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Sustainable City Strategies for Strategic Digital City Project in the Sustainable Development Goals (SDGs) Context

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Abstract: Cities demand strategic projects and sustainable indicators to improve the citizen quality of life. The research objective investigates how sustainable city strategies in Curitiba, Brazil, align with the United Nations Sustainable Development Goals (SDGs), offering valuable insights for urban planners, policymakers, and academic institutions. Based on open public data and employing a case study methodology, the research analyzes 29 municipal strategies categorized into environmental, social, and economic components. Findings reveal a high correlation between the strategies and SDG 11 (Sustainable Cities and Communities) and SDG 17 (Partnerships for the Goals), with 100% alignment. A moderate correlation trend is identified with SDG 3, SDG 10, and SDG 12, while the remaining twelve SDGs show lower levels of association. These results emphasize the multidimensional nature of sustainable urban planning and the varying degrees of integration across different SDGs. The research concludes that when city strategies are tailored to local contexts and supported by institutional collaboration, they can become effective mechanisms for fostering environmental stewardship, social equity, and urban economic resilience. The conclusion reiterates how localized planning can drive global sustainability agendas and highlights the importance of strategic alignment between urban policy and international development frameworks in the Strategic Digital City context.

Keywords: sustainable city strategies; sustainable development goals; strategic digital city; strategic smart city; urban management

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1. Introduction

Sustainable cities and Strategic Digital City projects are developed and sustained through strategic efforts that foster environmental resilience, equitable healthcare, and inclusive economic growth. Recent research indicates that investments in mass transit, clean energy, and infrastructure for walking and cycling can bring transformative economic and health benefits to cities and their broader ecosystems [1]. As a result, sustainable city strategies have gained importance among local governments due to their potential to shape urban development through a forward-looking, integrative planning approach. These strategies can contribute to sustainable urban management and are directly linked to improvements in the quality of life for urban populations [2,3], such as Strategic Digital City projects [4].

In this context, the Sustainable Development Goals (SDGs) have emerged as a critical framework guiding the formulation of city strategies. As internationally recognized objectives adopted by over 190 countries under the auspices of the United Nations [5], the SDGs offer clearly defined targets and indicators that help cities align local policies with global sustainability benchmarks. The intersection of urban strategies and the SDGs creates an opportunity for producing knowledge that is directly applicable to the challenges of urban planning. This alignment supports not only local governments but also urban planning institutions and academic communities in crafting effective, evidence-based territorial management tools [6,7].

One initiative within this scope is the Strategic Digital City (SDC) project; this urban planning concept integrates SDG-related objectives into municipal strategic planning and urban policy-making processes. By focusing on sustainability as a central axis, the project aims to improve the quality of life through the coordinated use of planning instruments, information systems, public services, and digital infrastructure [4]. However, contemporary cities remain increasingly vulnerable to environmental degradation, social inequality, and economic challenges, often due to the absence of integrated sustainable strategies and restricted access to funding mechanisms [2]. Furthermore, while various methodologies have been proposed to assess the sustainability of urban strategies [8–10], there remains a gap in systematically addressing the influence of local political and policy dynamics on the adoption and implementation of such strategies [3].

According to these research problems, the SDC framework faces challenges in practical application. It rests on four main constructs: city strategies, municipal information, public services, and the technological infrastructure needed to support digital governance [11]. Despite this comprehensive structure, many cities struggle to articulate their strategic objectives in a way that reflects local realities, creating obstacles to effective policy outcomes [4,12]. This gap raises a fundamental research question: are there identifiable relationships between the municipal strategies adopted by the city of Curitiba and the Sustainable Development Goals?

In response to this question, the research objective is to analyze Curitiba's city strategies through the lens of the SDG framework. This analysis is justified by the growing interest among local governments in aligning urban policies with sustainability principles that emphasize environmental protection, social inclusion, and economic viability [2,3]. The implementation of sustainable strategies has become a key indicator of effective urban governance and an essential component of improving citizen well-being [4]. City Strategic Planning, therefore, plays a pivotal role in identifying theoretical foundations, understanding local limitations, and designing long-term objectives for sustainable development [13].

Corroborating the research justifications, recent evidence has shown that sustainable urban strategies and urban agriculture, for example, have been recognized by residents, academics, and practitioners as powerful strategies for addressing food insecurity, especially in underserved communities [14]. Similarly, broader strategies such as investing in renewable energy, enhancing public transportation and active mobility, promoting circular economies, preserving biodiversity, reusing buildings adaptively, encouraging mixed-use developments, and fostering environmental ethics have all demonstrated the potential for reinforcing urban sustainability across multiple dimensions [15,16]. The Strategic Digital City concept has emerged as a city participatory planning tool that helps municipalities face the complexities of contemporary urban management through inclusive and data-informed strategic design with sustainable strategies [11,12].

2. Dimensions Under Study and Literature Review

2.1. Sustainable City Strategies

The concept of strategy, from a broader perspective, is defined as a set of actions, projects, and initiatives that make up the progress of a smart city [17]. On the other hand, the sustainable city strategy is seen as an urban planning approach with the purpose of guaranteeing long-term urban growth and development [18]. The consolidation of sustainable city strategies is mainly based on the integration of the strategic component in urban projects [19]. The participation of local governments is fundamental to determining sustainable strategies and creating community and social capital networks [20]. In addition, citizen participation is essential in the strategy design process for the cooperative construction of objectives and goals related to the different components of sustainability and the effective development of measures to achieve them [21].

Contemporary cities should create and implement strategies in the mid- and long-term aimed at the local realities of their territories and towards sustainability [22]. These city strategies can be associated with different contexts: environmental, social, and economic. To promote environmental protection, social equity, and economic development [3], the urgency of ensuring that sustainable city strategies are imbibed by cities is important; hence, there is a pressing need to actively engage the local dimension of including mayors and city administrations to enhance the attainment of the SDGs, thus expediting the process. There is a pressing need to translate international strategies into actionable plans at the national and local levels, and it is crucial to define implementation strategies for the SDGs by aligning local development plans with the targets and indicators outlined in the 2030 Agenda [23].

2.2. Sustainable Development Goals

The Sustainable Development Goals (SDGs) were implemented in the 2030 Agenda for Sustainable Development by 193 countries in 2015 as a universal demand for action to end poverty, protect the planet, and ensure that by 2030, all people enjoy peace and prosperity. The 17 SDGs are integrated and recognize that action in one area will affect outcomes in others and that development must balance environmental, social, and economic sustainability. Countries have committed to prioritize progress for those furthest behind. The SDGs are designed to combat poverty, hunger, aids, and discrimination against women and girls. Creativity, knowledge, technology, and financial resources from across society are needed to achieve the SDGs in all contexts [5].

Research shows that SDGs should be seen and used as services that enable the well-being of the human species; services that provide opportunity for all humans; services that manage resources for all humans; economic services for work and growth for all humans; services from institutions that offer fair and sustainable living for all humans; service ecosystems with the planet; and collaboration services for sustainable development partnerships. Researchers are urged to pursue collaborative research that reduces suffering, improves well-being, and enables well-becoming for the sustainability and prosperity of Planet Earth [24].

2.3. Strategic Digital City (SDC)

Strategic Digital City (SDC), a concept and sediment model coined by Rezende [25], can be understood as information technology resources applied in city management, including information and services provided to citizens, based on the city objectives and strategies of city management. Unlike the concept of conventional digital city and smart city, SDC goes beyond digitally including citizens in the global computer network, not just focusing on software alternatives. It is based on the city's strategies to meet the objectives of the

different public thematic or municipal functions of the city, aimed at improving the citizens' quality of life. SDC can also be seen as a Strategic Smart City Project, where the citizen is the priority rather than technology [4].

City public thematic or municipal functions are the macro activities present in all cities (or municipalities); they are not city areas and not municipal departments. For example, agriculture; science, technology, and innovation; dissemination or marketing or commerce; culture; education; sports; housing; industry; legal affairs; leisure; logistics or materials; environment; health; sanitation; security; social; transport or mobility; tourism; urban; and rural; among others. Each one can be divided into modules or subsystems, which can also be called municipal affairs or subject, theme, or issue systematized and integrated [4,12,25].

