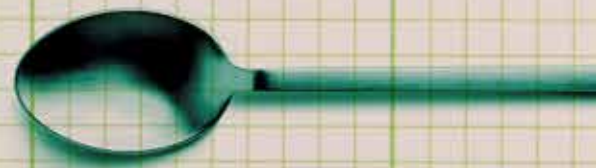
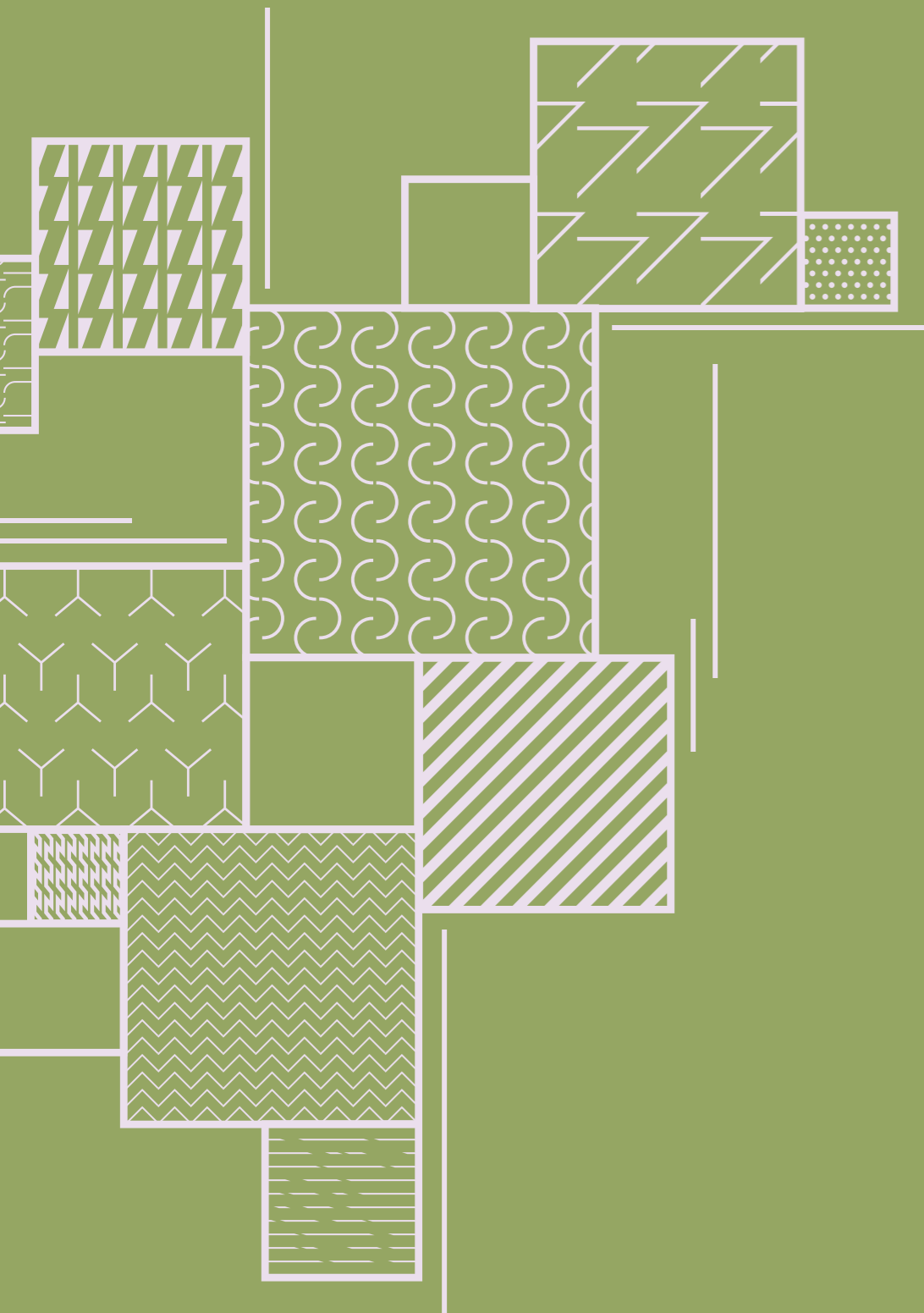


March 2025

Food pathways: the role of urban planning in food system transformation





Food pathways: the role of urban planning in food system transformation



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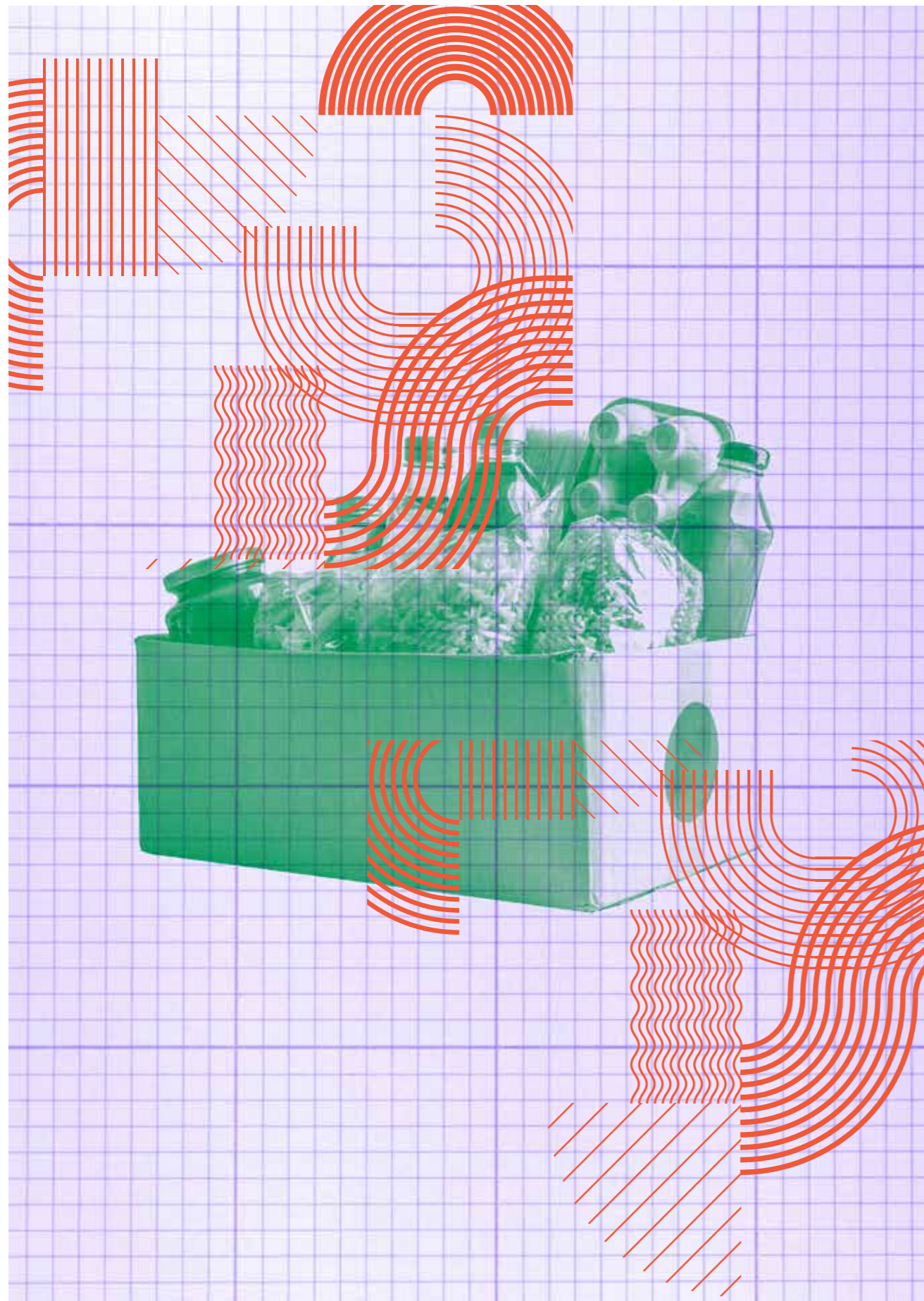


