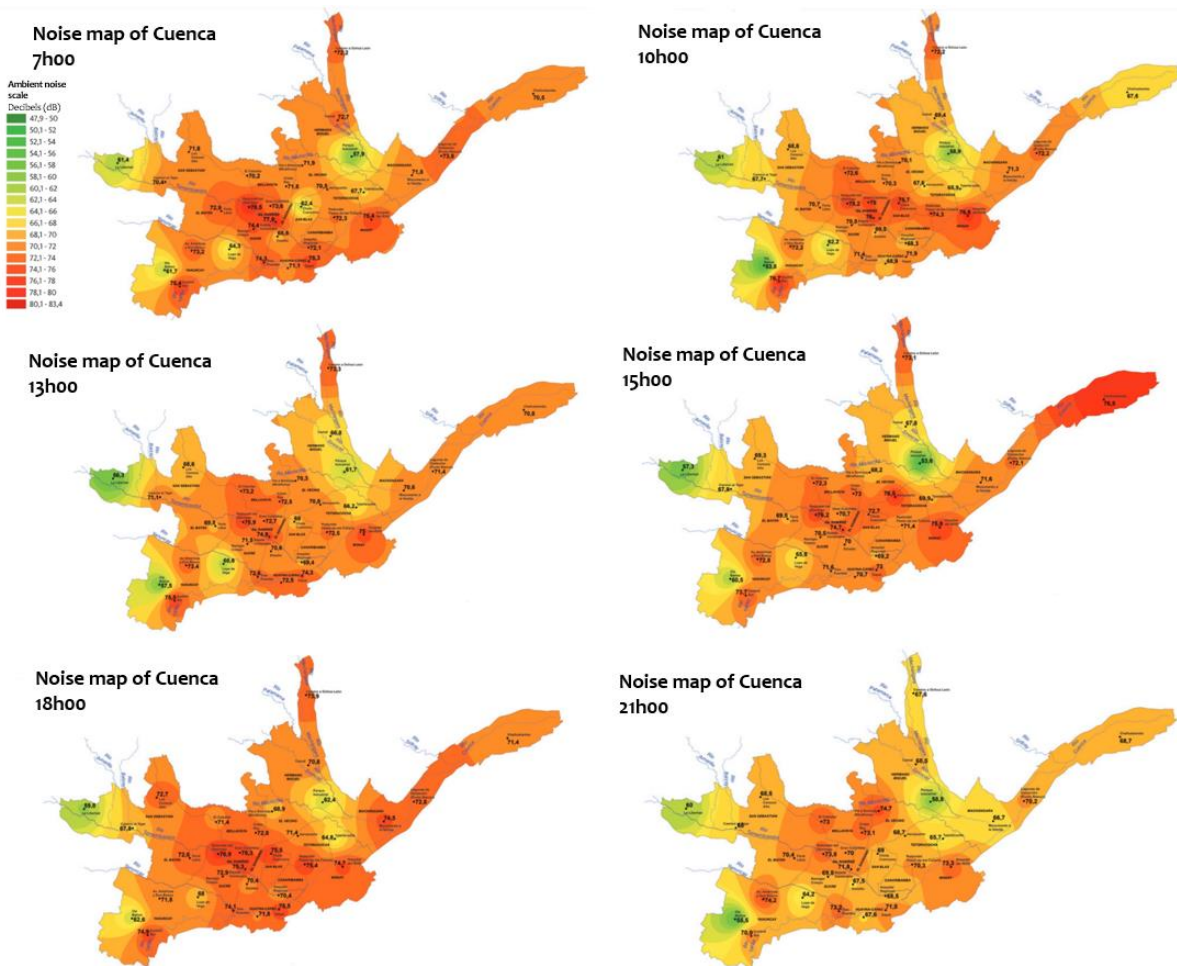
In 2020, due to mobility restrictions caused by the COVID-19 pandemic, there was a significant decrease in ambient noise in the city, "especially in commercial areas such as Remigio Crespo street at night when records the greatest reduction of up to 91% of the sound levels in April compared to February" (Universidad del Azuay and IERSE, 2020).

⁵ dB is the symbol for decibel which is a unit used to measure the intensity of sound.

In 2020, there was a decrease in the noise levels during the quarantine months. However, by October 2021, there was a 30% noise increase during night hours at the Remigio Crespo station - which had decreased during the quarantine-. The same occurred in other stations, such as the Industrial Park and Totoracocha (Universidad del Azuay and IERSE, 2021). With the recorded data, it can be concluded that the return of social activities has contributed to the increase in noise emissions, which must be considered by the municipal authorities to avoid noise disturbances to the inhabitants.

Figure 10:

Cuenca's noise map 2018



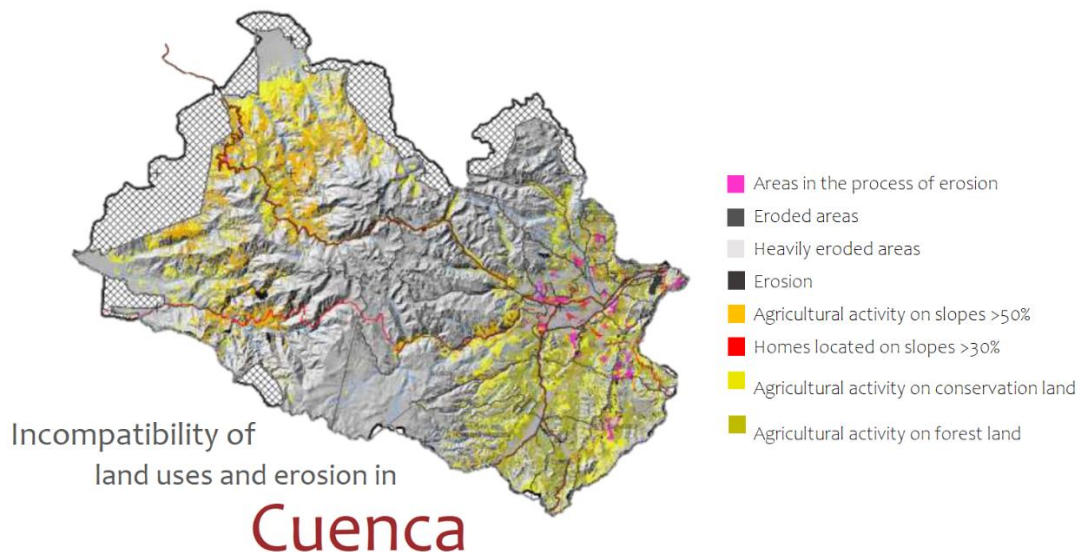
Note: The image was adapted from “Ruido en Cuenca 2012-2018” [Noise in Cuenca 2012-2018] by Alcandía de Cuenca & Universidad del Azuay (2018). <https://publicaciones.uazuay.edu.ec/index.php/ceuzuay/catalog/book/95>

2.2.1.4. Soil erosion and degradation due to incompatibility of use

The Territory Utilization Capacity (TUC) is an input that allows “defining the aptitude of the land to carry out activities” (Dirección de Planificación, 2021a, p. 269). The PDOT Diagnosis 2021 of the canton of Cuenca reports that almost 34% of the territory presents incompatibilities of use that do not allow for achieving a sustainable territorial model. The development of agricultural activities on conservation soils or steep slopes is one of the main factors that degrade the territory (Dirección de Planificación, 2021a, p. 271) (see Figure 11).

Figure 11:

Map of incompatibility of land uses and erosion in the Canton of Cuenca



Note: The image was adapted from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

The previous map shows that agricultural activities threaten fragile conservation ecosystems in the inter-Andean valley. In the central zone, the livestock and tourist activities are the ones that have the most impact on the moorland area. On the other hand, in the extreme east area of the map are the zones primarily impacted by erosion, the erosion process, and houses located on slopes,

resulting in a space that requires control and attention to avoid degradation (Dirección de Planificación, 2021a, p. 269).

Finally, it should be noted that agricultural activities are carried out on conservation land in more than 17% of the cantonal territory (see Table 4). A possible explanation for the phenomenon of displacement of agro-productive activities on natural ecosystems is the advance of the urban sprawl that puts pressure on farmers and farmers (Dirección de Planificación, 2021a, p. 271). That is another of the reasons why urban expansion must be planned in an organized and compact way to avoid the degradation of peripheral rural areas.

Table 4:

Percentage of the territory that presents incompatibility of land uses and erosion

Incompatibility of land uses and erosion	Committed hectares (HA)	Percentage of cantonal territory
Areas in the process of erosion	2,667.3	0.8%
Eroded areas	1,323.7	0.4%
Heavily eroded areas	1,074.1	0.3%
Erosion	1,865.8	0.6%
Agricultural activity on slopes >50%	21,163.1	6.6%
Homes located on slopes >30%	1,320.5	0.4%
Agricultural activity on conservation land	55,166.8	17.3%
Agricultural activity on forest land	23,741.4	7.4%
TOTAL	108,322.6	33.9%

Note: The table was prepared by authors using information from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

2.2.2. Diagnosis of the sociocultural system

This section will study the population dynamics, access and quality of essential services, housing conditions, level of education, health, and security, among others. Analyzing these and

other variables is necessary to identify the problems that afflict the inhabitants of Cuenca and prioritize plans that allow them to improve their living conditions. The diagnosis of the socio-cultural system will allow generating a first look at the social patterns of Cuenca, which will later serve as a guide for the development of *Chapter III*.

The PDOT of the Canton presents sustainable human development for the “construction of social and cultural policies that guarantee the exercise of individual and collective rights, territorial, intergenerational and gender equity, participation in cultural life and management of cultural heritage” as one of the backbone objectives of planning (Dirección de Planificación, 2021a, p. 297). The following subsection will be presented an analysis of the residents’ situation concerning the poverty rate, state of their homes, access to education, health, social security, attention to priority groups, citizen security, and the situation of domestic violence and urban mobility.





2.2.1.1. Poverty

Poverty can be measured through two methods. The first determines the number of people who live with a per capita income below the established poverty line. The second is called the direct method or poverty by NBI, which is evaluated based on the satisfaction of basic needs. In this sense, the Andean Community of Nations suggests that a household be defined as poor by NBI when the residential dwelling has inadequate characteristics, inefficient basic services, is in a state of critical overcrowding, and household children between 6 and 12 years of age do not attend school (Dirección de Planificación, 2021a, p. 327).

For a household to be considered poor, it must experience at least one of the previously detailed deprivations (see Table 5). In the case of Cuenca, the urban areas concentrate the most significant number of poor households by NBI, particularly in the parishes of Chaucha, Molleturo, Quingeo, and Victoria del Portete (Dirección de Planificación, 2021a, p. 328).

Table 5:

Index of poverty factors in rural and urban areas of Cuenca

Poverty in Cuenca				
	Housing with deficiencies	Poor water supply	Critically overcrowded households	School absence
				
Urban zone	0.30%	2.84%	9.16%	1.43%
Rural zone	1.57%	18.80%	14.08%	3.08%

Note: The image was prepared by authors using information from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

Regarding income poverty, the line has been drawn in \$54.64 income per month and below \$31.92 per month for extreme poverty. In September 2019, Cuenca was estimated to have the lowest poverty rate nationwide with 4.3%, while cities such as Quito and Machala had the highest percentages with 11.2% and 10.3%, respectively (Dirección de Planificación, 2021a, p. 330). Therefore, poverty in Cuenca is below the national average, although there is still 4.3% of the city population that lives in poverty and must be considered.

2.2.1.2. Housing

Segregation zones are not very notable in Cuenca, but it does not mean that there are no problems related to housing. According to the Population and Housing Census 2010, the number of dwellings in Cuenca was 174,579, 63% of the whole province. Of the registered dwellings, only 46.66% belong to the people living there, while 32.28% are leased, and 12.64% are loaned or assigned (Dirección de Planificación, 2021a). This fact highlights the need to create programs that allow Cuenca’s families to access financing to acquire their own homes.

Household Access to basic services

Access to services such as water, electricity, garbage collection, and disposal infrastructure is a clear indicator of the quality of life of the inhabitants and a sample of the social well-being of citizens. This section compares the coverage of services in Cuenca's urban and rural areas to identify if any of them require attention.

Cuenca has the highest level of water coverage in the country, reaching 96.92% through its public network. However, in rural areas, the coverage drops to 70.14%. Although it is higher than the national (45.92%) and provincial (60.55%) average, it is evident that the rural area has a disadvantage compared to the urban area. This situation has forced 21.38% of rural households to use water from rivers, springs, or canals and 3.79% from rainwater (Dirección de Planificación, 2021a, p. 315).

The electricity service coverage of homes in Cuenca goes to 97.84%. In the urban area, coverage is almost complete; however, in rural areas, although the level is higher than the average national and provincial levels, there has been an increase in the number of homes that do not have this service (Dirección de Planificación, 2021a, p. 316). Regarding garbage collection and disposal, 98.8% of households have this service, the highest coverage rate in the region. Although garbage trucks have access to urban areas, many households dump waste in vacant lots, streams, or rivers (Dirección de Planificación, 2021a, p. 316).

Finally, in the urban area, the public sewage network for excreta disposal covers 94.33% of the territory. However, 29.36% of households in rural areas do not have a good infrastructure for this purpose, resulting in waste disposal in wells, streams, or latrines (Dirección de Planificación, 2021a, pp. 315-316).

2.2.1.3. Education

The education levels are above the national average. For example, Cuenca has an illiteracy rate of 2.5%, lower than the national rate (6.5%). However, although the local index is lower than the average registered in the country, there is still work to ensure that the population has at least basic instruction (Dirección de Planificación, 2021a, p. 309).

Another problem regarding education in Cuenca is school dropouts. For the 2016 – 2017 course, 1,757 students did not continue their education. The most significant number of students who left the school belong to the rural area, whose dropout rate is 2% higher than the provincial rate. In addition, the most significant number of people who have not accessed the education system are women -of 15,000 registered cases, 11,183 are women, and 4,600 are men- (Dirección de Planificación, 2021a, p.10).

Finally, in Cuenca, there is a considerable asymmetry between the urban and rural areas concerning the number of students per teacher. For the 2018 – 2019 course, there was one teacher for ten students in the urban area, while in the rural area, there was one teacher for 34 students (Dirección de Planificación, 2021a, p. 10). That evidence shows that schools in rural areas need teachers to ensure adequate instruction for students.

2.2.1.4. Health

The health system in Cuenca is divided into two districts and has 49 public health establishments (Dirección de Planificación, 2021a, p. 317). The leading causes of morbidity⁶ in Cuenca are diseases such as rhinopharyngitis, tonsillitis, acute pharyngitis, diarrhea, parasitosis, bronchitis, tonsillitis, headache, and hypertension (Dirección de Planificación, 2021a, p. 319). Therefore, healthcare centers with the personnel and supplies to treat them are required.

Another area that should be analyzed is teenage pregnancy in Cuenca. It was reported that, in 2018, there were 50.4 births for every 1,000 adolescent women between 15 and 19 years old, and 80.9% were from the rural sector (Dirección de Planificación, 2021a). That reality negatively impacts the studies of young women, who also have difficulties entering the labor market. If they do, the conditions and wages are poor, making it difficult for them to have full economic solvency to achieve a decent life.

Finally, given the current situation, it is necessary to analyze the impact of the COVID-19 pandemic on the health of the people of Cuenca. According to preliminary data, 80% of the

⁶ Morbidity is the rate of people who get sick in a place during a given period, in relation to the total population (Real Academia Española, 2021).

infected people in Cuenca did not have symptoms or were mild, 20% severely presented the disease, and 5% required intensive care and monitoring. Additionally, the highest number of positive cases occurred among people between 20 and 49 years old (Dirección de Planificación, 2021a, p. 325).

The report of the Planning Directorate found a correlation between COVID-19 infections and external factors such as income level and the use of public transport. Some findings were that using public transport increases the risk of contracting the virus by 1.35 times more than traveling by private vehicle. Similarly, households with less than \$200 monthly incomes have the highest prevalence⁷ (15.84%) compared to those with incomes higher than \$1,500, who present a prevalence of 7.37%. In addition, street sellers have a higher prevalence of 29.17% (Dirección de Planificación, 2021a, pp. 326 - 328).

With that data, it is possible to establish connections to prove that economically vulnerable people have a higher risk of contagion. For that reason, policies should promote better working conditions and sanitation of public places -with particular emphasis on public transport- to prevent it from becoming a critical factor in infection.

2.2.1.5. Social security

Social Security -understood as the state service aimed at preventing and caring for society's welfare- operates by providing benefits in health, pensions, and bonds through mortgages and unsecured loans (Porrás, 2015). In the case of Cuenca, the population affiliated with the *Ecuadorian Social Security Institute* (IESS in its Spanish acronym), under a dependency relationship, in the public sector had a balanced percentage between men and women with 49.18% and 50.82%, respectively. This relationship is the opposite in the private sector since 56.48% of affiliates are men and 43.52% are women. With these data, it is concluded that more men are working in the private sector, which, in turn, shows the need to create mechanisms that promote gender equality to reduce the gap (Dirección de Planificación, 2021a pp. 331 - 332).

⁷ Prevalence is the frequency of all cases of a pathological disease at a time or period (Real Academia Española, 2022)

2.2.1.6. Priority care groups

In Ecuador, the 2008 Constitution defines the rights of Priority Care Groups. Article 35 determines that:

The elderly, children and adolescents, pregnant women, people with disabilities, people deprived of their liberty and those suffering from catastrophic or highly complex illnesses will receive priority and specialized care in the public and private spheres. The same priority attention will be given to people at risk, victims of domestic and sexual violence, child abuse, natural or anthropogenic disasters. The State will provide special protection to people in a condition of double vulnerability (Asamblea Constituyente, 2008).

With that definition, the local government of Cuenca, through its Planning Directorate, has compiled a series of indicators regarding the principal vulnerabilities of the priority attention groups previously described. The main findings of the municipality on the needs and difficulties of the most vulnerable sectors that need attention are the next.

There are two threats to their well-being and development in the children and teenagers' group: child labor and chronic malnutrition. The 0.84% of children between 5 and 11 years old have been involved in any work activity. The number rises to 13.42% for the teenager population. Chronic child malnutrition refers to boys and girls under five years old who are stunted. In Cuenca, 14.6% of children and teenagers have short stature and severe short stature in the urban area, while the percentage for children in rural areas increases to 20.7% (Dirección de Planificación, 2021a, p. 334–335).

Regarding the young population of the Canton, it was reported that only 43.05% of young people with higher education have a job (Dirección de Planificación, 2021a, p. 336). Policies should address this situation to ensure that this population sector can enter working life and be financially solvent to boost the local economy. On the other hand, barely 30% of the elderly population has social security (p. 338). That means that more than 70% of people over 65 years old do not have a retirement pension that ensures a fixed income to meet their food, housing, or medical care needs.

Finally, Cuenca reports that about 16.94% of the population, older than five years, self-identified as part of some nationality -Kichwa, Kañari, Puruhá, Shuar, Otavalo, Achuar, Panzaleo, Kayambi, among others- cannot read or write. Besides, of the members of working age, 50% do not have a job (Dirección de Planificación, 2021a, p. 339). The situations described above reveal the primary unsatisfied needs of some priority attention groups, for which the efforts of the public administration must align to satisfy and attend to said demands.

2.2.1.7. Citizen safety

It refers to the States responsibility to create the appropriate conditions for citizens to live in a safe environment, free of violence and access to public space. With that idea, local governments and authorities work to eliminate criminal acts and violence in society.

It was reported that the most relevant social problem in Cuenca is domestic violence. Despite a decrease of 10.82% of the complaints made during 2019, it should be considered that a significant number of cases are not reported year after year. Additionally, it indicates that more than 82.35% of the crimes registered in Cuenca are due to physical injuries, 9.15% are due to robbery or theft, and 5.51% are due to theft or theft of vehicles. Regarding the homicide and assassination rate of the canton, it decreased between the years 2018 and 2019. For every 100 thousand residents, the homicide rate in 2018 was 5.4 people, while for 2019, it dropped to 4.79 people (Dirección de Planificación, 2021a, p. 346).

Another security problem that authorities must address is sexual crimes. In Cuenca, these kinds of crimes increased from 2016 to 2019. In 45% of the reported cases, the victims were between 13 to 17 years old. Even more alarming, in 15% of cases, the victims were between 10 and 12 years old. Finally, 91% of the complaints about crimes of this nature were made by women (Dirección de Planificación, 2021a, p. 348).

2.2.1.8. Domestic violence

Domestic violence, whether physical, psychological, or sexual abuse, is a problem that local authorities must also address because it shocks the stability of the social structure. In 2019, more than 45% of domestic violence cases were caused by psychological aggression, while 23% of cases

were due to physical aggression and 21% were due to intimidation of the victim (Dirección de Planificación, 2021a, p.353).

The confinement due to COVID-19 is worth analyzing since that led to episodes of domestic violence. The Prosecutor's Office reported that they received 2,302 complaints of violence against members of the family group or women, including sexual abuse, sexual harassment, rape, and physical or psychological violence. Although the Prosecutor's Office showed a decrease in the number of complaints between March and May 2020, during the same period, ECU 911 recorded the highest peaks in reports of domestic violence (Dirección de Planificación, 2021a, p. 355).

This paradox is because, during the months of the highest mobility restrictions, domestic violence cases did not cease. No complaints were registered in the Prosecutor's Office since public institutions attended irregularly due to confinement measures. Therefore, it is valid and necessary that public management take action to avoid such violent situations.

2.2.1.9. Migration

Migration is a characteristic and known phenomenon in Cuenca. The origin of the migrant population of the city is mainly from the rural parishes. The parishes of Sinincay, El Valle, and Baños are the most representative, with 13.04% of the total migrant population of Cuenca. The main factor contributing to this phenomenon is the lack of employment and economic difficulties, coinciding that the most frequent age range of migrants is between 15 and 34 years old (Dirección de Planificación, 2021a, p. 340-341). That implies a significant loss of human talent for the city since they are among the economically active population.

On the other hand, Cuenca is not a territory that only sends migrants but has also welcomed people from various countries such as the United States -primarily retirees- Colombia, Peru, and, recently, Venezuela. In 2018, the number of visas issued to Venezuelans doubled 2017. In 2018, 1,258 visas were issued compared to the 647 granted the previous year (Dirección de Planificación, 2021a, p. 343). However, this figure does not reflect the actual number of Venezuelan immigrants in the city since data estimates that about 12,876 Venezuelans lived in Cuenca in 2020; which represents 2.7% of the total Venezuelan population living in Ecuador for that year (R4V, 2020; cited in Poma, 2020, p. 13).

By 2021, according to reports from the *Interagency Coordination Program for Refugees and Migrants from Venezuela* (R4V, 2021), the number of Venezuelan migrants in Ecuador has risen to 508,935 people. In the same document, they detail that, in Cuenca, there is a deficiency of shelter houses to attend to the refugees, which causes a situation of overcrowding. Some other needs of this group are food security, access to the labor market with fair remuneration, and access to health and education services. Improving the living conditions of immigrant families prevents the triggering of other social problems such as poverty and crime due to the precariousness of living conditions.

2.2.1.10. Culture

Cuenca has stood out for its architectural richness, archaeological remains, and cultural manifestations. The city was recognized as a *Cultural Heritage of Ecuador* in 1982 and a *Cultural Heritage of Humanity* by UNESCO in 1999 (Instituto Nacional de Patrimonio Cultural, 2021). Additionally, Cuenca was part of the pilot cities to implement *Agenda 21 for Culture* and *Culture 21 Actions*, promoted by the UCLG Committee on Culture to “turn culture into the fourth axis of sustainable development in the Canton” (Dirección General de Cultura, Recreación y Conocimiento, 2018, p. 7).

In 2018, it was an evaluation regarding the measures prepared by the 2015 global panel of experts for *Culture 21*, and Cuenca stood out by obtaining a score higher than the world average in eight of the nine topics raised (Dirección General de Cultura, Recreación y Conocimiento, 2018, p. 20). However, in the most recent updates of the PDOT, some challenges related to cultural management in Cuenca have been identified, among which are: the lack of comprehensive cultural policies that actively involve priority attention groups, a high concentration of cultural goods and services in the urban area, especially in the Historical Center, and gender employment gap. This last case is evident from the data obtained from the *2010 Economic Census*, which reports that, of the total number of cultural employees in Cuenca, 1,408 were men and 639 women (Dirección de Planificación, 2021a, pp. 359 - 494).

The Municipality of Cuenca is working to decentralize the services and cultural assets of the Historical Center. For example, through its Municipal Library Network project, which has under

its administration 21 of the 29 existing public libraries, and these “are distributed in each of the rural parishes, as well as the historic center” (Dirección de Planificación, 2021a, p. 409). Nevertheless, the administration still needs to:

(...) to build other centralities for culture or the deconcentrating of culture throughout the cantonal territory, providing quality cultural services and contributing to the improvement of the tourism sector, which is a boost within the social and solidarity economy, to sustainability and caring for the environment, and the growth and strengthening of research, allowing the involvement of the academy and the different sectors of culture, science, technology (Dirección de Planificación, 2021a, p. 410).

In this way, the local government has the challenge of ensuring that all residents have access to their cultural rights under similar conditions to strengthen citizens’ personal and social development.

2.2.2. Diagnosis of the economic system

This section prelude studies the city’s economic system through the analysis of the main sectors of the economy of Cuenca and the employment conditions of its residents. Finally, it is emphasized the evaluation of the impact of the COVID-19 pandemic on the city’s economy since it has been the main trigger for the closure of local businesses and the subsequent loss of jobs.

2.2.2.1. Productive structure

The employment behavior in the economic sectors allows us to understand the labor dynamics in the territory. In this sense, the most contributing economic activities to the cantonal *Gross Value Added (GVA)*⁸ are construction with 22%, manufacturing with 18%, and commerce with 12% (see Figure 12) (Dirección de Planificación, 2021a, p. 505). On the other hand, the

⁸ Gross Value Added (GVA) is a macroeconomic magnitude that measures the total value created by a sector. In other words, it is the set of goods and services produced during a period discounting indirect taxes and intermediate consumption (Economipedia, 2022).

sectors that generate the most annual income from services are the manufacturing sector with \$4,900 million, the commerce sector with \$3,174 million, and the services sector with \$1,981 million (Dirección de Planificación, 2021a, p. 507).

Regarding the sectors that concentrate the most significant number of workers in the city, it stands out: commerce with 24.38% and manufacturing with 16.78%. Other sectors that have significant participation in the labor occupation are teaching, accommodation and food service activities, human health care, and transportation (see Table 6) (Dirección de Planificación, 2021a, pp. 509 - 510).

Figure 12:

Gross Value Added by economic activity in Cuenca



Note: The image was adapted from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

Table 6:

Employed by economic activity in Cuenca

Economic Activity	Cuenca	
	Occupied	Share
Wholesale and retail; repair of motor vehicles and motorcycles	40986	24.38%
Manufacturing industries	28,220	16.78%
Teaching	13,697	8.15%
Lodging and catering activities	12,754	7.59%
Human health care and social assistance activities	9,678	5.76%
Transport and storage	9,253	5.50%
Professional, scientific and technical activities	7,897	4.70%
Construction	7,617	4.53%
Public administration and defense; compulsory social security plans	7,368	4.38%
Administrative and support service activities	6,057	3.60%
Agriculture, forestry and fishing	5,034	2.99%
Other service activities	4,758	2.83%
Activities of households as employers; undifferentiated activities of households as producers of goods or services for their own use	4,159	2.47%
Financial and insurance activities	3,661	2.18%
Information and communication	2,316	1.38%
Arts, entertainment and recreation	1,560	0.93%
Water distribution, sewage, waste management and sanitation activities	1,186	0.71%
Real estate activities	907	0.54%
Supply of electricity, gas, steam and air conditioning	880	0.52%
Exploitation of mines and quarries	156	0.09%
Total occupied	168,145	100%

Note: The table was adapted from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

On the other hand, agriculture is the sector that has the highest average annual growth rate with 7.91%, followed by the manufacturing industry with 6.82% and services with 6.26%. In addition, the average annual growth rate of companies in Cuenca has been 5.5% -during the pre-pandemic period- (Dirección de Planificación, 2021a, p. 512-513). For 2018, the economically active population in Cuenca was 178,015 people, of which 94.46% were working. During the same year, 4.19% of people had more than one job, and 4.21% were in poverty. Finally, the unemployment rate in Cuenca remained at 5.54% during that period (Dirección de Planificación, 2021a, p. 355).

2.2.2.2. Impact of COVID-19 pandemic on the city's economy

The COVID-19 pandemic impacted the world's economic and labor dynamics, and Cuenca was no exception. In March 2020 -when the quarantine began- there were daily losses of \$8 million in the productive sector of Cuenca. In addition, during the most critical period of the pandemic, 42,000 jobs were lost (Beltrán, 2021). Only from April to June 2020, more than 11,000 people lost their jobs (Sánchez, 2021).

Unemployment is one of the most apparent ravages of the problems caused by the COVID-19 pandemic. The loss of employment is related to the closure, temporary or permanent, of hundreds of local businesses due to the drop in sales. In 2020, the sales of the leading industrial and commercial sectors fell by up to 50%, with the distribution of vehicles and white goods being the most affected (Beltrán, 2021). Besides, the rate of underemployment in the city -which in 2019 was 7.9%- increased to 17.8% in 2020 (Sánchez, 2021). The previous indicators reflect the instability and precarious working conditions during the health crisis, which has left consequences during the first months of 2021.

According to the *Technical Bulletin of Labor Market*, during the first quarter of 2021, the unemployment rate increased in several cities, such as Quito with 13.5%, Machala with 10%, and Cuenca with 8.2% (INEC, 2021a). Even though by September 2021, 39,000 of the 42,000 lost jobs during the pandemic were restored, recovery is slow, and some factors hinder recovery and growth in the medium term (Beltrán, 2021).

Among these external factors are the global container crisis, the lack of adequate road infrastructure that allows the productive sector to connect with the rest of the national and international markets, and the absence of air routes to Guayaquil -which is an important market for doing businesses- (Beltrán, 2021). These are the main challenges that the national and local governments must take on to ensure development for the city's families.

2.2.3. Diagnosis of the mobility, energy and connectivity system

By analyzing the mobility, energy, and connectivity system of Cuenca, it is possible to evaluate the conditions of transportation, telecommunications, and electricity distribution service

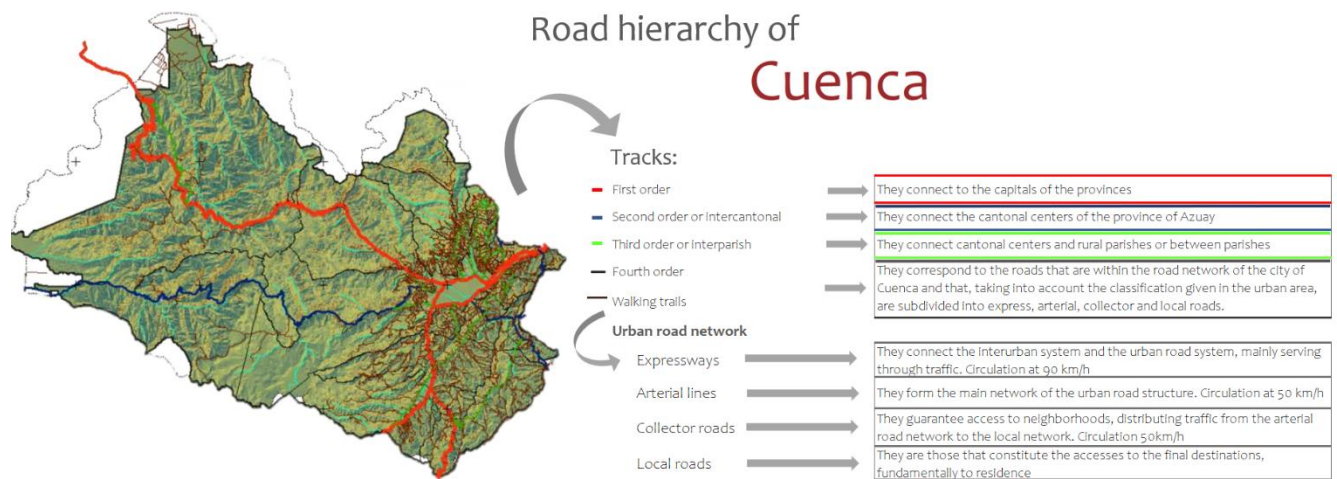
to detect shortcomings and create action plans. In this sense, the main findings on the weaknesses and strengths of each one is presented below.

2.2.3.1. Mobility

The road network of Cuenca is of four groups of roads that have the following hierarchy: first-order roads, second-order roads, third-order roads, fourth-order roads, express roads, arterial roads, collector roads, and local roads (see Figure 13). The *cantonal road network* allows the connection between the cantons of Azuay and other provinces of the country. This infrastructure is essential for transporting and selling products made in the area. On the other hand, the *urban road network* is made up of express, arterial, collector, and local roads, whose function is to guarantee the mobility of citizens within the urban perimeter and guarantee access to all areas of the city (Dirección de Planificación, 2021a, p. 642).

Figure 13:

Road hierarchy of Cuenca



Note: The image was prepared by authors using information from the document “Plan de Desarrollo y Ordenamiento Territorial del Cantón actualización 2015” [Development Plan and Territorial Planning of the Canton, updated 2015] by GAD Municipal Cuenca (2015).

The map shows that almost 80% of the road length is in the eastern zone. That is because of the concentration of the population in that zone. In addition, in the western zone, steep slopes contribute to the low road development of the area (GAD Municipal Cuenca, 2015, p. 467). As for the construction material of the roads, more than 40% are concrete -a paving material that is more durable than asphalt- the other 40% is asphalt, 14% cobblestone, and less than 1% dirt or ballast. This analysis makes it possible to assess that the road network is satisfactory, at least in the urban area. However, in rural parishes, the roads are not in optimal condition (Dirección de Planificación, 2021a, p. 643).

On the other hand, of the total flow of people who move from the rural parishes to the urban center -55% for work reasons and 30% for commercial reasons- 77% use a private vehicle as their primary means of transport (Dirección de Planificación, 2021a, p. 644). The use of motorized vehicles is one of the leading causes of pollution in the city. For that reason, it is essential to improve the inter-parish public transport service; since in rural areas, this service does not have proper terminals or signage that allows for identifying the transport route or destination, which discourages its use (Dirección de Planificación, 2021a, p. 650).

To improve urban mobility management, the Municipality of Cuenca presented the *Mobility and Public Spaces Plan* detailing non-motorized mobility projects such as routes for cyclists and pedestrians. In addition, it has promoted the change of the combustion transport system for more sustainable alternatives, such as the “4 rivers tram” that runs through the urban area of Cuenca. However, the benefits are only perceived in the city since there is no adequate infrastructure for people and bicycle circulation in the rural sector (Dirección de Planificación, 2021a, p. 652).

2.2.3.2. Telecommunications

Access to telecommunications networks such as cell phones, mobile phones, and the internet indicates the available infrastructure for population connectivity. Mobile connections and mobile internet coverage are 96% in populated areas and 85% on highways. Regarding landlines connection, 73.61% of the connections are in the urban area, and 26.39% are in the rural sector. Chaucha is the rural parish with the least number of connections (Dirección de Planificación, 2021a, p. 654).

Regarding internet coverage and supply, by August 2019, the number of connections in the canton was 75,791. Of them, 75.31% were from the urban area, and 24.69% were from the rural area (Dirección de Planificación, 2021a, p. 655). In this way, it is concluded that the inequality between the urban and rural areas is also presented in telecommunications.

2.2.3.3. Energy

The city has a 98.43% electricity coverage. The urban area has almost complete coverage of the service with 99.64%. However, some rural parishes barely reach 80%, as in the case of Chaucha and Molleturo (Dirección de Planificación, 2021a, p. 657). The generation of this energy comes from thermoelectric and hydroelectric plants that take advantage of the available resources of the environment.

In the case of hydroelectric plants, they take advantage of the water potential of the rivers in the area. In contrast, the generation of thermoelectric energy occurs thanks to the “decomposition of the organic matter deposited in the Pichachay Sanitary Landfill” (Dirección de Planificación, 2021a, p. 660). This plant receives about 500 tons of waste per day used to generate biogas. Then, the extracted gas is treated and purified in a bio-processor. The methane it contains serves as fuel to generate mechanical movement that, through an alternator, is converted into electrical energy. In this sense, “the benefits of the plant are multiple; clean electrical energy is obtained, GHG emissions are drastically reduced and it points to the change of social perception of solid waste” (Dirección de Planificación, 2021a, p. 660).

Thanks to this method, Cuenca became the first canton in the country to take advantage of waste to generate energy. This process has made it possible to supply 3,750 families in the rural sector with electricity, reducing pollution equivalent to 7 thousand vehicles (Dirección de Planificación, 2021a, p. 661).

2.2.4. Diagnosis of the institutional political system and citizen participation

Finally, this last section analyzes two large systems: the institutional political system and the citizen participation system. The first examines the city’s municipality’s organizational structure and institutional capacity, while the second analyzes the performance of current citizen

participation and accountability mechanisms. The proper functioning of these two systems allows the participation and inclusion of civil society in the city's political system, facilitating the ability to resolve conflicts and promoting complementarity in actions.

2.2.4.1. Analysis of the institutional political system

One of the needs detected within the Municipality was to maintain coherence and connection between the processes carried out concerning the institutional strategy. For this reason, the Municipality of Cuenca approved the *Organic Regulation of Organizational Management by Processes*. The organization and improvement of these procedures aim to improve municipal products and services. However, it also revealed a series of shortcomings within the municipal institution mentioned below.

The first weakness is not positioning the PDOT as the leading guide for every project within the territory. That is a problem for the administration and the land use planning since it is inconsistent with the hierarchy -which requires that the PDOT be the governing plan- and prevents the existence of a single action guide in urban development plans (Dirección de Planificación, 2021a, p. 805).

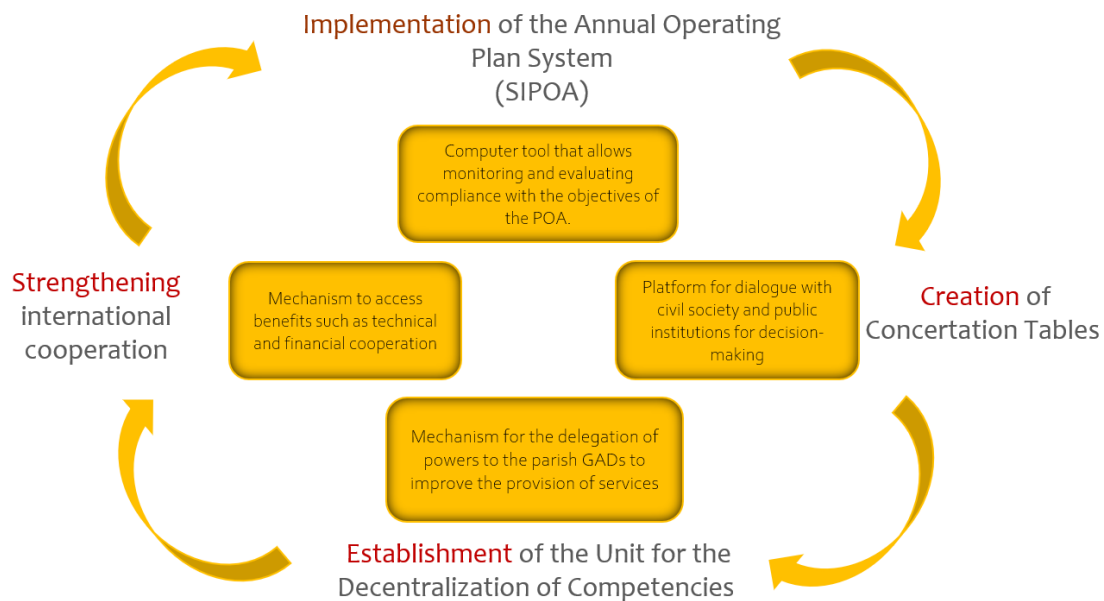
Second, when seeking to improve the quality of the processes, they discovered that there is a lack of coordination between institutions and other actors in the public sector (Dirección de Planificación, 2021a, p. 805), both inside and outside the canton, which delays synergy between dependencies and support for conflict resolution and project management. These deficiencies are reflected, for example, in the problems of existing communication channels, resulting in a decrease in the efficiency of companies, institutions, and civil servants. Additionally, there are difficulties in articulating timely responses to citizens' demands due to the lack of internal organization and communication channels with citizens. (Dirección de Planificación, 2021a, p. 806)

The Municipality launched a series of programs to minimize the impact of those problems and to find them a proper solution (see Figure 14).

Figure 14:

Responses to the flaws in Cuenca's institutional and political system

Responses to the shortcomings in **Cuenca** institutional political system



Note: The image was prepared by authors using information from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

2.2.4.2. Analysis of the citizen participation systems

Nowadays, several strategies seek to open public administration and management to the participation of a higher number of citizens (see Table 7). They, in turn, would play a promotion role in transparency and social control. As a result of the efforts to promote the citizen's active participation, between 2015 and 2018, there has been a 34.91% increase in participation in the Citizen Assemblies, representing 3,282 people (Dirección de Planificación, 2021a, p. 813). However, in the case of participation in mechanisms such as the General Commission, the participation of women is considerably lower than that of men (Dirección de Planificación, 2021a, p. 815).