SDC is divided into four subprojects: city strategies (to achieve the city's objectives); city information (to assist in the decisions of citizens and city managers); public services (to increase the citizens' life quality); and information technology resources applied in cities. For the adequate implementation of the SDC model [25], it is necessary to elaborate on four projects: city strategic planning with objectives and strategies covering all city public thematic or municipal functions; city information planning; city public service planning; and city information technology planning, also considering the municipality, prefecture, and municipal public organizations involved [4]. The SDC can also be understood as a public policy for city management and urban planning included in different city themes [26–28], being a consolidated city model for a decade [4,12,29–31].

2.4. Conceptual Relationships

Modern cities present various challenges, which require strategic planning mechanisms in the urban context. These mechanisms are called sustainable city strategies, which are projected in the medium and long term according to local realities. The objective of these strategies is to project sustainable cities in the future through the implementation of present actions in which sustainability is contemplated in the environmental, social, and economic components that constitute the urban system [3,22].

The Sustainable Development Goals (SDGs) established in the 2030 Agenda for Sustainable Development in 2015 are designed to combat poverty, hunger, discrimination against women, and environmental protection, among other global issues. They are aligned with the vision of sustainable city strategies and are associated with the sustainable development components of cities. Of the seventeen SDGs implemented, four SDGs, "Gender Equality (SDG 5), Decent Work and Economic Growth (SDG 8), Sustainable Cities and Communities (SDG 11), Climate Action (SDG 13)", require the implementation of actions and programs integrated to city strategies. [5]. The Strategic Digital City project is understood as an urban planning tool, which is based on the strategic planning of city objectives and strategies based on the different themes of the city, such as environment, economy, and social [4]. It can help contribute to the sustainable planning of cities in the medium and long term and thus be associated with the objectives of sustainable development.

Cities should have a long-term strategy for sustainable development that demonstrates its commitment to achieving Sustainable Development Goals and improving the quality of life of its inhabitants. They are expected to align with Sustainable Development Goals and the elements of the intervention model in urban areas as they will show a clear commitment to sustainable development at the local level [32,33].

3. Materials and Methods

Regarding the research method, the present research adopts a case study to explore the relationship between city strategies and the Sustainable Development Goals (SDGs) in the context of Curitiba, Paraná, Brazil. The case study method is well-suited to urban

research, allowing for an in-depth, context-specific analysis of complex systems and strategic practices [34]. The research scope or choice of research focuses on Curitiba—a city internationally recognized for its innovations in urban planning and sustainability—and the research situates itself within a real-world setting that exemplifies the potential for integrating global development frameworks with local urban policy.

Based on open public data, with the observation unit ensuring methodological robustness, the research applied both qualitative and quantitative techniques at different phases of the research, adopting a mixed-methods approach [35,36]. Qualitative methods were employed to conduct a content analysis of the "Curitiba Sustainable City World Barcelona 2023" document, which provided essential information about the names, structure, and scope of the city's strategic programs across environmental, social, and economic components. These insights enabled a thematic understanding of Curitiba's urban planning efforts.

Complementing the qualitative phase, the quantitative analysis involved the statistical examination of the strategies identified in the official document. This included categorizing strategies by component, associating each with relevant SDGs, and calculating the proportion of strategies aligned with each goal. Data were systematized using Excel spreadsheets, enabling the researchers to visualize patterns, identify correlations, and measure the distribution of SDG associations among the 29 recorded strategies.

The research unfolded in four key phases. First, a data preparation phase involved a comprehensive literature review and bibliometric analysis of foundational concepts using major academic databases such as Scopus and Web of Science. This provided a theoretical grounding in sustainable city strategies and digital city planning. In the second phase, data collection was conducted through technical visits to Curitiba's City Hall and the Urban Planning and Research Institute of Curitiba (IPPUC), where primary material was gathered to construct a detailed profile of the city's strategic planning document. Other technical documents were also considered: Curitiba Master Plan, Climate Plan, and Food and Nutrition Security Plan–IPPUC. The research protocol determined these variables: name of the city program, SGD number, name of the sustainable indicator, name of the sustainable strategy, and name of sustainability (environmental, social, economic, cultural, and political–institutional).

For the third research phase, during the data analysis phase, each strategy was coded and evaluated based on its thematic focus and alignment with specific SDGs. This enabled a quantitative summary of the city's engagement with the global development agenda. Finally, in the research documentation (fourth phase), findings were synthesized into conclusion, considerations, contributions to the field, and a discussion of methodological limitations, ensuring transparency and scientific reproducibility.

Although focused primarily on Curitiba, the research scope encompassed the broader conceptual context of sustainable urban governance, offering insights applicable to other cities aiming to align local strategies with the SDGs. By integrating qualitative content analysis with quantitative evaluation and grounding the case study in field engagement and the scholarly literature, this methodology contributes to the advancement of innovative urban planning approaches. It reinforces the strategic value of aligning municipal planning instruments with global sustainability frameworks while offering a replicable model for cities seeking to enhance resilience, citizen engagement, and sustainable development outcomes.

Table 1 illustrates the research methodology procedures through an infographic.

The research development and documentation period extended from May 2024 to April 2025.

Table 1. Research infographic.

Research Method: Case Study (open public data) Mixed Research Techniques: Qualitative (content analysis) and Quantitative (statistical analysis).			
Data Sources: Open Public Data Main Documents: Curitiba Sustainable City World Barcelona 2023; Curitiba Master Plan; Climate Plan; Food and Nutrition Security Plan (IPPUC)			
Research Phases:			
Preparation: Literature review (Scopus, Web of Science) Bibliometric analysis Research protocol Start: May 2024	Data Collection: Technical visits and interviews (City Hall & IPPUC) Collection of official planning documents Research approaches	Data Analysis: Coding strategies Categorizing by thematic focus (environmental, social, economic, cultural, political-institutional) Linking strategies to SDGs Quantitative summaries	Documentation: Conclusion Considerations Limitations Contributions Until: April 2025
Tools used: Excel, data organization, pattern visualization, and correlation analysis.			
Impact and Applicability: provides a replicable model for cities aligning local strategies with SDGs. Strengthens urban governance, resilience, and sustainable development practices.			

4. Results—Curitiba Sustainable City Strategies Analyses

The analysis of Curitiba's sustainable city strategies reveals a multidimensional approach structured around three interconnected dimensions: environmental, social, and economic. These dimensions were examined to understand how the city's strategic programs align with the SDGs and contribute to urban sustainability. In the environmental dimension, Curitiba demonstrates a strong commitment to ecological preservation and resilience, with initiatives focused on green infrastructure, mobility, biodiversity, and renewable energy. The social dimension highlights efforts aimed at reducing inequality, improving quality of life, and promoting inclusive access to public services, education, and housing. Meanwhile, the economic dimension encompasses strategies designed to foster innovation, sustainable entrepreneurship, and economic diversification, reinforcing the city's adaptive capacity and long-term prosperity. This triadic framework enables a comprehensive understanding of Curitiba's urban strategies and offers insights into the integrative planning required to achieve sustainable development in complex urban systems, integrated with the concept and model of the Strategic Digital City project, which assumes that the city's strategies are always sustainable.

4.1. Component: Environmental Sustainability Analyses

Curitiba is a city that seeks to preserve the environment, rivers, and water basins and expand its green areas while working closely with the citizens so that environmental education is part of the sustainability process and for everyone to do their part about sustainability. Table 2 illustrates all current programs regarding environmental strategies in execution by the city administration.

Table 2. Environmental Strategies.