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Introduction

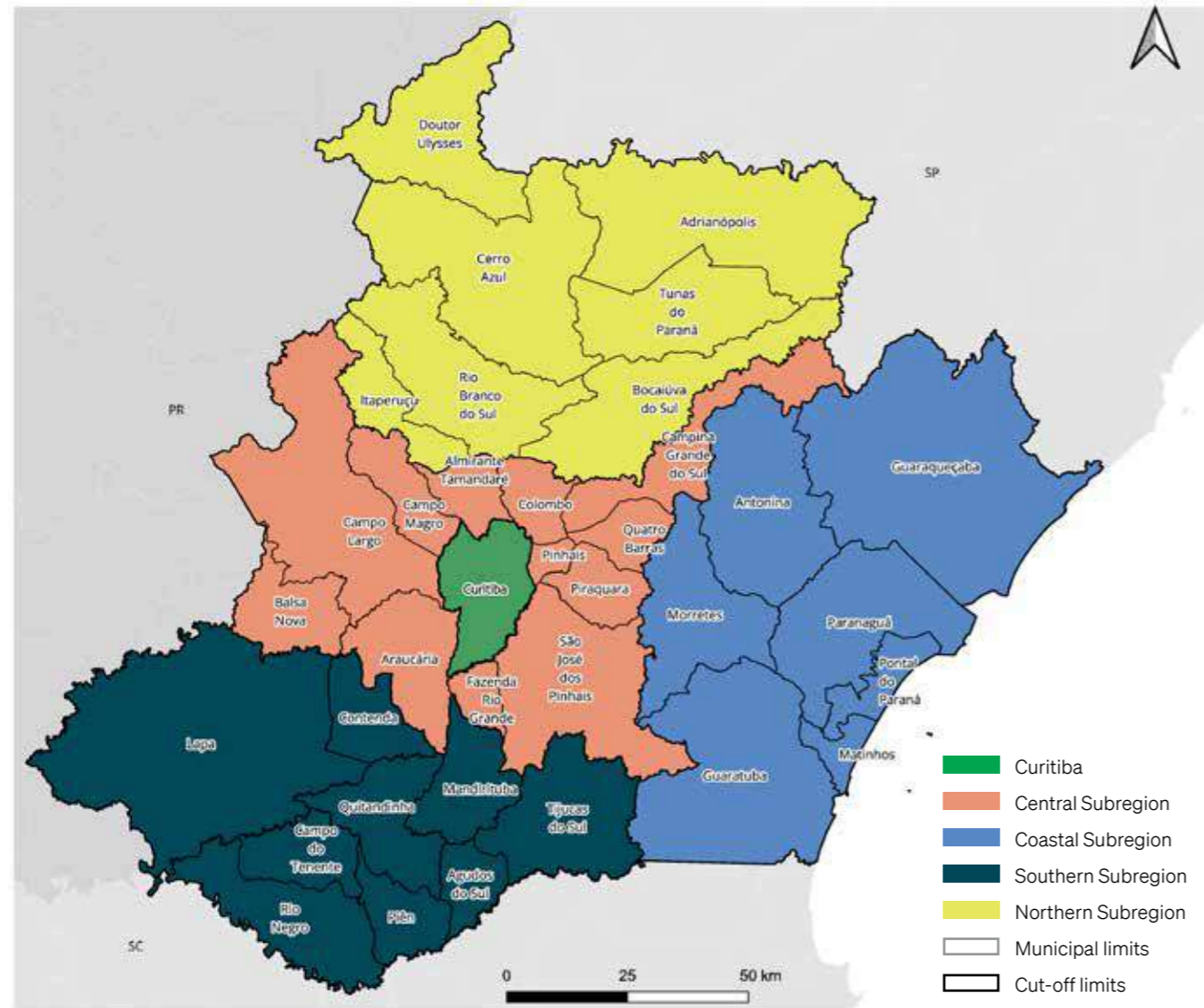
This study is the result of a partnership between Instituto Escolhas, the Instituto de Pesquisa e Planejamento Urbano de Curitiba (IPPUC), Curitiba's urban research and planning institute, and the Secretaria Municipal de Segurança Alimentar e Nutricional de Curitiba (SMSAN), the Municipal Secretariat for Food and Nutrition Security of Curitiba. These institutions joined efforts to examine how the municipalities of Curitiba, its metropolitan Area, and the coastal area could build on the progress identified in this territory while addressing the multiple challenges that persist in the region's food system. In addition, the study seeks to identify pathways through which urban planning can enable change.

The municipality is the administrative unit where both the positive and negative impacts related to food system activities are most strongly felt. For example, the city of Curitiba is a national and international reference regarding public policies on urban planning and the promotion of Food and Nutritional Security (FNS). To achieve these successful outcomes, the municipality relies heavily on food produced in the metropolitan area and along the coast.