Table 7:

Citizen Participation Mechanisms in Cuenca

Citizen Participation Mechanisms	Description
Citizen Assemblies	Space where the needs of the population are debated and prioritized.
Popular Councils	Instance of participation in open public sessions Cuenca there are the 'Council for the women of Cuenca' and the 'Council for the water of Cuenca'.
General Commission	Space intended for the approach of proposals, complaints and requirements that have not been met.
Advisory Councils	Through 10 Consultative Councils, specialized in different groups of priority attention, they are in charge of the operation of the system of integral protection of rights of the Cuenca canton.
Concertation Tables	Area for decision-making agreed between civil society actors, State institutions and local governments.

Note: The table was prepared by authors using information from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

In turn, the expansion of the actors related to the public administration would improve the attention to the demands and needs of the citizens. For that reason, the city developed a series of mechanisms that guarantee citizen participation and social control (see Table 8).

Table 8:

Social Control and Accountability Mechanisms

Social Control and Accountability Mechanisms	Description
Active Transparency	Enables the option of reviewing the Transparency of the Municipal Corporation through its website.
Corruption Prevention	Mechanism through which anti-corruption plans and programs are developed.
Open Council	Allows review of the minutes of the Council sessions.
Access to public information	Enables access to information through the Municipality's website
Annual operative plan	It remains permanently available to the public.
Open and transparent budget	It constantly monitors accounts and public spending.
Observatories accredited by the Council for Citizen Participation and Social Control	There are two control mechanisms that ensure the rights of different people in Cuenca: the Observatory for the Rights of domestic and companion animals in Azuay, and the Observatory for the Human Rights of the LGBTI population.
Accountability	Event presented by the highest authority of the city, which increases trust between authorities and citizens.
Citizen oversight	They inform, monitor and give their opinion on the performance of public management. In addition, they can request an accountability process.
Community defenders	Organization of communities that, through the Cantonal System for the Protection of Rights, seek the participation of the inhabitants of the canton and the protection of their rights.

Note: The table was prepared by authors using information from the document “Memoria Técnica de actualización de desarrollo y ordenamiento territorial diagnóstico” [Technical recollection for updating Development Plan and Territorial Planning - diagnostic] by Dirección de Planificación (2021a).

In summary, the analysis of the institutional political system and citizen participation system shows proposals to alleviate the problems identified in the administration. Nevertheless, there are still specific challenges to be solved in the following periods. In the first place, it should be noted that all the actions that the Municipality of Cuenca has taken have been covered by the legal framework that determines the capacities and jurisdictions of the city.

Second, despite various mechanisms for citizen participation, it is necessary to implement local policies that facilitate and expand access to a broader group of people since there is a disparity

in participation. Finally, although there are improvements in the planning of institutional processes -with successful results in terms of the efficiency of personnel and public resources- the improvement in articulation and coordination with other institutions and sectors of civil society is still pending.

It is concluded that the main challenge for the city in this century is to face the threats and risks of climate change while satisfying the needs and social rights of all its residents. However, it is essential to analyze this dilemma from a holistic perspective, contrasting the compromised natural systems and people's quality of life. Therefore, in the next chapter, the *City Portrait* methodological tool will be applied in Cuenca to evaluate the local and global impacts of socio-environmental management in Cuenca.

CHAPTER III

Cuenca's City Portrait

3.1. City Portrait Methodology

This chapter introduces the theoretical basis of the *City Portrait methodology: Doughnut Economics*. Then, it introduces the *Thriving Cities Initiative* (TCI) and the *Donut Economics Action Lab* (DEAL) as the entities that promote the application of this new methodology. Finally, it develops the City Portrait canvas for Cuenca. This tool will help to identify the city's current status in environmental and social matters.

3.1.1. City Portrait basics

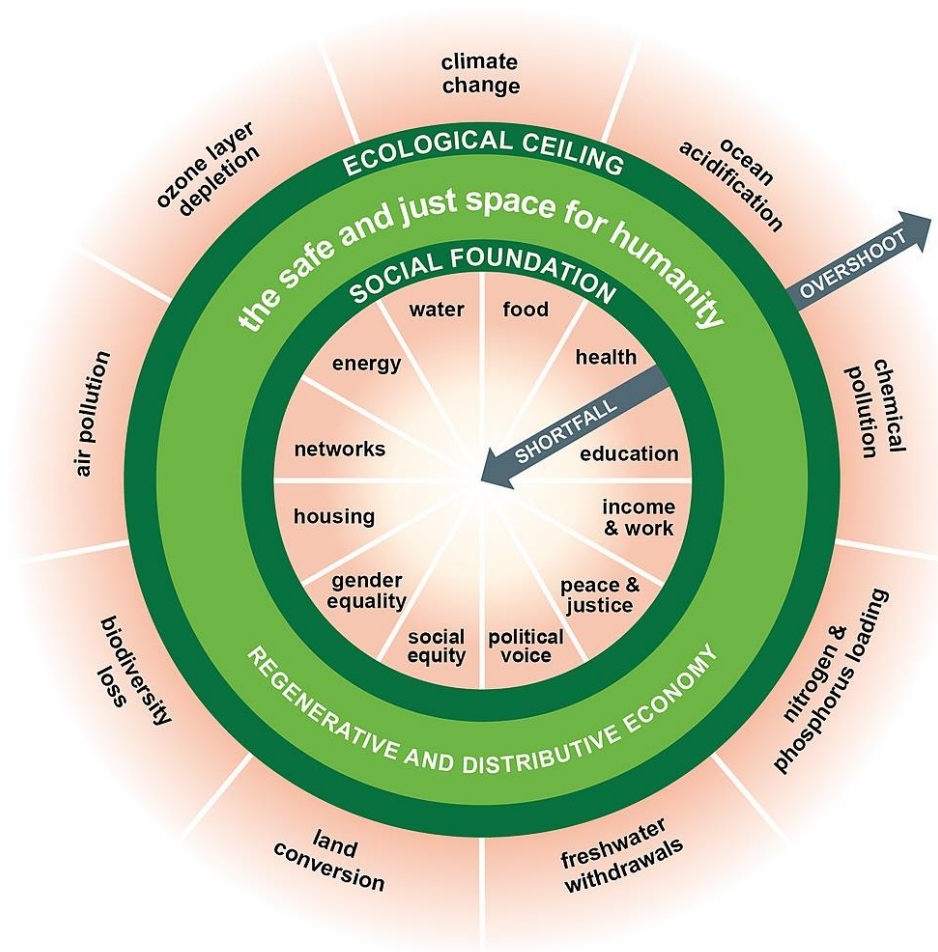
3.1.1.1. Doughnut Economics

Doughnut Economics (also known as *Donut Economics* or *Donut*) emerges as a new way of conceptualizing classic economy. It replaces the classic capitalist vision of infinite growth toward social justice and environmental sustainability. The author is Kate Raworth, a British economist inspired by the figure of a donut as a graphic metaphor to illustrate her new vision of economy (see Figure 15). First, Raworth lays the groundwork for her theory in his 2012 article *A Fair and Safe Space for Humanity*. Then, she developed it in her 2017 book *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist*.

Raworth proposes an alternative economic model based on the argument that the planet is suffering from severe ecological damage and, parallel, millions of people who cannot satisfy their most basic needs. This new theory seeks that all the people have the essential elements to live without going beyond the ecological ceiling of the planet (Raworth, 2017b), which would place humanity in a fair and safe space for its development. In this sense, the Doughnut Economy objective is far from the classic goal of economic growth and traditional theories.

Figure 15:

Kate Raworth's Doughnut Economics Illustration



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020). <https://doughnuteconomics.org/tools-and-stories/14>

The first thing about this theory is its double approach. On the one hand, it seeks to satisfy a series of basic needs to enjoy a decent life, grouped into what Raworth has called the *Social Foundation*. They are 12 fundamental aspects that guarantee a good and decent life: food, health, education, income and work, peace and justice, political voice, social equity, gender equality, housing, networks, energy, and water (Raworth, 2017b). These 12 essential aspects are based on the 2030 Sustainable Development Goals established by the United Nations, so governments

worldwide have agreed that these are rights that must be guaranteed to all their citizens (Sanz, 2021).

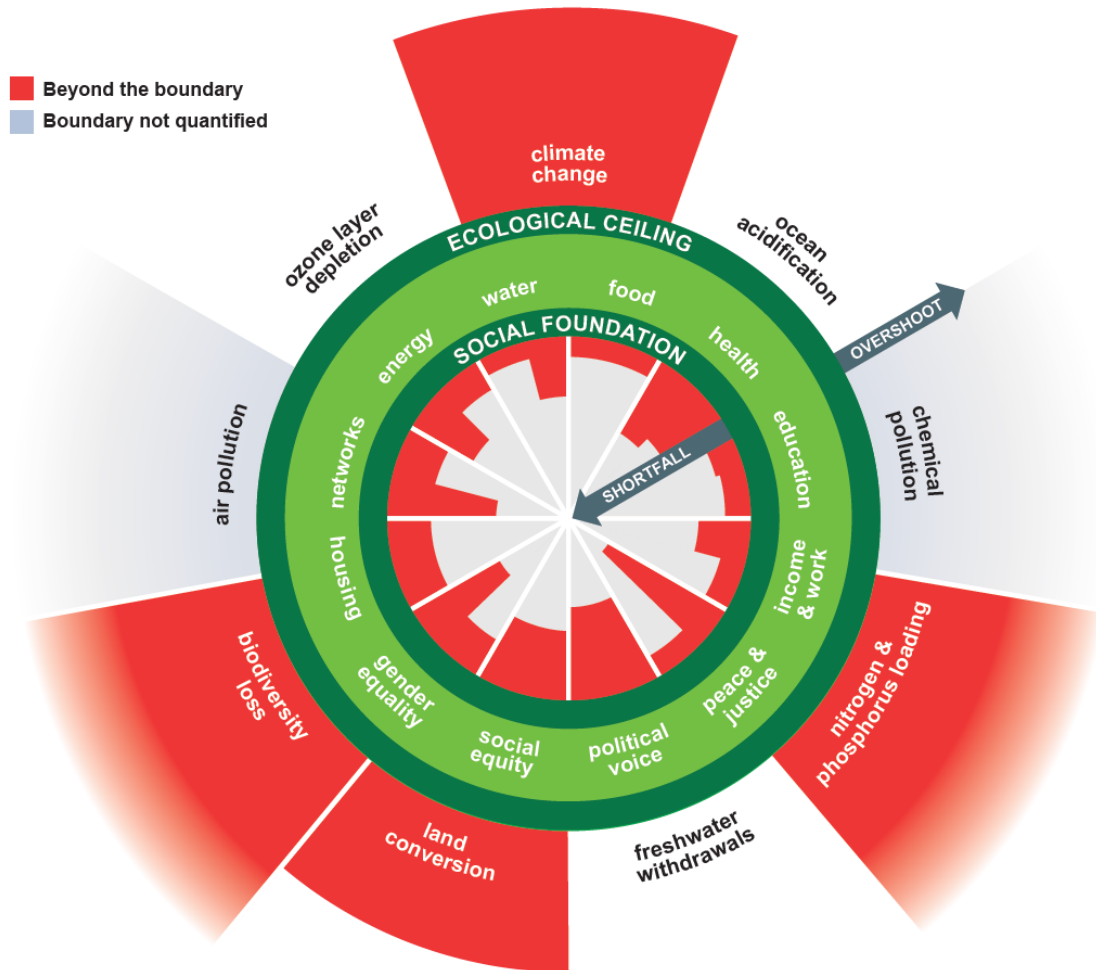
On the other hand, the Donut theory recognizes that meeting the elementary needs of people will require resources from the planet. Hence, the second conceptual framework of the Donut is the *Planetary Boundaries*. Developed by a group of scientists led by Johan Rockström and Will Steffen, this framework consists of nine planetary boundaries on which life on Earth rests. Processes such as climate change, ocean acidification, and freshwater use keep the planet balanced. However, when it is placed excessive pressure on them, the delicate balance of life on Earth is put at risk (Raworth, 2017a).

In this way, the inner green circle of the Donut (see Figure 15) represents the objective of the model. It seeks to satisfy people's essential needs -represented by the *Social Foundation* in the middle of the doughnut-; without exceeding the threshold established by the planetary boundaries -represented on the outside of the Donut-; so that humanity can live within an area that the author has called the *safe space* -represented by the green section-. Likewise, the Doughnut Economics aims to overthrow precepts of the traditional economy, such as the supremacy of the infinite growth and macroeconomic indicators such as GDP, or the preponderance of hypotheses such as the Kuznets Environmental Curve⁹ to justify environmental deterioration (Parra & Arango, 2018).

Nevertheless, the reality is still very far from Raworth's objective. *Figure 16* represents the current condition of social needs and planetary boundaries at the global level. The red-painted areas on the inside represent people that cannot meet their basic needs. On the outside are the exceeded boundaries on which too much pressure has been placed. For example, the 'health' space represents the 7 million people who die each year due to not having adequate medical care when breathing polluted air, which is also a reflection of climate change (PAHO, 2014). In other words, there are currently millions of people in the world who cannot satisfy the essential elements of life. At the same time, at least four of the nine limits set out in the Donut Model have already been exceeded (Sanz, 2021).

⁹ The Kuznets Environmental Curve analyzes the relationship between economic growth and environmental deterioration. It states that, in the short term, the environment deteriorates. However, in the long term, the wealth generated by economic growth reduces environmental damage (Falconí, Burbano, and Cango, n.d.)

Figure 16:
The Earth's Doughnut



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020). <https://doughnuteconomics.org/tools-and-stories/14>

3.1.1.2. Planetary Boundaries

The *Planetary Boundaries* are the second theoretical foundation of the City Portrait. It is a conceptual framework that consists of the diagnosis of nine biophysical processes that maintain

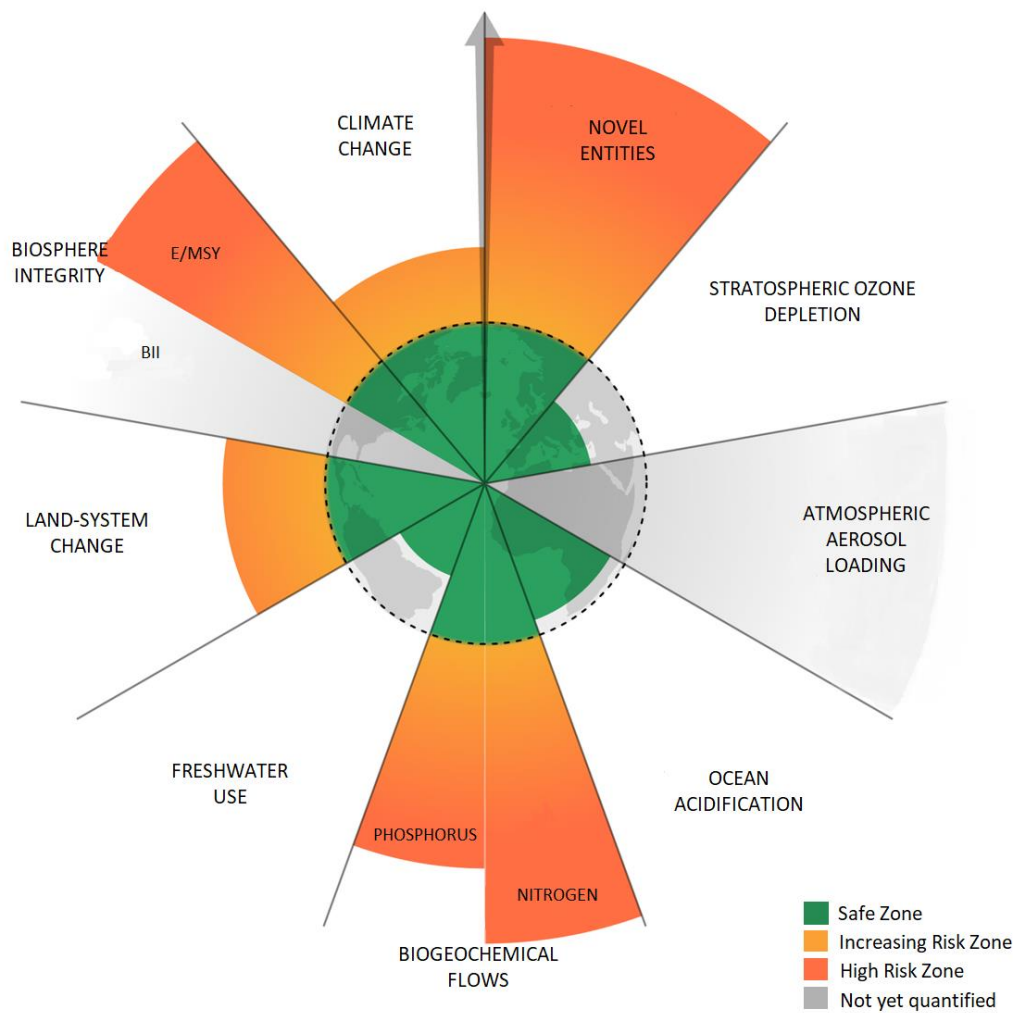
the stability of the *Earth System*¹⁰, which allow the planet to remain within its state of balance and resilience. In 2009, 29 scientists from the *Stockholm Resilience Center* (SRC) -led by Johan Rockström and Will Steffen- defined the nine processes and their associated limits for humanity to continue operating safely (Rockström et al., 2009). Rockström's model establishes that if humanity exceed the threshold established as 'safe' for these limits, irreversible environmental changes could be generated in the Earth System, triggering potentially catastrophic consequences (Terradas, 2009).

The SRC scientists determined that the nine fundamental processes to ensure the proper functioning of the earth system are: climate change, the incorporation of new entities, the ozone layer depletion, the aerosol load in the atmosphere, oceans acidification, biogeochemical flows (phosphorus and nitrogen cycles), freshwater withdrawals, land conversion, and biosphere integrity (also called biodiversity loss). They assigned quantifiable indicators for eight of the nine to determine whether that process is inside or outside the safe zone. For the rest: load of aerosols in the atmosphere, researchers have had more difficulty measuring it with a single specific indicator, which is why it has not yet been quantified (Terradas, 2009).

The status review of the nine processes is grouped into four levels represented by colors. The green color is used when the indicator is in the 'safe zone'. The yellow color is for an 'increasing risk zone'. The red color indicates the indicator is in the 'high-risk zone'. Finally, the gray color indicates that said process could not be quantified (see Figure 17). According to this model, exceeding the established limits would entail a series of catastrophic consequences globally, generating conditions "much less hospitable for the development of human societies" (Steffen et al., 2017. P. 737) However, according to its authors, five of these nine have already crossed the safe zone, mainly due to human activities (Steffen et al., 2015).

¹⁰ The Earth System refers to the interaction between the atmosphere, hydrosphere, geosphere, biosphere and heliosphere, whose physical, chemical and biological processes allow us to understand the Earth as an interconnected and complex system.

Figure 17:
Planetary Boundaries



Note: The image is from “Planetary boundaries.” by Stockholm Resilience Center (2022). Stockholm University.
<https://www.stockholmresilience.org/research/planetary-boundaries.html>

Currently, the nine processes are at different levels of the established thresholds. The following limits are in the red zone or ‘high-risk zone’:

- **Biosphere integrity:** this section refers to species loss and extinction. Although this is a natural process, the authors indicate that human interference has turned it into something massive. This process is essential to maintain the resilience of ecosystems since they depend on the genetic diversity of species to keep them functioning properly

in the long term. The model proposes the global extinction rate as an indicator, placing the loss limit at ten species per million per year (Rockström et al., 2009), which has been highly exceeded with a current rate of at least 100 species per million a year. In an update of the SRC, they propose a double indicator for the analysis of this limit. The first measures genetic diversity through the species extinction rate (E/MSY). The second measure functional diversity through the biodiversity integrity Index (BII), although the latter has not yet been quantified (Díaz et al., 2019).

- **Biogeochemical flows:** this process refers to the interference caused by human activities in the flows of nutrients such as nitrogen and phosphorus. These alterations are mainly due to their use to produce fertilizers, which has placed this limit in a high-risk area. The manufacture of fertilizers causes large amounts of phosphorus and nitrogen, in their reactive form, to end up polluting rivers and expelling GHGs into the atmosphere (Rockström et al., 2009).
- **Incorporation of novel entities:** new entities refer to any new element created or modified by humans. These entities are new “in a geological sense, and that could have large-scale impacts that threaten the integrity of Earth system processes.” (Persson et al., 2022, p. 1510) For example, microplastic contamination stands out, although the list extends to radioactive or even transgenic materials, placing this limit in the highest risk area. At the beginning of the model, this was an unquantified limit; nevertheless, in the year 2022, 14 scientists published in the journal *Environmental Science & Technology* a possible way to measure and evaluate the state of this process.

At a lower level, but just as worrying, there are two limits in the yellow zone or zone of increasing risk.

- **Climate change:** this is the most popular boundary in public and political debate in recent years. The indicator established to evaluate this process is that of parts per million (ppm) of CO₂. The safe zone establishes a limit of 350 ppm, which has been exceeded if one considers that this indicator currently stands at over 399 ppm, placing this limit in the zone of growing risk. Having exceeded this limit is already generating visible and disastrous effects such as floods, droughts, and heatwaves. However, this is

still worrying since the strong dependence on fossil fuels raises this indicator, which is why commitments are urgently needed to curb its growth (Steffen et al., 2015).

- **Land-system change:** this phenomenon is due to transforming terrestrial soils such as forests, wetlands, savannahs, thickets, and more, into areas destined for agriculture and livestock. The variable used to measure the status of this process is the amount of forest cover remaining; since it plays an essential role in the coupling between the land surface and the climate (Steffen et al., 2015).

Finally, in the safe zone, there are three essential processes:

- **Ocean acidification:** achieving this boundary is closely linked to climate change since if humanity meet the goal of limiting the parts per million of CO₂ to 350 ppm, the pH¹¹ of the water will remain the same. The indicator for this process is the state of saturation of the aragonite on the sea surface, which is currently within the levels that classify it as a safe zone. However, it is crucial to stop the burning of fossil fuels to avoid the acidification of these spaces (Steffen et al., 2015).
- **Stratospheric ozone depletion:** this process is the best example of what joint efforts and commitments can achieve, referring to the recovery of the hole caused in the ozone layer due to certain chemical products. Currently, it is heading towards full recovery thanks to the measures established by the Montreal Protocol (Sabogal, 1998). The indicator used to evaluate the performance of this process is the concentration of Ozone (O₃)¹² in Dobson Units (DU)¹³. The minimum of this indicator was established at 275DU, and it is currently in a ‘safe zone’ because it is around 283DU (Steffen et al., 2015).
- **Freshwater use:** This limit refers to the amount of fresh water available for consumption and is determined by the indicator of cubic kilometers (km³) of freshwater consumed per capita per year. The limit establishes a maximum consumption of 4,000

¹¹ pH indicates the measure of alkalinity or acidity of an aqueous solution.

¹² Ozone (O₃) is a gas composed of three oxygen atoms.

¹³ The Dobson Unit (DU) expresses the amount of ozone present in the Earth’s atmosphere, specifically in the stratosphere.

km³ of water per year, and the current consumption is around 2,600 km³ per year (Rockström et al., 2009). However, having this process within the safe zone can generate a false sense of security since the freshwater available worldwide varies according to the region (Steffen et al., 2015). Additionally, the demand for freshwater increases in a world with a constant and sustained population increase.

Additionally, there is still a limit that has not been quantified. However, the SRC continues to study methods and indicators that allow diagnosing the state of this last process.

- **Atmosphere aerosol loading:** this limit refers to polluting particles of human origin in the atmosphere, which affect the climate and living organisms (Steffen et al., 2015). Proof of this is the 7 million deaths a year allegedly due to air pollution (PAHO, 2014), placing it as one of the most dangerous environmental risks for the health of all living beings. For this reason, the CRE is still looking for a way to quantify the threshold of this process adequately; however, it remains an unquantified boundary.

Finally, the authors warn that even though the indicators are individual quantities -which could make it appear that they are isolated and independent processes- in reality, they are closely linked, interdependent and interconnected phenomena. For example, land-use conversion has pushed many species out of their natural habitats, driving them to extinction. Climate change also works as an accelerator of biodiversity loss. In turn, contamination by new entities such as plastics accelerates biodiversity loss by ingesting these elements. For this reason, exceeding one of them could trigger the others to be transgressed as well (Rockström et al., 2009).

Likewise, the *Stockholm Resilience Center* researchers warn that their conceptual framework is not a guide to what should or should not be done. It does not attempt to determine how each country should develop since the model does not consider certain human aspects when deciding how to act against environmental threats. They point out that: “these are political decisions that must include consideration of human dimensions, including equity, not incorporated in the Planetary Boundaries framework” (Steffen et al., 2015). For this reason, the economist Raworth has complemented her Donut Model with a series of social considerations, more closely related to the aspirations of humanity, explained below.

3.1.1.3. Social Foundation

On the other hand, the Social Foundation is the second component that shapes the Donut. This base is composed of 12 elements that have been classified as ‘essential for life’ by the Raworth model, among which are: access to water, food, health, education, income and work, peace and justice, political participation, social equity, gender equality, housing, networks, energy, and water. These are related to the 17 Sustainable Development Goals of the United Nations, mainly those focused on social issues (Raworth, 2017b).

The search to determine a framework of basic needs is based on the work of authors such as Max-Neef or Doyal and Gough. In their contributions, they propose the existence of a finite group of joint, classifiable, and universal needs. In addition, they say that, although the needs may be universal, the satisfiers may vary depending on individuals or their culture. However, this theory faces some questions due to its paternalistic nature and, on the other hand, proposing a framework of universal needs when these have been subject to relativity, history, and social constructions (O’Neill et al., 2018).

For this reason, Raworth has determined its social base framework based on the objectives proposed by the countries at the Rio+20 Conference, which discussed sustainable development issues. From the 80 submissions from the different national governments attending the Conference, Kate selected 11 common social needs. Additionally, this Conference was the starting point for creating the 2030 Sustainable Development Goals, so the social base is directly related to these global goals. Finally, the selection of these elements -unlike those proposed by Max-Neef or Doyal and Gough- has sought to maintain a more democratic component since these have been proposed by democratically elected governments and would better reflect the concerns and needs of their citizens (O’Neill et al., 2018).

3.1.2. Thriving Cities Initiative

Thriving Cities Initiative is a project based on the conceptual framework of the Donut Economy -developed by the British economist Kate Raworth- with the collaboration of the following international networks: *C40 Cities*, *Circle Economy*, *Donut Economics Action Lab*, and *Biomimicry 3.8* (Circle Economy, n.d.). The networks involved have recognized the potential of cities to promote actions aimed at ensuring that people can prosper within natural limits, both locally and globally. Therefore, the Thriving Cities Initiative (from now on, TCI) aims to guide cities in co-creating regenerative systems that allow them to prosper in balance and achieve a socially just and ecologically secure future (C40 Cities, 2022).

3.1.3. Donut Economics Action Lab (DEAL)

The *Donut Economics Action Lab* (hereafter referred to as DEAL) is part of an emerging global movement promoting the development of regenerative and distributive economies by design. It was founded in July 2019 by economists Kate Raworth and Carlota Sanz as an action laboratory based on the principles of the *Donut Economy*. DEAL works with agents of change around the world - communities, cities, businesses, and governments - to co-create tools and methodologies that turn the ideas of the Donut Model into concrete actions (Doughnut Economics Action Lab, 2022).

This organization operates by creating tools and resources based on the central ideas of Doughnut economics to guide political leaders to restructure the classic economic narratives and guide their projects toward social and ecological balance. In this way, in 2019, DEAL contributed to creating the City Portrait methodology to reduce the scale of the Donut Model at the local level. DEAL has an online platform through which they share resources and tools to adapt the principles of the Donut to local management models. DEAL urges governments and communities worldwide to “use the resources, innovate with them, change and adapt them to adjust to their contexts, and then share what they learn with the rest of the community” (Oldham, 2021).

3.1.4. The Donut Economy applied to cities: The City Portrait

The TCI's *City Portrait* tool was born as a methodology to reduce the vision of the Donut Economy, which was initially conceptualized at a global level, to the scale of cities. At the time, C40 Cities contacted DEAL to develop tools that align with the climate ambitions of the city networks' members. In that sense, the instrument "The City Portrait" was created in collaboration with Biomimicry 3.8 and Circle Economy (This information was provided by Andrew Fanning, personal interview, March 14, 2022) (see Appendix C).

This tool provides a holistic snapshot of a city's local and global impact by analyzing four lenses: Local - Social, Local - Ecological, Global - Social, and Global - Ecological. Through the TCI program, this methodology was first developed and applied in Amsterdam, Philadelphia, and Portland in 2019 to create prosperous cities. However, in the publication of the methodological development of the tool, its creators state that:

The methodology has the potential to be adapted beyond its first application to global North cities to make it relevant and useful for cities in the global South and neighborhoods, towns, nations, and regions. (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities y Circle Economy, 2020, p. 3)

In recent months, this tool has been replicated in cities with different contexts, for example, intermediate cities in the global south, especially in South America. Such is the case of Mexico City, Cali, and El Monte. However, City Portrait is only one of many other tools the DEAL has created to approach cities to the Donut Economics' principles (This information was provided by Leonora Grcheva, personal interview, March 14, 2022) (see Appendix C).

Considering what was presented previously, this instrument develops a snapshot of the city's performance by analyzing four lenses that arise from the combination of the social and ecological domains at two scales: local and global.

Taken together, the four lenses of the City Portrait are intended to start and inform a public discussion about what it would mean for your city to achieve local aspirations while

respecting the rights and aspirations of others, and the living planet. (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities y Circle Economy, 2020, p. 8).

The methodology was based on five criteria presented in *Table 9* that illustrates the originality of this tool and consolidates it as a starting point for creating complementary instruments and workgroups to promote dialogue among all the actors of society. The ultimate goal of this process is to encourage local strategies that strengthen the city’s vision as a prosperous place.

Table 9:

City Portrait Criteria

Criteria that support the City Portrait methodology	
1 Be locally relevant, rather than comparable between cities.	The Portrait of the City does not seek to produce directly comparable portraits between cities. By contrast, it aims to highlight the specificity of the analyzed place and its historical and cultural context. Each City Portrait and metrics will align to serve local objectives.
2 Compare desired results with current performance	The ultimate aspiration for each of the four Portrait lenses is to compare the current performance of the city with its desired performance.
3 Track city progress and design policies	The data and information used to create the four Portrait lenses can be tracked and updated over time, giving the capability to monitor the city's progress.
4 Offer a holistic snapshot for discussing complex issues	The Portrait simplifies data and details to display relevant information that provides an overview of the local situation. This way aims to help open debates on possible transformation paths in strategic areas that require attention.
5 Take a perspective on long term	The Portrait is a challenging starting point that invites reflection through an iterative change process. Therefore, it is a dynamic tool that seeks to face the changing challenges manifested within cities.

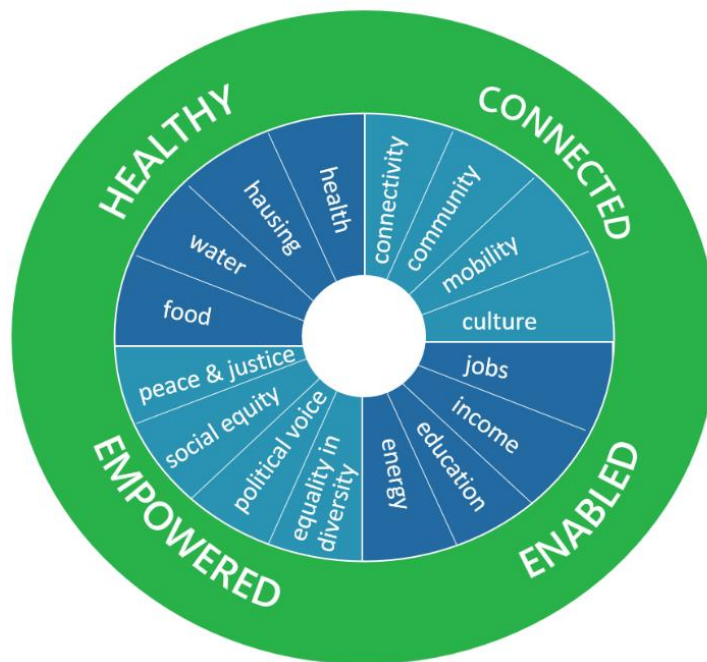
Note: The table was prepared by authors using information from the document “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

3.1.4.1. Local – Social Lens

The first lens of the ‘City Portrait’ analyzes a set of social dimensions that represent the basic standard of well-being that all city residents have the right to achieve. These dimensions derivates from the social base supported by the Donut Model, which, in turn, is extracted from the United Nations SDGs. The methodology proposes sixteen dimensions for this analysis, categorized into four groups that reflect the aspiration that all city residents be: healthy, connected, enabled, and empowered (see Figure 18).

Figure 18:

The dimensions of the City Portrait’s Local–Social lens



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

Local - Social Lens Methodology

There are several mechanisms to determine what ‘prosper’ means for the residents of a city. However, this methodology proposes to consider the official objectives elaborated by the local

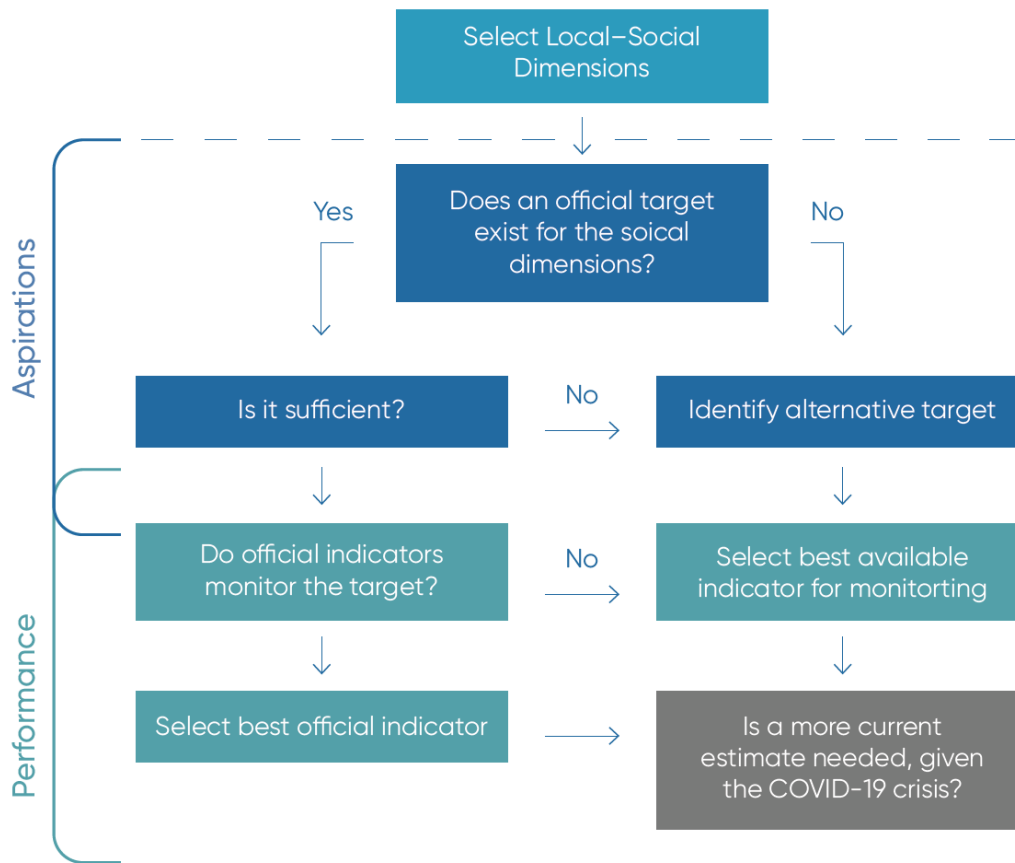
government, which were democratically elected to represent the interests of their people. Although the designers of the Portrait methodology warn that, in some cases, official objectives do not reflect all the needs and interests of the total population, the analysis of local goals was used for the pilot cities due to the availability of resources and time (see Appendix D). However, it must be considered that the objectives are evaluated according to whether they meet the needs of the City's residents under study (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020).

The methodology proposes a four-stage process to identify the officially agreed objectives in the city (see Figure 19). First, documentary research and public officials' consultants are necessary to identify the city's objectives or goals. Second, goals are categorized by their scope, focus, and deadline. Third, the most representative objective must be selected for each dimension described in Figure 18. Finally, the chosen goals are evaluated to ensure they match or exceed the level of ambition established by the SDGs or other derived international goals (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020, p. 12).

The methodology published by DEAL, Biomimicry 3.8, C40 Cities and Circle Economy (2020) recommend prioritizing the indicators that allow starting a reflective conversation on the subject since the objectives can be analyzed by a series of statistics that reflect the city's performance. For example, there may be doubt about choosing the indicator best reflects the situation of the education in the city - given it could be focused on the illiteracy rate or the number of teachers per student -. In those cases, priority should be given to the one that reflects the most pressing need of citizens. In this way, it will be included in the debate agenda the matters of priority interest for the residents' well-being.

Figure 19:

The Local–Social decision tree



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

3.1.4.2. Local – Ecological Lens

The second lens of analysis focuses on studying how biomimetics¹⁴ can inspire the design of cities. This lens identifies the local ecosystems of a city to encourage the creation of nature-

¹⁴ It is also known as biomimicry, refers to the process of observing, understanding, and applying solutions based on nature to human problems (Torres, 2018)

based solutions. In other words, the local-ecological lens questions how cities can serve as their natural environment does.

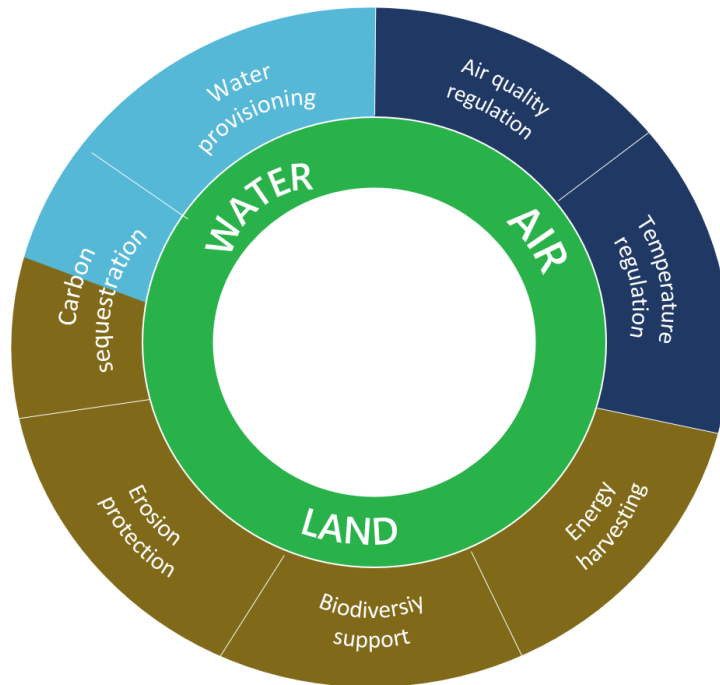
To be part of a thriving and resilient ecosystem, a city must do more than reduce its damaging impact on its surroundings: it must aim to deliver and support key ecosystem services that match or exceed the ecological performance of the wildland next door. (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities y Circle Economy, 2020, p. 18).

The publication of the methodology applied in the pilot cities of Amsterdam, Portland, and Philadelphia suggests that the analysis focus on seven ecosystem services that have been identified as key to the development of cities (see Figure 20). However, those are not the only benefits provided by ecosystems to cities. Still, they help create a critical approach to how cities can become regenerative and resilient urban communities (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020).

In the pilot cities, the environmental management projects were not initially developed with biomimetics; however, there were principles related to ‘nature-based solutions’ (This information was conceived by Andrew Fanning, personal interview, March 14, 2022) (see Appendix C). In this sense, Amsterdam’s City Portrait shows projects and proposals inspired by the services provided by their environment (see Appendix E).

Figure 20:

Dimensions of Local-Ecological Lens



Note: The image was prepared by authors using information from the document from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

Local - Ecological Lens Methodology

To build the Local-Ecological lens, reference local ecosystems must be identified to establish and prioritize ecological performance goals, specifically relevant to the needs of city residents (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020, page 18). In this way, interests may vary according to the local ecological priorities. For example, Amsterdam is located in the temperate forest biome with coastal dune formations, which provides a valuable opportunity for the city to analyze how it can learn from nature to provide its services, serving local needs (see Appendix E).

The second step is to identify and select the key services provided by the local ecosystem that the city can try to replicate. Subsequently, methods and ecological data sources must be identified and selected (see Figure 21). This process can be technically demanding if *in situ* data

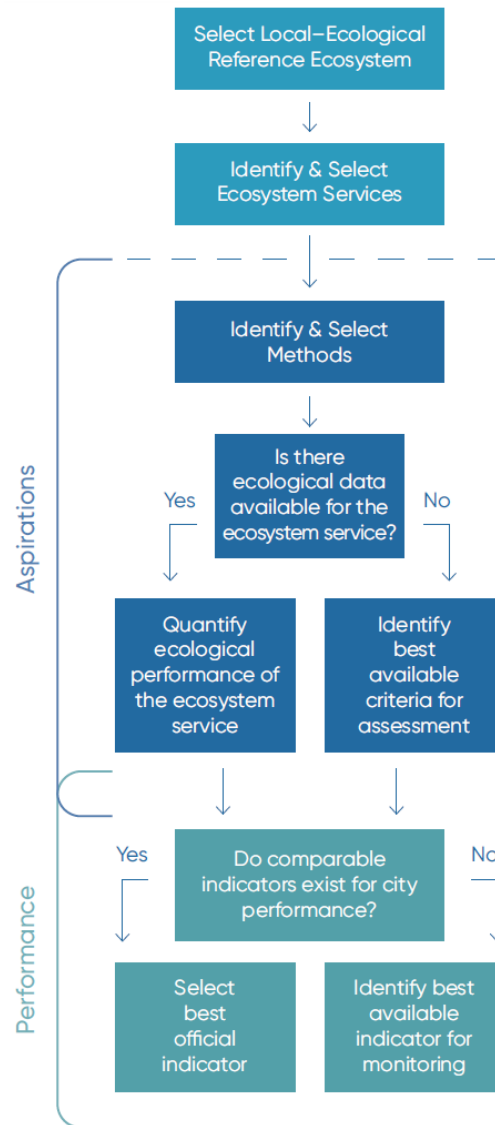
on local habitat performance is collected. To illustrate, in the case of measuring the annual storage of tons of CO₂ from the nearest local forest and, based on the results, establishing the city's objectives. However, for the analysis of the pilot cities, "the city's existing ecological targets can be taken as a first proxy for setting ecological performance ambition" (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020, p. 18) due to time and resource constraints in establishing such measurements.