Name of the Program	Description
PlanClima	The PlanClima project is the result of a joint effort between the Curitiba City Hall, Municipal Secretariats (Environment Planning, Finance, Works, Social Defense, Nutritional Food Security), Institute of Research and Urban Planning of Curitiba (IPPUC), Curitiba Agency for Development, water and energy state companies, universities, NGOs and institutions, and technical support from C40, iCare Consult, ICLEI, and Way Carbon. PlanClima has five strategic axes—Environmental and Urban Quality, Energy Efficiency, Solid Waste and Effluents, Sustainable Urban Mobility, and Urban Hypervisor—and 20 priority actions to make the city resilient and neutral by 2050. Among them, action to preserve and expand green areas; stormwater management; expansion of food and nutritional security; energy efficiency and renewable energy; waste management; low-carbon emission mobility; circular economy strategies; environmental education; implementation of "Urban Hypervisor" for data analysis; and governance.
Water Reserve of the Future	The Water Reserve of the Future project was implemented to guarantee water security in Curitiba and the Region, connecting the caves of the Iguaçu River to supply water. It is a partnership of the Curitiba City Hall, the Paraná State Government and Sanitation, the Water and Land Institute, and the Metropolitan Region of Curitiba. It is a project to expand the water reserve capacity for population consumption, with the implementation of water tanks in communities and a water reserve along the areas of the Iguaçu River. The project has a public call notice open to receive studies and projects that will allow the development of environmental recovery actions in the Iguaçu River Basin. The objective is to implement and conserve the river's floodplains, improving the water quality based on nature-based solutions. In addition to cleaning rivers and environmental education, the program includes environmental inspections to regularize sewage connections, monitoring the quality of water in urban rivers, dredging lakes, shore recovery works, and land regularization actions together with the Company of Social Housing. Since its implementation in 2019, the program impacted more than 140,000 people.
Waste Management	Curitiba was the first city in Brazil to implement the recyclable waste collection, the "Waste that is not Waste" program *Lixo que Não é Lixo*. In addition, the city has programs to strengthen and improve the recyclables chain in the city and engage citizens. In the Ecocitizen (*Ecocidadão*), 40 Associations and Cooperatives of Recyclable Material Collectors receive, sort, and sell waste from the city's collection. It is managed by the Municipal Environment Secretariat and aims to reinforce recyclable practices within the community, improve waste pickers' work conditions, and strengthen the network for collecting and sorting recyclable materials. In the "Green Exchange" (*Câmbio Verde*), the City Hall promotes the exchange of recyclable material for fruit and vegetable products. Every 4 kg recyclable is worth 1 kg of fruit and vegetables from local producers. The program also accepts cooking oil for the exchange. This program reinforces environmental awareness actions, promotes the distribution of local production from family farming, provides quality food, and allows families to save money. Every month, an average of 250 tons of recyclable waste is exchanged for 80 tons of food by the 5200 families participating in the program and benefits more than 370 families of urban agriculture. In addition, waste from the selective collection, Fuel Derived from Waste, is sent for co-processing in kilns in cement industries in the region, reducing waste destined for landfills, disposal costs, the risk of environmental liabilities, and carbon emissions, in addition to increasing the income of waste pickers. The city also has 11 Ecopoints, which are public spaces available for the population to voluntarily deliver small amounts of waste, such as construction waste, garden cleaning, debris, unusable furniture, compostable organics, paper and cardboard, plastic packaging, metal, glass and electronics in general, which can have correct disposal.
Friends of the River (*Amigos do Rio*)	The Friends of the River program promoted by the Municipal Environment Secretariat was realized together with the State Sanitation Company and other city departments and societies, encompassing actions for preserving rivers and water basins. It includes community planting actions on the riverbanks, parks, and woods, lectures to emphasize biodiversity conservation importance, and guidance on waste management and sanitation. The target audience includes students from municipal, state, and private schools, condos, neighborhood entities, and community centers, among others. The program has "Local Support Groups", which act as multipliers of the knowledge acquired in the program, ensuring its continuity and motivating the population about the importance of conservation and recovery of water resources in Curitiba. In addition to awareness-raising lectures, interactive workshops, webinars, educational activities and games, workshops, and interactive theatre plays are conducted to improve and increase the program's reach.

Table 2. *Cont.*

Name of the Program	Description
Planting 100,000 trees/year	To further engage the population in climate actions, City Hall, through the Municipal Secretariat of Environment, launched a project to plant 100,000 trees/year starting in 2019. The trees are planted by the City Hall and distributed to the population so they can help with the program and engage in the action. The program increases the planting of trees in the city to mitigate the effects of climate change, with a positive impact on improving the quality of life of the population. The seedlings are produced by the municipality, which guarantees the continuity and sustainability of the action, and since the launch of the project, more than 396,000 trees have been planted.
Leaves Family (*Familia Folhas*)	The Curitiba City Hall invests in environmental education as an important pillar to engage the population in building environmental sustainability. The "Leaves Family" is the main program, a City Hall campaign of a group of characters full of vitality who apply their experience and diversity to teach children, and also adults, the importance of constant care for the environment. They are friendly and pleasant characters. Part of the sustainability programs from the Municipal Environmental Secretary "Leaves Family" is an educational program that teaches not only about the proper separation and proper disposal of different types of solid waste but also about the importance of green areas, preservation of water resources, caring for animals, and correct attitudes to minimize environmental impacts and climate change. The Folhas Family interacts directly with the public, participating in campaigns in schools, parks, health units, neighborhood associations, regional administrations, companies, and condos, among others. The content of the group's presentations summarizes a series of good practices that citizens can adopt in their daily lives and lead to a better quality of life for each and every one, such as properly separating recyclable waste from common waste, implementing compost bins with organic waste, planting more trees and not deforesting, preserving the soil, the sustainable use of water, capturing rainwater through cisterns, preserving springs and conserving rivers, correctly allocating sewage, not throwing dog waste in sewers, protecting animals, using bicycles more and vehicles less, and using clean energy.
Curitiba More Energy	The Curitiba More Energy program implements clean and renewable energy projects in the city, with the aim of reducing energy consumption and carbon emissions and combating climate change with technology and new solutions, managed by the Municipal Secretariat of Environment Curitiba, committed to the Paris Agreement and the UN SDGs and is part of the C40, a network of cities focused on combating climate change and conducting urban actions to reduce climate risks. Curitiba More Energy started in 2018 with studies for the implementation of photovoltaic panels in public buildings, hydroelectric plants in parks, and a photovoltaic plant in an old landfill to generate clean and renewable energy within the city, reducing emissions with energy generation and transmission. With the support of the C40, Curitiba developed studies to analyze the technical, economic, social, and environmental viability of the projects, which led to the development of viable projects that are being implemented. In 2018, the program received USD 1 million from the Cities Finance Facility (CFF) to develop projects, including photovoltaic panels in bus terminals, and C40 supported the development of the Caximba Pyramid project, a pyramid-shaped photovoltaic plant in the former Caximba landfill, which started operating in March 2023. In addition, the City Hall building, the Municipal Institute of Public Administration complex in Barigui Park, and the Botanical Garden already have photovoltaic panels, and the city has implemented the first Power Plant Hydroelectric on the Barigui River.
Urban Agriculture	The Urban Agriculture program encompasses the chains of food production and food cycle; planting techniques; social, nutritional, and environmental education processes; food security; and income generation and improvement of social relations in an innovative and sustainable manner. There are currently 147 areas of urban gardens, with more than 37,000 people involved directly and indirectly. In addition, the Curitiba City Hall inaugurated the first public Urban Farm in Brazil in 2020 in a space of 4435 m. It is a place with new methods of planting, using renewable energy and rainwater. It is also a center for the study of urban and local agriculture practices for companies, startups, and universities to test solutions and new technologies and has a structure to host classes and workshops for the urban garden producers, available to the 34,000 farmers of Curitiba and the Metropolitan Region. The second Urban Farm will be inaugurated in 2024. The Urban Gardens foments food planting in urban voids, occupying areas that are usually garbage disposal or have limitations on public or private constructions. It provides more sustainable practices for the local population, creating environmental zones and expanding green spaces. These gardens use rainwater for irrigation and organic waste for fertilizer, controlling local climate change and providing the neighborhoods with quality landscapes. The Urban Gardens in Curitiba also help to control soil erosion and improve air quality. The gardens restore green to the city using fewer resources and engaging the citizens.