The study sought to map and analyze secondary data on the regional food system of Curitiba, its metropolitan area, and the coast of Paraná. It compiled information on food production, distribution, commercialization, access, and waste. Given the capacity of local governments to promote significant transformations in how food system activities are structured, the study highlights that urban planning is a pivotal element for promoting healthy and sustainable diets in the region.

In a year in which many municipal administrations have been renewed, we hope this document will serve as a resource to address current and pressing challenges such as food price inflation, food insecurity, job and income generation, metropolitan integration, and the climate emergency.

The main findings of the study are presented in the following pages.



Source: Prepared by the authors based on IBGE data (2024)¹.



Vitória Régia Community Garden, Curitiba. Photo: Instituto Escolhas Archive/Ecorural, 2023.

The Metropolitan Region of Curitiba and the coastal subregion comprise 36 municipalities, with a total population of 3.9 million inhabitants. This represents 34% of the population of the state of Paraná², distributed across the following subregions:

Curitiba

Southern subregion: Agudos do Sul, Campo do Tenente, Contenda, Lapa, Mandirituba, Piên, Quitandinha, Rio Negro, and Tijucas do Sul.

Central subregion: Almirante Tamandaré, Araucária, Balsa Nova, Campina Grande do Sul, Campo Largo, Campo Magro, Colombo, Fazenda Rio Grande, Pinhais, Piraquara, Quatro Barras, and São José dos Pinhais.

Northern subregion: Adrianópolis, Bocaiúva do Sul, Cerro Azul, Doutor Ulysses, Itaperuçu, Rio Branco do Sul, and Tunas do Paraná.

Coastal subregion: Antonina, Guaraqueçaba, Guaratuba, Matinhos, Morretes, Paranaguá, and Pontal do Paraná.

¹. IBGE – Instituto Brasileiro de Geografia e Estatística. **Panorama Censo 2022** [2022 Census Overview]. Available [here](#).

². See footnote 1.

Key figures

Enough food for **3.5 million** de people.



The annual production of vegetables and fruits in the Metropolitan Region of Curitiba and the coastal subregion in 2022 was sufficient to feed 3.5 million people, almost the entire population of the region (3.9 million inhabitants).

76% of agricultural establishments are family farms.



In 2017, the Metropolitan Region of Curitiba and the coastal subregion recorded 25,774 agricultural establishments, of which 76% were family farms, but accounted for only 25% of the total area of the establishments. In addition, 101 rural properties belong to traditional peoples and communities, including Indigenous peoples, quilombolas, faxinalenses, cipozeiros, caiçaras, and artisan fishers.

Approximately **1 in 3** food items traded at CEASA Curitiba originates from the Metropolitan Region of Curitiba and the coastal subregion.



Data on the origin of the food traded at Ceasa Curitiba in 2022 indicate the potential to reduce CO₂ emissions and food waste through the development of short distribution chains in the region.

21,000 fewer hectares for family farming.



From 2006 to 2017, the total number of family farming agricultural establishments and the total area they occupied decreased by 25% and 9%, respectively.

161% increase in soybean planted area.



From 2012 to 2022, the Metropolitan Region of Curitiba and the coastal subregion expanded the area planted with soybeans from 67,000 hectares to 174,600 hectares. Meanwhile, the area planted with beans decreased 35% (from 48,800 hectares to 31,700 hectares), corn by 55% (from 134,000 hectares to 60,500 hectares), and rice by 13.5% (from 1,800 hectares to 1,600 hectares).

79.6% of the population in the metropolitan region (excluding Curitiba) and **80.9%** of Curitiba's population are food secure—percentages above the Brazilian average (**70.3%**).



No data are available for the coastal subregion.

In Curitiba, **one in four** adults (≥18 years) reported a diagnosis of hypertension.



Poor diet is one of the risk factors for the development of non-communicable diseases (NCDs). Only 25% of the individuals aged 18 or older in Curitiba consume five or more daily portions of fruits or vegetables.

Municipalities of the Metropolitan Region of Curitiba have an estimated annual cost of **BRL**



38.7 million for landfilling organic matter from urban waste.

This cost could be significantly reduced by scaling up composting programs in the region, by generating inputs for food production.