Ultimately, the performance indicators of the city must be selected. In an ideal scenario, the indicators would directly compare the services provided by the local ecosystem and the city. However, in practice, those "most relevant and reliable indicators available for assessing each ecological target, with an illustrative statistical snapshot of that city's current performance" (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020, p. 18). The result of this analysis for the pilot cities was detailed below:

(...) in Philadelphia, Portland, and Amsterdam, mapping each city's existing local ecological targets against the set of key ecosystem services identified. In doing so, we noted where there were gaps in the coverage of ecosystem services that were addressed by those targets; this process provided a valuable opportunity for city staff and the community to reflect and recognize where new and additional local ecological targets may be required. (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities y Circle Economy, 2020, p. 18)

Figure 21:

The Local–Ecological decision tree



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

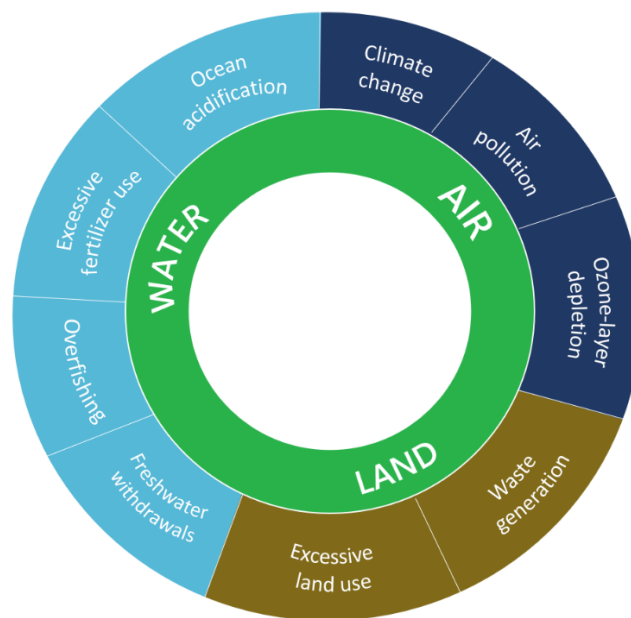
3.1.4.3. Global – Ecological Lens

The third lens of the *City Portrait* contrasts the resource consumption of the analyzed city concerning the “city’s fair share of a globally sustainable level of resource use” (Doughnut

Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020, p. 23). This analysis is based on the nine planetary boundaries that form the ecological ceiling of the *Donut* at a global level (see Figure 15). It identifies how the studied locality behaves “with respect to staying within global boundaries” (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020, p. 23).

Figure 22:

Dimensions of Global - Ecological Lens



Note: The image was prepared by authors using information from the document from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

Global - Ecological Lens Methodology

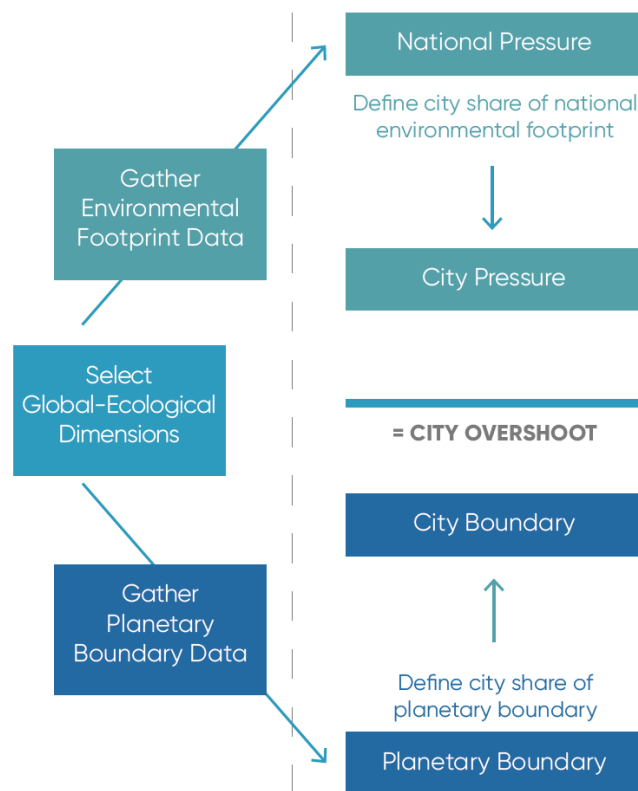
For the pilot cities, nine dimensions of analysis were selected and grouped into the category of air, water, and land (see Figure 22). The pilot cities used a *per capita equity* approach that conforms to a common distributive principle to determine each dimension’s fair share of resource use at the city scale (see Appendix F).

Accounting for the environmental footprint makes it possible to know the resources used and the waste generated derived from the production and transport of the goods consumed within the cities, regardless of their place of origin. However, such data is usually analyzed at the national level, challenging to scale down to the city level. In this regard, the publication of the DEAL methodology indicates that:

(...) there is no right answer for how to divide national environmental footprints into sub-national shares. For the Portland, Philadelphia, and Amsterdam City Portraits we collected national footprint data for the United States and the Netherlands, and calculated their respective city shares using an income-adjusted approach. (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities y Circle Economy, 2020, p. 25).

Figure 23:

The Global–Ecological decision tree



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

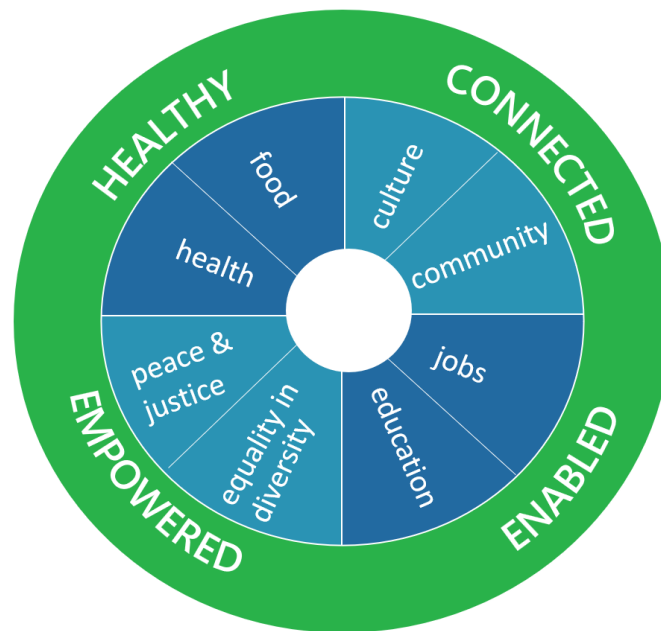
3.1.4.4. Global – Social Lens

The last lens of analysis in the *City Portrait* is the Global-Social. The lens aims to make visible the role of cities and the implications of their activities at a global level. This study focuses on how cities connect with the rest of the world and how they can generate positive or negative impacts on the well-being of people from other communities around the globe.

For the analysis of this lens, the methodology authors identified eight dimensions framed in the categories of healthy, connected, empowered, and enabled (see Figure 24). While DEAL notes that the design of this lens “was created specifically for high consumption cities in the Global North, it can be adapted for the context and interests of cities in the Global South” (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020, p. 29).

Figure 24:

Dimensions of Global - Social Lens



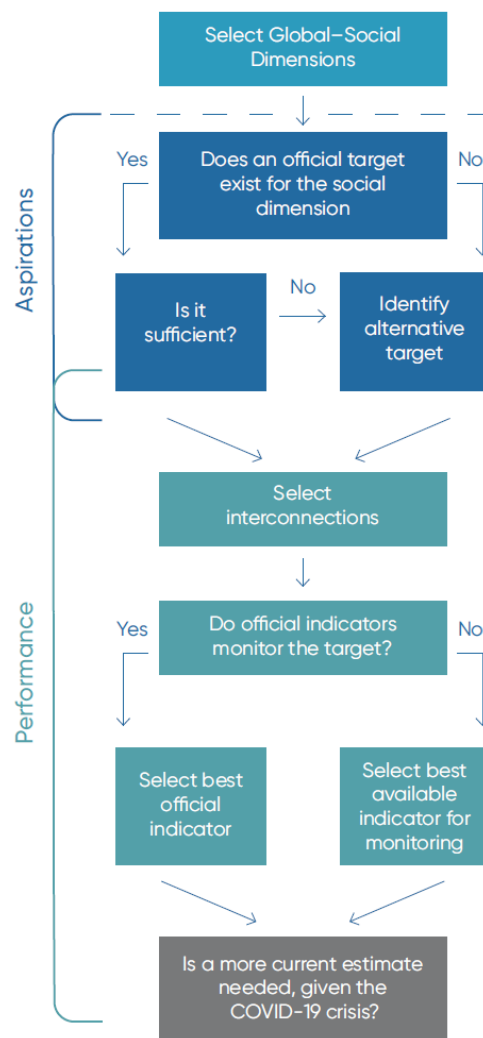
Note: The image was prepared by authors using information from the document from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

Global - Social Lens Methodology

This lens's selection of dimensions and objectives are derived from the Sustainable Development Goals since they are considered the internationally recognized minimum standard of well-being. To identify if the SDGs are a sufficient measure to evaluate the city's welfare, it is recommended to follow the process detailed in *Figure 25*.

Figure 25:

The Global-Social decision tree



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

The pilot cities analysis used local consumption indicators linked to the global supply chain. To synthesize the study, they focused on the chains that supply the city with food, clothing, and electronic products, since they are the categories that contribute the most to the city's consumption footprint (see Appendix G). This methodology warns that:

There are many ways to investigate the links between farmers, workers, and consumers, ranging from quantitative analyses using global supply chain databases across nations and multinational enterprises to a qualitative mapping of the 'systems of provision that link actors across a unique chain of production with a context shaped by culture, history, and power relations. (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities y Circle Economy, 2020, p. 30).

For this reason, a documentary analysis of reports on the connections between the supply chains of companies, labor rights, and human rights was carried out for the pilot cities. In this way, recurrent social impacts were identified and counteracted with the most closely related SDGs.

3.2. The methodology used to validate the information of the City Portrait of Cuenca, Ecuador

The methodology proposed by DEAL has been adapted to create Cuenca's City Portrait, considering the availability of official city indicators. However, to select the local objectives, the recommended method was maintained. The first step was identifying the local government's objectives or goals. To this, it was carried out interviews with officials and conducted documentary research. Second, it prioritized the objectives that respond to the needs identified in *Chapter II*. Finally, it was selected the goals specified a year for their fulfillment.

A direct approach has been made with the authorities of the Municipality of Cuenca, headed by the city mayor Pedro Palacios Ullauri. This project was presented to him, and he has expressed full support for its development. In this sense, the established institutional protocol has been

followed to access the needed municipal information to know the condition of the city and the local administration objectives in the medium and long term (see Appendix H). Along the same lines, interviews have been held with directors of specific departments of interest to deepen the investigation of the indicators required by the methodology.

For the documentary research to identify the city objectives and goals, the official documents and reports of the city administration were prioritized. In addition, those documents that had a validation or co-development process with social actors were favored. In this way, it was validated that the objectives set are aligned with the needs and aspirations of citizens. For example, the creation of the second volume of “Memoria Técnica de Actualización de Desarrollo y Ordenamiento Territorial 2021” [Technical Report for the Update of Territorial Development and Planning 2021] (from now on 2021 PDOT Update - Proposal) has followed a process of joint participation with key social actors for approximately two years and six months. The mayor of Cuenca, Pedro Palacios, in an interview granted to a local newspaper, states that around 307 meetings were held, with 5,850 participants from various sectors such as urban and rural representatives of parish governments, social organizations, civil society, academia, public institutions and productive sectors (El Mercurio, 2022)

The process of updating the PDOT allowed the interaction between the Municipal Corporation and the social actors. Through constant work meetings, the update’s progress was transparently communicated, and it was possible to integrate multiple positions, expectations, and interests of the social actors. The social public policy has been enriched from the feedback obtained in the meetings and workshops (Dirección de Planificación, 2021b, p. 52).

This document was held and approved in the first debate by the Cantonal Council of Cuenca in January 2022 (Academiaticvec, 2022). Although this document would be subject to modifications during the second debate for its final approval, it has been decided to use it as an analysis tool because it collects the political and citizens’ will about the management of the city in the following years.

In other matters, given that no studies have been carried out in Cuenca to fulfill all Portrait dimensions, adaptations have been made to the methodology. The DEAL team -specifically the economist Carlota Sanz, co-founder; Andrew Fanning, head of the research and data analysis department; and Leonora Grcheva, director of the department of cities and regions - guided the adaptations to Cuenca's City Portrait are thanked for the time and availability to respond to the concerns raised.

The following sections present the final snapshot of Cuenca through the four lenses of the Portrait. In addition, it is given a brief exposition of the leading research findings, reflected in the figures of each lens. Also, it justifies the variations that have been made to the methodology. In the same way, it details the selection criteria for the chosen final objectives that are highlighted in the figures. Finally, the Appendices section presents some tables that complement the Portrait lenses information and summarize the sources of the goals and indicators that have been selected.

3.3. Creation of Cuenca's City Lenses

3.3.1. Cuenca's Local – Social Lens

In order to identify the objectives and goals that Cuenca has set to address the dimensions of the different lenses of the portrait, there was a review of different official documents of the city. However, the objectives for this lens were selected from *PDOT 2021 Update – Proposal* because they were the most representative objectives and those that met the criteria of the methodology.

On the other hand, the information on the city's current state for each dimension was obtained from various sources, such as reports and documents from municipal bodies and the national government, media, academic research, and others. Additionally, it was considered necessary to relate the Sustainable Development Goals (SDG) with the different elements of the social foundation. Hence, the distinctive SDGs logos were added to each social dimension to the city's goals in that area. The constant relationship between local objectives and those formulated at a global level is highlighted (see Figure 26).

3.3.1.1. Healthy

The dimensions of the first group focus on four themes: health, housing, water quality, and food. These are the most basic needs that must be guaranteed to ensure an optimal standard of living for citizens. This group of dimensions relates to the Sustainable Development Goals. The first dimension is related to SDG 3: health and well-being. The housing dimension is related to SDG 11, specifically target 11.1, which calls for all people to access adequate housing and basic services. The third dimension is linked to SDG 6: clean water and sanitation. The fourth dimension is linked to SDG 2: zero hunger (see Appendix I).

Health

In the *health* dimension, it was identified that Cuenca has the objective to “Decrease the adolescent pregnancy rate from 3.16% in 2017 to 2.68% by 2023”. (Dirección de Planificación, 2021b, p. 139). Achieving this goal is urgent if it is considered that in the rural area of the Canton, there are 80.9 births for every 1,000 teenagers between 15 and 19 years old; which even exceeds the national average of 76.5 pregnancies (Dirección de Planificación, 2021a, p. 323; Ministerio de Salud Pública, 2018).

Considering that pregnancy in adolescent women triggers other sociocultural problems such as school dropout or job insecurity, which deepen conditions of poverty and vulnerability, public policy must address that problem by encouraging sexual and reproductive education. In the document *PDOT 2021 - Proposal*, it was identified that the parishes with the highest rate of adolescent pregnancy are: Baños, Sinincay, Ricaurte, and El Valle (Dirección de Planificación, 2021b, p. 48), so these should be areas of most significant interest for municipal management in reproductive health issues.

Housing

In the housing dimension, Cuenca’s goal is: “To reach 96% of the population with sewerage service by the year 2023.” (Dirección de planificación, 2021b, p. 170). Compliance with this goal is essential to improve residents’ quality of life, especially in rural areas, given that sewerage coverage only reaches 70.64% of households. This situation becomes even more complex because

households not connected to the public sewerage network eliminate excreta through cesspools or even discharge directly into streams, increasing the risk of contamination of water sources (Dirección de Planificación, 2021a, p. 316).

In contrast, the service coverage in the urban area amounts to 94.33%, even higher than the average coverage at the national level (Dirección de Planificación, 2021a, pp. 315 - 316). In short, the goal set by the city does represent a range of improvements concerning the current situation; however, in an ideal scenario, this service should cover the entire population, so it would be expected that the administration's objectives are geared towards that purpose.

Water

In the third dimension, *water quality*, Cuenca has proposed: “to maintain the average water quality index WQI¹⁵ in the canton over the ranges of (65 - 67) by 2023 after the Ucubamba treatment plant” (Dirección de Planificación, 2021b, p. 133). 95% of the wastewater from the urban area of Cuenca reaches the Ucubamba Wastewater Treatment Plant thanks to the sewerage network (Dirección de Planificación, 2021a, p. 632). However, as has been previously evaluated, the sewage system does not have complete coverage, so there is a risk that the wastewater will not undergo adequate treatment to be discharged into natural receiving bodies.

In this context, in 2019, Cuenca reached an average water quality WQI of 66, placing it within the range of ‘medium quality’ (Dirección de Planificación, 2021b, p. 133). For this reason, it would be urged to set a more ambitious goal and reach a higher range between 71 to 90, which corresponds to the category of ‘good’, to ensure the quality of water from the canton's water sources.

Food

Finally, the fourth dimension is food. Here, it is analyzed the access of citizens to sufficient and nutritious food. In this sense, Cuenca aims to: “Combat chronic malnutrition and promote

¹⁵ WQI (Water Quality Index) is an index that measures water quality that was developed by the US National Health Foundation in an effort to create a systematized comparison of rivers in various parts of the country (Jiménez and Vélez, 2016).

healthy living habits and practices, generating co-responsibility mechanisms between public institutions, the population and the private sector within the framework of food security and sovereignty” (Dirección de Planificación, 2021b, p. 181). To achieve this objective, the GAD maintains a policy of articulation with the Ministry of Public Health. In this way, the achievement of the established goal will allow the number of families with some level of food insecurity in rural areas to be reduced, which according to the ELCSA is located at 78.95% (Dirección de Planificación, 2021a, p. 527).

3.3.1.2. Connected

The second group of this lens contrasts the city’s objectives and state in the following dimensions of the social base: internet connectivity, urban mobility, sense of community, and access to culture. This group has a particular exception; two of its four dimensions do not derive directly from the social foundation of the Donut. In this case, the Portrait added the dimensions of community and culture as two additional elements that go beyond the SDGs; since the cities in which this model has been applied have recognized their value as essential components so that its inhabitants can enjoy a prosperous life (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020).

Even so, the dimensions of this group are linked to the Sustainable Development Goals, especially Goal 9 -industry, innovation, and infrastructure-, Goal 11 -sustainable cities and societies- and Goal 16 -peace, justice, and strong institutions- (see Appendix I).

Connectivity

The first dimension is *internet connectivity*. In this sense, the goal established as a city proposes: “To achieve a 13.5% internet penetration rate for the service provided by ETAPA EP, by the year 2023”. (Dirección de Planificación, 2021b, p. 170). It is essential to highlight that this has been formulated as the goal of a municipal public company, in this case, ETAPA EP, due to the powers that the local government has.

On the other hand, the city snapshot shows that, in the urban area, the percentage of homes with internet access is 79.02%, while in the rural area, it is 47.74% (Dirección de Planificación,

2021b). That information is worrying as it is below the national average of 80.2% (IWS, 2021). For that reason, it is imperative to meet the city objective with its reality to better respond to the connectivity needs of its citizens, mainly in the rural sector where there is less access to this service.

Community

The sense of *community dimension* contemplates the degree of belonging of citizens. Cuenca's goal in this area is to: "Promote community and neighborhood integration, through the collective construction of social and cultural spaces that contribute to strengthening the cantonal identity and contribute to citizen security" (Dirección de Planificación, 2021b, page 182). The snapshot shows that, according to the Security Observatory of the Citizen Security Council, 81% of Cuencans have a perception of insecurity due to crime and domestic violence (Orellana, 2022). In this way, the objective adequately attends to the city's situation since it considers citizen security. However, it has not yet been fully completed since the feeling of insecurity within the Cuencan community is still high.

Mobility

Cuenca's objective in the dimension of *urban mobility* is the "Promotion of non-motorized and active mobility within the Canton of Cuenca" (Dirección de Planificación, 2021b, p. 189). This objective addresses the city's situation since it faces a significant environmental problem such as GHG emissions and promoting alternative means of transportation, even more so in a city where "vehicular traffic (...) contributes with 94.5% of carbon monoxide emissions and 71.2% of nitrogen oxide emissions" (EMOV, 2020, p. 32).

The Municipality has carried out several projects that aim to improve mobility within the city, prioritizing non-motorized transport through the construction of bicycle paths -with an approximate length of 13.5 km that crosses from north to south of the city- and the construction of superblocks that favor and prioritize pedestrian mobility. Finally, it should be noted that Cuenca has an electrically powered mass transportation system: the 'Tranvia 4 Ríos' (Fundación Municipal El Barranco, 2020; GAD Municipal, 2017).

Culture

Finally, in the dimension of *access to culture*, the city's objective seeks to: "Promote a permanent program for the generation, implementation, promotion, dissemination (...) of routes, circuits and territories for the development of culture and protection and safeguarding of cultural heritage, (...) by the year 2023" (Dirección de Planificación, 2021b, p. 152). This objective is aligned to address one of the most relevant problems identified in this area: the concentration of services and cultural assets in the historic center of Cuenca, causing a gap in access to quality cultural services in remote areas, primarily rural areas (Dirección de Planificación, 2021b).

3.3.1.3. Empowered

The third group of social needs is composed of: peace and justice, social equity, political voice, and equality in diversity. These dimensions seek that people have the necessary tools to put their political, social, and economic faculties into practice. In addition, a particular dimension is added to this group: equality into diversity, which broadens the scope by focusing on the analysis of racial and gender diversity (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020). This section lists the goals and objectives of SDGs 10 and 16; since they aim to reduce inequalities and ensure peace, justice, and solid institutions, respectively (see Appendix I).

Peace and justice

The first dimension of this section, *peace and justice*, analyzes how cities can be a space that fosters the development of their citizens in a peaceful environment and ensures the conditions to guarantee their rights. In this effort, the city has set its goal: "To implement 100% a system that registers complaints of violence in the Cantonal Board of Rights¹⁶ by 2023, in the canton of Cuenca" (Dirección de Planificación, 2021b, p. 139). In terms of security, it is evident that, in Cuenca, citizens are not exempt from suffering attacks on their person or property. For example,

¹⁶ The Cantonal Board for the Protection of Rights has the function of knowing, ex officio or at the request of a party, cases in which the individual rights of children, adolescents, and women are violated within the jurisdiction of the Canton of Cuenca and has administrative measures to protect the threatened right or restore it (Gobierno Autónomo Descentralizado Municipal del Cantón Cuenca, s.f).

between 2018 and 2019, there was an increase in complaints of physical injuries, robberies, and thefts (Dirección de Planificación, 2021a, p. 346).

However, one of the most significant problems in terms of security is domestic violence. As of June 2020, there were 729 alerts related to domestic violence in Cuenca, which means an average of 7 alerts per day. Of the total alerts, there were 492 related to domestic violence in general, 145 to physical violence, 91 to psychological violence, and one to sexual violence against women or members of the family nucleus (Orellana, 2020). In this way, for Cuenca to be a peaceful and fair society, it is necessary to address the problems of gender violence, especially that which occurs in the intra-family context.

Social Equity

For the second dimension of this group, *social equity*, the city's goal is: "To have by 2023 a 100% implemented information system that contains social information on the priority attention groups of the Canton of Cuenca" (Dirección de Planificación, 2021b, p. 141). Of Cuenca's most relevant problems faced by priority attention groups, it stands out that 0.84% of children from 5 to 11 years old worked at least one hour, 70% of older adults do not have social security, and 16.94% of the population that self-identifies as indigenous, black-Afro-Ecuadorian, mulatto or Montubio cannot read or write (Dirección de Planificación, 2021b, p. 339). For this reason, the city's objective would contribute to knowing the situation of priority attention groups with updated information, which would allow the implementation of policies that respond to their most pressing needs.

Political Voice

The third component is that of *political voice*. The objective identified as a city is: "To have a cantonal system of citizen participation, 100% conformed by 2024" (Dirección de Planificación, 2021b, p. 177). Said ambition meets the needs of political participation of the canton, where between 2015 and 2018, there was a 34.91% increase in participation. The number of citizens who participated in 2018 was 3,282 (Dirección de Planificación, 2021a, p. 813). If it is considered the total population in Cuenca, the percentage of participation is still low.

Equality in diversity

The fourth and last dimension is *equality in diversity*, in which objectives are established so that priority groups' rights are guaranteed, emphasizing issues related to gender and racial diversity. In the case of Cuenca, the city has a goal: "To have a 100% intersectional public policy agenda by 2030 in relation to guaranteeing the rights of priority attention groups" (Dirección de Planificación, 2021b, p. 140).

According to a survey carried out in Cuenca as part of the Safe Cities Program of UN Women, 91% of the women and girls surveyed claim to have suffered violence and/or sexual harassment at some point in their lives, and 72% declare that they were victims of sexual harassment on public transport (UN Women, 2020). In addition, Azuay was the first province of Ecuador with a prevalence of violence against women (INEC, 2019). On the other hand, the Azuay Ombudsman reported that during 2019 it followed up on 20 cases of xenophobia (Castillo, 2020). All these data indicate that Cuenca must work to guarantee the rights of its citizens, especially those who are in a condition of vulnerability due to their gender or nationality.

3.3.1.4. Enabled

Finally, this group of social dimensions covers issues of decent work, sufficient income, quality education, and access to affordable energy, which are related to SDGs 8, 4, and 7, respectively (see Appendix I). Ensuring together this series of needs of the social base of the Donut Model allows people to be empowered to fulfill and satisfy the rest of their needs (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020).

Jobs

In the first of them, a *decent job*, the city seeks to reduce the growing social inequality resulting from unemployment and underemployment through socio-economic investment. For this reason, the city objective it to: "Annually maintain the training of 1,500 actors of the Popular and Solidarity Economy (EPS) by 2023 (...) with an emphasis on technology to promote e-commerce" (Dirección de Planificación, 2021b, p. 161). This objective has been satisfactorily met, since the number of EPS actors who have received training has increased from 2015 to 2019. In addition,

promoting electronic commerce, established as part of the local goal, saves coherence with the growth dynamics of digital commerce at a national and global level (Ekos, 2021).

Income

In the *income* dimension, the city has the objective: “To increase the salaried female population to 59.09% by 2023” (Dirección de Planificación, 2021b, p. 140). This aspiration is consistent with the current situation of salaried women in the canton. In 2019, this percentage was 56% (Dirección de Planificación, 2021b), so there is still a range of improvement between the instantaneous and the goal.

Education

In the third dimension, *quality education*, the city has the purpose: “To maintain or exceed 90% of the initial education rate by 2023 in the canton of Cuenca” (Dirección de Planificación, 2021b, p. 138). Analyzing the state of education in general terms, the performance of Cuenca has been very positive, maintaining a high rate of high school attendance and low percentages of illiteracy. However, the objective selected for the lens focuses on initial education since it is the only indicator in which it is still below the stated aspirations, with 86% in 2019 (Dirección de Planificación, 2021b).

Energy

Finally, in terms of *access to affordable energy*, Cuenca seeks to: “Guarantee the efficient provision of basic services and equipment, ensuring sustainable management of natural resources and generating territorial balances” (Dirección de Planificación, 2021b, p. 169). In this dimension, it is essential to mention that the competence for electrical energy supply is in charge of the *Empresa Eléctrica Regional Centro Sur C.A.*, so the city cannot establish an objective directly related to the provision of electrical services. However, the city contributes to the energy supply through the energy generated by the Biogas Plant, benefiting approximately 7,300 families per month (EMAC, 2022b).

Figure 26:

Cuenca's Local – Social Lens

Local - Social Lens of Cuenca

What would it mean for the people of the city to thrive?

HEALTHY



HOUSING



WATER



FOOD



CITY TARGET

To reduce the adolescent pregnancy rate (15 to 19 years old) to 2.68% by the year 2023.

To achieve that 96% of the population has sewerage service by the year 2023.

To maintain the average WQI water quality index in the canton in the range of (65-67), after the Ucubamba treatment plant, by 2023.

To combat chronic malnutrition and promote healthy lifestyles, creating co-responsibility between the public, private and the population in matters of food security and sovereignty.

CITY SNAPSHOT

The adolescent pregnancy rate in Cuenca was 3.13% in 2019. In rural areas, 80.9 births were registered for every 1,000 adolescents between 15 and 19 years old; exceeding the national average of 76.5.

The public sewerage network in the urban area has a coverage of 94.33%, higher than the national average; but in rural areas only 70.64% of households have service.

The average WQI water quality index of the canton, in 2019, was 66, placing it in the 'medium quality' range according to this indicator.

According to the ELCSA indicator, only 32% of households in the rural sector of Cuenca have food security.

CONNECTED

COONECTIVITY



COMMUNITY



MOBILITY



CULTURE



CITY TARGET

To achieve a 13.5% internet penetration rate for the service provided by ETAPA EP, by 2023.

To promote community integration through the collective construction of socio-cultural spaces that contribute to strengthening the cantonal identity and citizen security.

To promote non-motorized and active mobility within the Cuenca canton.

To generate, implement and promote mechanisms for the development of culture and the protection of cultural heritage, implemented in the urban and rural parishes of Cuenca by 2023.

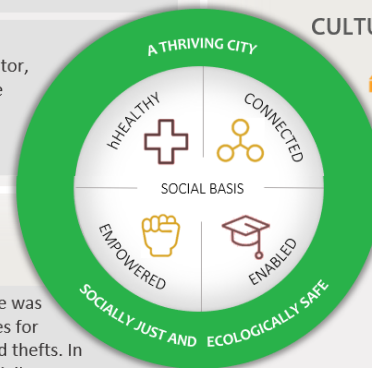
CITY SNAPSHOT

According to the 2019 multipurpose survey, 79.02% of households in the urban area of Cuenca have internet. While in the urban area only 47.74% of households have it.

In the canton of Cuenca, 60% of citizens report feeling 'not very safe' and 21% 'not at all safe'. In other words, 81% of Cuencans feel insecure to a greater or lesser extent.

In urban Cuenca, vehicles are the most important source of emissions; contributing with 94.5% of CO emissions and 71.2% of NOX emissions.

There is a deficit of efficient quality services and cultural facilities in urban areas far from the Historic Center of the city; as well as in the rural areas of the canton.



EMPOWERED

PEACE & JUSTICE



SOCIAL EQUITY



POLITICAL VOICE



EQUALITY IN DIVERSITY



CITY TARGET

To implement (100%) a system that registers complaints of violence in the Cantonal Board of Rights by 2023, in Cuenca.

By 2023, having a 100% implemented information system that contains social information on priority attention groups in the Cuenca canton.

To have a cantonal system of citizen participation 100% conformed by 2024.

To have, by 2023, a 100% intersectional public policy agenda in relation to guaranteeing the rights of priority attention groups.

CITY SNAPSHOT

Between 2018 and 2019, there was an increase in reports of crimes for physical injuries, robberies and thefts. In addition, on average about 7 daily emergency alerts related to domestic violence are received.

0.84% of children between the ages of 5 and 11 worked at least one hour, 70% of older adults do not have social security, and 16.94% of those who self-identify as having a nationality in the canton do not know how to read or write.

Participation in the Assemblies of Citizens of Cuenca has increased by 34.91% between 2015 and 2018 (from 1,146 people to 3,282).

91% of the women surveyed in Cuenca by UN Women report that they suffered violence or sexual harassment at some point in their lives. In addition, the Azuay Ombudsman's Office reports that it handled around 20 cases of xenophobia in 2019.

ENABLED

CITY TARGET

To maintain the annual training of 1,500 actors of the Popular and Solidarity Economy by 2023 in Cuenca with an emphasis on technology and promote

To increase the salaried female population to 59.09% by 2023.

To maintain or exceed 90% of the initial education rate by 2023 in the canton of Cuenca.

To guarantee the efficient provision of basic services, ensuring sustainable management of natural resources and generating territorial balance.

CITY SNAPSHOT

Since 2015, the number of actors of the Popular and Solidarity Economy trained per year increased from 500 to 1,500 per year in 2019.

Between the years 2014 and 2019, the percentage of salaried women varied between 52.2% and 56.3%.

The initial education rate in 2014 was 61.67% and until 2019 it increased to 86%, a percentage that is still below the established goal.

The Biogas Plant (EMAC-BGP ENERGY CEM) uses the gases generated in the Pichacay Landfill to generate 2MW of electricity, benefiting 7,300 families with a consumption of 160 KWh/month.

Note: figure prepared by the authors

3.3.2. Cuenca's Local – Ecological Lens

The second lens of Cuenca's City Portrait aims to respond to the question: how can the city be as generous and provide as many natural services as the ecosystem surrounding it? (Doughnut Economics Action Lab, Biomimicry 3.8, C40 Cities and Circle Economy, 2020). This lens comprises three types of ecosystem services: water, air, and land; each has its subsystems. Each subsystem analyzes four areas: the state of the city, the city's objective regarding that service, how nature provides such service, and what our city is doing to work like nature (see Appendix J).

Additionally, as in the Local – Social Lens, the SDG logos related to the three ecosystem services analyzed by the lens have also been added to this section: air, water, and land. The close link between the city's environmental management goals and the globally proposed objectives is also made visible (see Figure 27).

3.3.2.1. Water System

The first group of ecosystem benefits relates to water provision and carbon sequestration in the oceans. However, for a city like Cuenca, which does not have access to the sea, the Portrait methodology considers a single service: *water provisioning*; because the terrestrial ecosystem is the one that mostly sequesters carbon in the city. This ecosystem service is directly linked to objective 6: clean water and sanitation regarding its relationship with the SDGs.

Water provisioning

The objective related to drinking water supply is: “To reach 98% of the population with drinking water service by the year 2023” (Dirección de Planificación, 2021b, p.169). For its part, the snapshot of the city shows that this objective is close to being met in the city's urban area, where coverage reaches 96.92%. However, the rural area is still far from doing so since this percentage barely reaches 70.14%.

In this sense, one way the ecosystems around the city provide this service is through the moors. Due to the characteristics of its spongy soil, it traps and filters large amounts of water in the upper parts of the mountains, gradually releasing it downstream. Similarly, one of the water

treatment plants in Cuenca is Sustag, which resembles capturing, filtering, and reserving water from the moors. This plant supplies 400,000 m³ of water per month, benefiting around 35,000 people (ETAPA EP, 2022).

A nature-based project developed in Cuenca is the creation of wetlands for water treatment. Although this project does not aim directly at water provisioning, it stands out as an initiative based on the principles of biomimetics. Following the filtering process of natural wetlands, ETAPA was inspired to develop its wetlands to filter contaminated water and return it to its feeder. Additionally, the University of Azuay is studying the application of these wetlands in rural areas. Due to the difficulties involved in deploying large sewage systems in rural areas, this nature-based solution would become a more sustainable option with low environmental impact (This information was provided by Ana Elizabeth Ochoa, personal interview, February 8, 2022) (see Appendix K).

It is worth mentioning that the supply and quality of water in Cuenca depends on the state of the water recharge sources in the area; however, mining activity represents a significant threat due to the contamination of local water resources. For this reason, to guarantee the quantity, quality, and continuity of water, Mayor Pedro Palacios, along with activists and water protection groups, promoted a referendum in 2021. In it, 80% of Cuencans agreed to prohibit metal mining in water recharge areas of the Tomebamba, Yanuncay, Tarqui, Norcay and Machángara rivers (CNE, 2021).

Subsequently, the *Ministry of the Environment, Water and Ecological Transition* issued the Ministerial Decree MAATE-2021-077. Through that decree, the extension of the water recharge zone of the Canton reached 1919.37 km², even more than the original delimitation carried out by ETAPA EP (Ministerio del Ambiente, Agua y Transición Ecológica, 2021). However, there is still some concern since mining companies continue to seek loopholes to continue mining in the area. Also, since the referendum is not retroactive, some concessions such as *Loma Larga*¹⁷ and *Río Blanco*¹⁸ could continue to operate.

¹⁷ *Loma Larga* mining project is located in Victoria del Portete parish (Achiras, 2020).

¹⁸ *Río Blanco* mining project is located in Chaucha and Molleturo parishes (Achiras, 2020).

3.3.2.2. Air System

According to the City Portrait methodology, the second group of ecosystem services are air quality and temperature regulation. However, since Cuenca has a noise monitoring system in the urban perimeter, it was decided to add a system: *noise pollution regulation*. In this case, this ecosystem service is related to SDG 11: Sustainable cities and communities, because one of the specific targets of this goal is 11.6: “By 2030, reduce per capita negative environmental impact of cities, including by paying special attention to air quality and municipal and other waste management” (ONU, 2021).

Air quality regulation

Regarding the regulation of air quality, the goal to “Maintain average annual emissions below $38 \mu\text{g}/\text{m}^3$ ¹⁹ of Particulate Matter (PM₁₀) by 2023” has been selected for the City (Dirección de Planificación, 2021b, p.132). Until 2016 this value reached its maximum point, reaching $44.9 \mu\text{g}/\text{m}^3$, although this goal has been successfully maintained since 2019 and 2020.

For example, nature provides this service through the leaves of trees that, due to their porosity, can absorb the particulate matter floating in the air (TECPA, 2022). When looking for a way in which the city provides a similar function, the University of Azuay has promoted the construction of green walls: vertical gardens that fulfill the function of improving air quality. Currently, in Cuenca, this is used as a decorative element; however, experts recommend it be raised to municipal regulations, guiding the construction of buildings with this type of green infrastructure (Universidad del Azuay, 2022).

Temperature regulation

An optimal ecological structure provides excellent benefits for regulating urban temperature and increasing resilience to the possible effects of climate change (Mujica, Karis, and Ferraro, 2019). In Cuenca, according to the data provided by the ETAPA EP climate monitoring network, the mean annual temperature values oscillate around 14.6°C , and the hottest year was 2016, with

¹⁹ $\mu\text{g}/\text{m}^3$: microgram per cubic meter, unit of measure in which the values of some pollutants are expressed.

an average of 14.97°C. The coldest was in 2017, with an average annual temperature of 14.38°C (Dirección de Planificación, 2021a, p. 169).

In this sense, Cuenca has proposed a series of objectives that aim to improve the city's environmental conditions. For example, the objective is to “Maintain 9 m² recreational and natural green area per inhabitant in urban areas by 2023 with an equitable distribution” (Dirección de Planificación, 2021b, p. 134). On average, trees can “reduce the temperature by 10 degrees through evapotranspiration, capturing CO₂ and emitting water vapour. In addition, they provide shaded areas, help clean the air and make cities more pleasant places” (Rodríguez, 2019), so the city's goal is to maintain and regulate the city's temperature.

Some of the identified programs in the city included those promoted by the Municipal Public Cleansing Company of Cuenca (EMAC EP in its Spanish acronym). Through their forest management and green area maintenance units, they work to conserve and recover green areas and parks in the city. For example, as of 2019, it is reported that they planted 3,890 trees as part of their program of planting ten trees for every tree felled (EMAC, 2022a).

Noise pollution regulation

Cuenca has a clear objective regarding noise pollution: “To reduce noise levels to 65 decibels (dB) on average per year by 2023 in residential areas and facilities” (Dirección de Planificación, 2021b, p. 132). This goal is focused on residential areas since it is the area in which the highest levels of noise pollution are concentrated. For example, in some city sectors, such as Control Sur, IESS Hospital, and the road to El Valle, there are levels higher than 75dB, well above what is recommended by the WHO (World Health Organization, 2015).

Researching how ecosystems improve noise levels, it was found that vegetation can reduce sound in two different ways. On the one hand, some plant elements can refract sound. On the other hand, vegetation can absorb sound. Along the same lines, studies at the University of Almería revealed that green walls could reduce sound by up to 50%, much more than barriers such as glass or concrete that only absorb 20% of the noise (Azkorra, Z., Pérez, G., Coma, J., Cabeza, L., Bures, S., Álvaro, J., Erkoreka, A. and Urrestarazu, M., 2015). In this sense, the green wall projects of

the University of Azuay, in addition to their usefulness in improving air quality, have other benefits related to noise pollution.

3.3.2.3. Land system

The third group of ecosystem systems is *energy harvesting, biodiversity support, erosion protection, and carbon sequestration services*. Although they are all related to terrestrial ecosystems, they cover a much broader range of services, so they relate to a more significant number of SDGs. In this case, the associated objectives are 15: Life of terrestrial ecosystems, mainly its goals 15.3 and 15.5, which refer to soil erosion and biodiversity protection, respectively. Likewise, SDG 7: Affordable and non-polluting energy; and SDG 13: Climate Action are also considered.