Table 2. *Cont.*

Name of the Program	Description
Honey Gardens	The Honey Gardens program consists of installing boxes with native stingless bees across the city, where the bees can be protected and reproduced and where the population can learn about their importance. It encompasses educational activities to highlight the importance and benefits of native bees to the ecosystem, aligned with environmentally sustainable development strategies. The project engages the population and kids, highlighting bees' importance to ecosystems and biodiversity and the benefits of protecting and increasing their population. Furthermore, it encompasses management measures to protect the native pollinators and awaken ecological awareness to the importance of conservation and maintenance of urban biodiversity to the quality of life. The Honey Gardens disseminates the importance of bees in pollination, food production, and biodiversity, as well as preserving, increasing, and keeping stingless native bees in Curitiba.
Sustainable Mobility	The Sustainable Mobility program is anchored with projects for the Inter 2, Interbairros II (circular bus line), and West–East BRT bus lines, with financing from the Inter-American Development Bank (IDB) and the New Development Bank (NDB). These lines are the first that will receive electric vehicles starting in 2024. The goal is that by 2030, 33% of the fleet will operate with zero emissions, reaching 100% by 2050 as part of PlanClima. One of the initiatives is the project to increase the capacity and speed of the bus lines with new technologies, renewable energies, and better infrastructure aimed at sustainability and modernization of public transport. With the project, 70 km of roads are being requalified, 30 km of dedicated lanes for buses are being implemented, and 13 new stations and new terminals will be constructed. The new stations will have intermodal integration with micromobility car-sharing and app transport systems. The BRT (Bus Rapid Transit) East–West, an important structural axis of metropolitan connection, is also receiving interventions that will allow for intermodality. In addition, to change the energy matrix of public transport, the city launched a public notice calling for electric bus tests in 2022, and seven manufacturers have already signed up to carry out the tests in the city. The city is also investing in micromobility, with better sidewalks to improve pedestrians' comfort and safety and bike sharing.
Caximba New Neighborhood	The Caximba New Neighborhood program, defined as a Climate Risk Management project, was implemented to restore the environment and resettle families in socioeconomic vulnerability that occupies the Barigui riverside, an irregular settlement and an environmentally fragile area. It will provide infrastructure, housing, and socioeconomic development. It is a project to engage citizens and tackle climate change, encompassing macro-drainage, environmental recovery, urban infrastructure, and public equipment. This area, since 2010, has been an irregular settlement by the Barigui Riverbank, and to mitigate the poor conditions of the population and environmental vulnerability, a discussion started in 2017, integrating multisectoral government areas, the community, and civil society, resulting in the elaboration of the New Caximba Neighborhood project. The proposal is structured in two axes, macro drainage and environmental recovery, to resettle 1147 households from the permanent and flood-protected area (risk area) in new housing to be built, restore the river ecological corridor, implement flood basins, construct talus/dykes and macro drainage channel for flood control, delimit the environmental area from the urbanization, implement a park with sports and leisure areas, bicycle paths, and living center, socioeconomic development, income generation for the community with flower planting areas, and urban infrastructure, social, and public facilities to provide the population with adequate public transportation infrastructure, sewage, water supply, electricity and housing, guaranteeing services in education, health, and social assistance with the construction and refurbishment of equipment Caximba New Neighborhood integrates urban planning and multi-governance, enabling co-creation with the community, municipal team, and the private sector and also fostering the increase in job opportunities and local income, benefiting the 1693 families of the area directly and 669,000 indirectly. The financing for the New Caximba Neighborhood Climate Risk Management Project is signed with the French Agency for Development (AFD) and covers EUR 47,6 million in investments.

Source: Authors (2025).

4.2. Component: Social Sustainability Analyses

Curitiba takes care of its citizens and provides them with social assistance and opportunities to access the job market and have a better quality of life. Curitiba, with its socially sustainable approach, is known as the "City that Never Sleeps". In addition, valuing and supporting local culture is also an important axis of social and economic sustainability. Table 3 presents a summary of all social strategies programs that are on course.

Table 3. Social strategies.

Name of the Program	Description
Family Markets (*Armazém da Família*)	Markets that sell food, hygiene, and cleaning products that are up to 30% cheaper than in traditional commercial establishments, a program implemented and subsidized by the Curitiba City Hall. The Family Markets are accessible for socially vulnerable people and low-income families that earn up to five minimum wages. There are 35 Family Markets in the city that benefit 350,000 families.
Fruit and Vegetable Fair (*Sacolão da Família*)	To access the Family Markets, the Curitiba population also has access to 11 Fruit and Vegetable Fairs that sell products at USD 0.75/kg. On average, fruit and vegetables sold in the fairs are 30% cheaper than in supermarkets, providing quality food and products from family farming to the citizens.
Solidarity Table (*Mesa Solidária*)	The Solidarity Table program assists people with economic vulnerability and homelessness, providing meals for free. The objective of the program is not only to offer nutritious and free meals but also to provide shelter and dignity for vulnerable and homeless people. The Solidarity Table is a joint action by the City Hall, the Municipal Secretariat of Food and Nutrition Security, the Social Action Foundation, and the Municipal Secretariat of Social Defense, which provide premises and logistical support with partner entities, religious institutions, NGOs, and aid movements to homeless people who purchase, prepare, and serve food. Four places serve 1100 free meals located in the city. Since the beginning of the program in December 2019, more than 1000,000 meals have been distributed.
Popular Restaurant (*Restaurante Popular*)	Curitiba has five Popular Restaurants, places where citizens can have a healthy meal for only USD 0.60. Restaurants are subsidized by the City of Curitiba and offer quality meals with full use of food. More than 4500 meals are provided per day, which are prepared by cooks, assistants, nutritionists, and nutrition technicians.
Food Bank (*Banco de Alimentos*)	The Food Bank of Curitiba has been helping to avoid food waste and improving the quality of meals served in the social programs. The Bank receives food from urban farms, supermarkets, local markets, and street fairs that is still good for consumption but has lost commercial value, which is close to the expiration date or presents some imperfection; however, it still can be used to produce healthy meals or be consumed by the population. Private institutions also can donate to the program. In total, the Food Bank, since its implementation in 2019, avoided wasting 837 tons of fruits and vegetables through food used to produce meals and be served at social programs and distributed to the population. Curitiba Food Bank has benefited nursing homes, houses for vulnerable children, and partner institutions of Solidarity Table. In this way, countless people in social vulnerability have access to healthy and nutritious meals.
Local Culture	Curitiba is a city that values cultural development as a tool for a social economy. The Cultural Foundation of Curitiba is responsible for implementing the cultural public policies and promoting socio-cultural and artistic developments, engaging with the artistic segments to listen to their demands to enrich and share knowledge, and creating equal opportunities for all. In permanent dialogue with the community, the Foundation seeks to develop inclusive, innovative actions, preserve the Cultural Heritage, and guarantee democratization and access to cultural goods. The city implemented the Municipal Culture Incentive Law to encourage cultural development, which promotes financial support for projects in Music, Performing Arts, Audiovisual, Literature, Visual Arts, Historical Cultural Heritage, Folklore, and Handicrafts. In addition, in recent years, the city opened cultural spaces, street cinemas, and theatres in different neighborhoods to bring culture closer to the population. In 2022, the Cultural Foundation invested more than USD 650,000 in cultural projects. The main spaces in the city for culture are the Village Theatre, Cine Passeio (street cinema), Paranista Memorial, and Comics Library, and the city also promotes the Music Festival, Winter Festival, and Christmas in Curitiba, with cultural attractions that attract thousands of visitors every year.
Urban Agriculture	The Urban Agriculture program in Curitiba goes beyond simply planting urban gardens to create an intelligent and sustainable chain of healthy food production and distribution and socialization, involving public actors, the community, and the private sector. The urban gardens, together with the other food security and social protection programs, formed a food safety net that guarantees healthy food to the citizens. To the population, working in urban gardens is good for physical and mental health, in addition to providing fresh and healthy food. Moreover, since July 2020, when the Farm was inaugurated, more than 4 tons of vegetables produced at the Urban Farm have been delivered to religious institutions, NGOs, and movements that support the homeless or people at social risk to provide healthy meals for them, in particular, the ones attended at the Solidarity Table. Furthermore, Urban Gardens have a socioeconomic impact by increasing families' income since they can sell the products. Furthermore, it is an initiative that brings communities and citizens together to take care of urban spaces and put them into community use. The urban gardens are also implemented in schools to bring environmental and food education actions to children and in institutional spaces, such as Health Units, Social Assistance Reference Centers, NGOs, and Special Education Schools with occupational, therapeutic, and social objectives.