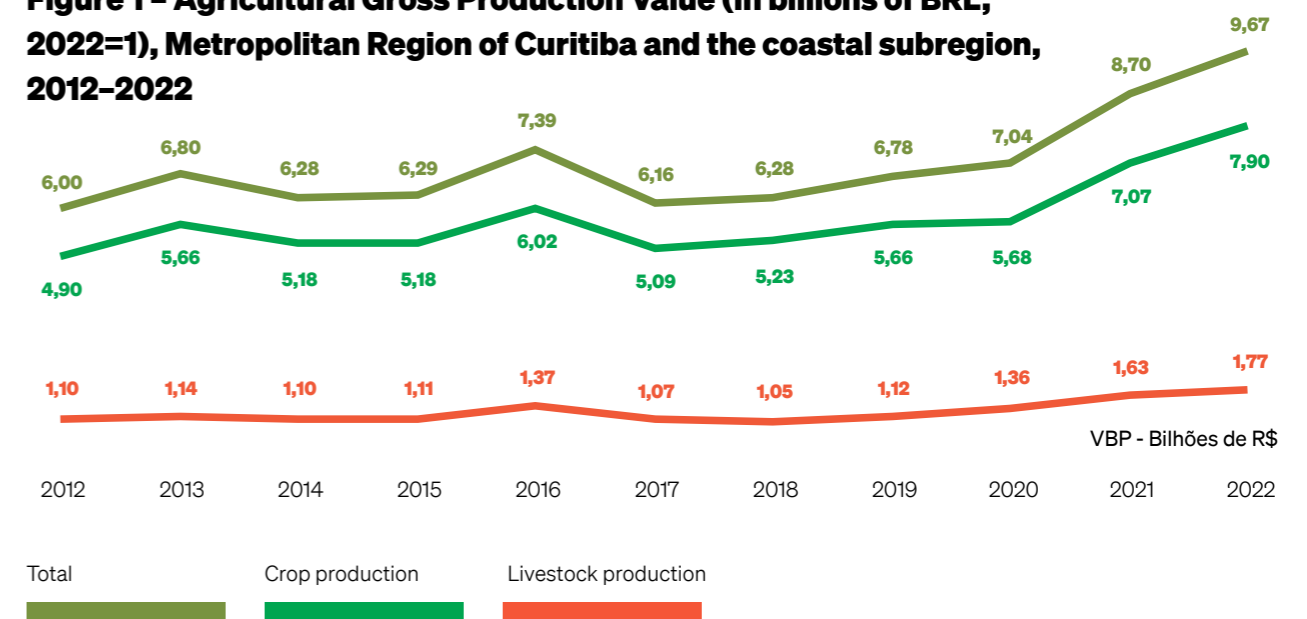
1. Food production

Agricultural production in the Metropolitan Region of Curitiba and the coastal subregion accounts for 5% of Paraná's total agricultural production in terms of Gross Production Value (GPV)³. The GPV of this region increased by 61% over a decade (from BRL 6 billion in 2012 to BRL 9.67 billion in 2022). This growth was driven mainly by crop production, which showed consistent growth despite fluctuations, while livestock production remained relatively stable (Figure 1).



Organic farm in Tijucas do Sul. Photo: José Fernando Ogura.

Figure 1 – Agricultural Gross Production Value (in billions of BRL, 2022=1), Metropolitan Region of Curitiba and the coastal subregion, 2012–2022



Source: Prepared by the authors based on data from the Paraná State Secretariat of Agriculture and Supply⁴.

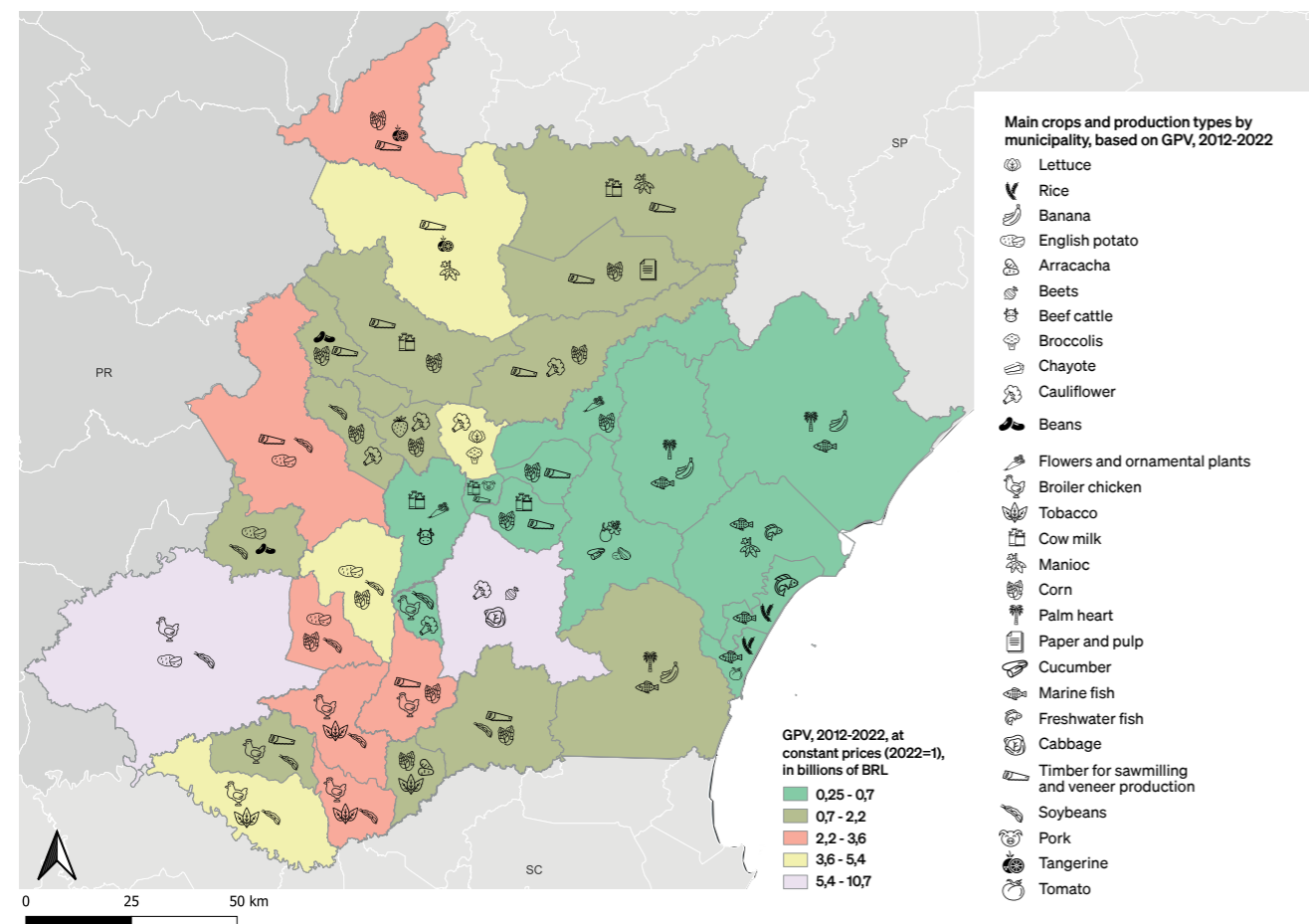
³ Gross Production Value (GPV) is a financial indicator for agriculture and livestock that reflects the value generated by agricultural production based on the amounts received by rural producers. The databases were provided by the Ministry of Agriculture and Livestock (*Ministério da Agricultura e Pecuária - Mapa*) and by the Department of Rural Economy (*Departamento de Economia Rural - Deral*) of the Paraná State Secretariat of Agriculture and Supply, covering the period from 2012 to 2022. All values were adjusted using the Broad Consumer Price Index (*Índice de Preços ao Consumidor Amplo - IPCA*), with 2022 as the base year.

⁴ See footnote 3.

All subregions show a diversity of production, according to GPV. In the Southern subregion, crops such as soybeans, poultry, tobacco, potatoes, and timber for sawmills and rolling mills prevail, with the city of Lapa standing out for having the highest gross production value in the entire region (Map 1). In the Central subregion, vegetable production, such as cauliflower, cabbage, and

lettuce, stands out, along with corn and soybeans, particularly in São José dos Pinhais and Araucária. The North subregion, especially in Cerro Azul, contributes by producing timber, tangerines, manioc, corn, and milk. The coastal subregion is characterized by the production of fish, rice, palm hearts, manioc, and tropical fruits such as passion fruits and bananas.