Energy harvesting

The collection or capturing of energy from the environment is a process that allows it to be channeled and used for institutional processes or domestic consumption. The energy sources in nature are varied; for example, certain microorganisms can generate biogas by decomposing biodegradable material through anaerobic digestion (Cámara, Laines, Sosa, 2011). Considering that Cuenca has a Sanitary Landfill that receives around 521 tons of solid waste per day and more than 190,000 tons per year (EMAC, 2022c), the city has a project to generate electricity through the EMAC Biogas Plant. It is the public company BGP ENERGY CEM, which the Pichacay Sanitary Landfill feeds.

The Sanitary Landfill generates an average flow of 400 m³-hour biogas, which takes advantage of Methane CH₄ gas to produce 840 kW-hour of electrical energy through a generator engine (EMAC, 2022c). The goal that the city has set is to take advantage of the “Biogas extracted from the Pichacay landfill to generate 2MW of electricity through two combustion engines and reduce pollution by approximately 46,000 tons of CO₂ equivalent per year” (EMAC, 2022b). With this objective, the current production of 840kw-hour would be increased to 2,000 kW-hour.

Biodiversity support

In order to guarantee the protection of biodiversity, it can be considered how natural ecosystems do it. In this sense, the moors are ecosystems that constitute a space for exchanging genes and refuge for threatened species (Aguirre, Eguiguren, Ojeda and Aguirre, 2015). With this in mind, Cuenca aims to: “maintain 73.15% of land with a conservation vocation and strengthen in some category of the subsystem of protected areas of Decentralized Autonomous Government, private, community or recognized as Areas of Conservation and Sustainable Use (ACUS) or water recharge for conservation purposes by 2023” (Dirección de Planificación, 2021b, p. 129).

Along these lines, on April 14, 2021, the Municipal Ordinance was approved for the creation of the Decentralized Autonomous Subsystem of Conservation and Sustainable Use Areas (ACUS) for the protection of water sources, clean air, and biodiversity (ETAPA, 2021). Through this, the areas of Curiquingue-Gallocantana²⁰, Mazán and Machángara were created (Dirección de Planificación, 2021a. p.237; Martínez, 2021). Additionally, the approval of this Ordinance:

(...) will guarantee that the ecosystems of El Cajas massif are protected from any process that is different from conservation and sustainable use. In addition, the doors are opened for new areas of biological and water importance to be added to this categorization (ETAPA, 2021).

El Cajas National Park is a high-impact natural park that is home to a wide variety of flora and fauna species -600 species of vascular plants, 43 mammals, 157 birds, 17 amphibians, and 4 reptiles- and the Municipal GAD has the competence of its administration since 2002 (Ministerio del Ambiente, n.d.). For this reason, the GAD of Cuenca has promoted several projects to guarantee the stability and protection of its diversity. For example, the ‘Save El Cajas Now’ project aims to carry out waste collection campaigns, especially plastic, generated by tourists in the nature reserve (EMAC, 2021).

²⁰ Curiquingue-Gallocantana area is part of the biological corridor located between the Machángara – Tomebamba protective forest and El Cajas National Park (Holguín, 2022).

On the other hand, in the urban area of the Canton, one way in which biodiversity could be promoted is through urban parks. Because in these areas, the vegetation cover generated by the branches of the trees causes the formation of microclimates necessary for the development of species such as lichens, fungi, and other organisms that increase biodiversity. However, although certain tree species found in city parks and riverbanks, such as eucalyptus, contribute to carbon sequestration and temperature regulation; these can have an adverse effect due to their high-water consumption (This information was provided by Fredi Portilla, personal interview, March 24, 2022).

Erosion protection

This dimension analyzes the city's state concerning the eroded surface in this dimension. In the case of Cuenca, the area in an 'eroded' and 'strongly eroded' state is 0.7% of the canton, which is equivalent to 2,397 hectares (Dirección de Planificación, 2021a, p. 271). Let us consider that the roots of the trees provide the soils with the structural and mechanical support necessary to prevent surface movements of the earth that lead to their erosion (FAO, 2015). So, it can be understood how the trees provide stability to the soils and prevent them from eroding. In response to this problem, the city aims to: "reduce the deforestation rate below 0.26% in relation to the total area of the canton by the year 2023" (Dirección de Planificación, 2021a, p. 130).

There were identified that various projects aim to achieve this goal in the city. One of them is the municipal project 'Vivero de Yanaturo'. This nursery produces around 90 species of trees and garden plants, which are later placed in the city's public spaces. According to EMAC records (2019), they planted about 19,800 trees, 17,900 shrubs, and 45,500 garden plants until 2019.

Carbon sequestration

Finally, the city has an essential objective for carbon sequestration, established in the *Action Plan to Reduce the Carbon Footprint and the Water Footprint for Cuenca*. This document details the goal of: "reducing 1,436,843 tons of CO₂e, corresponding to 67% of emissions by 2030" (Banco de Desarrollo de América Latina, 2018a). One way in which plant ecosystems provide this carbon sequestration service is through trees, which store the gas, reducing its presence in the atmosphere (Muñoz and Vásquez, 2020).

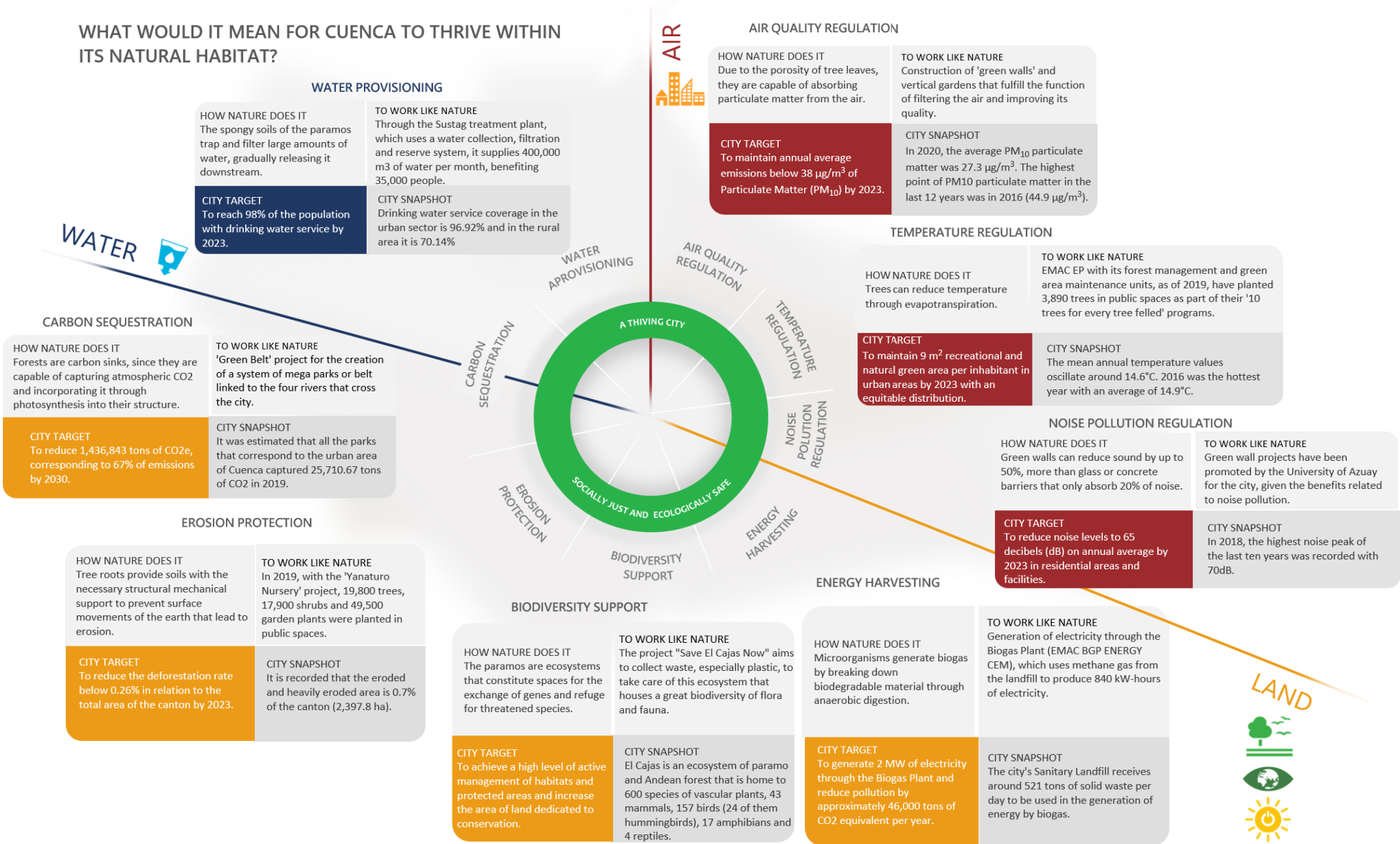
Following the same principle, there is an environmental benefit that green areas in urban areas can have to improve a city's air quality. In this sense, the city has promoted initiatives such as the 'Green Belt' project, which emerged in 2014 as an instrument of sustainable balance to create a system of mega parks and spaces linked to the four rivers that cross the city. This project received two Sacha awards from the Ecuadorian Ministry of the Environment for repopulation and urban ornamentation (Ecuador Initiative, Sustainable Development Goals and UNDP, 2020).

Figure 27:

Cuenca's Local - Ecological Lens

Local - Ecological Lens of Cuenca

WHAT WOULD IT MEAN FOR CUENCA TO THRIVE WITHIN ITS NATURAL HABITAT?



Note: figure prepared by the authors

3.3.3. Cuenca's Global - Ecological Lens

Several adaptations were required to construct Cuenca's *Global-Ecological lens* to fit the available data. The main limitation was the lack of indicators necessary to analyze the nine ecological dimensions of this lens. The calculation of Cuenca's quota on the use of environmental resources was not possible for all the lens dimensions since the city's ecological footprint has not been officially estimated to date. It has also not been possible to scale down the planetary boundaries of Ecuador to the city scale due to technical limitations beyond the scope and purpose of this research work.

For that reason, to identify how local -or national in cases no city indicators have been detected- actions contribute to the degradation or protection of the planet's ecosystem resources. For this, documentary research has been carried out and contrasted with the global dynamics of each dimension (see Appendix L). This comparison possibilities to approximate the implications of local activity at a worldwide level. At the same time, the connection between Sustainable Development Goals and lens dimensions was added to this analysis.

3.3.3.1. Water

The first lens group comprises four ecological dimensions: *freshwater withdrawals, excessive fertilizer use, ocean acidification, and overfishing*. The first three elements are directly extracted from planetary boundaries. However, overfishing has been added to the methodology due to its importance in protecting marine biodiversity. The Sustainable Development Goals associated with this set are SDG 6 and its goal 6.4, which focuses on the efficient use of water resources; and SDG 14: underwater life, mainly its goals 14.3 and 14.4, aimed at minimizing ocean acidification and excessive fishing.

Ocean acidification

The first ecological dimension of the water group deals with *ocean acidification*. This is a process in which the pH of the ocean increases due to the absorption of approximately 25% of CO₂ present in the atmosphere. Because this GHG has increased its concentration since the beginning of the industrial revolution, the ocean has captured more and more amounts of CO₂, increasing

water acidity. The consequences of this phenomenon directly affect corals, seaweed, fish, and other marine fauna and ecosystems (Reef Resilience Network, 2022). In addition, this also affects the millions of people who depend on marine resources for their livelihoods and food.

According to the *National Environmental Education Foundation* (NEEF), ocean waters have become 30% more acidic in the last 250 years, a trend that will increase if CO₂ emissions are not limited (NEEF, 2022). Even though Cuenca is not a coastal city, its carbon dioxide emissions contribute to ocean acidification. For this reason, the city does have an objective according to the situation: “Reduce 1,436,843 tons of CO₂e, corresponding to 67% of emissions until the year 2030” (Development Bank of Latin America, 2018b), so the compliance with this objective could have a very positive impact on the sea by reducing its acidification.

Excessive fertilizer use

The next dimension of the *water* system is the excessive fertilizer use since the concentration of chemical fertilizers -such as nitrogen, phosphorus, and potassium- poses a risk of contaminating surface and groundwater (González, 2019). In this sense, the United Nations Food and Agriculture Organization warns that the use of fertilizers is ten times higher than in 1960. In addition, it reports that each year the environment is sprayed with 4.6 million tons of pesticide chemicals. More importantly, they estimate that agricultural land globally receives about 115 million tons of mineral nitrogen fertilizers, of which 35% end up in the oceans (FAO, 2018b).

This situation is not alien to local dynamics. In Ecuador, “1,320,988.67 hectares of agricultural land use some type of chemical pesticide on their crops, which represents 47%” (INEC, 2013, p. 6). In addition, 37% of the country’s agricultural area that uses pesticides has water bodies located less than 200 meters away - the limit recommended by the FAO to not applied pesticides due to the risk of affecting water sources-. Of which almost 16.3% of the compromised bodies of water are for human consumption (INEC, 2013, p.14).

In the case of Cuenca, the situation is not more encouraging since reports indicate that upper areas of the Canton are the most affected by fertilizer use in agricultural plots, which, in turn, are dragged with the rains to the currents of the rivers (see Appendix M). In this sense, in February 2020, the Mayor’s Office of Cuenca signed an agreement with the Development Bank of Latin

America to obtain non-reimbursable \$150,100 to develop studies and projects on the contamination of Cuenca's water sources. Specifically, the former director of the CGA, Gustavo Chacón, stated in an interview with the newspaper *El Telégrafo* that: "the agreement that was signed will serve to carry out studies and projects in the upper areas of the city, such as Tarqui, Sayausi, San Joaquín, among other places" (2020).

Overfishing

Several factors, including plastic pollution, threaten marine ecosystems. However, this is not the only threat to Maria's life. Overfishing, understood as the capture of fish in a more significant proportion than those born in their reproductive cycle, has caused the spread of species that endanger the balance of marine ecosystems. For example, the overfishing of a particular species, such as bluefin tuna, supposes a break in the food chain since it affects other species that depend on it as their primary food source. On the other hand, it can also lead to the uncontrolled increase of other species due to the decrease of its natural predator (World Wildlife Found, 2019).

This dynamic also represents a risk to the well-being of humans, especially for those who depend on the oceans as their primary source of food or work (World Wildlife Found, 2019). With this in mind, it is unquestionable that this problem must be addressed, even more so when 30% of the fish stocks caught commercially are overexploited (WWF, 2020).

In this dimension, the state of overfishing at the national level will be analyzed since Cuenca is a non-coastal city. FAO included Ecuador in the list of the 25 countries with the highest marine capture fisheries production worldwide in its *2018 State of World Fisheries and Aquaculture Report* (FAO, 2018a). In addition, according to WWF (cited in *El Comercio*, 2020), in 2018, Ecuador captured 24% of the region's yellowfin, approximately 57,500 tons. Additionally, it caught 63% of the bigeye tuna in the area, equivalent to 41,250 tons.

Two years later, FAO removed Ecuador from the said list in their *2020 State of World Fisheries and Aquaculture Report*. However, it is still considered one of the leading Latin American exporters of shrimp, tuna, and salmon (FAO, 2020).

In 2019, world fish production stood at 178 million metric tons (Orús, 2022b). During the same year, Ecuador exported 82,000 metric tons of tuna and fish (Sánchez, Vayas, Moyorga and

Freire, 2020), representing 0.046% of production worldwide. With these antecedents, it can be concluded that policies and measures to control overfishing would have a positive impact at a global level. An example of the progress in this matter is the one that UNDP Ecuador reports:

In 2017, the starting point was 100% overexploitation of six species and 50% in a state of overfishing. By 2019, it was determined that two species, Botella and Pinchagua, had come out of their state of overexploitation and that none of them show levels of overfishing. (UNDP Ecuador, 2020)

Freshwater Withdrawals

For the last dimension, *freshwater withdrawals*, Cuenca has a clear line of action: “Preserve ecosystems of lagoons, rivers, streams, and their margins; understanding that the cantonal territory is crossed by a system of hydrographic networks (...)” (Dirección de Planificación, 2021b). As it is not a specific goal, it does not have a projection date to achieve this objective. However, it is crucial to define the future vision regarding the conservation of the canton’s water resources, especially in an urgent global situation where more than 2,300 million people live in countries with water scarcity (United Nations, 2021a).

To calculate how the city manages freshwater use, it compared the canton’s per capita water footprint with the established planetary boundary. Thus, according to the report “*Huella de Ciudades – Cuenca*” [Cities Footprint - Cuenca], the water footprint of the canton was 87,935,671 m³ in 2016 (Development Bank of Latin America, 2018a). This value, divided by the inhabitants of Cuenca in 2016: 603,269 people (INEC, 2017), yields an approximate water use per capita of 145 m³ of freshwater per year. The safe zone of this planetary limit is established at a maximum of 574 m³ of fresh water per year, so the city is still well below said limit.

3.3.3.2. Air

The second group comprises *climate change, air pollution, and depletion of the ozone layer*, all of which are derived directly from the framework of planetary boundaries. These dimensions are related to SDG 13: Climate Action for climate change, and SDG 11 goal 6: “By 2030, reduce

the negative environmental impact per capita of cities, including paying special attention to the air quality and municipal and other waste management” (UN, 2021)

Climate Change

Climate Change is one of the most famous dimensions of the planetary boundaries. The first chapter explained that this ecological dimension, despite not yet being in a “high-risk zone,” is crucial since it influences all other systems. The current strong dependence on fossil fuels - the main emitters of Greenhouse Gases that warm the planet - has made climate change a process that is difficult to mitigate, so cities must set goals in this area.

To stop the process of climate change, most of the countries in the world, including Ecuador, have joined the Paris Agreement. The Agreement seeks to limit the increase in global temperature between 1.5 °C and 2 °C. In that context, cities have become key actors in achieving that goal. In such a way that Cuenca, within the framework of the Footprint of Cities project, has set the objective of “Reducing 1,436,843 tons of CO₂e, corresponding to 67% of emissions until 2030” (Development Bank of Latin America, 2018b). The objective is also used for the dimension of *ocean acidification*.

In 2018, the *Final Report of the project ‘Cities Footprint’* estimates that Canton’s carbon footprint was 1,500,133 tons of CO₂e during 2016. That was produced by the transport sector 55%, and the industry sector 16%. In the national context, in 2016, Ecuador contributed 0.20% of global CO₂ emissions (Climate Watch, 2022). Moreover, Cuenca represented 2% of Ecuador’s total emissions (Development Bank of Latin America, 2018b).

Air pollution

Air pollution has become one of the most important causes of health problems today. The Pan American Health Organization (PAHO) has classified it as “the main environmental risk to public health in the Americas” (PAHO, 2016). Similarly, they maintain that 7 million premature deaths were attributed to environmental pollution during 2016, of which 88% belonged to low- and middle-income countries, such as Ecuador (PAHO, 2016). At the same time, 1,771 people died in Ecuador from diseases related to air pollution in the same year.

Cuenca aims to improve the city's air quality by: "Keep annual average emissions below 38 $\mu\text{g}/\text{m}^3$ of Particulate Matter (PM_{10}) by 2023" (Dirección de Planificación, 2021b). This objective focuses on limiting the concentration of particulate material equal to or less than a diameter of 10 microns, one of the air pollutants that causes respiratory problems. In this context, in 2020, the city reached its lowest point with 27.3 $\mu\text{g}/\text{m}^3$ of PM_{10} (Dirección de Planificación, 2021b). However, although the city is below the local goal, it still exceeds the WHO global recommendation by 7.3 $\mu\text{g}/\text{m}^3$, established at a maximum of 20 $\mu\text{g}/\text{m}^3$ of PM_{10} .

Ozone-layer depletion

Ozone concentrations in the stratosphere -between 11 and 40 kilometers above the earth's surface- act as a protective shield against ultraviolet radiation, making it possible to preserve life on the planet (Romo et al., 2019). Hence the importance of avoiding its deterioration. With this aim, in 1989, the Montreal Protocol entered into force, whose objective was to limit the production and consumption of the main chemicals and substances that deplete the ozone layer (ECLAC, s.f).

The thinning of the ozone layer in the stratosphere is known as an 'ozone hole.' According to NASA satellite observations, the ozone hole in Antarctica in 2021 reached a maximum of 14.8 million km^2 , comparable to the size of North America. Although, it is substantially smaller than the ozone holes of the early 2000s (Bates, 2021).

The ozone hole is recovering due to the Montreal Protocol and subsequent amendments that ban the release of harmful ozone-depleting chemicals called chlorofluorocarbons, or CFCs. If atmospheric chlorine levels from CFCs were as high today as they were in the early 2000s, this year's ozone hole would have been about 1.5 million square miles (4 million square kilometers) larger under the same climatic conditions. (Bates, 2021)

In the case of Cuenca, no specific objectives have been identified to protect the ozone layer but only for controlling tropospheric ozone -a secondary pollutant found in the troposphere and is harmful to health (European Environment Agency, 2016; EMOV, 2020). As a result, the situation will be analyzed nationally instead (see Appendix N).

In 2019, Ecuador launched the "Plan Nacional de Espumas" [National Foam Plan], which will eliminate the consumption of 147.24 metric tons of substances that deplete the ozone layer,

such as hydrochlorofluorocarbons (HCFCs) (Ministerio de Producción, Comercio Exterior, Inversiones y Pesca, 2019). One of this plan's measures was to implement import quotas for HCFC substances through Agreement No. 18-224 of the then 'Ministry of Industries and Productivity' - now the Ministry of Production, Foreign Trade, Investments, and Fisheries- (INFOCOMEX, 2019)

3.3.3.3. Land

This lens's third and last group consists of *excessive land use and waste generation*. This has been linked to SDG 15, particularly with goal 15.3, which seeks to “combat desertification, restore degraded land and soil, including land affected by desertification, drought, and floods, and strive to achieve a land degradation-neutral world” (UN, 2021).

Waste Generation

Waste management is an issue that has been present on the public agenda to achieve sustainable development. It is estimated that “approximately 11.2 billion tons of solid waste are collected worldwide each year (...) it contributes approximately 5 percent of global greenhouse gas emissions” (United Nations Environment Programme, 2022). In 2019, Cuenca generated approximately 163,000 tons of waste deposited in the Pichacay landfill (EMAC, 2022c), so it can be calculated that the city contributes 0.001455% of garbage production worldwide.

For the sustainable management of solid waste, Cuenca has set the goal of “achieving 5% organic and inorganic recycled material of the total solid waste sent annually to the landfill by 2023” (Dirección de Planificación, 2021b, p. 130). The city reports that it collects about 38.8 tons of light blue covers -destined for recycling- per month. However, only 25% of the content is used as recyclable material, which represents 104 tons (EMAC, 2022d).

Excessive land use

Excessive use of land and its resources has been another concern on the international agenda that must be agreed upon to achieve sustainable development. According to the Global Footprint Network (2022) data, our current use of natural resources is 1.7 times faster than ecosystems can regenerate. In other words, humanity requires 1.7 planet earth to satisfy its consumption demand.

In this sense, for 2018, the same organization reported that Ecuador requires 29 million global hectares (gha) to supply its consumers and has a biocapacity of 32.3 million global hectares, which means that you still have resources to cover your demand. However, it is noted that the vertiginous increase in consumption in the last 60 years is alarming. By 1961, 5.7 million ha were required to supply Ecuador's consumption, while an additional 23 million are now needed (Global Footprint Network, 2022) (see Appendix L).

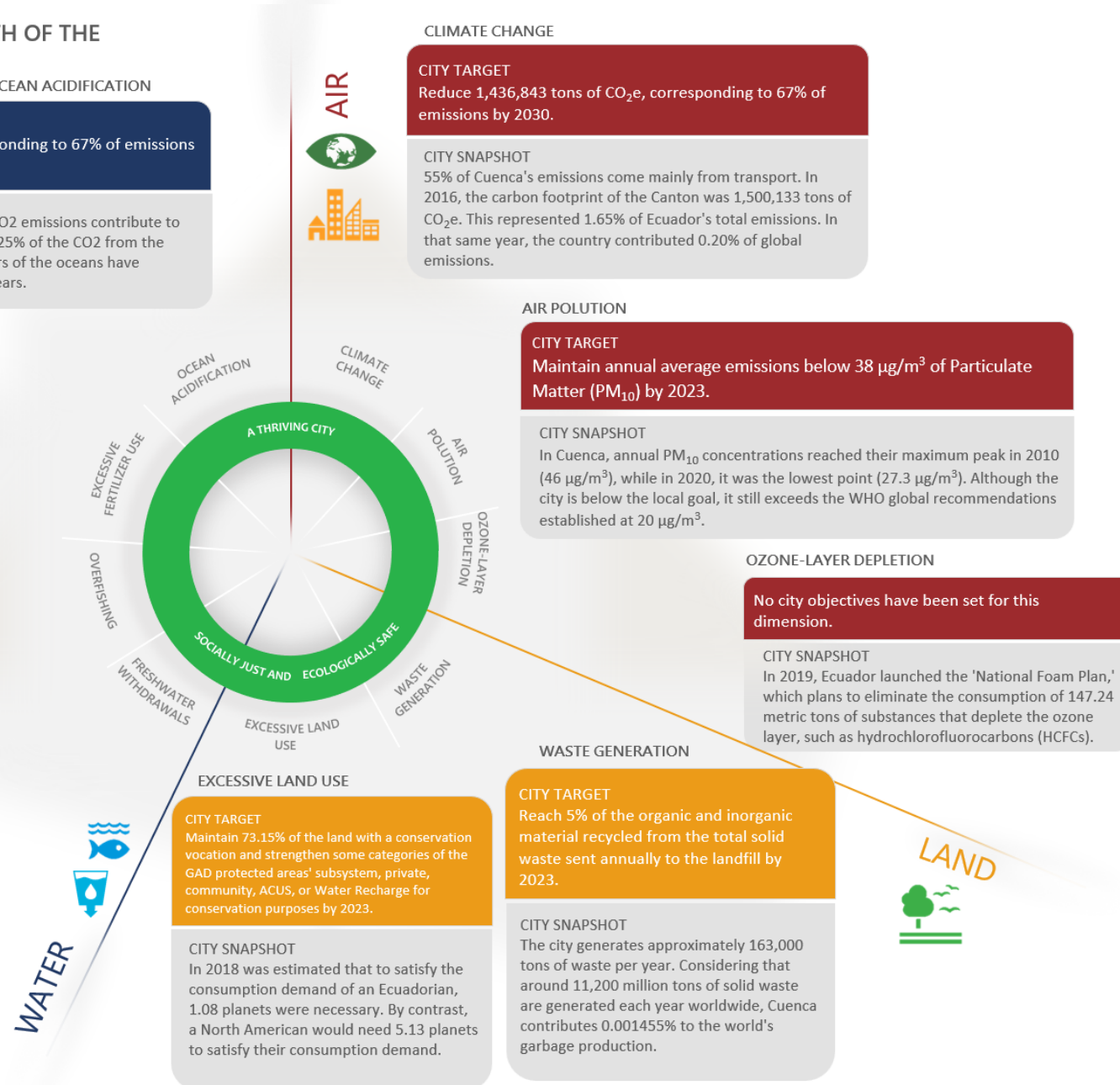
Furthermore, the ability to regenerate resources is slower than the consumption rate, which means that if current consumption levels are maintained, the planet's resources will be depleted for future generations. In context, to satisfy the consumption demand of an average Ecuadorian, 1.08 planets are needed. Concerning other countries, such as the US, 5.13 worlds are required to meet the consumption of an average citizen. Ecuador has not reached a critical point; nevertheless, the country should develop policies to regulate the excessive use of resources.

Finally, in Cuenca, land-use incompatibilities could compromise approximately 34% of the canton's surface due to the development of agricultural activities on conservation land, forest use, or steep slopes. In addition, the advance of the dispersed urban sprawl puts pressure on the area's natural ecosystems. (Dirección de Planificación, 2021a, p. 271). For this reason, Cuenca has set the goal of "maintaining 73.15% of the land with a conservation vocation and strengthening the subsystem of protected areas of Decentralized Autonomous Government, private, community or recognized as Areas of Conservation and Sustainable Use (ACUS) or water recharge for conservation purposes for the year 2023" (Dirección de Planificación, 2021b, p. 129).

Figure 28:

Global - Ecological lens of Cuenca

¿WHAT IS CUENCA'S IMPACT ON THE HEALTH OF THE WHOLE PLANET?



OCEAN ACIDIFICATION

CITY TARGET
Reduce 1,436,843 tons of CO₂e, corresponding to 67% of emissions by 2030.

CITY SNAPSHOT
Although Cuenca is not a coastal city, its CO₂ emissions contribute to the acidification of the oceans, absorbing 25% of the CO₂ from the atmosphere. According to NEEF, the waters of the oceans have become 30% more acidic in the last 250 years.

CLIMATE CHANGE

CITY TARGET
Reduce 1,436,843 tons of CO₂e, corresponding to 67% of emissions by 2030.

CITY SNAPSHOT
55% of Cuenca's emissions come mainly from transport. In 2016, the carbon footprint of the Canton was 1,500,133 tons of CO₂e. This represented 1.65% of Ecuador's total emissions. In that same year, the country contributed 0.20% of global emissions.

EXCESSIVE FERTILIZER USE

No city objectives have been set for this dimension.

CITY SNAPSHOT
In Ecuador, 52.59% of the agricultural land (5,132,065.54 hectares) uses chemical inputs such as pesticides and fertilizers.

AIR POLLUTION

CITY TARGET
Maintain annual average emissions below 38 µg/m³ of Particulate Matter (PM₁₀) by 2023.

CITY SNAPSHOT
In Cuenca, annual PM₁₀ concentrations reached their maximum peak in 2010 (46 µg/m³), while in 2020, it was the lowest point (27.3 µg/m³). Although the city is below the local goal, it still exceeds the WHO global recommendations established at 20 µg/m³.

OVERFISHING

No city objectives have been set for this dimension.

CITY SNAPSHOT
In 2018, Ecuador was among the 25 countries with the highest volumes of fishing worldwide.

OZONE-LAYER DEPLETION

No city objectives have been set for this dimension.

CITY SNAPSHOT
In 2019, Ecuador launched the 'National Foam Plan,' which plans to eliminate the consumption of 147.24 metric tons of substances that deplete the ozone layer, such as hydrochlorofluorocarbons (HCFCs).

FRESHWATER WITHDRAWALS

CITY TARGET
Preserve ecosystems of lagoons, rivers, streams, and margins, understanding that the cantonal territory is crossed by hydrographic network systems. And some of these are more fragile due to their geographical locations in relation to the variation of the different altitudinal floors.

CITY SNAPSHOT
The per capita consumption of fresh water per year in Cuenca is approximately 145 m³, a value below the established planetary limit of 574 m³ of freshwater per year.

EXCESSIVE LAND USE

CITY TARGET
Maintain 73.15% of the land with a conservation vocation and strengthen some categories of the GAD protected areas' subsystem, private, community, ACUS, or Water Recharge for conservation purposes by 2023.

CITY SNAPSHOT
In 2018 was estimated that to satisfy the consumption demand of an Ecuadorian, 1.08 planets were necessary. By contrast, a North American would need 5.13 planets to satisfy their consumption demand.

WASTE GENERATION

CITY TARGET
Reach 5% of the organic and inorganic material recycled from the total solid waste sent annually to the landfill by 2023.

CITY SNAPSHOT
The city generates approximately 163,000 tons of waste per year. Considering that around 11,200 million tons of solid waste are generated each year worldwide, Cuenca contributes 0.001455% to the world's garbage production.

Note: figure prepared by the authors

3.3.4. Cuenca's Global – Social Lens

For the analysis of the fourth and last lens of Cuenca's Portrait, a different approach has been given to the methodology applied in the pilot cities; because there is no official study in Cuenca about the global supply chain. As a result, it was not possible to evaluate the exact impact of Cuenca's consumption on the well-being of communities worldwide. For that reason, it was decided to examine the city's role in achieving international commitments, specifically the Sustainable Development Goals, whose progress has been affected by the COVID-19 pandemic.

It is not intended to make an exhaustive analysis of each edge of the SDGs since it is not the end of the methodology or this research work. Instead, it aims to encourage the dialogue about the main setbacks of the SDG's achievement at the global level and compare it with the local situation. One of the most relevant limitations of this analysis has been the lack of the city's updated information regarding social indicators and the impact of the pandemic on them; therefore, the most recent data available has been selected.

Finally, it is worth noting that the Municipality's Directorate of International Relations is developing the first *Local Voluntary Report* on the city's progress regarding the SDGs (This information was conceived by Sofía Arce, Director of the International Relations Department of Cuenca's Municipality since 2019, personal interview, March 11, 2022) (see Appendix B). However, the project is in the early stages of data collection, so it could not be included in this research. Still, it is expected to be an essential input for a future update of Cuenca's City Portrait.

The following subsections present the main findings on health, food, community, culture, peace, justice, equality in diversity, work, and education. It also explains the SDGs related to each lens dimension. In addition, it highlights the most significant setback of the SDGs, which has been presented in the 2021 Sustainable Development Goals Report. Finally, the global and local situation is contrasted for each study dimension (see Appendix O).

3.3.4.1. Healthy

Health

The COVID-19 pandemic has stretched the capacity of health care services worldwide. The number of deaths caused by the virus amounts to more than 6.11 million people globally until March 2022 (Orús, 2022a). In this context, the human and economic cost is unprecedented. It poses significant setbacks to the progress made in recent years concerning SDG 3: “ensure healthy lives and promote well-being for all at all ages” (UN, 2021). It is worth mentioning that “about 90 per cent of countries are still reporting one or more disruptions to essential health services, and available data from a few countries show that the pandemic has shortened life expectancy” (United Nations, 2021a, p. 30).

Furthermore, the United Nations, in its report, warns that: “a decade of progress in reproductive, maternal and child health could be stalled or reversed by the pandemic” (2021, p. 30). This is an alarming situation considering that, in 2020, 35% of countries reported interruptions in reproductive, maternal, newborn, and child health services. It is estimated that this may have contributed to an additional 228,000 child deaths and 11,000 maternal deaths in South Asia alone. However, it is noteworthy that the reduction in the global birth rate due to teenage pregnancy maintained its progress. Between 2000 and 2020, it fell from 56.4 to 41.2 births per 1,000 adolescents aged 15 to 19 (United Nations, 2021a, p. 30).

Ecuador has also been challenged in attending to health emergency due to the collapse of public health systems. As of June 2021, the number of people infected by the virus stood at 439,374, and 18,409 positive cases were reported in Cuenca (Dirección de Planificación, 2021a, p. 325). The official number of deaths from COVID-19 amounts to more than 35,416 people as of March 2022 (Observatorio Social del Ecuador, 2022). In the province of Azuay, 344 deaths were reported in the first quarter of 2021 (GTRM and R4V, 2021).

These data demonstrate the devastating impact of COVID-19 on people’s health and highlight the need to have public health systems in optimal conditions to face a crisis of such magnitude. On the other hand, concerning the United Nations statement on the negative impact of the pandemic on reproductive, maternal, and child health services, in Cuenca, there are no exact

figures on this situation. What is clear about the city's progress is that Cuenca, even before the pandemic, already had difficulty in achieving the SDG for adolescent pregnancy.

In 2018, for every 1,000 adolescent women between the ages of 15 and 19, from the Canton's rural area, 80.9 births were registered (Dirección de Planificación, 2021a); which is well above the birth rate calculated by the SDGs as global progress: from 56.4 births to 41.2 births per adolescent pregnancy. In short, Cuenca presents a fundamental challenge to adopting measures that improve its inhabitants' sexual and reproductive health, especially adolescents in rural areas, where the most significant number of cases of teenage pregnancy occurs.

Lastly, this dimension relates to other SDGs such as Goals 1, 2, 5, 6, and 13. Taken together, while all the SDGs are interrelated, the previously listed targets are closely linked to ensuring healthy lives for all. In short, achieving the goals set out in Objective 3 does not depend on isolated work. Instead, it is essential to attain other objectives to guarantee the health and well-being of the Cuenca people.

Food

Another pandemic impact has been the increase in hunger and food insecurity rates at a global level. That has affected the progress made on SDG 2: end hunger. United Nations (2021) estimates that between “720 and 811 million people in the world faced hunger in 2020, an increase of as many as 161 million from 2019” (p. 28). In Latin America, it is estimated that 9.1% of the population is affected by hunger. This increase in the hunger index would be closely linked to the loss of job stability during the health crisis and, consequently, the increase in extreme poverty, which went from 8.4% in 2019 to 9.5% in 2020 (United Nations, 2021a, pp. 26 – 28).

On the other hand, it is reported that the prevalence of malnutrition increased from 8.4% in 2019 to 9.5% in 2020. In other words, 1 in 3 people -approximately 2,370 million- was affected by moderate and severe food insecurity in 2020, increasing to around 3.02 billion people since 2019. In turn, the lack of healthy and nutritious food harms the development of children, especially aggravated by the closure of educational centers during the pandemic since they provided school breakfast. In 2020, 22% of children under 5 -around 149.2 million - were stunted. (United Nations, 2021a, p.28).

In short, the deterioration of households' economy for the pandemic has had substantial repercussions on people's food security, which, in turn, endangers the health and integrity of individuals. In the Ecuadorian case, the panorama is not more encouraging since it is reported that 3 out of 10 people do not have sufficient resources to feed themselves regularly (Coba, 2021). The lack of resources to feed oneself result in malnutrition and chronic child malnutrition (Gavilanes-Llango et al., 2021). According to Unicef Ecuador (2021), 27.2% of children under two years of age suffer from chronic malnutrition.

In Cuenca, reports indicate that 53.9% of households have a mild level of food insecurity, 11.2% moderate, and 2.8% severe in rural areas. In addition, 17.3% of the children and adolescents of the Canton have short stature and severe short stature. It is 14.6% of children in urban areas, and in rural areas, it rises to 20.7% (Dirección de Planificación, 2021a, p. 333 - 336). In summary, "the COVID-19 pandemic has increased the risk of deepening the rates of child malnutrition in the country and, above all, in Cuenca, where the Ministry of Health has detailed a 30% incidence of chronic malnutrition" (Acción Social Municipal, 2021).

Additionally, schools' temporary or permanent closure, especially in the rural sector, has contributed to children's food insecurity since they benefited from the School Feeding Program. For this reason, the Ministry of Education has delivered food rations to the country's school population during the pandemic. Specifically, school feeding packages have been delivered in Zone 6 -provinces of Azuay, Cañar, and Morona Santiago- estimating 206,177 beneficiary students from 1,252 educational establishments (Ministry of Education, 2020). However, whether it is sufficient to meet children's nutritional needs is questioned. In this sense, the GAD has also promoted "solidarity breakfasts" programs to provide food, especially to the most vulnerable groups (Acción Social Municipal, 2021).

3.3.4.2. Connected

Culture

The SDG that concentrates its efforts on protecting culture at a global level is goal 4 of SDG 11: "Strengthen efforts to protect and safeguard the world's cultural and natural heritage" (UN,

2021). For this reason, to analyze this lens's cultural dimension, the pandemic's impact on the cultural and creative industries (CCI) has been investigated, both globally and locally.

According to UNESCO, the pandemic impacted the cultural and creative sectors worldwide. More than 95% of museums were closed at some point between 2020 and 2021, and 15% of them are still at risk of closing permanently (UNESCO, 2021). Therefore, the pandemic has had social, economic, and political consequences in this sector. It has affected “the fundamental right of access to culture, the social rights of artists and creative professionals and the protection of the different cultural expressions” (United Nations, 2021b).

Countries report that the income of this industry has decreased by 20% and 40% compared to the previous year of pandemic (UNESCO, 2021). The same dynamic has been repeated at the national level. In Ecuador, around 225 million dollars have been recorded during 2020, according to the “*Sistema de Integral de Información Cultural (SIIC)*” [Comprehensive Cultural Information System] (SIIC, 2021).

Community

This lens dimension is directly related to SDG 11, which seeks: “make cities inclusive, safe, resilient and sustainable” (ONU, 2021). Along the same lines, the specific goal 11.1 of this SDG aims “by 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums” (ONU, 2021).

The pandemic has had a significant impact on the increase of residents in marginal neighborhoods. Before the pandemic, this was already a problem since people living in such areas increased from 23% to 24% between 2014 and 2018. More specifically, this translates to one billion inhabitants (Nations Nations, 2021a).

The United Nations' 2021 Sustainable Development Goals Report forecasts that this percentage will increase globally in the following years due to low-income households being the most affected by job losses, lockdowns, and other health measures taken to deal with COVID-19. As a result, many people in vulnerable conditions had to move to cities' marginal sectors (United Nations, 2021a).

At the regional level, the percentage of people living in those areas is even higher, reaching 29.1% of the urban population of Latin America and the Caribbean. Despite this, in Ecuador, the number of people living in marginal neighborhoods has been gradually reduced. In 2018, the county reached a minimum of 20%. However, the pandemic has also contributed to the increase of Ecuadorians living in marginal neighborhoods (United Nations, n.d.). That is worrying since marginalized households usually do not have planning, financing, and development projects and policies to improve residents' quality of life.

In addition, Cuenca has a high vulnerability and risk due to natural disasters, mainly floods and mass movements (Dirección de Planificación, 2021a. p. 699 - 702). One of Canton's most recent natural disaster cases was the landslide in the Sayausí rural parish on March 28, 2022, caused by heavy rains and flooding (Castillo, 2022). This event destroyed nine homes, and around 27 homes were damaged. Almost 29 families were affected, and five people died. On the other hand, this phenomenon affected the city's water treatment plants. As a result, ETAPA reported that nearly 250,000 users closed the service (Beltrán, 2022). In this sense, it is evident that the Canton is vulnerable to episodes of heavy rains; therefore, it is essential to have programs for emergency assistance and the prevention of natural disasters.