Table 3. *Cont.*

Name of the Program	Description
Speaks Curitiba (*Fala Curitiba*)	The City Hall aims for a more effective and efficient model of public consultation where the population can help decide the priorities of the city in spending the municipal budget launched in May 2017. Speaks Curitiba is currently in its seventh edition. Speaks Curitiba is a consultation model that brings the citizens together with the City Hall to construct and define the Budget Guidelines Law (LDO) and Annual Budget Law (LOA). It aims to guarantee the democratic character of public management, with citizen engagement being necessary for promoting socially sustainable development. Therefore, Speaks Curitiba pursues a dynamic balance between the bureaucratic management mechanisms and the citizen's participation. The program is increasing the capacity to process society's demands and stimulate population participation as a way of contributing to the improvement of the quality of life in the city, which is managed by the Municipal Institute of Public Administration (IMAP), with the support of the Regional Administrations to promote and publicize the program. The program starts with internal meetings of the City Hall teams aiming for their qualification. These initial meetings explain how the program works, what the budget laws are, how they are built, and how to engage citizens to have qualified and coherent participation. After these meetings, the program has two phases: the first consists of defining the main city's priorities to compose the LDO, and the second is to vote on the priorities to build the LOA. Both phases have in-person meetings, online forms, and an itinerant vehicle that goes to different neighbors of the city to allow more people to participate. The top priorities are sent to the City Council as suggestions for the city's budget laws. Speaks Curitiba is increasing the quality of public participation, guiding the population on how the laws are built and how the municipal resources are spent, covering investments, ordinary expenses, and debt financing, and guaranteeing the mandatory legal reserve. It is based on transparent information, active listening, classification, and collective responses aiming for the improvement of quality of life in Curitiba and for socially sustainable development.
Social Action Foundation Assistance	The City Hall, through the Social Action Foundation (FAS), aids homeless, low-income and vulnerable populations. FAS is responsible for managing public policies for social assistance and employment in Curitiba, acting integrated with governmental and non-governmental institutions. These services are decentralized in the 10 regions of the city, and with continuous training of its servers, improve and value the quality of services provided to the population at risk of vulnerability or homeless people. The services are organized into two levels of social protection: primary, which refers to the prevention of risk situations and the provision of services aimed at socialization and family and/or community coexistence, and the special, which is characterized by comprehensive care and is aimed at families and individuals with violated rights and broken or weakened family or community ties. The socio-assistance action in Curitiba includes professional training and development of entrepreneurs, with courses in several areas and integration workshops. FAS has Social Assistance Reference Centers, hotels, and shelters to provide the best service to the population, as well as spaces for training for employment and assistance with the search for vacancies in the labor market.
Lighthouse of Knowledge and Innovation (*Faróis do Saber e Inovação*)	The Lighthouse of Knowledge program revolutionized public education in Curitiba when they were implemented as a decentralized network of libraries with the first Brazilian public internet connection in 1993. In 2017, with the Pinhão Valley, these spaces are being reformulated and revitalized as the Lighthouse of Knowledge and Innovation, educational and maker spaces with 3D printers to foment creation, critical thinking, creativity, collaboration, and social inclusion. These new spaces, 32 in total, provide spaces for students and teachers from municipal public schools and are open to the entire community. Moreover, the teachers receive training in using spaces and learning about innovative methodologies. It has the concept based on hands-on creation and learning, in practice, encompassing projects, partners, passion, and games but adding a purpose and giving meaning to the process of creation. The main objective is to provide the students, teachers, and community access to new technologies and equipment, such as 3D printers, and the maker culture and improve municipal public education. The Education Secretariat, in 2022, implemented the itinerant Lighthouse of Knowledge and Innovation project to take the idea of the maker spaces of the Lighthouse of Knowledge and Innovation into the Municipal Centers and Schools for Early Childhood Education (CMEIs and EMEIs). The itinerant Lighthouse is an item of designed furniture with a 3D printer, technological equipment, virtual reality glasses, notebook, microscope, magnifying glass, globe, lightbox, books, blacklight pens, binoculars, magnetized alphabet, and toys that serve as a portable maker space for children in early childhood education. The program democratizes access to innovation, new technologies, and maker culture, giving public school students tools to have a better education and better opportunities.

Source: Authors (2025).

4.3. Component: Economic Sustainability Analyses

Curitiba supports entrepreneurship, startup development, and business growth through programs of entrepreneurial training, consultancies, public co-workings, and assistance for individual microentrepreneurs and micro and small businesses. Moreover, the city has fiscal incentives for companies that invest in innovation and technology, fomenting the job market within the city. Table 4 illustrates the economic strategies programs in execution by the city.

Table 4. Economic strategies.

Name of the Program	Description
Entrepreneurship Support	The Pinhão Valley and the City Hall work in partnership to support sustainable economic development, fomenting entrepreneurship and local businesses. The Curitiba Agency is responsible for entrepreneurship programs: Entrepreneur Spaces, Good Business Pinhão Valley, and Woman Entrepreneur Program, with the support of the Innovation Ecosystem, through partnerships for the development and implementation of training, mentorship, events, workshops, and assistance. Entrepreneur Spaces are public offices that provide guidance and consultancy to the population, helping before, during, and after the process of becoming a microentrepreneur. The Good Business Pinhão Valley is an Entrepreneurial Training Journey that capacitates citizens to improve their businesses through new technologies, innovative solutions, and sustainability or helps them create their own businesses. The Woman Entrepreneur Program encourages women in Curitiba to develop their own businesses. It encompasses specialized qualifications and tools needed for the development and strengthening of women-led businesses and creates networking and collaboration opportunities, including an award to recognize and inspire women. The support for entrepreneurship and the local economy in Curitiba is key to achieving a more sustainable city.
Worktiba	The Worktiba program is more than public coworking; it is a space for networking, training, business development, and building connections. Currently, there are three spaces in the city, allowing public coworking for entrepreneurs and startups in the early stages and offering space for work, training, and networking among participants and with the entire innovation ecosystem in the city, including the connection with potential investors. Entrepreneurs and startups do not have any cost to use the space, but as a counterpart to the free use of City Hall coworking spaces, entrepreneurs and startups must develop a collaborative project with a social impact on Curitiba. Worktiba also encourages the development of social projects that will benefit society and the city and improve the economic sector and employability in Curitiba. The program also has partners that offer free mentorship, training, and guidance for coworkers.
Tecnoparque	The Technopark program is set to foment the development of companies and institutions of technology and science and disseminate the culture of knowledge and innovation in the city, reducing the Tax on Services from 5% to 2% for companies. It was reactivated in 2018 within the Pinhão Valley and currently has 113 companies participating in the program. Together, the companies generate more than 20,000 jobs and earn USD 2 billion. Since its relaunch, the program has already guaranteed more than USD 63 million in investments for the companies. The incentives are helping the IT sector grow in Curitiba, with the overall goal being that the companies and the City Hall work together to transform Curitiba into a laboratory of solutions development that can benefit the population.
Lyceum of Craft, Innovation and Creativity	These programs offer free professional qualification courses for the population, with priority for low-income people and in situations of vulnerability and social risk. The objective is to enable the access, permanence, or re-entry of citizens into the world of work, digital inclusion, and income generation. Since 2018, the programs have been modernized to offer courses related to technology and Industry 4.0, enabling access to modern equipment and a prototyping laboratory to provide digital inclusion for the participants. The emphasis is on professional guidance and technical training, with lectures and workshops. The Partner Institutions offer an introduction to entrepreneurship and volunteer services and workshops focused on financial education, preparation for the job market, entrepreneurship, and workshops that seek to promote protagonism interactivity and learning through experience.