Map 1 – Main types of production by municipality, 2012-2022, based on GPV at current prices (in BRL, 2022=1)



Source: prepared by the authors, based on data from the Paraná Secretariat of Agriculture and Supply⁵.

Crop production is the main component of the agricultural GPV in the Metropolitan Area of Curitiba and the coastal subregion, accounting for 82% of the total, especially soybeans, vegetables, and forestry. Vegetables stand out due to their economic relevance and production stability over

the years, representing approximately one quarter of the region's crop GPV in 2022. Within the wide variety of crops, five main products stand out: potatoes, broccolis, lettuce, cauliflower, and cabbage. The first three recorded growth rates of over 100% in BFV between 2012 and 2022.

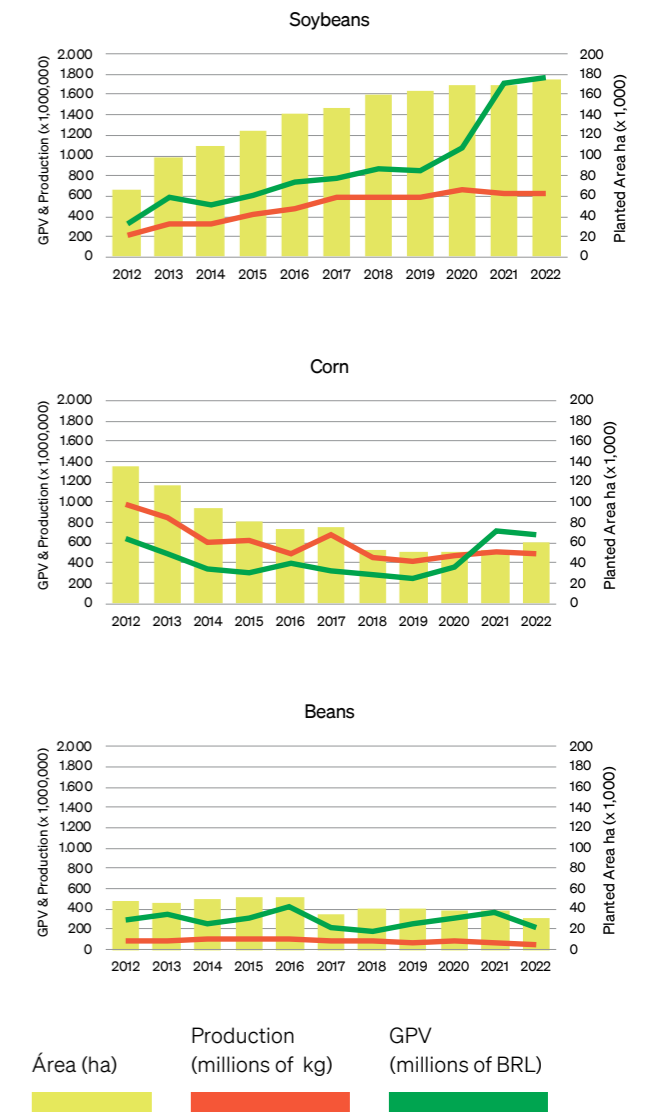
The Central subregion accounted for more than 80% of the GPV of broccolis, lettuce, cabbage, and cauliflower in 2022, while potato production was more widely distributed, with a predominance in the Southern subregion.

The production of vegetables and fruits in the Metropolitan Region of Curitiba and the coastal subregion, considering the average production from 2012 to 2022⁶, has the potential to feed 3.8 million people, almost the entire population of the region, estimated at 3.9 million people in 2022⁷. However, it is important to note that this volume has been declining since 2020, reaching its lowest level in 2022, at approximately 936 thousand tonnes, which would be sufficient to feed 3.5 million people.

Soybeans have become the dominant summer crop in the region, while corn and beans have been losing ground. Between 2012 and 2022, soybeans recorded a 453% increase in GPV, a 193% increase in production volume, and a 160% expansion in planted area, which grew from 67,000 hectares to 175,000 hectares (Figure 2). Over the same period, corn showed a modest increase of 7% in GPV, but also a reduction of 49% in production volume and 55% in planted area (from 135,000 hectares to 60,000 hectares). Beans also experienced significant declines, with a 22% reduction in GPV, a 43% decrease in production volume, and a 35% reduction in planted area (from 49,000 hectares to 32,000 hectares).

5. See footnote 3.
 6. The average production between 2012 and 2022 was 1,019,659.93 tonnes of vegetables and leafy greens. The potential number of people that could be fed was estimated based on (i) a daily consumption of 400 g (net weight) of fruits and vegetables per person (excluding tubers), according to recommendations of the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO); and (ii) a 22% loss rate between post-harvest and distribution. In: PARANÁ – Secretaria da Agricultura e do Abastecimento (2023). **Valor Bruto da Produção 2022 – Análise dos Resultados Preliminares** [Gross Production Value 2022 – Analysis of Preliminary Results. Departamento de Economia Rural (Deral). Curitiba, 21 de junho de 2023. Available here. Accessed on: Aug. 16, 2023.
 7. IBGE – Instituto Brasileiro de Geografia e Estatística. **Censo Demográfico 2022** [2022 Demographic Census]. Rio de Janeiro: IBGE, 2024.
 8. See footnote 3.

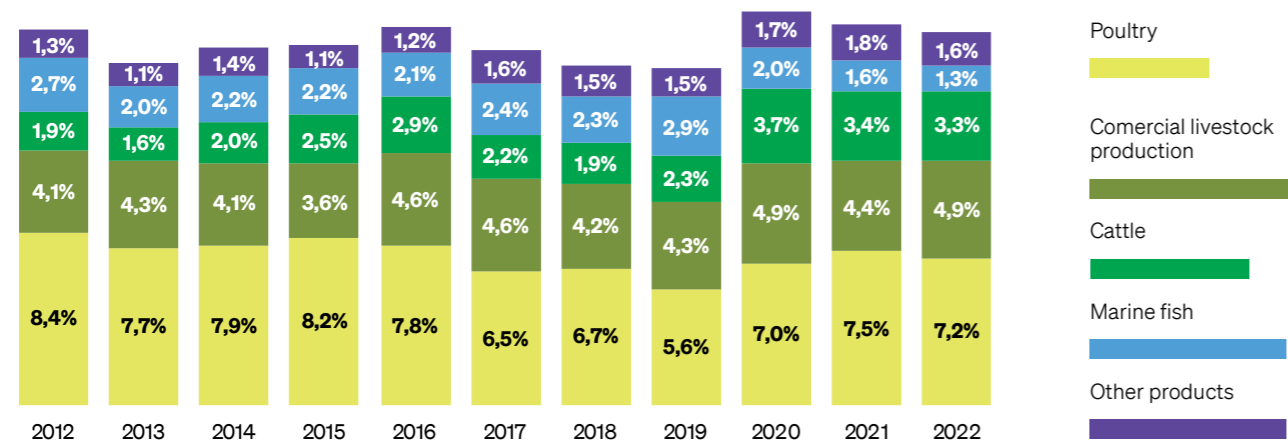
Figure 2 – GPV at current prices (2022=1, in millions of BRL), production (in millions of kilograms), and planted area (in hectares) of soybeans, corn, and beans in the Metropolitan Region of Curitiba and the coastal subregion, 2012-2022