3.3.4.3. Empowered

Peace and justice

Ensuring just and peaceful societies is one of the goals of the SDGs, precisely Goal 16: "promote just, peaceful and inclusive societies" (ONU, 2021). The pandemic, as previously analyzed, has created the ideal scenario to intensify the gap in needs between countries and people around the world. One of the COVID-19 pandemic effects has been increasing extreme poverty globally. As a result of the rise in unemployment, crime levels worldwide increased (González, 2021b; UNODC, 2020).

However, the United Nations (2021a) warns that one of the most significant impacts of the pandemic on the SDG 16 is the "risk of exploitation of children, including human trafficking and child labor" (p. 58). The number of children in child labor in 2020 – excluding cases of bonded

labor, forced labor, and sexual exploitation – increased to 160 million; that is, 1 in 10 children worldwide (United Nations, 2021a). For this reason, the analysis will be focused on this problem.

Even more alarming, it is estimated that 8.9 million children worldwide will be forced into child labor by the end of 2022 due to job loss and reduced household income. According to the 2012 National Child Labor Survey, around 360,000 children and adolescents were working before the pandemic in Ecuador, which places the country with a child labor rate of 8.56% (INEC, n.d; Unicef Ecuador, 2018; Ministry of Labor, 2018). However, this situation has only worsened due to the effects of the COVID-19 crisis, such as the closures of educational centers, school dropouts - more than 90,000 students have abandoned their studies - and lack of employment in households (Loaiza, 2021).

In Cuenca, 0.84% of children between the ages of 5 and 11 worked at least one hour, and in the adolescent population, this figure rises to 13.42% (Dirección de Planificación, 2021a). It is estimated that this figure has increased due to the pandemic. The alerts on begging and child labor handled by the Ecu-911 Integrated Security Service of zone 6 increased by 107% in 2020 compared to the previous year. (Orellana, 2020b). Seeking to control this problem, the Directorate of Social and Productive Development of the Municipality of Cuenca launched the campaign “Cuenca Unida Sin Mendicidad Infantil” [United Cuenca Without Child Begging] (Mosquera, 2021). This project reflects the political will to control and eradicate begging and child labor in the city, although there is still hard work to achieve this goal.

Equality in diversity

The dimension of *equality in diversity* is connected to a series of SDGs that focus on reducing inequalities, especially discrimination based on gender and race. Within this framework is SDG 10, reducing inequalities; specifically target 10.2, which calls for the social, political, and economic inclusion of all people regardless of their age, sex, disability, race, ethnicity, origin, religion, economic situation, or other conditions. In the same way, this dimension is linked to Goal 5, which seeks gender equality and empowers women; Goal 16, which promotes just, peaceful and inclusive societies; and Goal 17, building global alliances for Sustainable Development (UN, 2021).

The versatility of the approach for the analysis of this lens is extensive. Still, the study on the exacerbation of gender violence due to the pandemic, especially against women, has been prioritized. The United Nations (2021a) reports that “Nearly one in three women (736 million) have been subjected to physical and/or sexual violence at least once since the age of 15 (...) the current pandemic has heightened the challenges of women in abusive relationships” (p.36).

One of the reasons for the case increase has been the confinement -a measure to contain the virus- which contributes to the rise in violence at home (UN Women Ecuador, 2020). In Ecuador, the situation is alarming, primarily due to the increase in femicides in recent years. The Latin American Association for Alternative Development (2022) reported that, in 2021, femicide was committed in Ecuador every 44 hours. A discouraging scenario for the progress of the SDGs, mainly number 5, aimed at eradicating violence against women.

Cuenca reports that “80% of Cuencan women have suffered some type of violence” (Fundación Haciendo Ecuador, 2021), and 72% of women declare that they were victims of sexual harassment on public transport (Dirección de Planificación, 2021a). In this sense, gender-based violence is an issue presented on the Cantonal Council’s agenda. One of the most significant advances in the problem is the approval of the *Fund for the Prevention and Eradication of Violence against Women in Cuenca*, which addresses four lines of action: granting scholarships to orphaned children of mothers who are victims of femicide, psychological assistance to victims, promoting the purple economy and strengthening technological resources (Fundación Hacienda Ecuador, 2021; Zamora, 2021).

3.3.4.4. Enabled

Education

According to the United Nations 2021 Sustainable Development Goals Report, initial education was one of the most affected branches worldwide, affecting cities. Before 2020, 7 out of 10 children in early childhood education were developmentally on track, yet “good progress in early childhood education has been halted by the pandemic” (United Nations, 2021a). This setback in education was due to the closure of schools taken by governments as sanitary measures. In

general, the report encourages taking action to improve the situation of 1.6 billion children and young people affected by the closure of their educational centers.

In Cuenca, initial education is the schooling area with the worst indicators. The City's objective seeks to reach 90% attendance at this educational level; however, in 2019, this percentage barely reached 86% (Dirección de Planificación, 2021b). The Canton's rate is below the regional data, stating 96% of initial education. Therefore, even if the city were to reach the goal set locally, it would remain below the average in Latin America and the Caribbean (United Nations, 2021a).

Jobs

The SDG identified for the work dimension is objective 8: "Promote inclusive and sustainable economic growth, employment and decent work for all" (ONU, 2021). However, one of the most important effects of the pandemic on the labor sector was the massive loss of jobs, which mainly affected women and young people. Therefore, the analysis focuses on target 5 of said goal: "by 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value" (ONU, 2021).

In 2020, the global unemployment rate stood at around 6.5%, with 220 million people without work. However, this situation affected women and young people to a greater extent, with unemployment rates of 5% and 8.7%, respectively, compared to 3.9% for men and 3.7% for adults (ONU, 2021). In the Ecuadorian case, between June 2019 and 2020, around 1,270,180 jobs were lost. The female population is the most affected by the unemployment rate, with 20.9% compared to 12.7% of the male population (Esteves, 2020). By February 2022, the national unemployment rate was reduced from 5.4% to 4.3%, compared to the same period in 2021. Although the unemployment rate has improved, the unemployment rate for women is still higher than for men, at 4.9% and 3.9%, respectively (INEC, 2022).

In addition, women in Ecuador "have an unpaid employment rate approximately 3.4 times higher than men" (INEC, 2022, p. 9). Also, due to the confinement, domestic work has fallen on women (Esteves, 2020). Finally, although the Cuenca's unemployment rate by sex has not been recorded it has been reported that the rate was 6.6% for the last quarter of 2021 (INEC, 2021b).

Figure 29:

Global - Social lens of Cuenca

¿WHAT IS CUENCA'S IMPACT ON THE WELLBEING OF THE PEOPLE WORLDWIDE?

HEALTH

GLOBAL TARGET / SDG 3
Ensure healthy lives and promote well-being for all at all ages.
RELATED SDGs: 1, 2, 5, 6, 13

SETBACKS IN THE SDGS DUE TO COVID-19
In 2020, 35% of countries reported that reproductive, maternal, newborn, and child health services were interrupted. However, the decrease in the rate of births due to adolescent pregnancy maintained its progress. Between 2000 and 2020, the number of births per 1,000 adolescents between 15 and 19 years old fell from 56.4 to 41.2.

LOCAL SNAPSHOT
In rural areas, the average number of births per adolescent pregnancy is higher than that of the SDGs, with 80.9 births per 1,000 adolescents between 15 and 19 years of age.

FOOD

GLOBAL TARGET / SDG 2
Zero Hunger
RELATED SDGs: 1, 3, 15

SETBACKS IN THE SDGS DUE TO COVID-19
Around 1 in 3 people in the world (2.37 billion) was affected by moderate or severe food insecurity in 2020, increasing by almost 320 million people since 2019.

LOCAL SNAPSHOT
According to the ELCSA, in the rural area of Azuay, 78.95% of households have some level of food insecurity (p. 527). In the rural area of Cuenca, 53.9% of households have a mild level of food insecurity, 11.2% moderate, and 2.8% severe.

CULTURE

GLOBAL TARGET / SDG 11.4
Strengthen efforts to protect and safeguard the world's cultural and natural heritage
RELATED SDGs: 4.7, 8.9

SETBACKS IN THE SDGS DUE TO COVID-19
In 2020, the income of Cultural and Creative Industries has recorded losses between 20% and 40% according to countries from which information has been obtained.

LOCAL SNAPSHOT
Between March and December 2020, according to the Comprehensive Information System Cultural, losses were recorded in the cultural sector for around \$225 millions.

COMMUNITY

GLOBAL TARGET / SDG 11.1
By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums.
RELATED SDGs: 1, 3, 4, 8, 10

SETBACKS IN THE SDGS DUE TO COVID-19
COVID-19 has worsened the situation for slum dwellers and further affected those already vulnerable.

LOCAL SNAPSHOT
Between 2014 and 2018, the world population living in slums increased from 23 to 24% or one billion inhabitants. This figure is expected to rise after the pandemic, as the lowest-income households were the most affected.

PEACE & JUSTICE

GLOBAL TARGET / SDG 16
Promote just, peaceful and inclusive societies.
RELATED SDGs: 1, 5, 11

SETBACKS IN THE SDGS DUE TO COVID-19
At the beginning of 2020, children in child labor reached 160 million, or 1 in 10 children worldwide. Furthermore, the effects of COVID-19 threaten to push another 8.9 million children into child labor by the end of 2022, as families send children to work in response to job and income loss.

LOCAL SNAPSHOT
Regarding child and adolescent labor, it was reported that 0.84% of children between 5 and 11 years old worked at least one hour, in the adolescent population the figure stands at 13.42%.

EQUALITY IN DIVERSITY

GLOBAL TARGET / SDG 5
Achieve gender equality and empower all women and girls.

SETBACKS IN THE SDGS DUE TO COVID-19
Nearly 1 in 3 women (736 million) have been subjected to physical and/or sexual violence at least once since age 15, usually by their partner. The COVID-19 pandemic has exacerbated the problems of women in abusive relationships.

LOCAL SNAPSHOT
From March 2020 to February 2021, 2,302 complaints were registered under the following categories: sexual abuse, sexual harassment, rape, and physical, psychological, and sexual violence against women or members of the family group.

EDUCATION

GLOBAL TARGET / SDG 4
Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
RELATED SDGs: 3, 13

SETBACKS IN THE SDGS DUE TO COVID-19
7 out of 10 children in initial education were well on their way to development. However, in 2020 many preschool educational centers had to close their doors due to health measures due to COVID-19, posing a threat to this progress.

LOCAL SNAPSHOT
In 2019, the initial education rate was below the local goal established in the PDOT (90% attendance at this level of education). However, even if this objective is achieved, the city would still be below the regional average of 96%.

JOBS

GLOBAL TARGET / SDG 8
Promote inclusive and sustainable economic growth, employment and decent work for all.
RELATED SDGs: 11, 5, 10

SETBACKS IN THE SDGS DUE TO COVID-19
In 2020, global unemployment increased from 5.4 to 6.5%, which meant 220 million people were without a job. At the same time, young people and women were particularly affected, with job losses of 8.7% and 5.0%, respectively, compared to 3.7% for adults and 3.9% for men.

LOCAL SNAPSHOT
The national unemployment rate in Ecuador in February 2022 was reduced to 4.3% compared to the rate of 5.4% in the same period in the previous year. However, the unemployment rate for women is 4.9%, and for men it is 3.9%.



Note: figure prepared by the authors

CONCLUSIONS AND RECOMMENDATIONS

4.1. Conclusions

The Industrial Revolution marked a before and after in the history of humanity. On the one hand, human activity has had an unprecedented impact on nature and the climate system since the beginning of this process. On the other hand, this was also the trigger for an unprecedented demographic expansion that, over time, brought together most of the population in urban centers. In this way, cities are now strategic points for the development of economic and social activities. However, they have also become the primary sources of pollution and consumption worldwide.

The consequences of this dynamic have been extensive, transversal, and complex. In addition, the climate crisis is not an isolated phenomenon since it affects and coexists with a wide range of inequalities and unsatisfied social needs, which have become more complex due to the COVID-19 pandemic. However, international efforts in environmental and social matters have already been strongly questioned even before the health crisis. That is because of governments' lack of commitment to comply with their agreed obligations and the effectiveness of their actions concerning the urgency of climate degradation.

For that reason, action from different levels of government, such as cities, is key to prospering in social, economic, and environmental balance. Furthermore, the configuration of international networks of cities is necessary to provide them with a space to link with their peers, cooperate and integrate into the international debate on environmental and socioeconomic issues. In this context, smaller cities have been gaining relevance internationally. More and more urban planners highlight the strengths of applying sustainable management models from intermediate cities.

In response to the challenges arising from the COVID-19 pandemic, humanity has a historic opportunity to reconfigure its dynamics of environmental exploitation and reduce social gaps. That is to say, a paradigm shift in the conception of development, outlining itself towards one that considers humanity and the planet as two complementary elements. That is the premise of new postulates gaining relevance globally, such as the Doughnut Economic, which pursues social justice and environmental sustainability.

Based on the Donut model, the Thriving Cities Initiative has sought to promote socially fair and ecologically safe cities. Hence, this theory transformed into the tool known as the City Portrait to descaling the principles of this model for urban management.

The City Portrait is a graphic and straightforward tool intended to inform and initiate a public debate about the aspirations and goals of the city. The application of this model invites a reflexive analysis of the social and environmental state of the place under study. Although the tool does not intend to be a comparative model between cities, it seeks to be an introspective tool that adapts to the management needs of each locality. Applying the City Portrait model in Cuenca, an intermediate city, has made it possible to determine areas and dimensions in which public management must be strengthened to achieve a sustainable development model.

In the *Local-Social lens*, there were identified areas where Cuenca does not perform adequately, with rural areas being the most compromised. For example, the adolescent pregnancy rate in rural areas exceeds the national average. The public policy of education and reproductive assistance must address this situation to avoid deepening the dynamics of vulnerability and poverty. Likewise, it was identified that the rural area does not have optimal coverage of the public sewerage network. That has caused the implementation of inadequate alternative methods for eliminating excreta, compromising the health of the inhabitants, and increasing the risk of contamination of water sources in the area.

Similarly, many families in the rural area of the Canton have food insecurity. Therefore, programs are necessary that allow them to access healthy and nutritious foods that satisfy their daily caloric demand. In addition, internet connectivity has a meager rate, even more so in rural areas; however, the city's objective does not respond directly to improving this situation. In terms of mobility, there is a large gap between urban and rural. There are essential projects concerning mobility in the urban area, such as the bicycle lane network or the tram. Nevertheless, the road infrastructure that connects rural parishes with the city is often affected by rains and landslides. In addition, they do not have adequate infrastructure for pedestrians and cyclists to move, exposing them to traffic accidents.

On the other hand, it is necessary to address the problems of gender violence -especially domestic violence- discrimination and xenophobia so Cuenca can consolidate itself as a just and

peaceful society. In addition, it is essential that the national and local governments present programs aiming at eradicating begging and child labor, improving care for the population of elderly adults who do not have social security, and reducing the illiteracy gap in indigenous communities.

However, among the positive aspects of the city's management, it is found that the schooling rate in Cuenca exceeds the national average. In addition, the city has a biogas plant that uses the waste generated to produce electricity. Finally, the city's focus on labor is interesting because it does not aim directly at increasing the employment rate. Cuenca seeks to improve working conditions by investing in the training of the actors of the Popular and Solidarity Economy.

The *Local - Ecological lens* analyzes how the city works like nature to provide similar ecosystem services. In general, the city has not considered biomimetics as a principle for developing environmental management projects. However, some programs and projects are aligned with nature-based solutions, even though they were not born with such intention.

For example, in the case of water provision and treatment, the city replicates how natural systems such as moors capture and filter water. Likewise, the city generates electricity in its biogas plant based on the anaerobic digestion process. The city's goal of increasing its production in the future would contribute to reducing pollution. On the other hand, urban forests and green areas in Cuenca contribute to temperature regulation -although the city has not set a specific goal for it- improve air quality, protect soils against erosion and promote the formation of microclimates that favor biodiversity and the development of species. For this reason, the creation and consolidation of Conservation and Sustainable Use Areas (ACUS) are essential for the protection of water sources and the biodiversity of the area.

Finally, the addition of the dimension regulation of noise pollution in the analysis of this lens made it possible to identify that noise monitoring in the city is an essential step for creating policies and programs that control this form of pollution. Although, the city does not have projects based on nature for such an objective.

The *Global - Ecological lens* was adapted to the available indicators and resources; since the city still does not have an official estimate of the environmental footprint or estimates of the planetary limits descaled at the local level. Therefore, it has sought to demonstrate how, or to what

degree, Cuenca's environmental practices have impacted both within and beyond its borders. A specific case is the CO₂e emissions of the city, which had an impact on emissions at the national level and air pollution levels worldwide.

On the other hand, even though the city has no coastline, part of the fertilizers used and the CO₂ emitted reaches the rivers, which subsequently flow into the ocean, contributing to its acidification. Likewise, overfishing in the country is a problem that requires attention to prevent the degradation of marine ecosystems.

Although preliminary data shows that the amount of waste contributed by the city on a global scale is less significant than other urban centers, local management prevents the degradation of surrounding ecosystems. The same applies to the per capita amount of freshwater consumed annually in the basin, concerning the established planetary boundary and excessive land use. Finally, the city has not set any goals or projects related to protecting the ozone layer. Objectives only aim to reduce tropospheric ozone, a pollutant monitored by the Municipality's Air Quality Monitoring network.

In this way, it was identified that Cuenca had not set objectives as a city that aims to reduce its contributions to environmental pollution at a global level. Although they highlight that this is not a specific competence of the city, its activities at a local level contribute to environmental degradation at a global level. Therefore, it is necessary to carry out more in-depth technical studies to determine how local practices affect the balance of the planet. In this way, policies and projects can be proposed that reduce this situation as far as possible.

The *Global-Social lens* was also adapted to the existing data since an official study on the global supply chain has yet to be done in Cuenca. Therefore, it was not possible to calculate the impact of local consumption on the social welfare of other communities worldwide. Consequently, it was decided to examine the city's performance in achieving the 2030 Sustainable Development Goals linked to each dimension, prioritizing those SDGs most affected by the pandemic in the world.

One of the most committed objectives at a global level was health since the health systems in the world collapsed, and the local level was no exception. In addition, the United Nations reported setbacks in progress in reproductive, maternal, and child health. In the case of Cuenca, in rural

areas, the number of births due to teenage pregnancy is higher than the global rate; therefore, Cuenca has not complied with this SDG. Similarly, one of the most critical ravages of the pandemic was the increase in unemployment worldwide, which also increased at the national and cantonal levels, mainly affecting women.

Job losses during the pandemic caused poverty rates to rise, which, in turn, has put the food security of families at risk. In the case of Cuenca, it was identified that families in the rural sector are the most affected. In addition, child malnutrition is also one of the ravages of this event. Likewise, teaching at initial education levels suffered setbacks, both globally and locally. The rates of initial education in rural Cuenca are below the regional average. Added to this is the closure of schools and technical limitations so that students can study through digital platforms.

Adding to the above, another consequence of the increase in poverty has been the increase in crime levels in the world and the child labor index. Unfortunately, the same pattern happened in Cuenca. Also, the pandemic has exacerbated gender and domestic violence against women in the canton.

With the analysis provided by the City Portrait, it is concluded that Cuenca still has challenges to address before being considered an utterly sustainable city, understanding sustainability as a process of improvement and continuous evolution of management, but not as a goal or end to which cities must reach. Although the efforts of the local administration to assume international commitments to achieve sustainable environmental management are recognized; through the acquisition of non-reimbursable funds for the execution of socio-environmental projects.

Another of the identified limitations for Cuenca during this analysis is the lack and outdated indicators. It makes it difficult to pinpoint the most urgent needs of citizens and provide a timely response to them. Knowing the city's state is necessary to establish efficient public policies and access non-reimbursable fund programs at the international level.

On the other hand, it is essential to question the efficiency of the Development Plan and Territorial Ordering. Despite being a public document, it hardly reaches the majority of citizens, either due to connectivity limitations or complexity in the structure of the text. Similarly, it is noteworthy that the PDOT 2021 update still aligns with the National Development Plan 2017-2021, when the National Development Plan 2021-2025 is already existing.

Along the same lines, the updates of the city PDOT do not maintain regularity with the objectives set out in the initial document. To illustrate, in the PDOT of 2011, objectives have been set that have a timeline of 19 years; that is, until 2030. However, the subsequent updates to this document have not given continuity to the originally established goals. Furthermore, the status of the achievement of the objectives outlined in the previous text is not reported in the updated documents. In this sense, the lack of continuity of the management model proposed for the canton by the PDOT is questioned.

In this way, the City Portrait tool is a valuable instrument for generating proposals and policies that take into account mainstreaming in their analysis. In addition, due to its graphic and straightforward format, it is ideal for communicating the city's state to a broader audience. However, even though this model has several virtues, it is not entirely perfect.

At first glance, we read critics who called it a very broad tool that does not allow in-depth analysis. However, this tool intends to be a starting point for a series of actions to transform cities into prosperous spaces. In other words, it coexists and complements other tools that allow deepening the analysis of the snapshot provided by the Portrait.

Similarly, this model still has limitations when being applied in rural areas. Since it was created in larger cities, in the global north, and with a completely different social, economic, and administrative context, it may present some difficulties when applying to a canton like Cuenca, which has urban and rural parishes. However, both in the documents that detail the methodology and in the interview with its creators, they emphasized that this tool can and should be adapted to the reality and needs of each place where it is applied.

Applying this tool in Cuenca has been an enriching exercise in understanding and identifying the challenges that still need to be resolved to consolidate an ecologically safe and socially just city. In this way, tools such as the City Portrait, which seek to be introspective, prepare the ground to propose innovative and creative solutions. Proposing a guiding agenda to outline how the city will develop in the future is a challenge and competence of the local government, but also of all the actors of Cuencan society, who are called to get involved and build the city that we long to leave as a legacy for future generations.

4.2. Recommendations

- We urge academia, the private sector, and local government to unify their efforts to carry out studies and collect data and local indicators. Mainly to determine the city's ecological footprint and create a investigation about the global supply chain; since it has been identified as necessary to know the impact of local activities globally. Similarly, the survey and updating of environmental indicators would facilitate access to non-reimbursable funds for green projects.
- We recommend having an information system on its priority attention groups to implement policies that improve their quality of life and monitor their progress. Keeping this information up-to-date makes it possible to discuss innovative proposals that meet the needs of these groups.
- We suggest creating a system that standardizes the publications and the methods of collecting data and indicators between the Municipality departments.
- We recommend reviewing the Territorial Planning and Development Plan (PDOT) update to align with the new National Development Plan 2021-2025.
- Likewise, we advise considering goals with a longer-term vision for the final document of the PDOT, which would allow a broader range of activities to implement projects that generate more impact.
- We recommend carrying out campaigns to present the PDOT to citizens in an executive summary, highlighting the most outstanding topics of the final document. In this way, the highest number of actors would be involved in local management.
- We propose incorporating the City Portrait in a specialized tab of the municipality's website. In this way, we would show the city's residents the state of the city, the existing objectives, and the projects being carried out in a graphic, condensed, and holistic way.
- This tool is the first step in a long process for city management. We recommend creating working groups, or even a network of different actors from the city, to discuss, validate and improve the Portrait presented in this document, both in the indicators that fed this tool and in the vision of Cuenca in the long term.

- We invite updating the Portrait of Cuenca every time the city sets new objectives, the indicators are updated, or new projects considered relevant for public management are incorporated. Above all, we recommend comparing the current information on the city state with the data from the National Census scheduled for the end of 2022.
- We urge technical professionals to continue investigating the city's state in environmental matters and add a more precise quantification of the impact of polluting activities at the local level concerning their global responsibility.
- We encourage the creation of programs and projects in rural parishes since we identified that their needs are achieved in a lower proportion than the urban population of the Canton.
- We highly recommend integrating Cuenca into the C40 Cities network as a way of approaching the Thriving Cities Initiative and the methodology proposed in this research work. In addition, we recommend a rapprochement between local authorities and the DEAL team to dialogue and co-create new tools based on the Donut Economics principles that are adapted to local needs.
- Finally, we invite the initiative 'Cuenca 2070 Observatory' to create a campaign at the local level, which takes into consideration the citizen's opinions about what they aspire for their city in the future. Similarly, this entity could be a network that allows more direct contact with the citizen, informing in a simple way how the city is doing and what projects are being carried out at the moment, using the City Portrait format.

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APPENDICES

Appendix A: Interview to Mgtr. Pablo Osorio

Date: January 18th, 2022

About the interviewee: Pablo Osorio is an organizational psychologist from the University of Azuay with a master's in urban studies from the Colegio de México. He is a researcher at LlactaLAB of the University of Cuenca. Osorio works as an advisor on sustainable urban development for Cuenca in the Program of Sustainable Intermediate Cities of the German Technical Cooperation - GIZ. Additionally, he is a member of the Donut Economics Action Lab.

To start, we found you through the DEAL page. While doing our research, we were looking for members to get closer to this initiative, and we found you. We were excited when we saw that there was a DEAL member in Cuenca. After searching a little more, we found out about your work at LlactaLAB and the municipality. So, taking advantage of having you here, we would like to know a little more about your academic background and your experience in this area of sustainable cities and development.

Okay, then I'll introduce myself briefly because we don't know each other that well. I am a psychologist by profession, an organizational psychologist from the University of Azuay. Organizational psychology has two lines, let's say. One is related to human talent management, and the other area is more related to organizational development, facilitation of processes, etc., which is what I like the most. So, after my training at the university, I needed a little more of a social, economic, and reality framework (let's say) that would give me the light for my professional growth because I was already working. That was not so much with companies but more local governments and organizations.

So, there I studied a specialization in Bogotá, at the Universidad de los Andrés. Then I linked a little more to the urban theme. There I studied for a master's degree in urban studies in Mexico. And the work that I have been doing, as you say, Andrés, I have been in LlactaLAB linked to research in the last ten years. And lately, a couple of years ago, I joined the German Technical

Cooperation, the GIZ. Now, I am working on a program called “Sustainable intermediate cities” - the project began its second phase-. And the idea is that we can work on climate media and financing in the cities developing it. So, I am in charge of Cuenca with these two perspectives: one of climate financing and another of the development of measures under our programmatic frameworks.

Our framework would be “The New Urban Agenda,” you must have heard it, and climate change in general. With the climate change mechanisms that have been sent with the last COP 26, let’s say it is our closest reference, and the Paris agreement is the basis of these issues.

At the national level, there is something called the “Sustainable Habitat Agenda” signed by the Ministry of Urban Development. I think it has, to a large extent, a bit of what you are proposing. Let’s say it’s something that GIZ itself helped to facilitate, and I think it has several of the components that you might be looking for. Of course, it focuses on the local level, but perhaps you would have it more or less resolved in that part. I think that this is a very, very good mechanism to respond to what the city needs at this time. And I think that for Cuenca, it fits pretty well. It is a fairly advanced document since many Ecuadorian towns would not even understand much of their scope because they talk about some pretty innovative management tools. For example, they have not yet been used in the country, such as land management. That is not used much, but I think Cuenca, Portoviejo, possibly speaking of the intermediate ones, is not true... I believe that Portoviejo, Manta, and Cuenca may be among the most advanced in that aspect, and they could and would be discussing these issues. So there, from what I see of this matrix that you have, perhaps the local point, both socially and environmentally, let’s say, could be answered there.

Another of our general documents that we use is, I don’t know if you have heard, the NDC as the Nationally Determined Contributions. It is a document required by the Paris Agreement to define what Ecuador is committed to in the next five years, let’s say. So, we have to align ourselves if we want to be within the premises of climate change, of the fight against climate change. We will probably access financing, so we have to be aligned on that issue. It is a document that is not very clear. It seems to me that it is not that good: it is difficult to read, elementary in its structure, and a little confusing in its wording. I wouldn’t say I like it that much, but it is what will be approved, and it is what we have as a country that is another component that we have.

And as I was saying, I'm working in Cuenca. My main counterpart is the municipality. From there, in the first phase of the program in which I joined, almost at the end of the program, we worked a lot on planning, which is a bit of what you are proposing. At this time, we no longer want to work so much on planning within the cooperation; we would like to do things. And those "doing things" is supporting circular development measures and climate finance. Those are our two most important elements.

Thank you very much for that general context of how work is being done, even with specific projects, in Cuenca. In that sense, it precisely linked to what you were telling us. What specific documents would you recommend us to find the city's objectives? For example, we have reviewed the PDOT and POA. Still, I don't know if there is another macro document that specifies precisely the city goals for 2030, for example, as some other cities have.

The problem with the PDOT is that, of course, at some point, it's a methodology that we import without much criteria from Spain: this idea of land use planning. I'm not sure that it works so well because the truth is that it is a giant document in which they try to put everything there. In other words, everything that will happen in Cuenca is somehow broken down there, more or less. And what is not there, because not much attention is paid to it. I don't know if that topic is beneficial, but in any case, that is it. I can recommend the page they are using for socialization, and I think there are some questions, I think planning, I believe it is this [shows the page]. It is a page that we, GIZ, support construction, and the idea is that there are source questions. And probably some of your questions may be there. You can interact with the page. I don't know if it's working fine.

I would also recommend the Sustainable Habitat document and the Sustainable Habitat agenda. It is a good tool that covers many of your topics. It is structured into four significant axes, and each of these axes is subdivided. In the end, we will have about ten different management areas. It seems very big at first, but I think once you are familiar with it, it can be summed up quite well, and I think it could be a good idea; as a structure where the urban theme, in general, can go.

And well, what is that to apply in Cuenca?

Did you know that we are participating in a consultative corporation? It began the previous year in which the municipality, the University of Cuenca, and the production chambers were linked precisely because there was no prospective city proposal. That is to say, what do we dream for Cuenca in the coming years. But it is exactly the questions that you have just asked me. We don't have it; we don't have the answer. In other words, we have to go to the PDOT. It is a document that, possibly, I am not saying that it is wrong. Let's say it is a mistake -and excellent people are working in the PDOT- but it is no more than a structure that is sometimes even repeated in cities. So, suppose one sees the PDOT of Riobamba or Ambato, Loja or Portoviejo. In that case, we almost have a similar framework, and I think that cities are not always like that. You have to believe, and like Cuenca, what would you like to achieve in the future? And go back a bit to that idea of strategic plans that existed at some point; that we didn't give much attention to in their time, but I think it helps a little to think about where the city can go: What are the signs of Cuenca in the future?

And I think that can give them a direction and help us in various ways to work. We don't have that. And, in this consultative corporation that I am telling you about, one of its projects is to achieve a strategic plan for the city. Having this idea of a prospective city is a little what you are looking for. To ask ourselves the questions head-on: what do we think Cuenca would need to prosper socially and environmentally? And out there to mark a route because, I tell you, the PDOT is not wrong. Excellent people are working there. But since the structure is like you have to take these five lines, you have to define these issues. You cannot get out of that straitjacket, and it can restrict a bit the creativity.

That is something we like about this tool is how simple it tries to show itself [the City Portrait], especially now that we've revisited the PDOT. It tries to be very graphic and holistic at the same time. Precisely by comparing what the city's objective is and what it is doing, it is possible to see very graphically and simply in which areas work is lacking or in which areas something is being done. In that sense, we like it.

Yes, exactly. I think that is just what you say, Andrés. To walk, I would need to have three or four clear things in mind, and I think a city would also need to have three or four clear things. But, of course, if the option is a 200-page document

The PDOT has 900 pages, we read all 900

In other words, no one, no one is going to read it. Not even the political enemies are going to read it. They are the ones who read the documents the most.

In fact, I reviewed how the PDOT updates had been. For example, the last update of 2021 basically has the same information as 2015. So, in reality, there is a minor data update, which was worrying us since the access to data shown to the public is somewhat restricted and repetitive. That is why I wondered whether there was any other document or where we could consult. Or if you know, for example, more researchers in this area or authorities who you could recommend us. People who could guide us a little because we have seen the documents enabled by the municipality page, and most of them are very repetitive in information and structure.

Let's see, that's a problem that starts; I feel like I'm giving you pure justifications. I don't know if my interview helps you a lot, but ok. Let's see. I tell you that yes, you are right. This document is too repetitive that it is challenging to find an answer. You have such a lengthy document that it's hard to follow. It is also repetitive on the data issue because we still do not have a census update. Although we have good surveys that take Cuenca into account to make it representative at the city level, it is not enough. So, we hope to have representativeness within the city. We have no idea what to do inside the city. We have data from Cuenca, but we cannot divide the interior.

The truth is that other projects, because in this corporation, as I told you, there is like the idea of doing three projects: one is this strategic plan, another is an employment investment plan, "how to develop employment in Cuenca?", and the third, is one that, we are strongly interfering with German cooperation, which is the Cuenca observatory. And this calls a bit to "what data we have about the city?"

And this “what data do we have about the city?” In other words, what we are going to do because we have no other source... we are just going to take the census, I understand, at the end of the year. At the end of 2022, imagine what that is. They are just going to collect the information, and that is not that it is ready right away. The bases must first be refined, all the documents transcribed, and then, in 2023, we will have the census information. So, we won't be able to know much about Cuenca until then, and we will continue working with the 2010 information. At the intercantonal level, there isn't much to do here; there isn't much to do there.

What is our option there? We have thought within the observatory that universities, right or wrong, have a super important research budget. Let's see. There are four prominent universities in Cuenca. If we add the UNAE in Azogues, which is also national and is very important, and many Cuencan studies there, we could think of these five regional universities. Each of them spends a significant budget on research. In fact, at one of its best times, it was spending more than two million dollars a year on research. Imagine what that is. Two million dollars a year in research would mean that we should have all our questions answered. But where is that information? That information is undoubtedly in an article. Now researchers like to publish, but that doesn't necessarily reach people, the mayors, the councilors, and the people who make decisions. So, it's also a big drawback.

We probably have many questions answered, but they are in international articles, sometimes written in English. More and more in English. And even if it is in Spanish, the academic language can be very complicated to decide. It's almost like reading a PDOT to make a decision. If you have a question about something, you will read 30 pages of the article -which is sometimes in English- to decide. No mayor, no journalist is going to do that to give an opinion. So, I feel that society and the community are moving away from knowledge. Knowledge is becoming part of a sphere that we cannot easily access. The idea of this observatory is to make that link; that is, everything published in that academic language can be easily translated into the most every day, colloquial language that can be helped.

I feel that I am giving you pure justifications, but that's what we have. I think these are questions that people are asking. The ones you have requested are questions that are being asked. Some people are concerned that there is no answer to this, and people are working so that this can happen.

Unfortunately, I don't know what to tell you at this point. We have made little progress on the issue of the observatory. We have a few questions that have been answered. We have a general outline of what we would like to do, but I don't know if it would help you. The idea that I imagine that you could solve at this moment would be to have some key interviews with people who may be working on planning issues. Ask them that type of question. That they answer what are the Cuenca needs. Pay attention and generate an understandable structure. Your thesis will be a kind of translation of that super broad and general planning to something chewier. Let's say that everyone can understand. I believe it would be super interesting. You could systematize what Cuenca aspires to and what it needs. I think your interests could go as far as trying to elaborate something like that. Putting together a document seems complicated to me, and I don't know if it's necessary.

The contribution that you can make is in the global sphere. That I see that the problems, as a person from Medellín once told me... [the session stops]

I was saying that this friend who I mentioned and worked in Medellín told me that cities located in the middle of the mountains had this problem: that they always spend time looking at their navel. In other words, they refer to themselves all the time. They never compare to other cities. It is very different, he said, from the cities on the coast, which always have other cities as a reference. They know that beyond, there are other cities with which they have exchanges, links, and relationships. So that's the problem of towns that live enclosed between mountains, and I think that's what happens to us. Cuenca is like that. We do not refer to other places. We don't know what our relationship is with people from different places.

I think it also occurs because we are on the periphery. You have undoubtedly read and know more about this subject. We are not at the center of contemporary world discussions. We are not a passing point in the dynamics of almost anything. Here in Latin America, we have some centers, of course, which are Buenos Aires, Sao Paulo, possibly Lima, Mexico -perhaps Mexico is the most important city- and that is a place that is very connected to the world. The people, the scientists, and the rock singers all want to go there to express their art and knowledge because it is an entry point.

We are about two steps away, at least, in Cuenca from those centers, and we are a periphery. The most contemporary thought within social discussions is not discussed here. This look runs through the entire debate in Cuenca: we are being self-referenced a lot. Then, we don't know how we are linked to the rest of the planet. But as much as possible, I think we're doing many things right. For example, what can you say is related to the outside world in the environmental issue? Let's see, possibly the issue of air, maybe the issue of water. In both, there are very interesting topics that Cuenca is doing and has plans to improve them. These are more difficult to think about on a social and global level, but perhaps on an environmental level, we are linked. We have some interesting ideas there.

Cuenca is commonly known as a sustainable city. Some events and publications present Cuenca as a 'sustainable city.' There are a lot of projects such as the tram, the IERSE, water monitoring, and the bike path, for example. From what you know and what you are working on, could Cuenca already be considered a sustainable city? Or, from what you have seen, in which areas are they lacking work?

That's a good question because sustainability is a category - well, it's a concept, but let's talk about it as a category - that appears as a contrast to something that is happening. I mean, sustainable mobility faces the problems of traditional mobility. It faces its pollution, the energy source used, and the use of space it has. That's what it does. So, sustainable development, the sustainable city, responds to something happening, and that isn't very easy. So, I don't know if it's a place where you can get there. I do not know if it is something that one can say: this is sustainable. I don't know if there is any example, in fact, in the world. It happens more or less like the ecological: the buses are ecological, the houses are ecological, and the cutlery is ecological. It is a phrase that begins to come out and that, after a short time, is emptied of content and does not have a meaning. Precisely, exercises like yours can help give them meaning. So, for us, what is sustainable? For Cuenca, what would be sustainable?

So, sustainability would be like moving away from a type of development that does not help us socially or environmentally; but that for different cities may be different. I think Cuenca is doing

well in some of its areas. Waste management is excellent. The work with the water is also quite good. There are conservation issues that are very interesting in Cuenca. Plans, for example, energy and transportation. The tram, as you say, is one. The idea of buying electric buses is also out there. Promote a little more walking. Try a little more what the PDOT and PUG do: don't expand disorderly because that greatly complicates how we use our resources.

These are all steps that need to be taken, but I don't think it's even convenient to say that we are sustainable. To say that would be: let's stop here, let's continue doing the same thing because we have already reached a sustainable place. No, the truth is that sustainability is a way of doing it. We are not clear about what exactly it is. So, new ideas always arise to be able to get hooked on this sustainable theme. I like the topic more than the idea of 'city of people' or other adjectives that puts to cities because it is pretty broad and makes us think of a form of development. No city is completely sustainable because new ideas always appear to improve. For example, we should use fewer plastics, consume local farmers, and transport ourselves differently.

In other words, many things can happen from sustainability. And I tell you, it is not in the hands of the local government alone. That is why it is essential the idea of the actors that you have there. All the industrialists who manage many formal jobs in Cuenca have a lot to say. They manage the entire local production system. They can be an interesting point of reference, and they are involved in this corporation that I am telling you about. So quickly answering your question, what else do you have out there.

Just now that you mentioned this, to what extent do you consider that cities, by belonging to international networks or international cooperation programs, really have a tangible impact within cities? Or they only remain in projects or initiatives, which perhaps do not translate into more tangible benefits for society. I don't know if there are illustrative cases in Cuenca of what was done through such a cooperation program and had a real impact.

It's a super good question because, as I said, Cuenca is always good as a self-referenced, and we don't like to see much beyond that. Some interesting things are happening in Portoviejo, much better than in Cuenca. That is what I know from my job. That is something that many citizens

possibly don't even have an idea is happening. For example, Portoviejo is ahead in many things that Cuenca was thought to be the best intermediate city in the country in absolutely everything, and there was no rival. Now we have a lot to learn in Portoviejo. We have to put our eyes there and start emulating many of their actions. And I think that, with what you say, the issue of international cooperation is super important. And now, in fact, Sofi - you know her, don't you? - of cooperation, launched the plan for the 'Internationalization of Cuenca,' and I think this is a valid option.

The truth is that I quite like it because Cuenca is outside the international circuits -well, now everything in a pandemic everything is in chaos- but it was challenging that Cuenca was the host of international events. Cuenca is not the destiny of the great scientists to come and present their ideas. Of course, we have cooperation because Cuenca is still important in the context of Ecuador. Surely you will do master's degrees outside the country. Then you will realize that simply being a student in more connected cities worldwide gives you incredible opportunities such as assistance to a teacher's class from the other side of the world.

So, I think that these types of efforts that can be made to internationalize Cuenca are super important. First, to have a relationship of what our interpersonal relationships are and the cooperation we are having. As I was saying, now the German alliance, in this program, what we try to do is to be able to unite the supply of financing with the demand that we have for climate financing. Actually, in climate financing, there are a lot of resources that are not being used, and sometimes it is not enough. Instead, it is not enough to write a good project. You can write a good project, but the city needs to prepare; You need the conditions to access that financing. Suppose you don't have a monitoring system. If you don't have an inventory of greenhouse gases, you don't have a type of institutional framework, and you are not linked to certain kinds of conceptual planning issues: you cannot apply for those funds. And I think that thinking about this internationalization and knowing where the world is moving is critical.