Table 4. *Cont.*

Name of the Program	Description
First Job Program	The First Job Program was implemented in 2018 to help the youth population prepare for the job market and find job opportunities even without experience. It aims to raise the employability level of adolescents, preferably those linked to FAS services, low-income, and vulnerable young people. The program offers a training path that covers cognitive, relational, and behavioral areas. The First Job Program is aligned with the Charter of Educating Cities and the SDGs. The young people are referred to employment opportunities through vocational apprenticeships in companies in the city. After entering the job market as an apprentice, the young people participating in the program could take additional modules of professional learning, with content on reading and communication, socio-professional relations, citizenship and ethics, work planning and organization, accounting and financial management, and operations logistics.
1º EmpregoTech and EmpregoTech 40+	The 1º EmpregoTech program was implemented in 2020 to offer free training in technology for young people who are low-income and vulnerable and to increase their employability in the IT industry, revealing talents for the technology market and bringing them closer to companies and startups. In 2023, the city verified the need to expand the program's activities and offer training to people over 40 years old who want to reposition themselves in the job market or who are looking for a career transition and launched the EmpregoTech 40+. The programs are a partnership between the Curitiba City Hall, Curitiba Agency for Development, Social Action Foundation (FAS), Human Robotics, Prime Control, Minsait—an Indra Company, Positivo University, Innovation Hub Hotmilk, and Brazilian Association of Technology Companies (ASSESPRO). The 1º EmpregoTech consists of five months of classes encompassing computer programming and soft skills. EmpregoTech 40+ offers Java (40 h/class) and Low Code (20 h/class) courses. The training cycle lasts up to three months, depending on the learning path, and includes guided training, training in virtual and in-person classes, and assessments, with certification at the end of the course. The participants can know the partner companies and the technologies used by them through monitored visits and participation in interviews. In the end, the best students can be hired as apprentices by the companies.
Fab Lab	The Fab Lab program is a prototype and digital fabrication laboratory. It is open to the community, universities, and companies to develop and share knowledge and projects, a space to encourage creativity, maker culture, and innovation in Curitiba. The Fab Lab had a big importance during the pandemic. In March 2020, the Fab Lab temporarily became the space to produce face shields for health professionals, frontline professionals in the fight against COVID-19, social workers, teachers, and municipal guards. The Curitiba City Hall, FAS, and Curitiba Agency, to guarantee the supply of PPE, articulated the public structure of Fab Lab to produce the face shield. The production of face shields at the Fab Lab was highlighted as a smart and articulated response to the pandemic at Cities for Global Health and UNESCO. In 2022, the Fab Lab resumed its activities and is back to developing projects with the universities, students, entrepreneurs, and citizens. The Fab Lab is connected to the global network of 2000 Fab Labs located in more than 149 countries. From community-based labs to advanced research centers, Fab Labs share the goal of democratizing access to the tools for technical invention, sharing the same equipment and open-source projects, and integrating data and knowledge.
Guarantee Fund	In August 2020, the City Hall, with the support of the Curitiba Agency and the Brazilian Micro and Small Support Service (SEBRAE), approved the Guarantee Fund, law nº 15.676 2020, with USD 1.9 million to help individual microentrepreneurs, microentrepreneur, small businesses, and rural producers to obtain loans and financing to support them during this period of crisis. It is the largest contribution ever made by a municipality in the country to a Credit Guarantee Society (SGC)—the GarantiSul, responsible for operating the Guarantee Fund with financial credit institutions, and which can leverage up to USD 19.0 million in loans. The financial institutions accredited for the fund are Sicredi (98), Sicoob (87), Coopesf (31), Fomento Paraná (24), Credisol (15), Rapidium (03), and Viacredi (01). The Guarantee Fund has already benefited 259 companies with USD 3.19 million in credit letters.
Debureaucratization	The Curitiba Economic Acceleration program encompasses measures to reduce bureaucracy and make it easier to open businesses in the city businesses. The City Hall increased the number of activities included in the Economic Freedom Act from 242 to 545, which does not require a license to open, to an increase of 125%. The measures also facilitate business openings for entrepreneurs who need a license, reducing the bureaucracy for them. The city implemented the integration of services and an online system through the City Hall website; the entrepreneurs can make a registration request, send documents, and pay the fees to obtain the licenses. Curitiba is among the fastest cities to open a company in Brazil. The average is 25 h, according to data from the Business Map by the Ministry of Economy, for the second quarter of 2021, 60% faster than the Brazilian average of 64 h. The reduction of bureaucratic ties represents an incentive for entrepreneurs, facilitating the opening of businesses to generate income and jobs.

Source: Authors (2025).

4.4. Analysis of the Strategies with the Type of Component

The city of Curitiba has developed and implemented a comprehensive set of 29 sustainability strategies (city program), systematically categorized into four distinct component classes: environmental, social, economic, and a hybrid category combining both environmental and social dimensions. This classification enables a clearer understanding of how the municipality's initiatives address multiple facets of sustainable urban development, as presented in Table 5.

Table 5. Number of strategies per component.

Component and Strategy Name	Sum of Strategies
I—Environmental	9
Curitiba More Energy	1
Friends of the River (*Amigos do Rio*)	1
Honey Gardens	1
Leaves Family (*Familia Folhas*)	1
PlanClima	1
Planting 100,000 trees/year	1
Sustainable Mobility	1
Waste Management	1
Water Reserve for the Future	1
II—Social	9
Family Markets (*Armazém da Familia*)	1
Food Bank (Banco de Alimentos)	1
Fruit and Vegetable Fair (*Sacolão da Familia*)	1
Lighthouse of Knowledge and Innovation (*Faróis do Saber e Inovação*)	1
Local Culture	1
Popular Restaurant (*Restaurante Popular*)	1
Social Action Foundation Assistance	1
Solidarity Table (*Mesa Solidária*)	1
Speaks Curitiba (*Fala Curitiba*)	1
III—Economic	9
1º EmpregoTech and EmpregoTech 40+	1
Debureaucratization	1
Entrepreneurship Support	1
Fab Lab	1
First Job Program	1
Guarantee Fund	1
Lyceums of Craft Innovation and Creativity	1
Tecnoparque	1
Worktiba	1
IV—Environmental and Social	2
Caximba New Neighborhood	1
Urban Agriculture	1
Total	29

Source: Authors (2025).

In the environmental component (Class I), nine strategies have been identified, each aimed at enhancing ecological sustainability and resilience. These include "Curitiba More Energy", "Friends of the River (Amigos do Rio)", "Honey Gardens", "Leaves Family (Família Folhas)", "PlanClima", "Planting 100,000 Trees/Year", "Sustainable Mobility", "Waste Management", and "Water Reserve for the Future." Collectively, these initiatives demonstrate the municipal commitment to climate action, biodiversity, renewable energy, and natural resource conservation.

The social component (Class II) also comprises nine strategies focused on fostering social equity and citizen well-being. These include programs such as "Family Markets

(Armazém da Família)", "Food Bank (Banco de Alimentos)", "Fruit and Vegetable Fair (Sacolão da Família)", "Lighthouse of Knowledge and Innovation (Faróis do Saber e Inovação)", "Local Culture", "Popular Restaurant (Restaurante Popular)", "Social Action Foundation Assistance", "Solidarity Table (Mesa Solidária)", and "Speaks Curitiba (Fala Curitiba)." These initiatives address food security, cultural inclusion, participatory governance, and social protection for vulnerable populations.