Source: Prepared by the authors based on data from the Paraná State Secretariat of Agriculture and Supply⁸.

Livestock production accounted for approximately 18% of GPV of the Metropolitan Area of Curitiba and coastal subregion over the period 2012-2022, with emphasis on broiler poultry, commercial livestock production—whose main products are milk and fertilized chicken eggs for human consumption—and beef cattle.

Figure 3 – Percentage distribution of livestock production by type⁹ in relation to the total agricultural GPV in the Metropolitan Region of Curitiba and Coastal subregion, 2012-2022



Source: Prepared by the authors based on data from the Paraná State Secretariat of Agriculture and Supply¹⁰.

Poultry is the livestock production subcategory with the largest share of the total agricultural GPV, accounting for 7.2% in 2022 (Figure 3). Broiler chicken is the main product driving this result, representing 79% of the total GPV of poultry production. This product recorded a 57% increase in GPV, rising from BRL 351.5 million to BRL 552 million in 2022. Production is concentrated in the Southern (86%) and Central (14%) sub-regions.

1.1. Profiles of establishments and farmers

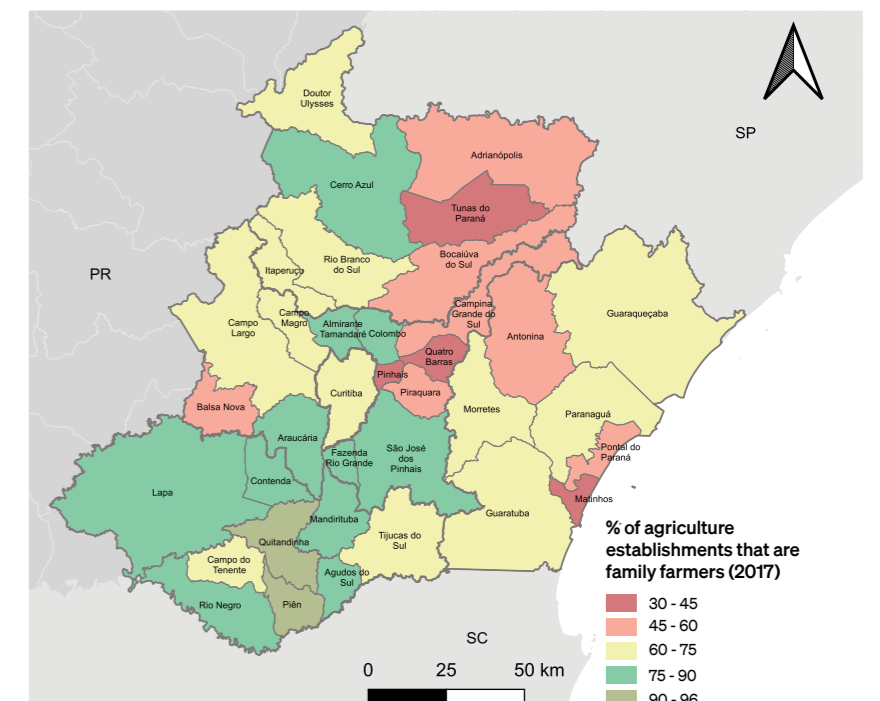
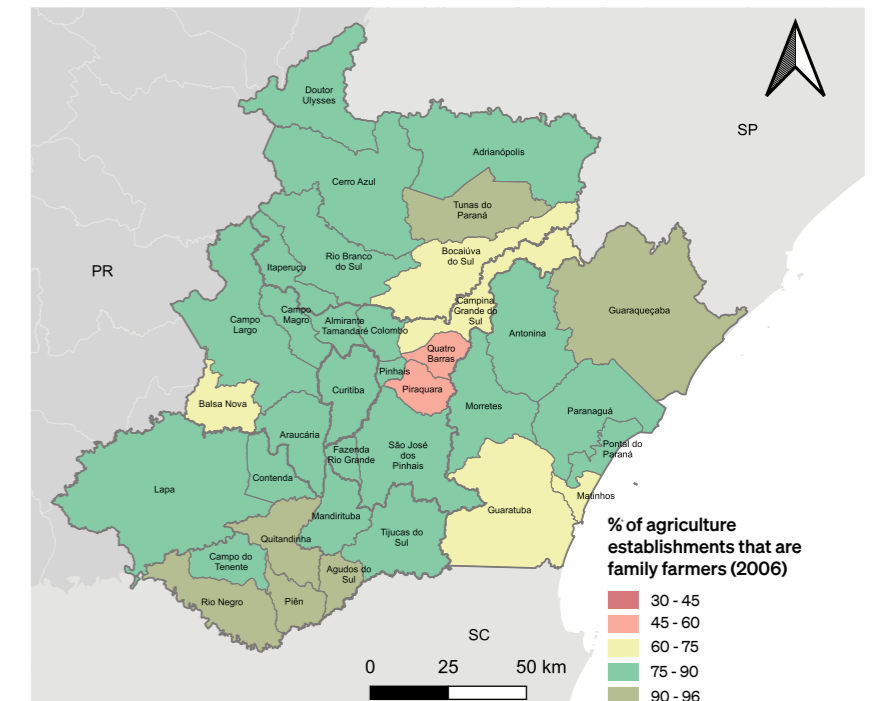
Family farming is in decline in the region, with a reduction in the number of establishments and in cultivated area, while non-family farming has grown significantly. From 2006 to 2017, the total number of agricultural establishments in the Metropolitan Region of Curitiba and the coastal subregion fell from 30,347 to 25,774 (-15.1%), but total area increased, rising from 810,000 hectares to 899,000 hectares (+11%). During this period, family farming recorded losses of 6,341 establishments (-24.5%) and 21,000 hectares (-8.6%). In contrast, non-family farming expanded by 1,768

establishments (+39%) and gained 110,000 hectares (+19.5%), indicating a process of land concentration. Despite this, in 2017, 76% of agricultural establishments were family farms, accounting for 70% (44,840) of the employed population¹¹.