So, I think that these types of efforts that can be made to internationalize Cuenca are super important. First, to have a relationship of our interpersonal relationships and our cooperation. As I was saying, now the German alliance, in this program, what we try to do is to be able to unite the supply of financing with the demand that we have for climate financing. Actually, in climate

financing, there are a lot of resources that are not being used, and sometimes it is not enough. Instead, it is not enough to write a good project. You can write a good project, but the city needs to prepare; You need the conditions to access that financing. Suppose you don't have a monitoring system. Suppose you don't have an inventory of greenhouse gases. You don't have a type of institutional framework, and you are not linked to certain kinds of conceptual planning issues: you cannot apply for those funds. And I think that thinking about this internationalization and knowing where the world is moving is critical.

This new wave, because it's like an emergency, as I say, it's like the irruption of microprocessors. It is a global climate emergency that we're already seeing. Every time we have emergencies. If before, we had floods in Cuenca once a year or major floods once every two years. We have two, three, or four significant floods per year now. And indeed, they are going to be stronger every time, and that is being felt worldwide. That emergency is not true; the countries and cities - which I think are important cities - that know how to get into this emergency as soon as possible and understand how this issue works will get ahead. Those cities are going to be at the forefront. This has happened to many cities globally with the case of microprocessors. Cities in India, in China, in the United States, said we get into this issue here, this is where the problem is going, and we go.

Almost the same is happening now. So if Cuenca can learn that at this point, we still don't know. Yesterday I received a report from a consultancy that put us behind Portoviejo in climate finance, for example. We have a lot to work on. For you who are just starting, and I think that even for myself, as a professional option, we will be talking about the issue of a climate emergency for the next 20 years, which is already a professional life. You could retire from climate experts and do well in your professional life.

In order not to stay any longer, as you had told us that you had separated an hour for this interview. We wanted to ask if you could provide us with any contact within the DEAL or the municipality who can provide us with information and contribute to the project. Above all, technical experts in the environmental area.

The problem is that the environmentalists, the good ones, speak a little tricky. Let's see, what I would suggest is that the PDOT and the PUG have been debating in the cantonal council. This means that there are open sessions to the public, and I think they even stream through Facebook. Where a topic is presented each day, I think they show it on Tuesdays and Thursdays, but I'm not sure. I would suggest looking at the pages or coming to the PDOT offices to tell them about this and going to that presentation or listening to it. I think they can have an idea of what is happening. Possibly they are recorded on Facebook, and you can have access. And try to summarize that presentation.

This could be your job because digging into the subject much more is complicated since it is so broad that you have to touch superficially on what is happening in Cuenca. But like that, just a screenshot. You will not have time, possibilities, or knowledge to go deeper because one cannot cover all the topics. I would recommend you not to get into issues that you don't handle much because you won't know how to deal with the concepts, and you will do some crazy things. You can't do crazy things there. So, I recommend that to you.

Take advantage that there are presentations to the PDOT. There should be videos of that. Presentations to the council members are prepared before the debate. Don't stay in discussion with the councils if you don't want to. So, stay in the team's presentation, listen to some questions, and get out. That is my recommendation.

I'm going to think, if I had something, I have your contact Salomé, I'll write it to you there.

Perfect. Thank you very much for your time and for guiding us a little about what is happening in Cuenca. Sometimes it is a bit difficult to find accurate information. So, we are going to follow your suggestion to watch these sessions. It is an excellent contribution because I did not know we could attend the sessions. We could meet people who maybe know a little more, and we could get the information we need.

Yes, instead, thank you very much again, we will be commenting on anything, but I think that, in principle, it helped us a lot.

No, I hope so; sometimes I feel like I'm just making a bit of noise [laughs]. Please let me know when you advance; this topic interests me a lot.

Sure, it would be a pleasure if you could hear what we finally end up writing. Until then, thank you very much and have a nice day.

Appendix B: Interview to Mgtr. Sofia Arce

Date: March 11th, 2022

About the interviewee: Sofía Arce has a degree in International Studies from the University of Azuay and a Master's degree in international business from the Universitat Pompeu Fabra in Barcelona. She currently works as General Director of the International Relations and Cooperation Department in the Mayor's Office of Cuenca.

We have precisely reviewed the legal framework that supports cities to establish international cooperation. We have seen that Cuenca focuses on twinning, technical collaboration, and projects with international organizations such as the World Bank or UNDP. What other type of international cooperation categories Cuenca specifically have?

Yes, perfect. The international cooperation that Cuenca handles is non-reimbursable financial cooperation and non-reimbursable funds. We also manage technical assistance, and we also take donations. So, in those three categories, I would say that the one where we are strongest is in international technical assistance and non-reimbursable funds.

Town-twinning fits into any of these categories? what is precisely the issue in which it is framed?

Well, twinning has been a practice that has been carried out in cities since... it gained a lot of strength after the Second World War. So, it was the relationship that cities had, especially European ones, to strengthen relations with the world and receive donations as part of the Marshall Plan to rebuild Europe. Later they gained a lot of strength in the 1980s. So, what remained in people's minds in the 1980s and 1990s was "have a twinning or establish international relations is that they send us a road team or an ambulance." And in reality, decentralized international ties, which are cities, have evolved a great deal and are no longer just twinings. Because many times,

twinning are just that: a document you sign. It usually says: I will relate with a Guatemalan city to work on issues of tourism, academic exchange, and cultural exchange”, but in the end, we do nothing.

So, we have sought to reactivate the old twinning of Cuenca, for example, with Popayán, which is the first twinning agreement that Cuenca has. Above all that, the twinning also go along with specific work projects. For example, yesterday, we talked with the Dominican Republic Embassy. They want us to join hands with Santiago de los Caballeros. Still, we don't want to stay only in the twinning, but we invite the mayor to come to the mayor's event in June. So, after that, yes, we will already sign agreements not only for the municipality but also for the universities for academic exchange. Also, we were interested in the model they are having there to attract foreign investment.

So, it includes, let's say, concrete things to the vein, to the needs, and it has to be beneficial for both parties.

I understand you were talking more about economic issues in this specific case. But in matters of climate change, the fight against climate change, and, above all, social welfare issues. To what extent does Cuenca have the powers to assume international commitments?

We, let's say, have several agreements that are framed in climate change. For example, several city networks such as ICLEI and C40 are focused precisely on climate change. Through them, we have access to commitments from cities such as Cities For Forest. That one moved a lot during COP26 in November of last year in Glasgow. Cuenca is also part of the Zero Carbon Cities initiative. So, what did we sign: a commitment to decarbonize, not the city, because zero carbon is unattainable -because we emit carbon when we breathe, use cell phones- that is, we have a carbon footprint in everything we do; but what we can commit to as a city is to electrify all public transport? So, the tram is 100 percent electric. We are buying our first fleet of electric buses for this year. It is important to mention that we manage this debt swap with Germany, so they are non-reimbursable funds. A gift for Cuenca. Ten million euros that we do not have to return to Germany and that we will use to buy electric buses.

That is a specific initiative on climate change initiative and commitments we can assume as a city. What else do we do about climate change?

Now we are working with the GIZ. We have to present. They made us a consultancy to identify the performance we are having as mayor to access climate financing. So there we saw that some issues that we have to strengthen are, for example, gender mainstreaming in climate change projects. The climate change project includes gender mainstreaming. So that you understand me better: purchasing land in the upper part of El Cajas because that is where Cuenca's water sources are born. We want to buy land to expand the guide zone to avoid contamination in the lagoons, which ends up here in our rivers. But when purchasing those lands, the issue is we are also displacing the original population. So, we have to have this approach of not affecting the women who work probably cultivating the land; they have cattle in that area. That would be a climate change project with gender mainstreaming.

I think even intersectional issues are attacked there. As in this case, you talked about women, women in the countryside.

Correct

Well, precisely linked to what we were talking about, we would like to know if there is any project or technical cooperation framed in principles of 'solutions based on nature.' I don't know if you have heard about the subject. It's, for example, how nature does carbon sequestration through forests. So, one proposal would be to regenerate the banks of the river. Does something like this exist in Cuenca? Or are you working cooperatively in those areas?

Yes. For example, we have a circular economy program with the CGA and Germany's support. So, what is done regarding regular solid waste management is to throw it away. Still, people are reusing certain raw materials in industries so that they do not go to waste and will not be incinerated. Still, they are used to manufacture other types of products. For example, Collineal manufactures furniture, large furniture. They process their wood, but with the waste, they make

cutting boards or bowls to serve the salad. So, they are not disposing of that waste; they are reusing it. That may be one example. Another maybe with the topic of tire-shredding. They are using it for children's games; when they fall, they now have a protective layer in the playground.

I think we could, focused precisely on this, advance a little on the issue of the SDGs. I told you that we were searching if there was a document or somewhere it summarizes how the progress of the Development Objectives has been in Cuenca. How is that topic?

Yes, that's called voluntary local reporting. The city of New York began to present them in 2018. Since then, several cities -Buenos Aires and Barcelona- have presented them. Cuenca is currently going to launch that document as well. So, what we are doing is collecting data, not only from the municipality of Cuenca but from companies, universities, and civil society organizations. What we do is: this data is a picture of how Cuenca's current state concerns the SDG, that we do every year. So that helps us, one to know how we are as a city; but also, international cooperation, as a guide to understanding what they can strengthen here in Cuenca through their work.

If it is done every year, does that mean there is some record of the previous year?

No, this is the first year we are going to do it.

Oh, okay, okay, and how would you rate the performance of the city, from what you have been able to review so far, in this matter?

It is still too early to say because it does not depend only on the data we collect. Still, it is also necessary to validate and present the information to the universities. We cannot say that they are terrible at fulfilling the education SDG, and they can tell us: no, that is not true. We have this, this, and this aligned with such a goal. And well, then it is need counteracting what is in data with the information that universities have qualitatively.

Now that we have done research on the cities that are applying this City Portrait model that we are using, we realize that Amsterdam has a kind of local plan that guides all the activities carried out as a local government. This is called the Amsterdam Agenda 2050 and basically, what they want is, by 2050, to be an utterly circular city. This macro-objective guides all departments' policies even if it has sub-objectives. But we would like to know how it is managed in Cuenca or how is the municipality's management. There is some mission or vision for Cuenca in the future years?

Of course, an observatory is created between the universities, the chamber of industries, the municipality, and the GIZ, called "Observatorio Cuenca 2070". What this observatory does, for example, is collect data on how COVID 19 has affected different areas: social, economic, and health. But from this data that is generated, what they also do is develop public policy. That is what we are for as a municipality, to create ordinances. Specifically, on the environmental issue and circular economy, I do not know that there is. This is more of an observatory for social and economic problems. Still, being an observatory, the environmental issue could also be included.

Ah, perfect. As we reviewed other cities such as Amsterdam, Portland, and Philadelphia, we saw that it has this macro-objective of governing the city towards the same goal. In the specific case of the Department of International Relations, what purpose or axis do you have for your activity?

We have the Cuenca Internationalization Strategy. We took it out last year. It is the 2021-2025 Strategy, and its goal is to position Cuenca among the ten Latin American cities chosen to study, invest in, and visit. That is the long-term objective of the office. Within the strategy, it has several recommendations for where the international action of the city should go.

We have reviewed this strategy document was super exciting and should be a mandatory document in our career. Right there, we found the mission, the vision, the objective. We

found the list of Cuenca's twinnings, but it is updated until 2020. So we want to know if, since that date, other twinnings have been made.

Yes, for example, in the United States, we have Newark and Peekskill. Newark is a city next to New York. In Mexico, here is Puebla, but we have one with San Miguel de Allende. Peru, Cajamarca, Cuzco. We also have one with Beit Sahour in Palestine. I think those are the last ones.

Perfect, and we also saw the networks to which Cuenca is attached in that same line. It was the same until 2020. Perhaps some change has been made?

Yes, let me see. We maintain all of these [points to the table with the information on the networks to which Cuenca belongs]. Not this one, the International Association of Educating Cities. We came out of this because the city networks offer activities, capacity building, and workgroups. But when we see this not have a direct impact on the town, are inoperative or not align with the city's objective -an annual membership fee is paid for these networks-. If we do not use them, for example, this one, I decide to disaffiliate. But on the other hand, we are looking to join C40, another network of cities that works on everything related to climate change.

Of course, the initiative we are working on is from C40. We saw that only Ecuador's city that belongs to this network is Quito. So, it was also interesting to see that. What internal process is handled to join a new network in terms of the internal process?

Let's say, very administrative. We decided here, in my office. So basically, it's getting in touch with the network, finding out what working groups they have, the services they offer, and how we would benefit from paying for that membership. A form is filled out, usually where a contact point is put, what are the city's interests, and it has to be signed by the mayor. So, everything signed by the mayor passes by the office. I send it to the legal secretary, to the syndicate where I say: "please review and give the 'okay' for the mayor to sign." The office answers and tells me: "okay, Sofía,

endorsed.” With that, I send a letter to the mayor that first goes through the council’s secretary, where I say: “okay, let the mayor sign”—the head of office reviews, and then the mayor signs. So, when sometimes they ask us for the mayor’s signature for tomorrow, it’s not that we catch him in the corridor to sign. He did not sign anything not reviewed legally and passed through all the filters.

The documents that we have reviewed in the PDOT and many other reports -not only from the city but also from other organizations- always highlight Cuenca as a sustainable city. For example, they talk about bike lanes, trams, air monitoring, and water quality. Actions that aimed at making Cuenca a sustainable city. We would like to know if, with all these actions that the city has already taken, Cuenca can already be considered a sustainable city? Or what steps, according to you, are we missing to continue moving towards it?

No, more is still needed. For example, sustainable public transport is necessary to reduce greenhouse gas emissions. Two years ago, a study that was carried out reported the primary sources of pollution in Cuenca, and one of them was the mobilization. So, it is needed to electrify public transport, but to encourage more people to use the public bike and the bike lanes, walking and not use the car so much because it is a pollution source. We also work a lot with this ‘Mobilize your city’ initiative. It proposes activities to have a more sustainable city based on better public mobility.

To finish with the first questions that we prepared, what documents would you suggest to find these key city objectives of Cuenca? For example, we have spoken with other municipality departments, and they told us that there is no macro document that summarizes all the goals that Cuenca has. So, what would be your suggestion to identify the critical goals of the city administration for the Cuenca’s management for the following years?

The PDOT. PDOT is the roadmap of urban planning of the city, urban and rural. But something like that, more or less, has to come out of Observatory 2070. But I think there is nothing we can

say that it is ready because this Observatory has not been officially launched yet. So there is no working document for the city's vision for 2070.

Sorry, and when would the plan be launched?

If I'm not mistaken, we're meeting in April.

And in this case, I don't know if you know a little about that since it's not your area specifically. We were investigating the issue of the environmental footprint, Cuencas's ecological footprint. May you know of a project or some type of development preliminary? Because administrative told us that they do not have an official document of that.

There is no official document, but there are some initiatives, for example, ETAPA. With GIZ, we are supporting training to determine the water footprint. And another thing that we have just talked about today in this meeting is the need to standardize the methodology to measure the reduction of greenhouse gases in the city. Why? Because that's something that international organizations pay a lot of attention to when they work on climate change projects or support you with climate change resources. Therefore, there is no official, approved periodic measurement. At this moment, there is air quality; EMOV does it. ETAPA is about to calculate the water footprint, but there is no longer homogenization in the city.

The homologation issue is how to get certified, I imagine, right? like a certification that validates the methodology

No, no, no. It is as if you and I reported following the same format; because there are several ways to measure the footprints, the water footprint or the carbon footprint. So the idea is to homologate in all the municipal departments that have these climate change projects, such as the CGA, EMAC, ETAPA, and the EMOV, and make periodically reports

Related to the tool we are developing; the technical part has been the most challenging for us. We need city data that is not settled yet. Even in Amsterdam, these three are pointers that didn't have available data, so we're also having difficulty finding information.

They can be found at the country level. The secretariat makes the national reports of Plan Ecuador, but at the city level, as I say, it is difficult.

We have seen a bit of the information at the country level. We have been talking with a doctor from the UDA. She is giving us some support on how to de-escalate. The problem is that since our training is not technical, she told us that this would be another complete thesis. I would imply resources, time, and knowledge that we do not manage. So, instead, we try to adapt it in a slightly more qualitative rather than quantitative analysis.

In this case, this analysis helps us identifying that it does not exist studies in certain areas in Cuenca. And this is also a valuable contribution because if we do not know in which areas, we do not have indicators, much less we can analyze the state of Cuenca. What we have done, because it was easier for us, is the local-social lens. For which there are many more indicators available and objectives also of the city. However, we also talked with the economist Xavier Mendez. He guided us a little about what we could find in the PUGs and others. And what he also suggested to us is to use other types of indicators, since this is also very new, and there is no specific development of how to measure, for example, the carbon footprint in Cuenca. So, we've tried to see more or less what we can find.

But beyond that, what we want to do is a general mapping of Cuenca status. One step beyond this, which exceeds the scope of our thesis, is that at the moment this lens is developed, this serves as a filter. Tool's creators say that this is like a filter through which proposals for public policies pass. They use the instrument to see how much it affects here, how negatively it affects there, to maximize positive impacts and minimize negative ones. So, in this sense is what this tool is used for. In conclusion, this tool helps to establish the state of the city, which is how far we are going to go, but serves as a kind of filter for decision making.

What methodology do the model's creators propose for data collection and filtering?

In fact, it is interesting because they have a document in which they summarize what the methodology is. They say there are several methods to identify the city's objectives. It is even very subjective to say "what the mayor said is the objective," but what happens with the reality of the people. So, what they have proposed for these cities is what we have also tried to do, for time and resources, talk with leaders -in this case the mayor's office- since they represent the city's interests.

I'll tell you a little about what we want to do with this 'Local Report.' The first step is to collect all the local data on how the city is doing concerning the SDGs. We take that photo, let's say, we project it on work tables called 'cantonal tables of the SDGs,' and we validate it, as I said in the case of university. And from this validation, we can build a report on how the city is regarding the SDGs. We will do that this year. I calculate that we will probably have the information by July or September. But, of course, your research is a step further because this tool is based on the data mentioned. I find it interesting.

Our intention beyond presenting this methodology is to be the first approach. We knew from the beginning the limitations of time, of resources to make, for example, a work table with more people and bring them together. Above all, to have that calling voice and for people to want to work on this project. We just presented the mayor more than a month ago, this initiative. He liked it and said that we had all the support to ask for information. But beyond that, we would like this tool to be applied to the city's management if this is useful to you. Because we know that several methodologies; but if at some point this can contribute, we are satisfied.

Precisely what we explained to the mayor is that we will not be able developing it as it was developed in other cities. Due to they are working directly with the people who have the contacts, resources, and the convening power to make a much broader call.

So, we would like to know if you have any suggestions that, in our limited time as well, we can add to the research. What would you suggest?

Actually, the issue of data is what feeds this tool. And this is also complex to collect and be reliable; because it is not only collecting it but validating it with those who are the direct beneficiaries of that data. I find the tool interesting. In other words, I can use it. I can use it with the information that we generate from the local reports. But as a recommendation, you could seek a strategic ally in the cantonal council. But I am referring to a counselor who works on social issues that can use it on social or environmental issues. I don't know if you know the councilman, Diego Morales. Diego Morales is a councilor who works a lot on the environmental themes, circular economy, and climate change.

For example, you can tell him: "We have this tool and would like you to test it in your climate change proposals." And he probably also has data because he is a professor at the polytechnic university.

Okay, perfect.

Yes, it occurs to me that if you want this tool to reach those spaces, an ally.

Yes, yes... Rather thank you very much for your time. I think we have already passed the interview time.

No, gladly [laughs]

Have a nice afternoon.

Appendix C: Interview to Carlota Sanz, Andrew Fanning and Leonora Grcheva, DEAL members

Date: March 14th, 2022

About the interviewees: Carlota Sanz is an Economist from the Carlos III University of Madrid. She is co-founder and Strategy Director of DEAL. Andrew Fanning is Ph.D. Policy for Sustainable and Equitable Economies. Leader in research and data analysis of DEAL. Leonora Grcheva is an architect and has a Ph.D. in Urban Planning. She is the leader of the department of cities and regions of the DEAL.

¿Could you share with us how the DEAL was created?

Carlota: The starting point is Kate Raworth's book: *Doughnut Economics Action Lab: seven ways to think like a 21st-century economist*. In that book, Kate offers the doughnut as a vision for guiding humanity in the 21st century and describes the kind of mindsets that would take us to that place. The concepts and the ideas in her books really had a lot of traction very spontaneously. So, entrepreneurs took the concept, designers, architects, teachers, playing with the ideas and figuring out what would it mean to put them into practice. So, as I said, it is a point when it was quite clear that something was needed to bring these ideas out of the page and really support that community of changemakers. So, back in 2019, I myself met Kate at a college at the south of England, where I was also living and studying new economics narratives. There was a point where Kate felt that her ideas were generating a lot of traction, so she started to being contacted by networks of cities like the C40 and Amsterdam. So, we joined forces very quickly and clicked on the vision of what would it mean to create an organization to bring these ideas into action. And so, we decided to create DEAL and I think that it's very important to acknowledge that from the beginning it was to be focused on triggering action, to create and to co-create this new economy, but also is an experiment so we always like the spirit of experimentation. Also, it's always been in response to that community, so we create DEAL to work with the community of changemakers that had already started picking these concepts and putting them into practice. We started with a team of

two people. We focused on create this online platform, that's the space that from the beginning we visioned to have this space to bring together this community to be connected and inspire. Overall, we work since then across different areas of action, such as communities, self-organizing networks, in the realm of education, teachers, schools, universities, cities and regions, and businesses and also governments. We think that most of our focus is on creating open-source tools to make these tools available and invite others to use what we are doing. What is very important to us is to share and amplify how partitioners and pioneers like you are adapting and putting them into practice.

How is your internal organization and what is the process for the admission of new members?

Carlota: DEAL is created as a community interest company, some kind of charity here in the UK. It was formed by Kate and me, but the DEAL team has a core, which is composed by nine people at the moment. As a part of the work of the DEAL we created this online platform and we opened up a community of partitioners. So, the members you see in the platform are changemakers all over the world that have chosen to take part of the community because they are interested with the ideas or experimenting with them, so we are inviting them to this space where they can connect with each other but also get access to all the tools and stories that not only the DEAL is creating, but also the community have the option to create and then share back. It's a repository of knowledge and action. The organization and the DEAL team is a small team of nine people and then there exists a bigger community where anyone can be a member and engage with these ideas and put them into practice; we invite them to become a member, to inspire and learn, to use our tools, to innovate and to share back the stories of how they are doing.

Do you provide technical assistance to local governments that wish to implement the tools proposed by the DEAL? How do you provide that assistance?

Leonora: We are a small team organization and we balance the interest of the cities with our own capacity. One of the things we do to support cities is to develop tools and we continue to develop different tools, whether these are methodological tools like the city portrait, and the workshop tools that we are about to launch now. Also, reflection tools and learning tools, presentations, materials, and things that people in cities would be able to use to do different processes internally. Another thing we do is that in every city administration that would start working with the concept, as we are meeting you, we met them and we play the role of strategic friends, meaning that we are here to listen, to have a call to understand the concepts, the work of other cities, anything useful and have a discussion. Then, we have an open-door kind of relationship, throughout the work of that the city would be doing to have a call every few months to discuss some strategic questions that are emerging, to discuss specific technical questions, which is Andrew's realms. We are quite flexible depending on the city they are going on a different journey. Some would ask us to have a big public presentation. Some would ask us to help them to co-design or take some advice and a workshop. We are very responsive of any needs of the city and have that open strategic relationship.

Then, on the other side, another thing that we are developing is bringing different cities that are working with Doughnut Economics together to be learning with and from their peers. Last week, we held our first peer-to-peer learning session with different cities and organizations that are working with Doughnut Economics. We had over 40 different cities from around the world. As I said, we are very flexible and open, so once cities start with the journey, we have an open conversation and we estimate what we can do and how we can support them.

Is there any cost or subscription that local governments must pay to access this kind of assistance?

Carlota: No. We designed DEAL, or at least for now and the initial years of DEAL, to have external funding or co-funding so that we can support cities to a certain level. So basically, we exist to provide and support without needing to be receiving additional fees. There have been certain projects when we get really involved and become more than normal support when we have

agreed some kind of founding scheme with the city government, but it really depends on what is available. Overall, we have a basic kind of foundational support that we can give to the cities without having to charge for it.

How is the DEAL linked to the Thriving Cities Initiative?

Andrew: Overall, the Thriving Cities Initiative was kind of a partnership between DEAL, C40 cities, and Circle Economy, for very reasons. C40 cities were essentially holding the project more than others in there. It's a network of 96 cities who are at the most climate ambitions of the world, looking to create meaningful reductions in emissions taking a consumption-based approach, which is novel, acknowledging that we need to not just look at technological change but also at changings in lifestyle, in behaviors. They reached Kate and Carlota right at the time when the Portrait was also being developed, so they created that as a conception collaboration with Biomimicry. It almost started aligned with C40 cities saying "we have these cities that are looking to adopt progressive methodologies or Doughnut Economics" and the other part saying "we have this portrait methodology that could be very useful". One thing led to another, and that's more or less how we were created. We went to Philadelphia, which is one of the pilot cities, and then Amsterdam, which is a special case, they were having their own internal journey with Doughnut Economics and Kate did a national book tour. There was also a circular economy strategy that was ongoing at the time, and Amsterdam said "Thriving Cities Initiative? We are part of C40 cities and we can join this initiative, and that's how these three pilot cities really came out in the first place. In that first place, the whole idea of the Portrait methodology was almost like, as an input to a workshop-based kind of exploration, as a tool for transformative action, for discussion, for thinking about how can we make those changes and actually turning them into action.

But of course, then the pandemic came, and a lot of the planning for the TCI got put on hold. And so, we ended up not being able to do a lot of in-person work, but we adapted like everyone else in the world did. We put the methodological guide as a way to share that methodology, to make it public and available, to make all people to pick it up and innovate, and all the things that you have heard before. Since then, the TCI has gone into a phase two, with C40 cities and Circle Economy,

but DEAL is no longer a part of that official partnership. The reason for that is tied to funding and that when DEAL gets involved in a more formal tech project, often from our perspective, what we would like be doing is developing new tools, and developing new concepts that we can share with the DEAL community. And in this particular case, the Portrait methodology has already been introduced and so that we didn't see a particular need for our formal involvement in the next stage of the TCI.

Now that we have presented Cuenca, has this tool been applied to cities with similar features? For example, intermediate cities, from the global south, from Latin America, and small cities.

Leonora: Yes. This is a map of all the cities that have started or are starting to work with the concepts of the Doughnut Economics right now. It's not a complete map in the sense that it doesn't have also places that are starting to explore concepts right now, it doesn't involve community-led initiatives but only city administration. So, we can see that there are quite a lot of cities around the world. So, in terms of similar cities, there are several cities in South America. Mexico City and Cali in Colombia, and El Monte, which is a city of small size in Chile, which is more comparable. And there are also quite of few smaller cities in Europe as well. Obviously, very different contexts, geography, both social and ethical concepts, but in terms of size, there are cities like Bad Nauheim in Germany, Tomelilla in Sweden. All of these are cities which I think possibly are more smaller cities than Cuenca, less than 100.000 population. Thimphu in the capital of Bhutan that is also a growing but still a very small size city with a predominant role to migration.

I would say that there is a lot of places where there are a lot of different comparable circumstances like in Cuenca and there has been quite a lot growing interest from South America and I think that we are yet to see more cities coming along.

Andrew: Just to quick add one thing that are not quite reaching kind of the map level, but just a reminder that we had a conversation with some changemakers that are looking to get involved to the initiative in Galapagos actually. It was kind of first faces but it seemed to be some interesting building a portrait in Galapagos, which I would be keen to follow up.

Leonora: Yes, and some other islands in the area as well yet to come, but yes, some different other explorations in South America as well. And before you move on to the next questions, I thought it would be useful for you to see an overview of the type of work that the cities are doing. The city portrait is the methodology that you are familiar with, but there are many cities that are developing city portraits right now. So, many of the cities on that map are starting the work by developing city portraits, but cities have also been taken and continue to take many different approaches while doing the city portrait, or kind of separate avenues of getting concepts of doughnut economics into their work all together. We have seen all kind of policies, strategies, action plans, that we kind of summarized in these eight approaches. They are not a list of possible approaches that we have set, but rather seeing the practices of cities and seen the directions in which they been going. You will see some of the emerging patterns that we see of how it is used doughnut economics. You will see that the second one is the city portrait, which is just one way that cities have chosen to get started. But some have used doughnut economics as a principle, as a concept, as a compass. So, councils adopting a motion for doughnut economics to become a guiding framework. Cities like Copenhagen have done that. I just wanted to give you this kind of bigger overview picture of the many different things that cities are doing before even getting starting with the city portrait, and this is really coming from creativity of cities themselves.

In addition to the ‘objective’ and ‘snapshot’ dimensions, would it be possible to add the ‘proposal’ section in the local-ecological lens?

Andrew: First, for any adaptation, if you see it as something useful, we are generally listening and learning with all the initiatives that come. We have tried to do if there were goals with a precise date like, “look, in 2030 we want 100% of people living in decent houses,” that would be perfect, but many cities do not get ‘wet’ like that to commit. So, we have found what there was, and I like the part of making a comparison that is rather qualitative of that objective with the snapshot. I like it because it allows you to make that comparison. The objective of this tool is to serve as an input to see a more holistic point of view of the city. So, we often see that if one goes into each dimension, there is a world. You have to be careful not to get too deep into each dimension because then it starts to be too much, and, until now, (the tool) has not been intended to be a comprehensive

analysis of a city. It has been directed to make the four lenses and put them together to have a more holistic view. However, if there are one or two lines of action regarding where we are and where we want to go and a bit about how the city intends to get there, I see it as very interesting.

Considering the amplitude of the existing objectives in the different dimensions, how can we define the best objective?

Andrew: That is the question. It is complicated because what we have tried, especially in the local - social, where there is usually more information and more data because it is the city's jurisdiction. These are everyday things, so there are usually many possible indicators and targets. In this case, what we've done is compile what we have found and then an analytical process of choosing one or two targets. However, in our case, it has been input for a workshop or a participatory space where you can say, "look, we have chosen this. Is it enough? Do you know others? what do you think?" And the same with the snapshot, where you can say, "We found this." However, many times, when you set the objective with the snapshot, you said "yes, there is an objective" and "yes, there is a performance indicator", but many times it gave the impression that they could be improved. They gave a very blurred image of what housing really is like in Amsterdam, or in Cuenca, or wherever. So, we have used that blurriness as a source of discussion, and that has been the strategy, but in the end, it was a matter of choice.

In the local-ecological lens, we have seen that the concept of biomimetics is widely used. What the authorities in charge in the city have told us is that, although there are projects in the city, they were not born with the aim of being based on this principle of biomimetics but are related to it. In this case, would it be valid to show how these projects are linked to this concept or do we directly show that the projects are not born with this initiative?

Andrew: Yes. We have found the same. Biomimetics is almost a radical aspiration, because it says "how can we design our cities to be generous like nature." If we compare it to urban design around the world, it's a very radical ambition, because cities traditionally are always using resources and throwing away waste. So, the idea that a city could contribute as a member of an

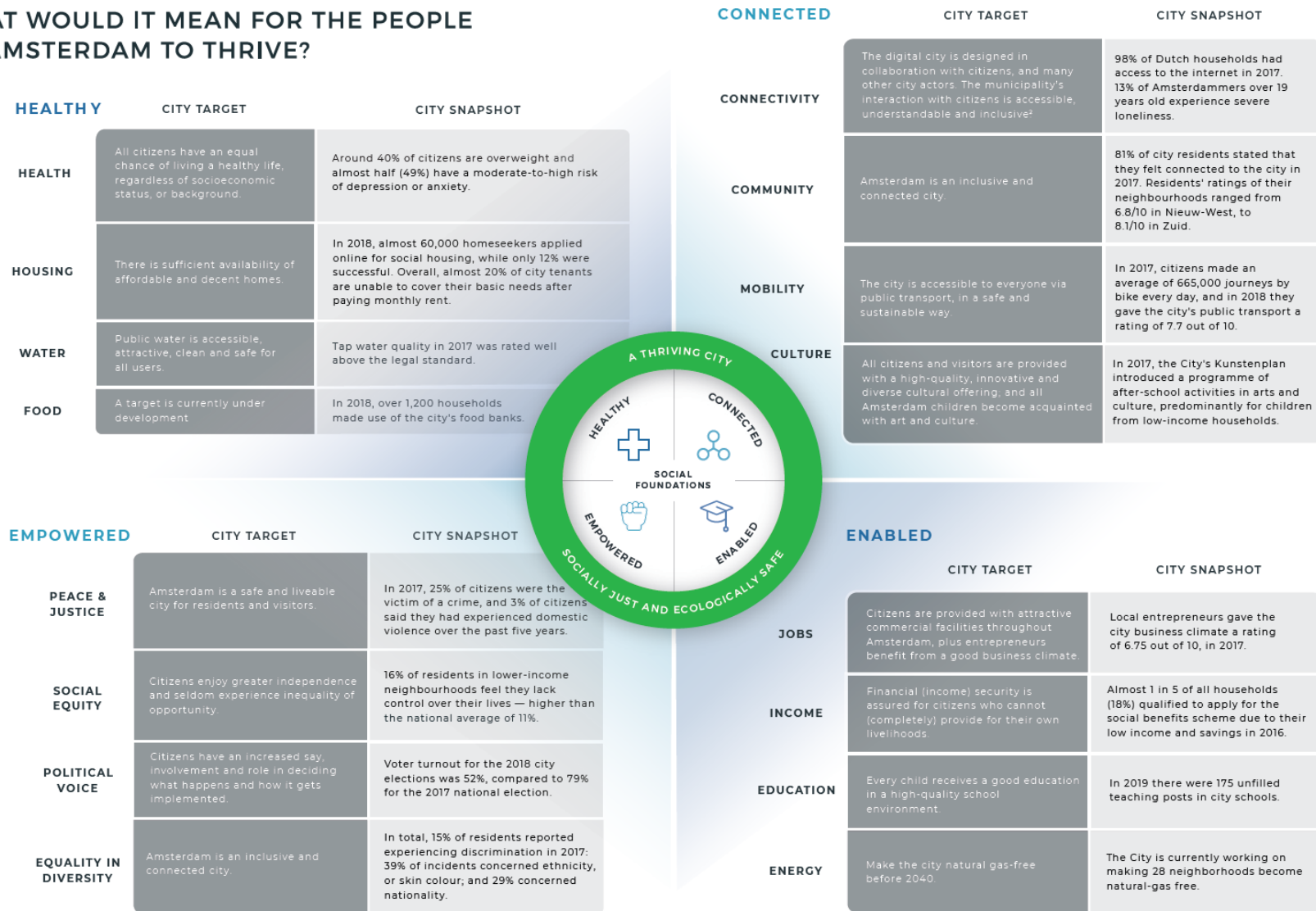
ecosystem is very radical, but at the same time very natural. In practice, there is no city that is saying “look, I want my city to cool down like this”. But yes, the ideal would be to go to a nearby ecosystem and measure how that ecosystem is behaving and use that as an aspiration. Compare, if it’s CO₂ or whatever, how can we try to do the same thing. We have not done this in Amsterdam, Portland or Philadelphia, due to resource issues. So, what we have done is, see how nature does it and try to map it with some objectives of the city. If there is no objective, it also has value to leave that gap empty, because we believe that this is the way to fill in the empty parts. We have done it in such a way, looking at the objectives that were there and then trying to see the performance again. So, it was a very distant approach to biomimicry, but we believe that it helped to begin to give a vision of how it could go along that line. I think that what you said could be something similar to the approach that we have made.

Thank you very much for all the information. With the information you have given us, you have helped us a lot and we have a clearer idea of how to make the adaptations to our reality.

Please, we are in contact. You can send questions to Andrew. Now I’m sending you an email with all the contacts so we can stay connected. Bye.

Appendix D: Amsterdam's Local - Social Lens

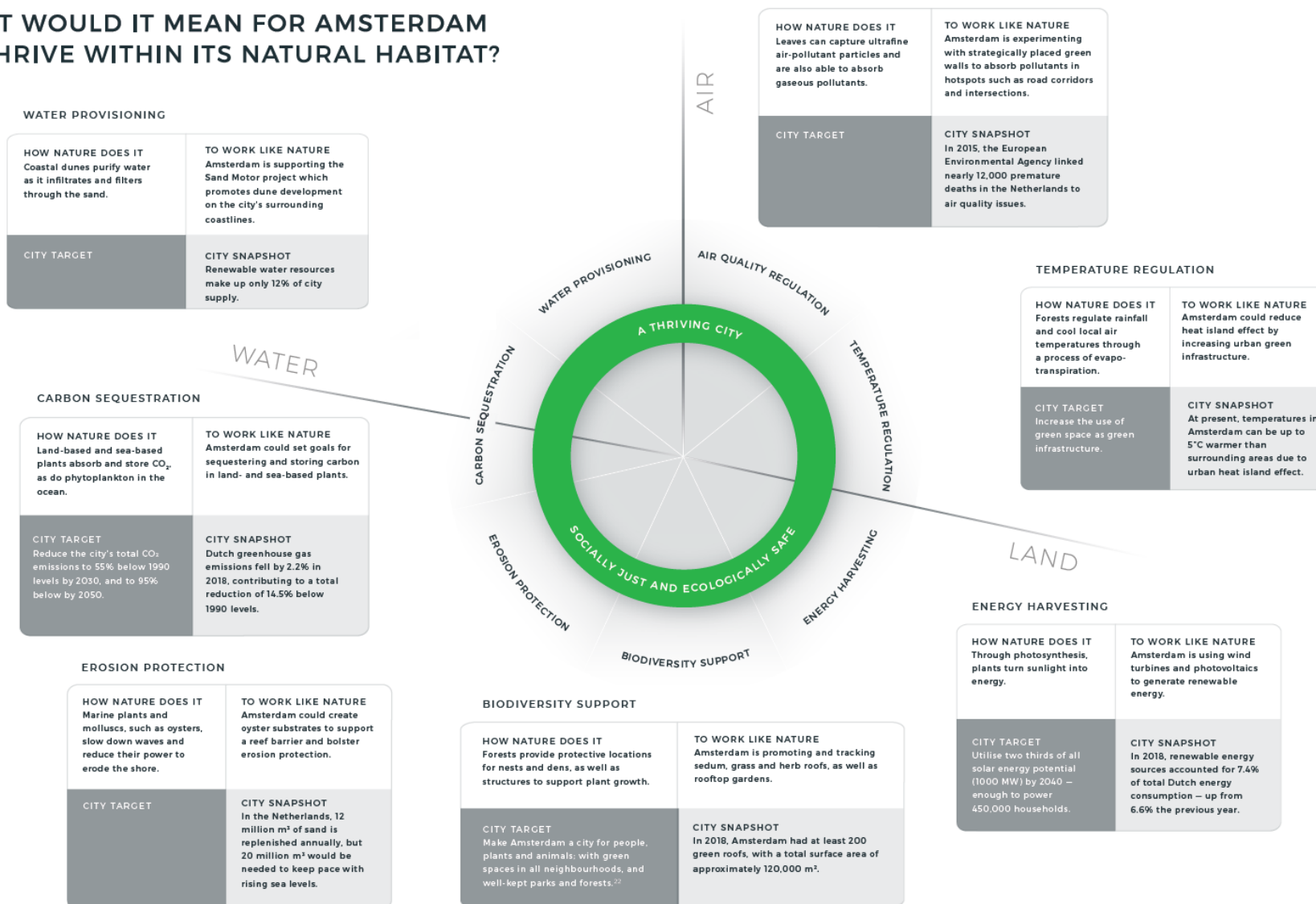
WHAT WOULD IT MEAN FOR THE PEOPLE OF AMSTERDAM TO THRIVE?