In the economic component (Class III), another nine strategies have been categorized, emphasizing innovation, employment, and economic diversification. The programs include "1º EmpregoTech and EmpregoTech 40+", "Debureaucratization", "Entrepreneurship Support", "Fab Lab", "First Job Program", "Guarantee Fund", "Lyceums of Craft Innovation and Creativity", "Tecnoparque", and "Worktiba". These strategies reveal a forward-looking approach to economic development rooted in technology, education, and entrepreneurship.

Finally, two initiatives—"Caximba New Neighborhood" and "Urban Agriculture"—fall under the integrated environmental and social component (Class IV). These strategies reflect a holistic vision by addressing both ecological sustainability and social equity simultaneously, illustrating how urban redevelopment and food sovereignty can be interconnected to improve quality of life.

Together, these 29 initiatives form a robust strategic framework that reflects Curitiba's commitment to sustainable development, balancing environmental stewardship, social inclusion, and economic innovation in alignment with the Sustainable Development Goals (SDGs), in line with what the concept and model of the Strategic Digital City project advocates, which assumes that the city's strategies are always sustainable.

5. Discussion

The relationship between the strategies and the SDGs is shown in Table 6, in which the 29 city strategies (city program) were related to the 17 SDGs based on the description of the strategies and the description of the Sustainable Development Goals in accordance with the established research protocol.

Table 6. Association between strategies and SDGs.

Name of the Strategies	SDG1	SDG2	SDG3	SDG4	SDG5	SDG6	SDG7	SDG8	SDG9	SDG10	SDG11	SDG12	SDG13	SDG14	SDG15	SDG16	SDG17
1º EmpregoTech and EmpregoTech 40+	X							X	X	X	X						X
Caximba New Neighborhood	X		X				X			X	X	X	X				X
Curitiba More Energy			X				X				X	X	X				X
Debureaucratization								X	X	X	X						X
Entrepreneurship Support				X	X			X	X	X	X						X
Fab Lab				X				X	X	X	X						X
Family Markets (*Armazem da Familia*)	X	X	X							X	X	X					X
First Job Program	X							X	X	X	X						X
Food Bank (*Banco de Alimentos*)	X	X	X							X	X	X					X
Friends of the River (*Amigos do Rio*)			X			X					X	X	X	X			X
Fruit and Vegetable Fair (*Sacolão da Familia*)	X	X	X							X	X	X					X
Guarantee Fund	X							X	X	X	X						X
Honey Gardens			X								X	X	X		X		X
Leaves Family (*Familia Folhas*)			X			X	X				X	X	X	X	X		X
Lighthouse of Knowledge and Innovation (*Faróis do Saber e Inovação*)				X					X	X	X						X
Local Culture	X									X	X						X
Lyceums of Craft Innovation and Creativity	X			X				X	X	X	X						X
PlanClima		X	X				X				X	X	X	X			X
Planting 100,000 trees/year			X								X	X	X		X		X
Popular Restaurant (*Restaurante Popular*)	X	X	X							X	X	X					X
Social Action Foundation Assistance	X									X	X					X	X
Solidarity Table (*Mesa Solidária*)	X	X	X							X	X	X					X
Speaks Curitiba (*Fala Curitiba*)				X		X		X		X	X	X	X			X	X
Sustainable Mobility			X								X	X	X				X
Tecnoparque				X				X	X	X	X						X
Urban Agriculture		X	X								X	X	X		X		X
Waste Management		X	X								X	X	X	X	X		X
Water Reserve for the Future			X			X					X	X	X	X			X
Worktiba								X	X	X	X						X

Source: Authors (2025).

Considering these two variables of analysis, the results of the comparative analysis between the strategies and the SDGs visualized in Figure 1 show that two SDGs, "Sustainable Cities and Communities (SDG 11) and Partnerships for the Goals (SDG 17)", are

associated with the 29 strategies, equivalent to 100% (high correlation trend). On the other hand, three SDGs, "Good Health and Well-Being (SDG 3), Reduce Inequalities (SDG 10), and Responsible Consumption and Production (SDG 12)", are associated with between 16 and 19 of the strategies, equivalent to 55% and 66% (moderate correlation trend). Finally, 12 SDGs, "No Poverty (SDG 1), Zero Hunger (SDG 2), Quality Education (SDG 4), Gender Equality (SDG 5), Clean Water and Sanitation (SDG 6), Affordable and Clean Energy (SDG 7), Decent Work and Economic Growth (SDG 8), Industry, Innovation and Infrastructure (SDG 9), Climate Action (SDG 13), Life Below Water (SDG 14), Life on Land (SDG 15), and Peace Justice and Strong Institutions (SDG 16)", are associated with between one and twelve of the strategies, equivalent to 3% and 41% (low correlation trend).

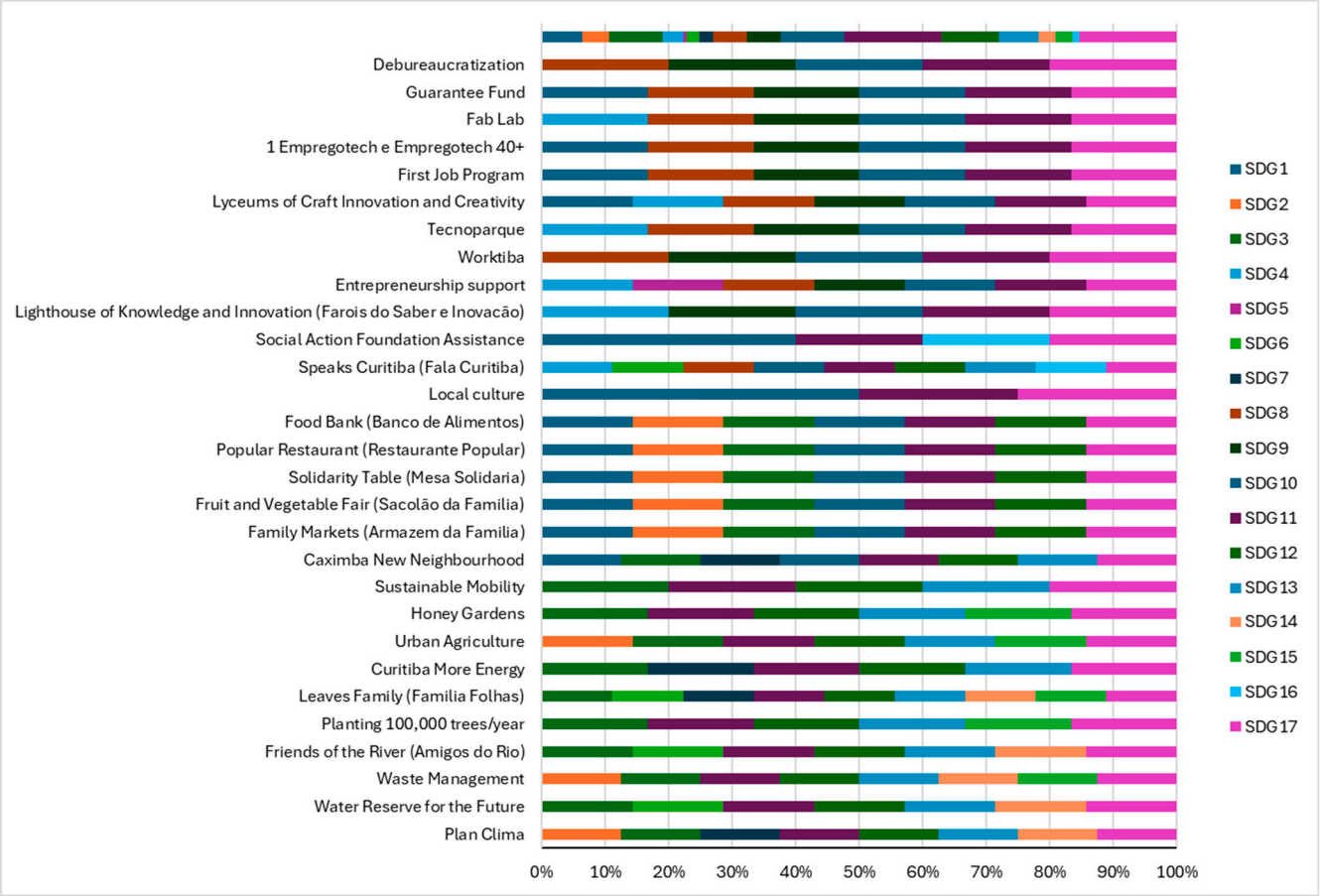

Figure 1. Proportion of SDGs within the strategies of the city of Curitiba. Source: Authors (2025).