Changes in the distribution of establishments varied across subregions. The expansion of non-family farming was most pronounced in the Northern subregion, where forestry is particularly significant. The total area of these establishments in the subregion increased by 120,000 hectares in 2017, with notable growth in Adrianópolis, Itaperuçu, and Tunas do Paraná. In contrast, family farming in the Northern subregion experienced a 25% decline in the number of establishments, alongside a 1.7% increase in area.

Curitiba experienced the largest proportional decline, with a 71.9% reduction in total area and a 27.2% decrease in the number of establishments, affecting both family and non-family units. The Central subregion, which stands out for vegetable production, and the coastal subregion also recorded significant reductions in the number of family farming establishments, of 31.5% and 33%, respectively. In the Southern subregion, although family farming still accounts for 84% of properties, the total area cultivated by family farms declined by 8.5% (Map 2).

Map 2 – Comparison of the percentage of family farming establishments by municipality in the Metropolitan Region of Curitiba and the coastal subregion, in 2006 and 2017



⁹. Other products include: aquaculture; medium-sized animals; equines and mules; small animals and silage; and animal feed.
¹⁰. See footnote 3.
¹¹. Other products include: aquaculture; medium-sized animals; equines and mules; small animals and silage; and animal feed.
¹². IBGE – Instituto Brasileiro de Geografia e Estatística. **Censo Agropecuário 2006 e 2017** [Agricultural Census 2006 and 2017]. Rio de Janeiro.

Source: Prepared by the authors based on IBGE data (2006 and 2017)¹².

Another relevant aspect is the shift in the profile of farmers, marked by the ageing of the rural population and economic vulnerability. Between 2006 and 2017, there was a 10.8% decrease in the number of producers aged up to 45, while the number of farmers above this age increased by 16.9%. In addition, in 2022, there were 1,755 family farmers registered in CadÚnico¹³, of whom 85% had a monthly income of up to half the minimum wage, particularly artisanal fishers. For 57% of family farms, income generated on the property remains the main source of livelihood, in contrast to non-family farming, where only 29% of establishments have production as their main income-generating activity.

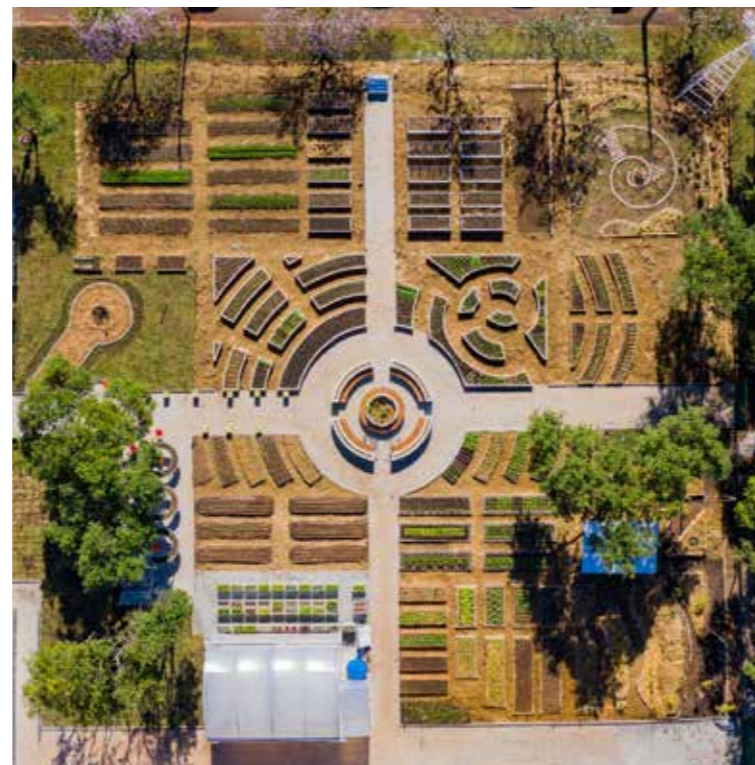
1.2. The strength of urban agriculture in Curitiba

Curitiba stands out nationally for the longevity of its public policies promoting urban agriculture, which have been in place since the 1980s and combine objectives such as food production, the use of idle land, social engagement, the promotion of food and nutrition security, and the dissemination of sustainable practices.

Currently, the municipality supports the implementation and/or maintenance of 190 urban gardens, of which 85 are located in schools, 53 are community gardens, and 52 are institutional gardens. Together, they cover approximately 21 hectares and directly benefit 39,756 people. These gardens are primarily oriented toward self-consumption by gardeners, as well as local

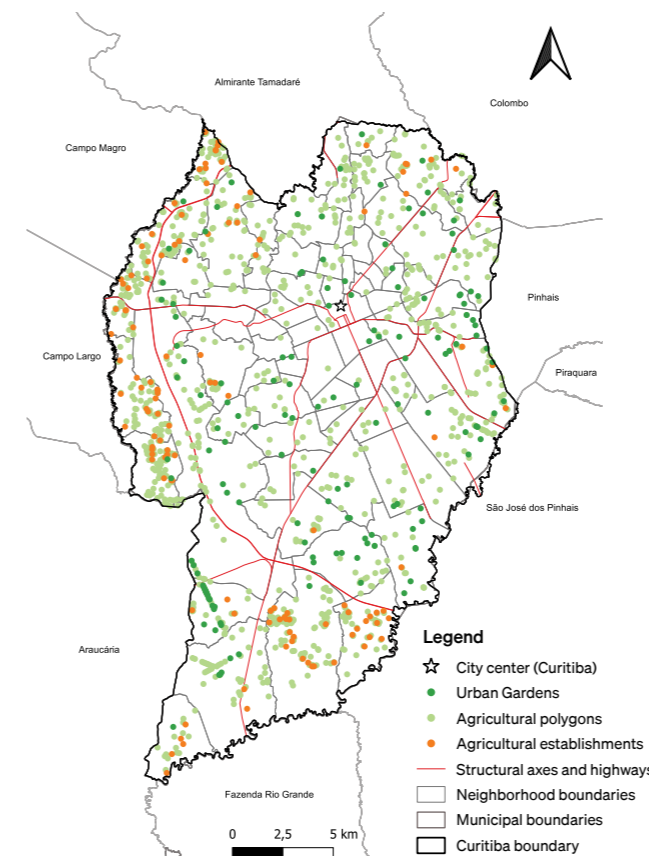
marketing. The municipality also operates two urban farms, which serve as spaces for production, experimentation, and education. Most of the gardens have been established in Special Social Housing Areas (SEHIS), indicating that public policy is designed with attention to the specific characteristics of the territory.