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

Appendix E: Amsterdam's Local – Ecological Lens

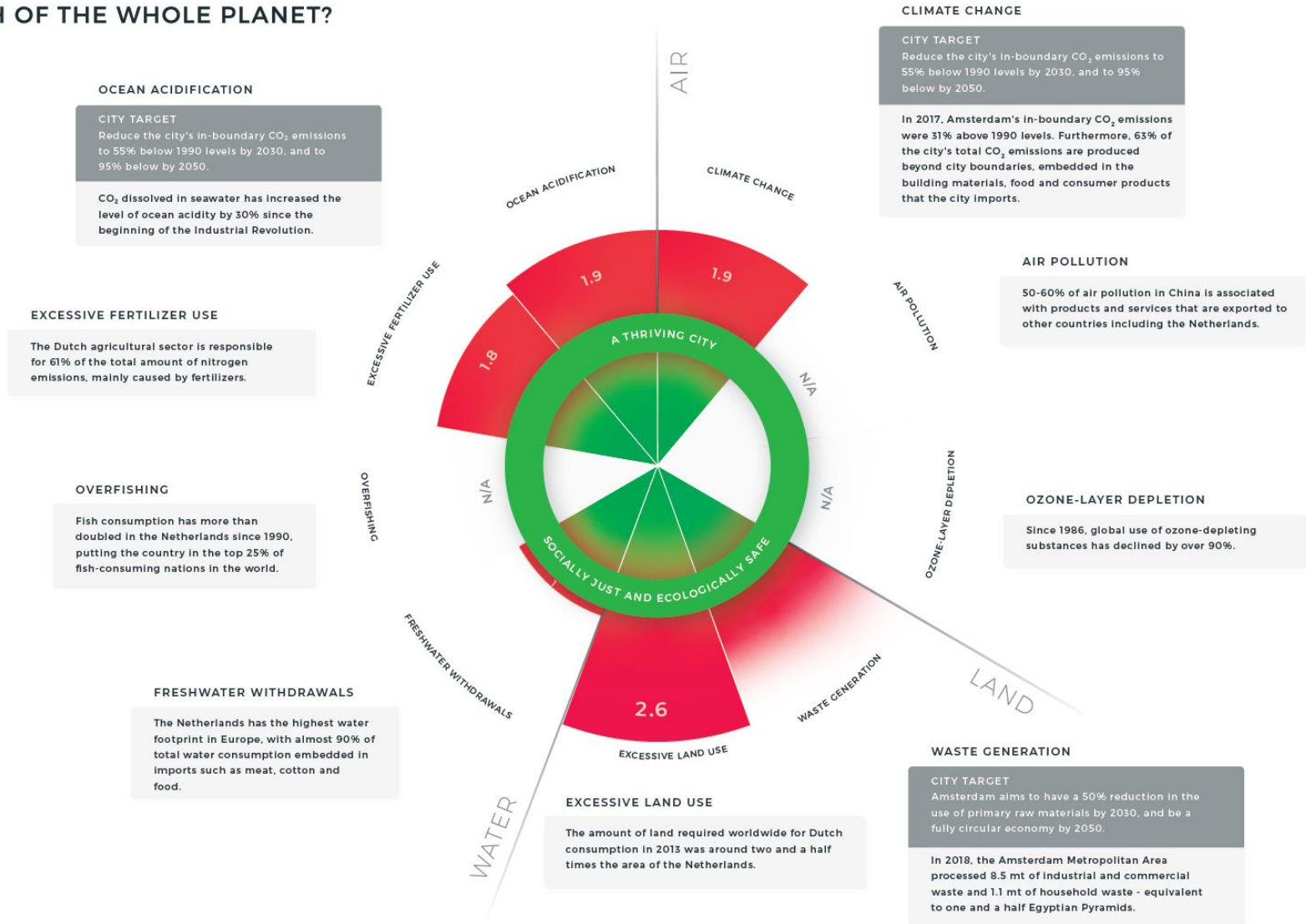
WHAT WOULD IT MEAN FOR AMSTERDAM TO THRIVE WITHIN ITS NATURAL HABITAT?



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Appendix F: Amsterdam's Global – Ecological Lens

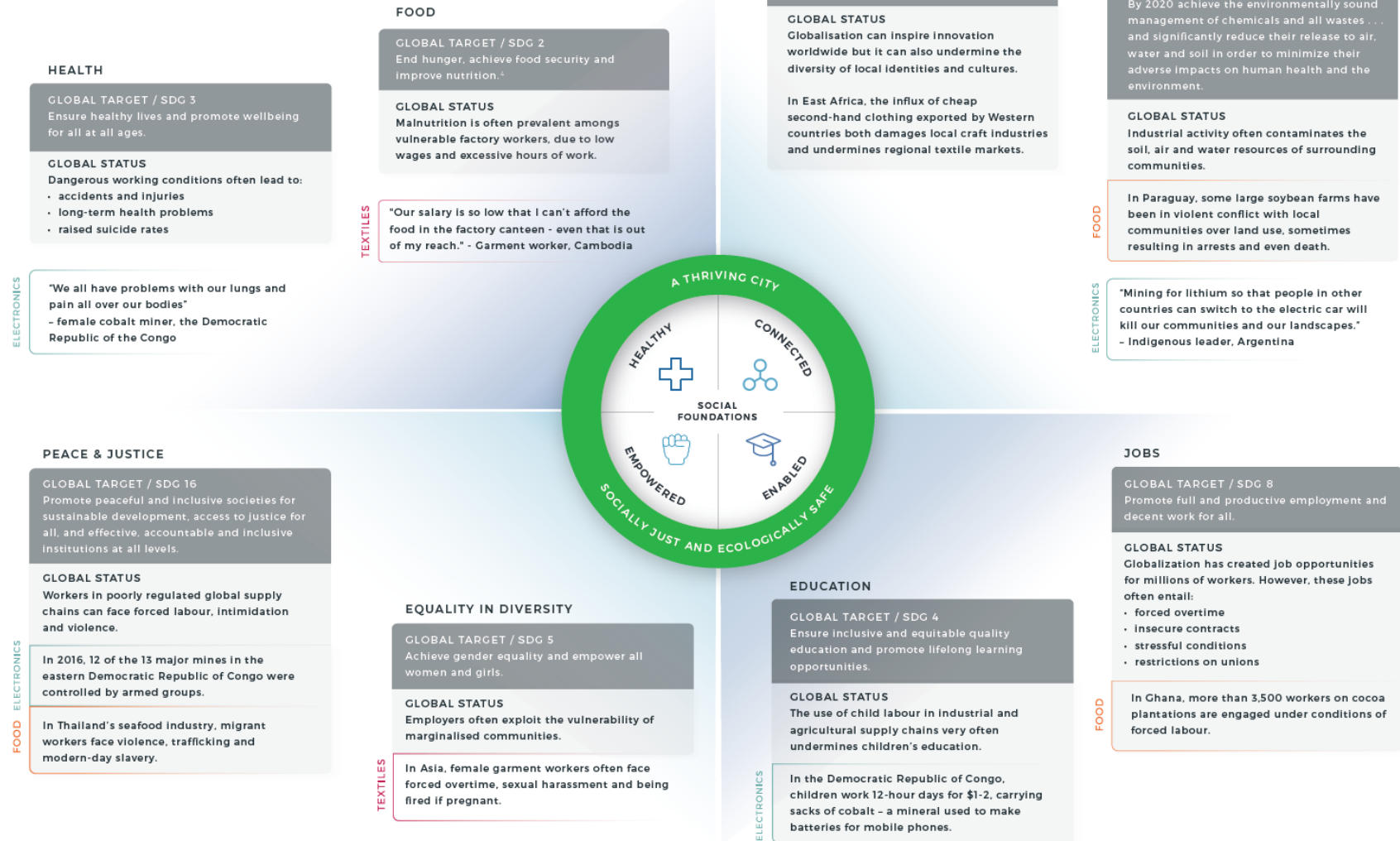
WHAT IS AMSTERDAM'S IMPACT ON THE HEALTH OF THE WHOLE PLANET?



Note: The image is from “Creating City Portraits: A methodological guide from The Thriving Cities Initiative” by Doughnut Economics Action Lab et al. (2020), available under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

Appendix G: Amsterdam's Global – Social Lens

WHAT IS AMSTERDAM'S IMPACT ON THE WELLBEING OF PEOPLE WORLDWIDE?



Note: The image is from "Creating City Portraits: A methodological guide from The Thriving Cities Initiative" by Doughnut Economics Action Lab et al. (2020), available 233 under a Creative Commons Attribution-Sharealike 4.0 License. Oxford. <https://doughnuteconomics.org/tools-and-stories/14>

Appendix H: Cuenca Mayor's Office Certificate



cuenca
ALCALDÍA

Cuenca, 10 de Febrero del 2022

CERTIFICO

Que, la Srta. **MARÍA SALOMÉ GARZÓN ROJAS** y Sr. **ERVIN ANDRÉS AGUIRRE CEDILLO**, egresados de la Escuela de Estudios Internacionales de la Universidad del Azuay, Cuenca-Ecuador, han solicitado al Gobierno Autónomo Descentralizado Municipal del cantón Cuenca la información necesaria para el desarrollo de su trabajo de titulación denominado: **“Aplicación de la Metodología de la Triving Cities Initiative para la creación del Retrato de la Ciudad en Cuenca para el periodo 2019-2020”**, ante lo cual, nuestra institución apoyará esta iniciativa considerando que la misma aporta al desarrollo de Cuenca como ciudad sostenible.

Es todo cuanto puedo informar en honor a la verdad.

Atentamente,

Ing. Oscar Vele



DIRECTOR GENERAL DE DESARROLLO ESTRATÉGICO INSTITUCIONAL
GAD MUNICIPAL DEL CANTÓN CUENCA

Note: This is a certificate from the Mayor's Office of Cuenca. The municipality provided official information for the development of this investigation

Appendix I: Cuenca's Local - Social Lens sources

Cuenca's Local - Social Lens												
Dimension	Category	SDG	Description	Type (vision / objective / goal)	Year	Source		City Snapshot	Year	Source		
						Document	Department			Document	Department	Link
Healthy	Health	SDG 3: Good health and well-being	To reduce the adolescent pregnancy rate from 3.16% in 2017 to 2.68% by 2023, in the age range of 15-19 years.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	The teen pregnancy rate in 2019 was 3.13%. In 2018, 36 births per 1,000 adolescent women between 15 and 19 years of age were registered in the urban sector, while in the rural area it was 80.9 births, exceeding the national average of 76.5 births per adolescent pregnancy.	2019	PDOT 2021 Diagnóstico / Salud.gov / Observatorio Cuenca 2070	Dirección de Planificación	https://www.salud.gov.ec/antecedentes-politica-intersectorial-de-prevencion-del-embarazo-en-ninas-y-adolescentes-2018-2025/#:~:text=Se%20ha%20definid
	Housing	SDG 11: Sustainable cities and communities Target 11.1: By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums	To reach 96% of the population with sewerage service by 2023	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	The public sewerage network in the urban area covers 94.33% of homes, a value higher than the national average. However, in rural areas, only 70.64% of households have an optimal public sewerage network.	2019	PDOT 2021 Diagnóstico / Observatorio Cuenca 2070	Dirección de Planificación	
	Water	SDG 6: clean water and sanitation	To maintain the average WQI water quality index in the Canton within the ranges of (65 - 67) by 2023 after the Ucubamba treatment plant.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	The average WQI water quality index of the canton, in 2019, was 66, placing it in the 'medium' quality range according to this indicator.	2019	PDOT 2021 Diagnóstico	Dirección de Planificación	
	Food	SDG 2: Zero Hunger	To combat chronic malnutrition and promote healthy living habits and practices, generating co-responsibility mechanisms between public institutions, the population and the private sector within the framework of food security and sovereignty.	Objective	Not set	PDOT - Propuesta 2021	Dirección de Planificación	According to the ELCSA indicator (Latin American and Caribbean Food Security Scale), only 32.4% of households in the rural sector of Cuenca have food security.	2019	PDOT 2021 Diagnóstico	Dirección de Planificación	
Connected	Connectivity	SDG 9: Industry, innovation and infrastructure	To achieve a 13.5% internet penetration rate for the service provided by ETAPA EP, by 2023.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	According to the 2019 Multipurpose Survey, 79.02% of households in the urban area of the Canton have internet, compared to 47.74% of households in rural areas. In both the rural and urban sectors, this indicator is below the national average (80.2%).	2020	PDOT 2021 Diagnóstico / Internet World Stats	Dirección de Planificación	https://www.internetworldstats.com/south.htm
	Community	SDG 16: Peace, justice and strong institutions. Target 16.1: Significantly reduce all forms of violence (...)	To promote community and neighborhood integration, through the collective construction of social and cultural spaces that contribute to strengthening the cantonal identity and contribute to citizen security.	Objective	Not set	PDOT - Propuesta 2021	Dirección de Planificación	According to the Citizen Security Observatory of the Citizen Security Council, in Cuenca, 60% of citizens feel unsafe and 21% feel unsafe at all. In other words, 81% of Cuencans feel insecure to a greater or lesser extent.	2022	Observatorio de Seguridad Ciudadana	El mercurio	https://elmercurio.com.ec/2022/01/26/el-81-de-los-cuencanos-se-sienten-inseguros-en-las-calles/
	Mobility	SDG 11: Sustainable cities and communities Target 11.2: By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety (...)	To promote non-motorized and active mobility within the Canton.	Objective	Not set	PDOT - Propuesta 2021	Dirección de Planificación	In the urban area of Cuenca, vehicular traffic is the most important source of emissions, as it contributes 94.5% of carbon monoxide emissions and 71.2% of nitrogen oxide emissions.	2020	Informe de Calidad de Aire en Cuenca	EMOV	http://gis.uazuay.edu.ec/erse/sistemagrafico.php
	Culture	SDG 11: Sustainable cities and communities Target 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage	To promote a permanent program for the generation, implementation, promotion, dissemination and enhancement of routes, circuits and territories for the development of culture and protection and safeguarding of cultural heritage, implemented in the urban and rural parishes of Cuenca by the year 2023.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	There is a deficit of efficient and quality services and cultural facilities in urban areas far from the Historic Center of the city and in rural areas of the Canton.	2021	PDOT 2021 Diagnóstico	Dirección de Planificación	

Empowered	Peace and Justice	<p>SDG 16: Peace, justice and strong institutions.</p> <p>Target 16.1: Significantly reduce all forms of violence and related death rates everywhere</p>	To implement (100%) a system that registers complaints of violence in the Cantonal Board of Rights by 2023, in Cuenca.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	<p>According to the center for strategic studies, between 2018 and 2019, there was an increase in complaints of crimes due to physical injuries, robberies and thefts. On the other hand, domestic violence is positioned as the strongest social problem in the Canton, placing women as the main victims. On average, in Cuenca, around 7 daily emergency alerts related to domestic violence are received.</p>	2019 / 2021	<p>PDOT 2021 Diagnóstico</p> <p>Noticia</p> <p>Cuenca en cifras 2019</p> <p>Boletín estadístico del CSC</p>	<p>Dirección de Planificación</p> <p>El Mercurio</p> <p>Consejo de Seguridad Ciudadana de Cuenca</p>	<p>https://elmercurio.com.ec/2020/06/25/violencia-intrafamiliar-985-casos-en-azuay-y-canar/</p> <p>https://csc.gob.ec/CSWeb/publicaciones/</p>
	Social equity	<p>SDG 10: Reduced inequalities</p> <p>Target 10.4: Adopt policies, especially fiscal, wage and social protection policies, and progressively achieve greater equality</p>	To have by 2023 a 100% implemented information system that contains social information on priority attention groups in Cuenca.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	<p>Main problems of priority attention groups</p> <ul style="list-style-type: none"> - Childhood and adolescence: child and adolescent labor. It was reported that 0.84% of children between 5 and 11 years old worked at least one hour, in the adolescent population the figure is 13.42% -Older adults: the population of older adults in the Canton is 7.08%, of which 70% do not have social security -Peoples and Nationalities: 4.4% of the canton's population self-identifies as indigenous, black-Afro-Ecuadorian, mulatto or montubia. Of which, 16.94% do not know how to read or write 	2019	PDOT 2021 Diagnóstico	Dirección de Planificación	
	Political Voice	<p>SDG 10: Reduced inequalities</p> <p>Target 10.2: By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status</p>	To have a cantonal system of citizen participation, 100% conformed by 2024.	Target	2024	PDOT - Propuesta 2021	Dirección de Planificación	<p>Participation in the Assemblies of Citizens of Cuenca has increased in recent years. Between 2015 and 2018, there was an increase in participation by 34.91% (from 1,146 people to 3,282).</p>	2018	PDOT 2021 Diagnóstico	Dirección de Planificación	
	Equality in diversity	<p>SDG 10: Reduced inequalities</p> <p>Target 10.3: Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and action in this regard</p> <p>SDG 5: Achieve gender equality and empower all women and girls</p>	To have by 2023 a public policy agenda that is 100% intersectoral in relation to guaranteeing the rights of priority attention groups.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	<p>According to a survey carried out in Cuenca as part of the UN Women Safe Cities Program, 91% of the women and girls surveyed suffered violence and/or sexual harassment at some point in their lives and 72% stated that they were victims of sexual harassment in public transport</p> <p>-The Azuay Ombudsman attended 20 cases of xenophobia in 2019 for issues related to access to education for children, lack of attention in public institutions and labor issues</p>		<p>Il plan cantonal de Cuenca para la erradicación de la violencia de género contra las mujeres 2010-2020</p> <p>Noticia</p> <p>ODS Territorio Ecuador</p>	<p>PNUD y ONU Mujeres</p> <p>Defensoría del Pueblo de Azuay</p> <p>ODS Territorio Ecuador</p>	<p>https://jobs.undp.org/cj_view_job.cfm?cur_job_id=93747</p>

Enabled	Jobs	SDG 8: Decent work and economic growth	To maintain the training of 1,500 annual actors of the Popular and Solidarity Economy - circular economy (entrepreneurs, artisans, agroecological producers, recyclers, among others) by 2023 in the Cuenca canton with an emphasis on technology to promote e-commerce.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	Since 2015, the number of actors of the Popular and Solidarity Economy trained per year increased from 500 to 1,500 per year in 2019.	2019	PDOT 2021 Diagnóstico	Dirección de Planificación	
	Income	SDG 8: Decent work and economic growth Target 8.5: By 2030, achieve full and productive employment and decent work for all women and men (...) and equal pay for work of equal value	To increase the salaried female population to 59.09% by 2023.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	Between the years 2014 and 2019, the percentage of salaried women varied between 52.2% and 56.3%.	2019	PDOT 2021 Diagnóstico Observatorio Cuenca 2070	Dirección de Planificación	
	Education	SDG 4: Quality education	To maintain or exceed 90% of the initial education rate by 2023 in the Canton.	Target	2023	PDOT - Propuesta 2021	Dirección de Planificación	The initial education rate in 2014 was 61.67% and until 2019 it increased to 86%, a percentage that is still below the established goal.	2019	PDOT 2021	Dirección de Planificación	
	Energy	SDG 7: Affordable and clean energy	To guarantee the efficient provision of basic services and equipment, ensuring sustainable management of natural resources and generating territorial balance.	Objective	Not set	PDOT - Propuesta 2021	Dirección de Planificación	The Biogas Plant (EMAC-BGP ENERGY CEM) uses the gases generated in the Pichacay Landfill to generate 2MW of electricity, benefiting 7,300 families with a consumption of 160 KWh/month.	2021	Panta de biogás	EMAC	https://emac.gob.ec/servicios/planta-de-biogas/ EMAC.gob.ec

Note: table prepared by the authors as a summary of the sources used to create the Cuenca´s City Portrait lenses

Appendix J: Cuenca's Local – Ecological Lens sources

Cuenca's Local - Ecological Lens																			
System	SDG related to the ecosystem	Ecosystem service	Description	Type (vision / objective / target)	Source			To work like nature	Source	City situation	Fuente				City projects/proposals to work like nature	Source			
					Year	Document	Department				Document	Year	Departament	Link		Document	Year	Entity	Link
Water	SDG 6: Clean water and sanitation	Water supply	Reach 98% of the population with drinking water service by 2023.	Target	2023	PDOT 2021	Dirección de Planificación	The paramos are the most important biomes in terms of the supply of water resources. Due to the characteristic of its spongy soil, it traps and filters large amounts of water in the upper parts of the mountains, gradually releasing it downstream. Due to the purity of the water, it is used for human consumption and agriculture.	https://www.ucuenca.edu.ec/component/content/article?id=33-espanol/investigacion/blog-de-ciencia/203-paramos-geralmente-2c-20-debido-20a-20su-20calidad-para-20sostener-20los-20sistemas-20acu-20c-20al-20trico-s	In the urban sector, 96.92% of the population has drinking water service; while in the rural sector, coverage is 70.14% of the population.	PDOT 2021	2021	Dirección de Planificación		"Through the Sustag treatment plant, which uses a water collection, filtration and reserve system, it supplies 400,000 m3 of water per month, benefiting 35,000 people. *Although this project is not born as a direct solution based on nature, it does use the same logic to capture and reserve this resource"	ETAPA Web	NI	ETAPA EP	https://www.etapa.net.ec/principales-agua-potable/operacion-mantenimiento-plantas-de-potabilizacion etapa.net.ec
Air	SDG 11: Sustainable cities and communities. Target 11.6. By 2030, reduce the per capita negative environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.	Air quality regulation	Maintain annual average emissions below 38 µg/m3 of Particulate Matter (PM10) by 2023.	Target	2023	PDOT 2021	Dirección de Planificación	Due to the porosity of tree leaves, they are capable of absorbing particulate matter found in the air, helping to reduce air pollution.	https://www.tecpa.es/contaminacion-atmosfera/urbanas-plantas#:~:text=Las%20plantas%20absorben%20particulas%20de%20superficie%20de%20las%20hojas.	During 2016, the highest point of PM10 particulate matter in the last 12 years occurred, standing at 44.9 µg/m3. However, in 2020 the average PM10 particulate matter was 27.3 µg/m3.	Informe de Calidad de Aire en Cuenca 2020	2020	EMDOV EP		At the University of Azuay, the construction of "green walls", vertical gardens that fulfill the function of improving air quality, has been promoted. Currently in Cuenca this is used as a decorative element, however, experts recommend that it be raised to municipal regulations, guiding the construction of buildings with this type of green infrastructure.	Prensa Universidad del Azuay	2017	UDA	https://www.uazu.edu.ec/premsa/verdes-son-opcion-ambiental
		Temperature regulation	Maintain 9 m2 recreational and natural green area per inhabitant in urban areas by 2023 with an equitable distribution.	Objetivo	2024	Plan de Gobierno 2019 - 2024	Alcaldía	Trees can reduce temperature through evapotranspiration, capturing CO2 and emitting water vapour. In addition, they provide shaded areas, help clean the air and make cities more pleasant places.	https://www.tiempo.com/noticias/ciencia/arboles-para-combatir-el-calor.html#:~:text=Los%20arboles%20pueden%20reducir%20un%20grado%20de%20temperatura%20en%20ciudades%20urbanas%20muy%20calientes.	According to the data provided by the ETAPA EP climate monitoring network, the mean annual temperature values oscillate around 14.6°C. It is reported that the hottest year was 2016 with an average of 14.9°C and the coldest was 2017 with an average annual temperature of 13.38°C.	PDOT 2021 - Diagnóstico	2019	Dirección de Planificación		The Municipal Public Cleansing Company of Cuenca EMAC EP, through its forest management and green area maintenance units, maintains and recovers the city's green areas and parks. As of 2019, it is reported that they planted a total of 3,890 trees as part of its program to plant 10 trees for every tree felled (453 trees)	Áreas Verdes	NI	EMAC	https://emac.gob.ec/serviciostar-eas-verdes/
		Regulation of noise pollution	Reduce noise levels to 65 decibels (dB) on average per year by 2023 in residential areas and facilities.	Target	2023	PDOT 2021	Dirección de Planificación	"Sound waves propagate through media such as air and water. On the other hand, vegetation can reduce sound in two different ways. First, some plant elements can refract sound; and second, vegetation can absorb sound. Studies at the University of Almería have revealed that these green walls can reduce sound by up to 50%, much more than barriers such as glass or concrete that only absorb 20% of the noise."	https://www.sciencedirect.com/science/article/pii/S0003682X14002333	In 2018, the highest peak of the last ten years was recorded with 70dB.	PDOT 2021	2018	Dirección de Planificación		The green wall projects promoted by the University of Azuay, in addition to their usefulness to improve air quality, have other benefits related to noise pollution.	Evaluation of green walls as a passive acoustic insulation system for buildings.	2014	Universidad del Azuay Universidad de Almería	https://www.uazu.edu.ec/premsa/verdes-son-opcion-ambiental https://www.sciencedirect.com/science/article/pii/S0003682X14002333

Appendix K: Interview to Dr. Ana Elizabeth Ochoa, PhD.

Date: February 8th, 2022

About the interviewee: Ana Elizabeth Ochoa has a Ph.D. in Water Resources and a master's degree in Water Resources Engineering and Civil Engineering. She has experience in water resources and climate change. Currently, she is a research professor at the University of Azuay and studies the climate impact on natural and human systems.

What do the National Doughnut environmental indicators measure?

These biophysical indicators give us an idea of how many are the emissions of each one of the aspects of the biosphere. So, we have atmosphere, land, a lot of things. So, for example, these CO₂ emissions necessarily refer to industry or large CO₂ emitters. Of course, there are many other components, we ourselves with our individual activities contribute to CO₂, but, mainly, we know that the main emitters are the industries.

So, when we think of CO₂ we think of all post-pre-industrial human activities since 1845. That's why it's measured in tons per year. So here we think about how much pollution is going into the atmosphere and it is creating this greenhouse effect. This greenhouse effect is mainly due to CO₂. There are also other gases that are important, but most are CO₂.

Now, nitrogen and phosphorous refer to the soil. When you think about this, you think about the amount of nutrients that are being taken into the soils. Blue water is quite explanatory, it has to do with the cubic meters of water that we have per year. I would have to check if it refers to the fresh water that we lose due to global warming, it may be because of that.

Soils are extremely important because they emit CO₂ as well. So, if we change and alter the properties of the soil, which are sometimes CO₂ sinks because they capture it and help climate change, but when we change their properties, they start to be CO₂ emitters. So, if we till the soil or do many activities and leave it bare, what happens is that this ability to capture CO₂ is reversed and instead they become CO₂ emitters and pollute more.

Regarding the phosphorus and nitrogen indicators, do the units of measurement refer to the accumulation or emission of phosphorus and nitrogen?

That depends on how people have done their methodology and how they have taken the indicators. I can even measure this in other units of measurement than phosphorus and nitrogen.

We have the indicators and their measurements at the national level, but we don't know exactly how to scale it down to the cities. Do these indicators exist for Cuenca?

Some data is needed, I think that it should not be that simple. It must be something much more complex that maybe required a lot of data, maybe that's why they couldn't do it. From what I know, ETAPA and the Municipality were working on raising indicators on the environmental impact for which they did have data. Perhaps the limitation would be data, which would be the worst situation in which we could find ourselves.

Now, what we could do is that I can help you by checking how they got it for Ecuador and see if the assumptions made for Ecuador are applicable to Cuenca and we could say, for example, that in Cuenca, the estimate is the same as for Ecuador. Let's assume in the event that the estimates apply to us. But I would have to review what those assumptions are, those data, and see if we can get here and calculate them, which, by itself, could be a separate thesis, because if you have to calculate it, that is another degree thesis, it is an environmental engineering thesis.

We find a measurement of the national environmental footprint, and we also have the national planetary limits for the global – ecological lens. In this, the qualitative component seeks objectives of the city to reduce its participation in the biophysical processes of the planetary limits. But for its quantitative component, could these national data be taken into account if the city data cannot be obtained?

Yes, that's exactly what I was telling you. If there is not enough data, we cannot make it very long. I would have to check to see if Ecuador's assumptions can be made to Cuenca for any reason. This is valid as long as we accept the implications of taking a national index instead of a local one.

What you are telling me is that the qualitative part also comes into play, knowing what we want to do in the future. Always to set a goal for the future, it is good to have an indicator of the past to know where we started from and where we are going, that is necessary. But if we don't have that, I see it as valid to put more emphasis to the qualitative part of what we want to do.

The local-ecological lens analyzes how the city provides similar services to those provided by nature. Its principle is biomimetics. Do you know, within your area, any project that the city has regarding water provisioning?

There are things that are being done. All of this has to do with the nature-based solutions that are now being used and taught in environmental engineering. It is something new for us, but fully developed in other countries, which is precisely to replicate things that happen in nature and to use, not necessarily gray infrastructure, but to use natural structure to solve problems. So, it comes to mind right now the natural wetlands that ETAPA is doing to decontaminate water. For example, they have contaminated water or gray water, the water that goes through the toilets and goes through these wetlands that are made by humans, but replicate the natural wetlands that are gravel, fine sand, vegetation.

Then the water passes through there, it stays and decontaminates and, in the end, we have an affluent that is much more friendly to the environment. There is a doctoral thesis at the University of Azuay that is testing these wetlands and studying their application in rural areas. Because rurality is completely impossible to reach with sewerage with all these large systems, but, instead, we have these nature-based solutions with minimal environmental impact and with solutions that are independent of the central system of the city.

So, these things are extremely new for our city. Obviously, there are not in the country, it's something from Cuenca, and it would be cool to put it there, but it's not the water supply part, because it's more about water treatment. There is little in nature-based solutions in reality, it is something that is being done in the latest doctoral theses by people who have been seeing this in Europe and replicate it here and adapt it here, but they are new topics. I will think of a few more things that I can help you with in this part as well.

Thank you very much, it has really helped us a lot because we have had difficulties with the environmental issue. Thank you very much for the predisposition and for the time as well.

Not at all. Send me by mail the information we discussed here so as not to search again but to have it there at hand.

Appendix L: Cuenca's Global – Ecological Lens sources

Lente Global - Ecológico													
Dimension	ODS relacionado a la dimensión ecológica	Category	Goal	Source					How the city / country contributes to the global situation	Source			
				Type (vision, target or objective)	Year	Document	Department	Link		Document	Year	Department	Link
Air	"SDG 13: Climate Action SDG 11: Sustainable cities and communities. Target 11.6: By 2030, reduce the per capita negative environmental impact of cities, including by paying special attention to air quality and municipal and other waste management."	Climate change	Reduce 1,436,843 tons of CO2e, corresponding to 67% of emissions by 2030.	target	2030	Huella de ciudades	Banco de Desarrollo de América Latina	https://www.caf.com/es/act/ualidad/noticias/2018/03/cuenca-redobla-su-agueta-por-un-crecimiento-bajo-en-emisiones-y-resiliente-al-cambio-climatico/	In 2016, the canton's carbon footprint was 1,500,133 tons of CO2e. This represented 1.65% of Ecuador's total emissions in that same year. In 2016, Ecuador contributed 0.20% of global emissions. Cuenca's emissions come mainly from transport, 55%.	Proyecto Huella de Ciudades Informe Final	2018	Banco de Desarrollo de América Latina	http://cqa.cuenca.gob.ec/sites/default/files/Informe%20Huellas%20-%20Ciudad%20Cuenca.pdf https://www.climatewatchdata.org/data-explorer/historical-emissions?historical-emissions-data-sources=ca1&historical-emissions-end_year=2018&historical-emissions-gases=all-ghg&historical-emissions-regions=All%20Selected%20CECU&historical-emissions-sectors=total-including-lucf%20total-including-lucf&historical-emissions-start_year=2015&page=1
		Air Pollution	Goal 1: Keep annual average emissions below 38 µg/m3 of Particulate Matter (PM10) by 2023. Goal 2: Maintain average annual emissions below 27 µg/m3 of Nitrogen Dioxide (NO2) by 2023.	target	2023	PDOT - Propuesta	Dirección de Planificación		According to the "Air Quality in Cuenca 2020" Report, the annual PM10 concentrations reached their maximum peak in 2010 (46 µg/m3), while in 2020 it was the lowest point (27.3 µg/m3) Although the city is below the local goal, it still exceeds the WHO global recommendations established at 20 µg/m3. The Pan American Health Organization (PAHO) maintains that 7 million premature deaths were attributed to environmental pollution in 2016, of which 88% belong to low- and middle-income countries (such as Ecuador). On the other hand, in the same year, in Ecuador 1,771 people died from diseases related to air pollution, of which 86 were boys and girls. Finally, PAHO itself points out that in Latin America, more than 150 million people breathe air with pollution levels higher than those recommended by the WHO, among which are the inhabitants of Cuenca.	Informe de Calidad de Aire en Cuenca 2020 Directrices mundiales de la OMS sobre la calidad del aire Municipios saludables respiran vida Calidad del aire	2020 2021 2016	EMOV Organización Mundial de la Salud Ministerio de Salud Pública Organización Panamericana de la Salud	http://qis.uazuay.edu.ec/erse/links_doc_contaminantes/Informes%20Claudia%20Calidad%20del%20Aire/Informe_Calidad_Aire_Cuenca_2020.pdf https://apps.who.int/iris/bitstream/handle/10665/346062/9789240035461-spa.pdf?sequence=1&isAllowed=y https://www.salud.gob.ec/municipios-saludables-respiran-vida/# https://www.paho.org/es/temas/calidad-aire
		Ozone Layer Depletion	No city objectives have been set for this dimension							In 2019, Ecuador launched the National Foam Plan, approved by the Multilateral Fund of the Montreal Protocol, and which will eliminate the consumption of 147.24 metric tons of substances that deplete the ozone layer, such as hydrochlorofluorocarbons (HCFCs). One of the measures was the implementation of import quotas for HCFC substances, through Agreement No. 18-224 of the then 'Ministry of Industries and Productivity' (now MPCEIP).	Plan Nacional de Espumas Ecuador restringirá sustancias que afectan capa de ozono Acuerdo No 18-224 / Informativo de Comercio Exterior de Aduanas del Ecuador	2019	Ministerio de Producción, Comercio Exterior, Inversiones y Pesca El telégrafo

Land	SDG 15: Life on land ecosystems	Waste Generation	Reach 5% of the organic and inorganic material recycled from the total solid waste that is sent annually to the landfill by the year 2023.	Target	2023	PDOT - Propuesta p. 130	Dirección de Planificación	<p>Each inhabitant of the urban area of Cuenca generates 0.519 kilograms of solid waste per day. This is less than the national average of 0.84 kg/person/day; which in turn, is below the country with the production per capita of solid waste highest in Latin America: Mexico (1.2 kg/inhab/day)</p> <p>In 2019, approximately 163,000 tons of waste were generated and deposited in the Pichacay landfill. Considering that approximately 11,200 million tons of solid waste are generated each year in the world, Cuenca contributes 0.001455% of the world's garbage production.</p> <p>In Ecuador for 2019, around 4,624,980.7 tons of waste were collected (Approx 361.5 tractor-trailers full of garbage). Therefore, Cuenca contributes 0.35% of the national garbage generation. And in turn, Ecuador contributes to 0.041% of garbage generation worldwide.</p>	<p>Relleno Sanitario</p> <p>Boletín Técnico Gestión de Residuos Sólidos GAD Municipales, 2019</p> <p>UN Environment Programme</p>	<p>NI</p> <p>2019</p> <p>2020</p>	<p>EMAC EP</p> <p>INEC</p> <p>PNUMA</p>	<p>https://emac.gob.ec/servicios/planta-de-biogas/</p> <p>https://emac.gob.ec/servicios/relleno-sanitario/</p> <p>https://www.ecuadorencifras.gob.ec/documentos/web-inec/Encuestas_Ambientales/Municipios_2019/Residuos_solidos_2019/Boletin_Tecnico_Residuos_2019%20v05_2.pdf</p> <p>https://www.unep.org/explore-topics/resource-efficiency/what-we-do/cities/solid-waste-management</p>
	Target 15.3 By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.	Excessive land use	Maintain 73.15% of land with a conservation vocation and strengthen in some category of the subsystem of protected areas of Decentralized Autonomous Government, private, community or recognized as Areas of Conservation and Sustainable Use (ACUS) or Water Recharge with conservation purposes for the year 2023.	Maintain 73.15% of land with a conservation vocation and strengthen protected areas by the year 2023.	2023	PDOT - Propuesta p. 129	Dirección de Planificación	<p>For 2018, it was reported that Ecuador needed 1.7 global hectares per person.</p> <p>In 2018 it was estimated that 1.08 planets were necessary to satisfy the consumption demand of an Ecuadorian; In comparison, on average, a North American would need 5.13 planets to satisfy their consumption demand.</p> <p>According to data from Global Footprint Network, our current use of natural resources is 1.7 times faster than ecosystems can regenerate. Another way to look at it: To meet our rate of consumption, humanity requires 1.7 Earth-like planets.</p> <p>The country requires 29 million global hectares (gha) to meet its current consumption (1.7 gha per person), and has a biocapacity of 32.2 million global hectares (1.89 gha per person). But the oversupply of natural resources is coming to an end. 58 years ago, in 1961, it required 5.7 million hag to meet consumption and had a biocapacity of 35.3 million.</p>	<p>Publicación Food Print Network</p> <p>Noticias Latinclima</p>	<p>2018</p>	<p>Foot Print Network</p> <p>Latinclima</p>	<p>https://data.footprintnetwork.org/#/countryTrends?cn=58&type=earth</p> <p>https://data.footprintnetwork.org/#/countryTrends?type=earth&cn=2004</p> <p>https://latinclima.org/articulos/humanidad-necesita-17-planetas-para-satisfacer-su-ritmo-de-consumo</p>
	SDG 6: Clean water and sanitation	Fresh Water Extraction	Preserve ecosystems of lagoons, rivers, streams and their margins; understanding that the cantonal territory is crossed by a system of hydrographic networks and some of these more fragile due to their geographical locations, in relation to the variation of the different altitudinal floors.	Objetivo	No establecida	PDOT - Propuesta	Dirección de Planificación	<p>In 2018, the Cuenca Cities Footprint report determined that the water footprint of the canton in 2016 was 87,935,671 m3. This, divided for the inhabitants of the canton in 2016, yields an approximate per capita consumption of 145 m3 of fresh water per year. This value is below the planetary limit, established at 574 m3 of fresh water per year.</p>	<p>Proyecto Huella de Ciudades Informe Final</p>	<p>2018</p>	<p>Banco de Desarrollo de América Latina</p>	<p>http://cqa.cuenca.gob.ec/sites/default/files/Informe%20Huella%20-%20Ciudad%20Cuenca.pdf</p>

<https://www.elcomercio.com/tendencias/amb>

Water	<p>the efficient use of water resources in all sectors and ensure the sustainability of freshwater withdrawals and supplies to address water scarcity and substantially reduce the number of people suffer from lack of water</p> <p>SDG 14: Life below water</p> <p>Target 14.3: Minimize and address the effects of ocean acidification, including through increased scientific cooperation at all levels</p>	Overfishing	No city objectives have been set for this dimension				<p>- According to WWF, Ecuador caught 24% of the region's yellowfin in 2018. This is equivalent to 57,500 tons. In addition, it caught 63% of the area's bigeye tuna, which corresponds to 41,250 tons.</p> <p>-In 2019, world fish production stood at 178 million metric tons and during the same year, Ecuador exported a total of 82,000 metric tons of tuna and fish; which represents 0.046% of the production worldwide</p> <p>- In 2018, Ecuador was among the 25 countries with the highest volumes of fishing worldwide</p>	<p>Noticia El Comercio</p> <p>Informe PNUD Ecuador</p> <p>Publicación Cadenas Mundiales Sostenibles de productos del mar</p>	<p>2018</p> <p>2019</p>	<p>El Comercio</p> <p>PNUD</p> <p>Cadenas Mundiales Sostenibles de productos del mar</p>	<p>https://www.elcomercio.com/temas/temas/ambiente/sobrepesca-problema-region-conservacion-amenazas.html</p> <p>https://www.ambiente.gob.ec/wp-content/uploads/downloads/2013/01/impacto-s-de-la-pesqueria-arrastre-Ecuador-1.pdf</p> <p>ec.undp.org/content/ecuador/es/home/presscenter/articles/2020/ecuador-joira-avances-significativos-en-la-reduccion-de-sobrepes.html</p> <p>https://blogs.cedia.org.ec/obest/wp-content/uploads/sites/7/2020/08/Pesca-y-acuicultura-en-Ecuador.pdf</p> <p>https://es.statista.com/estadisticas/635354/produccion-de-pescado-a-nivel-mundial-de-2002-a/#-text=En%202019%2C%20la%20producci%C3%B3n%20de.178%20millones%20de%20toneladas%20m%C3%A9tricas</p> <p>http://pesqueriassostenibles.produccion.gob.ec</p> <p>https://www.fao.org/documents/card/en/CA0146EN</p> <p>https://www.fao.org/news/story/item/1141818/code/</p> <p>https://www.ecuadorencifras.gob.ec/documentos/web-inec/Encuestas_Ambientales/plaquicidas/Plaquicidas-2013/Documento_Tecnico-Uso_de_Plaquicidas_en_la_Agricultura_2013.pdf</p> <p>https://www.ecuadorencifras.gob.ec/documentos/web-inec/Encuestas_Ambientales/plaquicidas/Plaquicidas-2014/Modulo_Uso_y_Manejo_de_Agroquimicos.pdf</p>
	<p>Target 14.4: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices, and implement science-based management plans to rebuild stocks of fish in the shortest possible time, at least reaching levels that can produce the maximum sustainable yield according to their biological characteristics</p>	Excessive use of fertilizers	No city objectives have been set for this dimension				<p>- The environment is sprayed each year globally with 4.6 million tons of chemical pesticides. Developing countries account for 25 percent of global pesticide use in agriculture, but account for 99 percent of deaths derived from its use in the world.</p> <p>- Today the world consumes ten times more mineral fertilizers compared to 1960</p> <p>- In Ecuador, of the 5,132,065.54 hectares of agricultural land in the country, 52.59% of the agricultural land uses chemical inputs such as pesticides and fertilizers</p>	<p>More people, more food... worse water? - Water Pollution from Agriculture: a global review</p> <p>Uso y manejo de agroquímicos en la agricultura 2014</p>	<p>2018</p> <p>- Pag. 29</p>	<p>FAO</p> <p>INEC</p>	
		Ocean Acidification	Reduce 1,436,843 tons of CO2e, corresponding to 67% of emissions by 2030.	Target	2030	Huella de ciudades	<p>Banco de Desarrollo de América Latina</p> <p>https://www.caf.com/es/actualidad/noticias/2018/03/cuenca-redobla-su-apuesta-por-un-crecimiento-bajo-en-emisiones-y-resiliente-al-</p>	<p>Although Cuenca is not a coastal city, its CO2 emissions contribute to the acidification of the oceans, which absorb 25% of the CO2 from the atmosphere. According to NEEF, the waters of the oceans have become 30% more acidic in the last 250 years, a trend that would increase if GHG emissions are not limited.</p>	<p>Acidificación del océano</p>	<p>2022</p>	<p>Fundación Nacional de Educación Ambiental (NEEF)</p> <p>https://www.neefusa.org/weather-and-climate/climate-change/acidificacion-del-océano/#-text=L%20acidez%20de%20las%20aguas.contin%C3%BAan%20aumentando%20a%20ritmo%20actual</p>

Note: table prepared by the authors as a summary of the sources used to create the Cuenca's City Portrait lenses

Appendix M: Interview to Dr. Fredi Portilla, PhD.