These findings highlight the varying degrees of alignment between municipal strategies and the global Sustainable Development Goals (SDGs), with a notable emphasis on SDG 11 (Sustainable Cities and Communities) and SDG 17 (Partnerships for the Goals). The high frequency of these associations suggests that local government increasingly recognizes the centrality of urban sustainability and collaborative governance in addressing complex urban challenges.

To deepen this analysis, it is important to contextualize these results within the broader literature on digital cities, smart cities, and urban governance. Just like the concept of strategic smart cities, the smart city concept has evolved beyond a technocentric view and now encompasses holistic models of urban development that integrate digital innovation, participatory governance, and sustainable policy frameworks [10,37,38]. Recent studies emphasize that truly "smart" cities are those capable of fostering inclusive, adaptive, and resilient systems that respond not only to economic and technological imperatives but

also to social and environmental priorities [39,40], corroborating the applied concept of Strategic Digital City project [4,25].

In this sense, the results of this study come to meet the ongoing discourse on policy coherence for sustainable development (PCSD), a concept central to the 2030 Agenda, which advocates for the systematic alignment of local policies with the SDGs [41]. While several city-level frameworks have emerged to track this coherence, few studies offer empirical insights into how city strategic planning tools operationalize these global objectives in local contexts. By comparing the degree of integration of SDGs across a wide array of urban strategies, this research bridges the gap between normative sustainability frameworks and concrete municipal action.

Moreover, this analysis responds to calls within the literature for more grounded, comparative empirical studies that examine how cities internalize global sustainability agendas through strategic governance practices [42]. It shows that while some SDGs are more intuitively embedded in urban strategies, others—particularly those dealing with social equity (SDG 10), health (SDG 3), and resource efficiency (SDG 12)—remain under-addressed, suggesting a need for more comprehensive and integrated city planning approaches.

The unique relevance of this study lies in its methodological integration of strategy mapping with SDG analysis, offering a replicable tool for assessing urban sustainability alignment. It advances both theoretical and practical understandings of how cities interpret, translate, and prioritize global goals in their sustainable strategic frameworks. Other forms of research may extend this approach to include dynamic assessments over time, stakeholder analyses, or cross-national comparisons to better understand how institutional, political, and socioeconomic factors shape SDG coherence at the urban level.

The analytical model proposed in this study shows the advancement of the state of the art by offering a structured and replicable framework for assessing the alignment between city strategic planning and the Sustainable Development Goals (SDGs). Unlike conventional approaches that focus narrowly on individual projects or sector-specific policies, this model adopts a systems-oriented view, enabling a more comprehensive evaluation of how diverse urban strategies contribute to sustainable development. By systematically mapping strategic actions to specific SDGs, the model enhances transparency in policy evaluation and supports more coherent decision-making at the municipal level. Its application provides policymakers, planners, and researchers with a diagnostic tool to identify priority areas, reveal inconsistencies, and stimulate integrative city planning practices aligned with global sustainability agendas.

Despite these innovative approaches proposed, they also present challenges that should be addressed. First, the mapping of strategies to SDGs relies on qualitative interpretation of strategy documents, which may introduce subjectivity and reduce reproducibility across different contexts. Incorporating stakeholder input or natural language processing techniques could strengthen the objectivity of this step. Second, the current research focuses on formal city strategic plans and does not account for implementation gaps, local governance dynamics, or informal policy influences, which are critical in determining real-world impact. It is possible to search to incorporate performance indicators, longitudinal data, and multilevel governance analysis to enhance the robustness and applicability of the model. Additionally, comparative studies across cities of varying sizes, geographies, and institutional capacities could further validate the framework and inform context-sensitive adaptations.

6. Conclusions

The concept, model, and research on Strategic Digital City prioritizing city strategies and their sustainable indicators can corroborate the integrated vision of cities in relation to

their physical and digital environments, improving the quality of life of citizens, especially with their participation in the development of sustainable projects, as is the case in Curitiba.

Recovering the proposed research objective, this study reaffirms that cities demand strategic and adaptive planning to address the growing complexity of urban challenges. In this context, sustainable city strategies, when designed in accordance with the specific realities of a city, emerge as potential instruments for urban planning and governance. The case of Curitiba demonstrates that aligning municipal strategies with environmental preservation, social equity, and economic resilience is not only possible but also beneficial for long-term urban sustainability. By grounding these strategies within the framework of the SDGs, Curitiba positions itself within a globally recognized development agenda, adding both legitimacy and strategic direction to its urban initiatives. The city's digital and strategic planning approach represents a participatory and goal-oriented model that other urban centers can adapt to suit their unique social, environmental, and economic landscapes.

The results of the analysis showed that among the twenty-nine city strategies (city programs) implemented in Curitiba, two stood out for addressing multiple thematic dimensions, thereby achieving broader systemic impact and attracting significant support from international and private sectors. While all strategies showed clear alignment with SDG 11—which emphasizes inclusive, safe, resilient, and sustainable cities—a majority also contributed meaningfully to SDGs 3, 10, and 12, highlighting their relevance to public health, social equity, and responsible consumption. However, the limited association with other SDGs reveals critical gaps, particularly in areas related to governance, innovation, and climate action. This underlines the need for a more comprehensive approach that ensures broader SDG integration across sustainable urban strategies in accordance with the assumptions of Strategic Digital City sustainable projects and subprojects.

This research offers several contributions to the field of urban management. It provides empirical evidence on the use of city strategic planning tools in aligning local policies with global sustainability goals, offering a model for other cities to replicate or adapt. Moreover, it bridges theoretical concepts from the literature with practical urban planning through a structured case study methodology, reinforcing the value of integrated, data-informed decision-making in sustainable public policy. It also demonstrates how international cooperation and public–private partnerships can enhance the viability and reach of local initiatives. Contributions can be directed to city managers who can dialogue and implement the respective SDC concept and project model and research cases. This can also be extended to the academy or relevant studies or science related to the theme SDC, which is still original with its four subprojects. In this way, researchers on related topics, including strategic smart cities, intelligent cities, and digital cities, can expand their respective studies.

Research limitations report that the SDC concept and project model cannot be generalized and applied in all cities, requiring specific projects and mainly action research to monitor the progress of the proposed projects. From a scientific point of view, there were no limitations on the SDC concept and project model; however, the challenge of the cities is related to the acceptance and application of this innovative concept and with an original model for cities that want to contemplate the strategic vision of the digital city, not expressing the reality of world cities because they have economic, environmental, cultural, and social differences, among others.

The focus on a single city and the reliance on a single planning document is one study limitation; though enriched by technical visits and stakeholder insights, it constrains the generalizability of the findings. Future research should explore comparative case studies across diverse urban contexts and consider broader data sources, including participatory inputs, longitudinal analyses, and implementation assessments.

In conclusion, this research confirms that strategically formulated sustainable city strategies—when informed by local realities and anchored in global agendas such as the SDGs—serve as essential mechanisms for modern urban management. Curitiba's experience provides a valuable roadmap for cities worldwide seeking to enhance sustainability, inclusivity, and resilience in their urban development policies in the Strategic Digital City context, considering multiple strategic and sustainable indicators where citizens can improve their quality of life.

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Abbreviations

The following abbreviations are used in this manuscript:

SDC	Strategic Digital City
SDG	United Nations Sustainable Development Goal

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