Date: March 24th, 2022

About the interviewee: Fredi Portilla is a teacher and researcher at the Salesian Polytechnic University, and is involved in projects on urban agriculture, climate change and ancestral pharmacy. In addition, he is part of the Sovereign Educational Innovation and Food Safety Group.

We are going to ask you some questions in this area of study and, specifically, in the degree work that we mentioned in the email. Our degree work is a thesis on environmental and social management. We are students of International Studies at the University of Azuay. We have been in contact with various researchers in the area of climate change and city authorities to learn about projects and research in these areas. This is how we find that you were Director of the thesis “Estimates of the carbon capture potential in urban parks and vehicle CO2 emissions in Cuenca, Ecuador”. As for the specific questions that we have, could you share a brief explanation about the process of how carbon sequestration takes place through urban parks.

Well, thank you very much. First of all, I apologize for the noise. We are in a section where other teachers also work and they are arriving and greeting at this moment, so that is why there is some noise. Well, this thesis that we did is one among others that we have done here, and at the level of Azuay and Austro. It takes into account the plant mass and quantity the number of trees and ‘shrubs’ -that is, bushes-, and of minor species present in the parks. Then these are transformed towards the surface, using the conventional formulas at the scientific level and also of vegetal mass.

So, taking that into consideration, you can see throughout the document that we use, for example, to measure bush diameters over breast height, using the ‘DBH’ formula. Then the data is taken from the surface of the leaves, randomly, and then multiplied by a factor that is obtained from the same plant mass. That is a conventional way. There are other formulas that scientists use for more

reliable approaches; but in this case, since we are dealing with 24 parks with a large number of trees and vegetative mass, we have used the conventional ones.

Doctor, both in this work and in others we reviewed on carbon sequestration, we have seen that they make a differentiation between tree species when they talk about their ability to capture or sequester CO₂. Could you tell us how species influence in this process?

Of course, you can see in the paper published in Focus Springer, there is a list of species. I have this list of species right here in front of me because sometimes memory fails. There we have, for example, introduced species. For example, different types of acacias, which are not ours. We also have casinas, some types of cedar, citrus and, especially, eucalyptus; which is the one found in the paper as eucalyptus citroidora. This is the one that has been found in most of the parks. But, also, we have species that are our own or that became our own, such as the capulí. The capulí has reproduced many, many years ago, as a result of the European conquest; but then it became a local species. Actually, capulí, the prunus salicifolia, which was the initially introduced species, has now become the serotina that initially has the capacity to adapt and contribute organic matter to the soil. On the other hand, species such as Eucalyptus, and others that we have mentioned before, such as acacias, absorb a lot of water.

Eucalyptus is a species used mainly to dry swamps. This is what they did in Australia and then they had a reverse effect, in Australia it became almost desert because the eucalyptus absorbs a lot, a lot of water. Consequently, it is a species seen in the parks of Cuenca, which contributes to the capture of carbon by the plant mass, but it has a reverse effect on the environmental part because it consumes a lot, a lot of water. That means that it is dangerous to plant them near water wells such as water sources, including rivers, because they would absorb too much water.

We have other species; I continue with my list here. We have the quishuar, this is American, this is ours. It belongs to the scrofulariaceae family. The quishuar is an eminently noble bush because it provides a lot of organic matter to the soil so that the organisms themselves can develop and transform it. At the same time that it is food for these macro, micro and meso organisms; they release nutritional elements such as nitrogen, phosphorus and potassium that sustain other

vegetables. In addition, it is a bush that favorably extends its roots horizontally and thus stops soil erosion. So, it is a plant widely used to reduce soil erosion. This, unfortunately, we have very little. We should think, as you can see in the paper below, that they recommend the gradual and structured replacement of species that capture a lot of water, such as eucalyptus, by other species. Total removal is not recommended, but replacement is. This would be in question of the masses.

Now, in the parks there it goes back many years, depending on the officials who have been in charge, they had a slightly more empirical approach to the planting of plant species in the parks. With this paper it was established, and it is like an example for the city, so that a vegetal restructuring of the same is done. Based on, first, favoring native crops. In this case of native plants that do not damage the soil and do not capture much water; that is, in some way they help water management, which at the same time provides fruit trees for the promotion of biodiversity, bio fauna in this case. See that in our parks there is almost an absence of wild birds; rather what have abounded lately are pigeons. These are also introduced species in the case of sparrows that are our own. But these need food and, therefore, it will be necessary to plant species that bear fruit, as in the case of capuli. We could alternate with plants that are introduced that are, for example, apple trees, some types of citruses, guava -for example, a very noble fruit- could be added there, for example, fig trees, etc. That is what I could tell you regarding that part of your question.

Precisely along the same lines, we have been investigating and reviewing that the urban parks also help regulate the temperature of cities. In this case, perhaps you know of, or have there been, some kind of research or study on how specifically urban parks are helping to regulate temperature in Cuenca?

Yes, I know of some essays. I haven't seen Cuenca-specific publications yet, but some universities have been working on trials and experiments. Among them, the University of Azuay, the Catholic and the UPS. Something was presented at the congress of the previous year, the four universities did it on the day of the environment. This year there will also be this event and I think there will be some progress. But from what I know, we have data that indicates that the greater the mass of vegetation in the parks, the lower the temperatures and regulate them, as can be seen throughout the paper.

A wide plant cover causes the formation of microclimates, of meso-climates within the parks themselves. Sometimes you go under a tree on a sunny day, because you take shelter. That is one of the functions of the vegetal mass, to protect, because directly the solar radiation stays in the flower area, in the leaves. This triggers photosynthesis for growth and the transformation of food into starches. And below them, a microclimate is structured for the development of other species, which are necessary. For example, lichens, fungi, bacteria and minor species such as grasses, and species such as rats that will favor and increase biodiversity.

In this way, the temperature is regulated. That is why it is necessary for the parks to keep the large species, but in a prudent distance so that they also favor the development of the others, because they need sun to develop. When they are very close, there is a competition between them. They begin to grow longitudinally, favoring lateral growth. What is sought in parks is lateral growth to regulate temperatures. This in other countries they are working hard; especially the Nordic countries. In such a way that the parks become a refuge in the summer. Remember that in a country with four seasons, summers are extremely hot. In our country, we have the four seasons in the same day; therefore, this also requires careful management of the species that are placed in the parks, seeking lateral growth and diversification of the species.

Doctor, we saw that you are part of urban agriculture projects. In this sense, we wanted to know if there are projects and initiatives for the development of urban gardens.

This is a particularly necessary and indispensable issue for urban centers. The excessive growth. If we look at the case of Cuenca, there is growth towards the poles, the cardinal and collateral points; but without urban planning that is based on green areas for every certain number of inhabitants. So, there is a deficit in Cuenca in this aspect. Then, the spaces that are increasingly being occupied for business. For example, the lower area of El Ejido was previously a residential area and is now a commercial area. That whole area has already become a commercial area. The spaces that were in front of the houses, which were gardens, have been replaced by businesses. And this is a dynamic that is taking place throughout the city.

So, urban agriculture seeks to rescue these spaces and make people aware. That, for business reasons and changes in land use - which are dictated by the cantonal council's own regulations - they use other spaces such as: terraces, walls for vertical crops, balconies for crops in pots, and patios internal -for example, in the historic center-. From the Polytechnic University, in the last seven years, we have been working on urban gardens. We started at the Polytechnic University, with internal flowerbeds to plant lettuce, cabbage, onions, tomatoes, etc.

The purpose is to ensure the quality of food safety and improve the community economy -because having plants grown at home saves a few cents or dollars, compared to buying them in the supermarket-. One also feels safe because they are irrigated with good water and good fertilizer. At the same time, we have been measuring carbon capture to see how these species are capturing it, as part of the fight against climate change. The rehearsals that we have had, both at the level of the UPS headquarters in Cuenca and the fifteen schools with which we have worked -both in the north, south and in the historic center- since the pandemic, we have worked with young people and children in the urban gardens. Encouraging environmental education and motivating them to replicate it in their homes. And it has been achieved.

We have found very curious data. For example, species such as lettuce and bralcitas -cabbage, broccoli and purple cabbage- are the ones that have reported the most carbon capture. From the data we have obtained, we infer that it is due to the number of leaves, plant mass and flower surface. So, these are ideal species in the fight against climate change, sequestering carbon and regulating temperature.

Additionally, it also serves to measure the number of harmful elements in the air, such as nitrous oxide. If you review other theses that have been published by the university, there are very interesting data. According to these experiments, Cuenca still has lead contamination. And it is alarming because it exceeds by ten what is recommended by the World Health Organization. Consequently, urban agriculture becomes a point of experimentation to determine these pollution rates. This is what we have, until now, within the Salesian Polytechnic University. You can review more papers of the work carried out. There you can find more information about it.

Finally, we would like to know in this area of agriculture: how is the situation of the use of fertilizers in the Canton? We have been looking for research, but we have not found analyzes on contamination from excessive use of fertilizers. Also, how are fertilizers affecting nitrogen fluxes and phosphorus fluxes?

Well. On the subject of the use of fertilizers and biopesticides within the urban area, we do not have data. We haven't analyzed that. There are experiments underway. Some colleagues are working on it, and will publish it soon. What I know are the data from the peripheral and rural area. That is where we talk about the Canton of Cuenca. So, we are talking about the rural area, where the use of pesticides and agrochemicals has exceeded the limit. The data from the Sayausí and San Joaquín orchard area are alarming, where, for a long time, vegetables have been grown with excess agrochemicals.

There is a practice for the control of pests and diseases, using potentially carcinogenic products - such as phosphorous and chlorinated-. There are interesting studies and you can find them in the Faculty of Medicine of the University of Cuenca. These are really alarming data. Two years ago, at the ancestral medicine meeting we had here at the Polytechnic, the University of Cuenca presented these data. You can review them, in the medical school, in the nursing section.

In addition, the authorizations for the use of agrochemicals in the productive sector exceed the limits, because they do not analyze the soil and the needs of the plants. If they do, it is in an empirical way. That is a reality and, added to that, businesses take advantage of it. Companies that sell products are not so technical. What they say is: 'put two or three sacks for a certain crop'; but they do not do a previous analysis of the soil, air and water to determine exactly the plant needs. They do not point towards an agriculture based on bio fertilizers -which would be better-. The use of leaves, trunks, branches, fruits, compost, accessories with worms to remove the humus, or the same violas, would be the best for crops. We have to move towards organic and ecological. In this vein, the world is changing and universities are looking in that direction and new jobs are appearing. But I can't give you concrete data on how much is affected. I'm afraid I'm wrong.

But for San Joaquin, which has been exposed to flower crops for more than ten years, there are still remnants of the amount of chemicals they used to grow flowers. And elements like lead will

be around for many years and won't go away. There you have to do environmental remediation work and, especially, bioremediation. To do this, there are tests and experiments that are bearing fruit, using fungi and bacteria that destroy molecules of lead, selenium and tellurium.

Hopefully the cantonal government manages it, takes it seriously and considers urban agriculture as a method of combating climate change. A method to ensure the food security of the population. Also, for the capture and elimination of harmful elements. There is a thesis by Mr. Sinchi, where they analyze the harmful elements in the air of Cuenca. Cuenca's industries have contributed to increasing pollution. You can check that and you will find alarming data, especially nitrous dioxide, tellurium and lead, found in different parts of the city. Mainly where there is a strong daily vehicular presence, such as the one inside las Américas avenue, at the airport, in La Condamine and in Huayna-Capac Avenue. That is what I could tell you about it.

Ok. Thank you again for your time and for your willingness to answer our questions.

At your orders.

Appendix N: Interview to Eng. David Vásquez

Date: March 28th, 2022

About the interviewee: David Vásquez is a specialist in hydrogeological protection in climate change scenarios. He is Director of the Basin Environmental Management Commission (CGA).

Are there projects in our city that are born with the principle of biomimetics? that is, that have the objective of being solutions based on nature. Are they projects structured in another way? Because we have found that the city has several projects that could be adapted to this concept, but we do not know if they were born with this purpose.

The principle of environmental management is to adapt and learn from nature. So, any environmental management project or initiative has that component. Many of the occasions it is not even designed with that criterion. However, any theory, research or proposal for the conservation and proper management of natural resources is based on nature and is based on scientific studies of nature itself. In your explanation you spoke of the process of natural regulation of flows, that is, that the soil works like a sponge that retains. This water storage process is much better than a reservoir. However, the reservoir itself is also such a proposal. So now you have to combine the two things. There is always talk of structural measures and non-structural measures. Non-structural measures are those that are based on nature, trying to diminish the infrastructure. First for costs and second for results. In non-structural measures we obtain long-term results. They are non-structural measures, for example, reforestation processes, establishing conservation areas, protected areas. Cuenca has been a city that has promoted these non-structural measures. And the structural ones are the construction of dikes, construction of pipes, storage tanks, etc. Since the 1980s, Cuenca has acquired the Mazán area, a water recharge zone. Later they assigned him the administration of the El Cajas National Park. I dare to say that it is the best managed national park in the country. Perhaps Galapagos could have another component. However, the Ministry's own people have said and affirmed it on several occasions.

In addition, in January 2021, an ordinance was created for the creation of conservation and sustainable use areas, called ACUS. What is the difference with a national park or other types of protected areas? In an ACUS, land tenure is not under public administration. We have started with three ACUS, two of them on land owned by the ETAPA company. However, we are working with some other areas where the population will continue to own the land. The principle is that the human is also part of nature. We cannot think about conservation issues outside of people. So, the proposal is that in these spaces called ACUS it is possible to work in harmony, respecting certain spaces and setting certain rules that allow adequate conservation and regulation of flows. Last Thursday we had a meeting with the GAD of the city of Baños, with other social actors, and some others from the region. Some GADs such as San Joaquín, Baños, Tarqui, Molleturo, Chaucha have joined this process to make a new privately owned ACUS. As I was saying, it was not always raised with that objective. Not every project started with a climate change vision. However, when researching there are many edges and criteria that add up and strengthen any resource management initiative.

Is there a study, carried out by the Municipality, related to the change in temperature in the city? Is there any project that is aimed at regulating the temperature in urban spaces or parks?

There are no specific projects and with the sole purpose of regulating the temperature. Only one that we are starting here in the botanical garden of Cuenca. We are doing an evaluation of different types of vegetation cover. The Botanical Garden is a young space, and in the process of growth, with small plants. For this reason, we are going to install thermometers, some temperature measurement points, to confirm the theory that a soil with greater vegetation cover, reduces its temperature, compared to areas with pavement. There is literature on the matter, however, there is nothing with that approach in Cuenca. I know that a couple of investigations are being carried out by the universities, however, they still do not have results. The preliminary phase is an investigation process of air quality in Cuenca. The stations that measure air quality also measure temperature. So, there is some base information and some documentation about it. However, something concrete at the local level does not exist. What the universities have done are the macro

scales, where the entire Ecuador is almost a single cell in their analysis. For several years, Cuenca and some local institutions such as the Electric Corporation of Ecuador, universities, SENAGUA -now absorbed by the Ministry of the Environment-, have been working on downscaling processes. That is, reduce the national scale to be able to have regional information on climate change trends. Either with extreme events or with average temperatures and winds.

The project that is starting here in the botanical garden that will measure the temperature in areas with vegetation cover, the principle of this project is to monitor the temperature, just as air monitoring is carried out in the city?

Yes. The intention is to have a record of the temperature. As I say, it is a process that is beginning, we are preparing the project. There is the intention to work with some theses and with students, because the connection of the academy is very important, especially to generate long-term processes. Please note that the Municipality is not a research institution. However, we are interested in all the decisions that are made in the Municipality being based on scientific principles, as well as social and cultural ones, that they be balanced and sustainable. In any case, the intention here is to generate information that allows us to make decisions in green areas and throughout the city, not only for temperature regulation. Right here, the Botanical Garden is a recreation of eight ecosystems of the region. We have from a recreation of an area at 800 meters above sea level, to one of 2500 meters above sea level. It would be too bold to think that, without an acclimatization infrastructure, we can replicate exactly what we have in these ecosystems. However, what we want to do is see the adaptation capacity of the vegetation, fauna and flora of these different ecosystems in Cuenca. With the information collected here, we will be able to determine and make decisions about revegetation in some areas of Cuenca.

The next question is focused on soil erosion. Within the Municipality there are ordinances and projects that prevent improper use of the land. However, we would like to know what powers the Municipality has to prevent erosion or improper use of the soil.

The Municipality of Cuenca and the Municipal GADs have some powers that are defined in the Constitution of Ecuador. Likewise, in documentation such as the COOTAD and some other legislation. Within the Municipality, there is a structure where there are some Directorates. Among them, the Municipal Control Directorate. This Directorate controls the proper use of the land. This, linked with the planning areas, with the CGA and all those that belong to the Municipality. Even from there, the PDOT is generated, as well as the Land Use and Management Plan. After a study of the current conditions, about which areas are populated, which have a tendency to be populated, which are being invaded -not only by urban expansion, but also by agriculture-, it is analyzed where the city should grow.

For those of us who love nature and would like to live in the countryside with our large green space, we know that it is environmentally harmful. If we all wanted to live in a space like this, we would have already run out of green areas. Balance must be sought, which is why city planning is so important, so that places for parks and green areas are determined. In fact, I emphasize the importance of the information collected here to make decisions in different spaces. So that those who decide to stay in a more populated area - perhaps in buildings or single-family homes - can also have a bit of that experience. So, the Municipal Control Directorate carries out the review later and has to carry out constant control. It seeks to avoid inappropriate construction, earthworks without permits. And when people do it with the necessary permission, they also verify that the appropriate studies are presented, because the impact does not cease to exist.

You know that any activity has an environmental impact, so we must ensure that any activity we carry out is as sustainable as possible. Always keeping in mind that compensation should be the last option before taking the initiative. However, it must be borne in mind that you cannot stop living, producing. We cannot take a comfortable position of saying “this whole area here is of interest to the city and you can't touch it”. It is easy to adopt such speeches from our homes, from our comfortable position and with all the services. So, that is why other alternatives are created, such as the ACUS, which seek to ensure that people do not stop living in those spaces, that they do not stop producing, but that their practices and productivity be as appropriate and compatible as possible with conservation interests.

Regarding the global - ecological lens, the methodology proposed an analysis from consumption and global supply chains. However, when talking with Directors from other areas, they told us that there is still no study on the supply chain in Cuenca. For this reason, we have sought to adjust this lens to the resources we have here in the city. However, in this lens there are dimensions that would not apply to Cuenca because it is not a coastal city, such as ocean acidification or overfishing. What type of analysis do you recommend to do in this section?

Sometimes being far from the oceans has made us lose some perspective. However, we must understand that one of the characteristics of Cuenca is that it is crossed by four rivers. In fact, there are more than four rivers, many streams that are of enormous importance. Even now we are working hard to study the streams with the intention of generating balanced spaces. In fact, one of the definitions of sustainable development that you have surely seen is that of the balance between environment, society and economy. As I said, we cannot sit back and say “this area should be dedicated to conservation and nothing else”, because there are people who live there, who feed their families and who have certain needs. There are areas that we need to allocate to agriculture, where we need production. But yes, as you say, there is no study in Cuenca focused on the supply chain. I find it interesting to work on it.

About ocean acidification, as I said, being far from the oceans we lose that perspective. However, what we deposit in our rivers contributes to the acidification of the oceans. This is an example city, because it was the first to have a waste treatment plant, which is located in Ucubamba. And despite the fact that, with this plant, we have over 85% of the wastewater treated and deposited in an adequate quality, there is that additional 15% that has not yet been processed. For this reason, the construction of a new wastewater treatment plant will begin in the Guangarcucho area. This is, by far, the project with the most investment made in Cuenca in terms of sanitation. The key is to work from water recharge sources to feed water collection sources, and not only for drinking water, but also for irrigation and other uses, whether industrial or domestic. The issue of risks is a fairly latent issue. Lately there have been some events, like in Quito with La Gasca, and today in Sayausí, and some other floods that we have had. It is a subject that has been somewhat forgotten. However, now we intend to make a reinforcement.

Another area where we fail to meet city goals is in the area of excessive use of fertilizers, pesticides, or chemical fertilizers.

Cuenca does not have the competence in the management of agriculture. That already belongs to the Ministry of Agriculture. However, work has been done indirectly in the urban agriculture program. This program is intended to educate people to be efficient and responsible in the use of pesticides and other chemicals in agriculture. But it is more focused on the production side. From the side of ETAPA, we are working on some projects, such as mutual agreements for water, where we work with the population. ETAPA is interested in not using too many fertilizers, because if these chemicals reach the rivers, the water treatment processes will be more expensive and complicated. The fish farms themselves are not bad, it is the excess of fish farms and their use and management that generate certain problems. This is why ETAPA works on education issues, with issues of strengthening local capacities.

Is ETAPA in charge of these trainings and awareness campaigns?

Yes, exactly. We also in the CGA. The Environmental Management Commission is not an executor of projects, rather it is a control entity that dictates policies. Obviously, we have carried out some pilot projects that are later passed on to some of the municipal entities to be promoted. We support these processes that are mainly carried out by ETAPA, because as I was saying, there is a direct relationship. In turn, with EMAC, it focuses on the issue of management of green areas, landfills and inadequate dumps, as well as municipal control.

Within the PDOT, one of the objectives that the city has is on tropospheric ozone. However, we did not find anything related to the ozone layer itself. Are there objectives or goals focused on reducing pollutants that affect the ozone layer?

Yes, but in a very general way, we do not have our own investigations. Work is being done on approaches with some universities to seek to strengthen this research. However, we do not have a

direct relationship with ozone layer issues. Rather, the inclusion of that objective in the PDOT is to try to bring this process closer, so that the city has in mind that there are issues that must be addressed.

We have reviewed the PDOT of 2011, 2015 and the updates that have been made now in 2021. Those that are approved in the first debate. We have noticed that there is a difference between the achievement of the goals in terms of time. That is, in the 2011 the goals were established for 2030, and in the 2021 they were established for the year 2023. In addition, there are goals that are set in the 2011 PDOT that then no longer have continuity in the following ones. Why does this happen?

What has been done is to regroup, reorder and refocus some goals. In other words, there are certain goals that can be aligned with the Sustainable Development Goals. In fact, it is one of the main bases. We recently had a workshop to check that the proposed goals are addressed both to the SDGs and to national and local planning. So, it could be thought that some goals fit better in one or another SDG. Only with the SDGs have we had some cases, such as the gender issue. There are people who believed that the issue of "gender" should be in a certain SDG and, however, because it is also focused on the issue of productivity, it is included in another SDG. But it does not mean that we stop taking into account the gender issue, but rather that it is also focused on productivity. That equity is also contemplated in other spaces. In the proposed plan there is currently an approval in first debate. However, in the debate that took place in the Cantonal Council, in this first debate, several changes and several regroupings were requested. It is being restructured, but always bearing in mind that the Sustainable Development Goals and the National Plan are contemplated. We had to make a matrix to see each one of the goals and each one of the proposed plans, that they fit and that they are also balanced in the environment. However, if you have found something that has definitely been left out, I would appreciate it if you would point it out to us so we can verify that it hasn't been left out. Or, if it has been discarded, know why.

And why were they raised before for 2030 and now for 2023?

Well, for 2023 not so much. There is also a differentiation in the times mandated by legislation. And even, the planning of the PUGS, for example, has a time, and of the PDOT it is another time. The legislation itself already establishes it. Rather, even the mayor has been very emphatic in the sense that... The times that are established, both for the PDOT and for PUGS, are in accordance with what is required by the regulations. Whether it's 5 years, 10 years. In 2023 there may be some very specific issue, because time is very short. Surely perhaps, in some draft document it was raised, because this PDOT has actually been under construction for some time. I understand that they started to build it in 2018 or 2019. Even so, if it were 2018 it could fit within one of the times that are 5 years, and for that reason mention it in 2023. However, if we are going to approve it now in 2022, in no way will it have the logic to generate such a long process for a year. Rather, what I was stating is that the mayor has been quite emphatic in the sense that, even though the regulations require us 5 years, 10 years in some cases, we actually have a vision towards the year 2050. That is the logic with which it is being built. However, when you work in the public sector, you have to do what is written to be done. So, one must meet certain requirements. And surely it is by that criterion. The PDOT, if I'm not wrong -and I don't want to assure you because I could be confused- the PDOT itself seems to me to be for 10 or 12 years, and the PUGS is for 5 years.

Thank you very much David, you have solved many doubts, thank you for your time this morning.

Don't worry, it was a pleasure.

Appendix O: Cuenca's Global - Social Lens sources

Cuenca's Global - Social Lens															
Dimension	Category	Global Objective / SDG	Most significant setbacks	Global Situation / Situation in pandemic	Source				City Snapshot	Source					
					Year	Document	Department	Link		Document	Year	Department	Link		
Healthy	Health	<p>Objective 3: Ensure healthy lives and promote well-being for all at all ages</p> <p>Related objectives:</p> <ul style="list-style-type: none"> - SDG 1: End poverty in all its forms everywhere - SDG 2: Zero hunger - SDG 5: Achieve gender equality and empower all women and girls - SDG 6: Ensure access to water and sanitation for all - SDG 13: Take urgent action to combat climate change and its impacts 	<p>"A decade of progress in reproductive, maternal and child health could stall or reverse due to the pandemic" (p. 30).</p> <p>"There has been an increase in extreme poverty since 1998. It went from a rate of 8.4% in 2019 to 9.5% in 2020" (p. 26).</p> <p>COMPROMISED SDG TARGETS: 3.1-3.2-3.7-3.8-5.6-3.3-3.4-1.1-1.2-1.3-1.5</p>	<p>- 90% of the countries still report one or more interruptions in essential health services. In 2020, 35% of countries reported interruptions in reproductive, maternal, newborn and child health services (this may have contributed to an additional 228,000 child deaths and 11,000 maternal deaths in South Asia alone). Although it should be noted that the global adolescent birth rate showed progress: between 2000 and 2020 it fell from 56.4 to 41.2 births per 1,000 adolescents aged 15 to 19</p> <p>- The effects of the COVID-19 pandemic have caused a setback in the progress made in reducing poverty. This exacerbated the difficulty of accessing quality health services and food, directly affecting people's quality of life and their health.</p>	2021	The Sustainable Development Goals Report 2021	United Nations	<p>https://www.un.org/sustainabledevelopment/es/health/</p> <p>https://es.stata.com/estadisticas/1107719/covid19-numero-de-muertes-a-nivel-mundial-por-region/</p>	<p>- In 2018, for every 1,000 adolescent women between the ages of 15 and 19, there were 36 births in the urban area and 80.9 births in the rural sector. In rural areas, an average number of births per adolescent pregnancy is higher than that of the SDGs</p> <p>- As of June 2021, at the national level, COVID-19 cases amounted to 439,374. In Azuay 23,930 were registered, which represents 5.4%, and in Cuenca, 18,409 cases were reported to date.</p> <p>- It should be noted that during the first quarter of 2021, the province of Azuay reported 344 deceased people. While the Ecuadorian State officially recognizes 35,416 people deceased by COVID-19 as of March 2022.</p> <p>- The lack of data is the main obstacle to understanding the true magnitude of the COVID-19 pandemic</p>	<p>PDOT - Diagnóstico</p> <p>Observatorio Social del Ecuador</p> <p>Reporte Operacional enero - marzo 2021 Cuenca</p>	2021	2022	2021	<p>Dirección de Planificación de Cuenca</p> <p>Municipio de Cuenca</p> <p>GTRM y R4V</p>	<p>https://www.covid19ecuador.org/fallecidos</p> <p>https://reliefweb.int/sites/reliefweb.int/files/resources/%5B-CLEAN%5D%20Reporte%20Operacional%20GTRM%20Cuenca%20-%20ENE-MAR%202021.pdf</p>
	Food	<p>Objective 2: Zero hunger</p> <p>Related objectives</p> <ul style="list-style-type: none"> - SDG 1: End poverty in all its forms everywhere - SDG 3: Ensure healthy lives and promote well-being for all at all ages - SDG 15: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss 	<p>"COVID-19 causes the rates of hunger and food insecurity to increase even more" (p. 28).</p> <p>"The consequences of the pandemic may cause an increase in the figures for stunting, since it affects more than 1 in 5 children" (p.30).</p> <p>"There has been an increase in extreme poverty since 1998. It went from a rate of 8.4% in 2019 to 9.5% in 2020" (p. 26).</p> <p>COMPROMISED SDG TARGETS: 2.1 - 2.2 - 1.1 - 1.2 - 1.3 - 1.5</p>	<p>-Between 720 and 811 million people in the world faced hunger in 2020, an increase of up to 161 million since 2019. In addition, the prevalence of malnutrition increased from 8.4% in 2019 to 9.9% in 2020. Hunger affects 9.1% of the population in Latin America.</p> <p>- Around 1 in 3 people in the world (2.37 billion) was affected by moderate or severe food insecurity in 2020, increasing by almost 320 million people since 2019</p> <p>- In 2020, 22% of children under 5 years of age worldwide (149.2 million) were stunted. In addition, in the same year, the number of children who may have suffered wasting is 15% higher than the estimated figure due to the deterioration of the economic situation of households during the pandemic</p> <p>- The effects of the COVID-19 pandemic have caused a setback in the progress made in reducing poverty. This exacerbated the difficulty of accessing nutritious food, due to the deterioration of the economic situation of households, directly affecting the quality of life of people and their health</p>	2021	The Sustainable Development Goals Report 2021	United Nations	<p>https://www.un.org/sustainabledevelopment/es/hunger/</p>	<p>- According to the ELCSA, in the rural area of Azuay, 78.95% of households have some level of food insecurity (p. 527). In the rural area of Cuenca, 53.9% of households have a mild level of food insecurity, 11.2% moderate and 2.8% severe (p.528)</p> <p>- 17.3% of children and adolescents in Cuenca have short stature and severe short stature. In the urban area, 14.6% have short stature and severe short stature and in the rural rural area, 20.7% have short stature and severe short stature (pp. 335 - 336)</p> <p>- The COVID-19 pandemic has increased the risk of deepening child malnutrition rates in the country and, above all, in Cuenca, where the Ministry of Health has detailed a 30% incidence of chronic malnutrition</p>	<p>PDOT - Diagnóstico</p> <p>Alcaldía de Cuenca lucha contra la desnutrición infantil</p>	2021	2021	<p>Dirección de Planificación</p> <p>Acción Social Municipal</p>	<p>http://www.asm.gob.ec/content/alcald%C3%ADa-de-cuenca-lucha-contra-la-desnutrici%C3%B3n-infantil</p>	

Connected	Community	<p>Objective 11: Make cities inclusive, safe, resilient and sustainable</p> <p>Related objectives:</p> <ul style="list-style-type: none"> - SDG 1: End poverty in all its forms everywhere - SDG 3: Ensure healthy lives and promote well-being for all at all ages - SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all - SDG 8: Promote inclusive and sustainable economic growth, employment and decent work for all - SDG 10: Reduce inequality within and among countries 	<p>-"COVID-19 has worsened the situation of slum dwellers and has further affected those who were already vulnerable" (p. 48).</p> <p>COMPROMISED SDG TARGETS: 11.1 and 11.3</p>	<p>According to the 2021 SDG Report, between 2014 and 2018, the world population living in slums increased from 23 to 24%, that is, one billion inhabitants. This figure is expected to rise after the pandemic, as the lowest-income households were hit the hardest.</p> <p>Similarly, marginalized people are excluded from urban planning, financing and policy making.</p>	2021	The Sustainable Development Goals Report 2021	United Nations	https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021_Spanish.pdf	<p>At the regional level (Latin America and the Caribbean), 29.1% of the urban population lived in marginal neighborhoods. In parallel, in Ecuador, the population in slums fell by up to 20.1% in 2018. However, this percentage is projected to increase again due to the pandemic.</p>	<p>Informe de los Objetivos de Desarrollo Sostenible 2021</p> <p>SDG Country Profile - Ecuador</p>	2021	Naciones Unidas	https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021_Spanish.pdf https://country-profiles.unstats.org/ecu
	Culture	<p>Strengthen efforts to protect and safeguard the world's cultural and natural heritage</p> <p>Related objectives:</p> <p>4.7 By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development (...)</p> <p>8.9 By 2030, devise and implement policies to promote sustainable tourism that creates jobs and promotes local culture and products</p>	<p>-"The impact of COVID-19 on the cultural sector is being felt throughout the world. This impact is social, economic and political, as it affects the fundamental right of access to culture, the social rights of artists and professionals in the creation and protection of different cultural expressions" (United Nations)</p> <p>COMPROMISED SDG TARGETS: 11.4"</p>	<p>In 2020, those countries from which information on Cultural and Creative Industries income has been obtained have recorded losses of between 20 and 40%.</p>	2021	Las industrias culturales y creativas frente a la COVID-19	UNESCO	https://unesdoc.unesco.org/ark:/48223/pf0000377863_spa	<p>Between March and December 2020, according to the Comprehensive Cultural Information System, losses in the cultural sector were around \$225 million.</p>	<p>Impacto del Covid-19 en el sector cultural y patrimonial del Ecuador - marzo 2021</p>	2021	Sistema Integral de Información Cultural (SIIIC)	https://www.culturaypatrimonio.gob.ec/wp-content/uploads/2021/04/Bolet%C3%8In-Impacto-del-Covid-19.pdf
	Peace and justice	<p>Objective 16: Promote just, peaceful and inclusive societies</p> <p>Related objectives:</p> <ul style="list-style-type: none"> - SDG 11: Make cities inclusive, safe, resilient and sustainable - SDG 1: No poverty - SDG 5: Gender equality 	<p>-"The pandemic intensifies the risk of exploitation of children, including human trafficking and child labor" (p. 58)</p> <p>COMPROMISED SDG TARGETS: 16.1 - 16.2 - 16.3</p>	<p>-At the beginning of 2020, the number of children in child labor (not including its worst forms, such as children in bonded and forced labor or in commercial sexual exploitation) amounted to 160 million kids (63 million girls and 97 million boys). This translates to almost 1 in 10 children worldwide. The effects of COVID-19 threaten to push another 8.9 million children into child labor by the end of 2022, as families send children to work in response to job and income loss.</p>	2021	The Sustainable Development Goals Report 2021	United Nations	https://www.un.org/sustainabledevelopment/es/peace-justice/	<p>- Regarding child and adolescent labor, it was reported that 0.84% of children between 5 and 11 years old worked at least one hour, in the adolescent population the figure stands at 13.42%</p>	<p>PDOT Diagnóstico</p>	2021	Dirección de Planificación	

Empowered	Equity in diversity	<p>SDG 10: Reduced inequalities</p> <p>Target 10.2 By 2030, empower and promote the social, economic and political inclusion of all, irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status</p> <p>Related objectives</p> <p>- SDG 5: Achieve gender equality and empower all women and girls</p> <p>- SDG 16: Promote just, peaceful and inclusive societies</p> <p>- SDG 17: Revitalize the global partnership for sustainable development</p>	<p>- "Violence against women persists at unacceptable levels and has intensified due to the pandemic" (p. 28).</p> <p>- "The pandemic increases women's unpaid workload, while removing them from the labor force" (p.30).</p> <p>- "The equitable participation of women in decision-making, essential for the response and recovery of COVID-19, remains a distant object" (p. 37)</p> <p>- "The proportion of the world's population that has been a refugee has more than doubled since 2010" (p. 46)</p> <p>COMPROMISED SDG TARGETS: 5.1 - 5.2 - 5.4 - 5.5 - 16.7 - 10.3 - 10.4 - 10.7</p>	<p>- Nearly 1 in 3 women (736 million) has been subjected to physical and/or sexual violence at least once since the age of 15, usually by their partner. The COVID-19 pandemic exacerbated the problems of women in abusive relationships</p> <p>- Between 2001 and 2019, on a typical day, women spend 2.5 times more hours on unpaid domestic and care work than men</p> <p>- Although women represented almost 39% of the global workforce in 2019, they only held 28% of managerial positions: only 3 percentage points more than in the year 2000</p> <p>- By the end of 2020, the number of people who fled their countries and became refugees due to war, conflict, persecution, human rights violations and events that seriously disturb public order increased to 24.5 million; the highest absolute figure ever recorded.</p>	2021	The Sustainable Development Goals Report 2021	United Nations	https://www.un.org/sustainabledevelopment/es/gender-equality/	<p>- According to a survey carried out in Cuenca as part of the Safe Cities Program of UN Women, in Cuenca, 91% of the women and girls surveyed suffered violence and/or sexual harassment at some point in their lives and 72% declare that they were victims sexual harassment on public transport</p> <p>- Women dedicate 35h 22min to internal domestic work, compared to men who dedicate 25h 56min, this means that women dedicate 9h25min more than men in this activity (p. 333)</p> <p>- In the public sector, the number of people with affiliation under a dependency relationship is 50.82% women and 49.18% men, which indicates that the distribution of workers according to gender is equal. However, for the 2019-2023 period, only two of the fifteen members of the Cuenca Cantonal Council are women.</p> <p>- Azuay Ombudsman attended 20 cases of xenophobia in 2019 for issues related to access to education for children, lack of attention in public institutions and labor issues -Azuay was positioned as the fourth province with the most cases of femicide until 2017</p>	<p>PDOT - Diagnóstico</p> <p>Municipio de Cuenca</p>	2021	Dirección de Planificación	http://www.cuena.gob.ec/?q=content/conceales
Enabled	Jobs	<p>Objective 8: Promote inclusive and sustainable economic growth, employment and decent work for all</p> <p>Related objectives:</p> <p>-Objective 12: Ensure sustainable consumption and production patterns</p> <p>-Objective 5: Achieve gender equality and empower all women and girls</p> <p>-Objective 10: Reduce inequality within and among countries</p>	<p>- "COVID-19 caused massive job losses, especially among young people and women" (p. 42)</p> <p>COMPROMISED SDG TARGETS: 8.5 - 12b - 5.1 - 10.3 - 10.2</p>	<p>- In 2020, global unemployment increased from 5.4 to 6.5%, which meant 220 million people without a job. At the same time, young people and women were particularly affected, with job losses rates of 8.7% and 5.0% respectively, compared to 3.7% for adults and 3.9% for men.</p> <p>- In most countries, less than 50% of women and men engaged in agriculture have ownership or rights to agricultural land. In 9 of the 10 countries evaluated, women have relatively few such rights compared to men.</p> <p>- COVID-19 is estimated to increase the average Gini coefficient of developing countries by 2.6 points, to 42.7 (an increase of 6%). This will reverse the decline in inequality since the global financial crisis of 2007 to 2009.</p> <p>- In the countries of Latin America and the Caribbean, the averages indicate that almost 1 in 5 people lives with less than half of the national median income (although in many countries there has been some progress since 2010).</p>	2021	The Sustainable Development Goals Report 2021	United Nations	https://www.un.org/sustainabledevelopment/es/economic-growth/	<p>- In Ecuador, between June 2019 and June 2020, approximately 1,270,180 jobs were lost, this due to the production stoppage due to sanitary measures, with the female population being the most affected by the unemployment rate, with 20.9% compared to 12.7% of the male population.</p> <p>- The national unemployment rate in Ecuador, for February 2022, was reduced to 4.3%, in relation to the rate of 5.4% of the same period in the previous year. However, the unemployment rate for women is 4.9% and for men it is 3.9%. In Cuenca, the unemployment rate stood at 6.6%</p>	<p>El impacto del COVID-19 en el mercado de trabajo de Ecuador</p> <p>América Latina y el Caribe: tasa de desempleo por país en 2020</p> <p>Encuesta Nacional de Empleo, Desempleo y Subempleo</p>	2020	<p>Statista</p> <p>INEC</p>	<p>https://revistas.flacsoandes.edu.ec/mundospurales/articulo/view/4875/3680</p> <p>https://es.statista.com/estadisticas/1280173/tasa-de-desempleo-de-america-latina-y-el-caribe-por-pais/</p> <p>https://www.ecuadorencifras.gob.ec/documentos/web-inec/EMPLEO/2022/Febrero-2022/202202_Boletin_empleo.pdf</p> <p>https://www.ecuadorencifras.gob.ec/documentos/web-inec/EMPLEO/2022/Febrero-2022/202202_Boletin_empleo.pdf</p>

Education	Objective 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	- Despite that 7 out of 10 children in initial education were advancing in their education, 2020 posed a threat to this progress, since many preschool educational centers had to close their doors due to health measures due to COVID-19.								
	<p>Related objectives:</p> <p>-Objective 3: Ensure healthy lives and promote well-being for all at all ages</p> <p>-Objective 13: Take urgent action to combat climate change and its impacts</p>	<p>"Exceptional measures are needed to get students back on track after a disastrous year for teaching" (p.34)</p> <p>- In 2019, only 59% of third graders were proficient in reading. The pandemic is expected to cause an additional 101 million children to fall below minimum reading proficiency</p> <p>- Only one-third of countries achieved parity in primary school completion between rural and urban students, and only one-sixth of countries achieved parity between students from the poorest and richest households</p> <p>- In 2020, as the COVID-19 pandemic spread across the globe, most countries announced temporary school closures, affecting more than 91% of students globally. In April 2020, nearly 1.6 billion children and young people were out of school. Similarly, about 369 million children who depend on school canteens had to seek other sources of daily nutrition.</p>	2021	The Sustainable Development Goals Report 2021	United Nations	https://www.un.org/sustainabledevelopment/es/education/	In Cuenca in 2019, the initial education rate was below the local goal established in the PDOT, which sought to reach 90% attendance at this level of education. Even if this objective is achieved, the city would still be below the regional average located at 96%.	PDOT - Diagnóstico	2021	Dirección de Planificación

Note: table prepared by the authors as a summary of the sources used to create the Cuenca's City Portrait lenses