Urban agriculture practices are present across different areas of the city (idle spaces, vacant lots, setbacks, backyards, schools, rights-of-way under transmission lines and along railway tracks, rooftops, etc.). In 2017, a total of 745 hectares were occupied by 123 agricultural establishments mapped by IBGE¹⁴, while in 2023, 728 hectares comprising 1,118 agricultural polygons were mapped by Instituto Escolhas¹⁵ (Map 3).



Cajuru Urban Farm, Curitiba. Photo: Daniel Castellan.

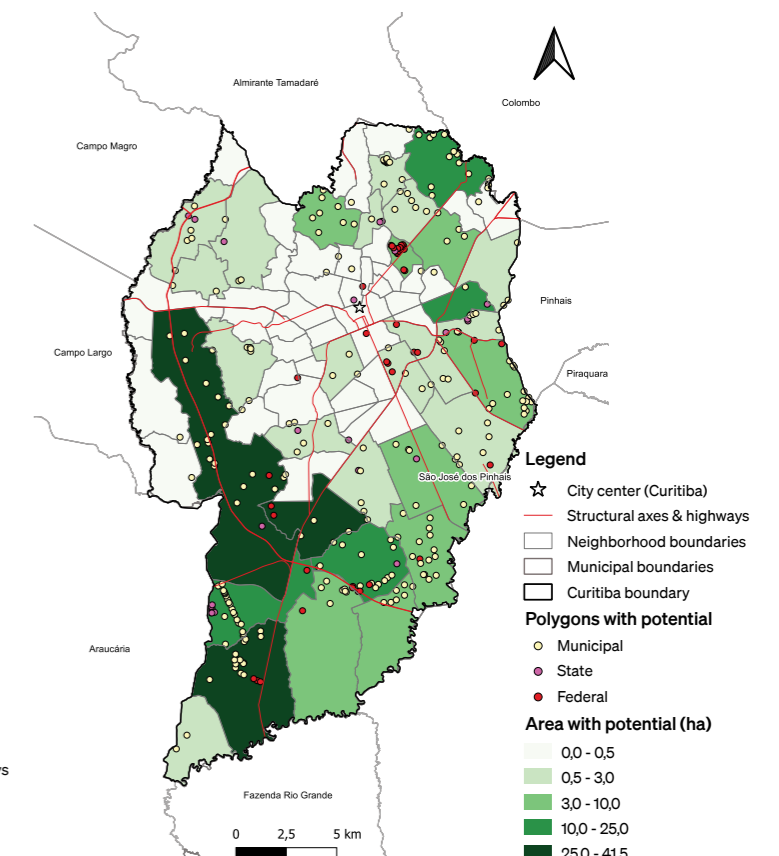
Map 3 – Urban agriculture in Curitiba



Source: Prepared by the authors based on data from Ippuc (2024)¹⁶ and Instituto Escolhas (2023)¹⁷.

The municipality also has 1,506 hectares of potential spaces (unused areas free of buildings and vegetation) for sustainable food production¹⁸. Of this total, 153 hectares are located on municipally owned land, where there is greater capacity for governance and implementation. An additional 11.6 hectares are located on state-owned land and 72.2 hectares on federal land.

Map 4 – Polygons and areas with agricultural potential on public plots by neighborhoods in Curitiba – 2023



Source: prepared by the authors based on data from Ippuc (2024)¹⁹ and Instituto Escolhas (2023)²⁰.

Whether on public or privately owned land, encouraging food production has significant potential to enhance food security in Curitiba, especially if the strategy prioritizes areas with limited access to fresh, healthy food and higher levels of social vulnerability. In just 100 hectares of the mapped areas, it would be possible to produce the equivalent of 6,452 tonnes of vegetables annually, enough to feed 183,221 people²¹.

¹³. The Unified Registry for Social Programs of the Federal Government (*Cadastro Único para Programas Sociais do Governo Federal – CadÚnico*) is a tool used to identify and characterize low-income families in Brazil in order to support the formulation and implementation of public policies aimed at reducing social inequalities.

¹⁴. IBGE – Instituto Brasileiro de Geografia e Estatística. *Censo Agropecuário 2017* [Agricultural Census 2017]. Rio de Janeiro.

¹⁵. A survey conducted by Instituto Escolhas mapped 1,118 agricultural polygons in Curitiba using satellite imagery. Polygons were identified based on visual agricultural markers, such as orthogonal planting layouts, vegetation arranged in rows, and beds separated by soil, among others. Activities carried out within enclosed structures (such as sheds and buildings) and those with low visibility via satellite were not included. Initially, only polygons larger than 1,000 m² were mapped. Subsequently, in more densely urbanized areas, smaller polygons were also included. These polygons may include, among other uses, municipal urban gardens and agricultural establishments. Agricultural establishments recorded in the census are georeferenced as points rather than polygons. For this reason, census points and polygons mapped in the study were not aggregated. Particularly in contiguous areas, as shown in the city maps, it is reasonable to assume that agricultural polygons identified through satellite imagery may overlap with georeferenced points from the 2017 Agricultural Census. See: "Hortas urbanas como uma estratégia de combate à fome nas cidades brasileiras. *Relatório Técnico* [Urban gardens as a strategy to combat hunger in Brazilian cities. Technical Report]. São Paulo: Instituto Escolhas, 2023." available [here](#).

¹⁶. Ippuc – Instituto de Pesquisa e Planejamento Urbano. *Setor de Geoprocessamento* [Geoprocessing Sector], 2024.

¹⁷. Hortas urbanas como uma estratégia de combate à fome nas cidades brasileiras. *Relatório Técnico* [Urban gardens as a strategy to combat hunger in Brazilian cities. Technical Report]. São Paulo: Instituto Escolhas, 2023." available [here](#).

¹⁸. See footnote 17.

¹⁹. See footnote 16.

²⁰. See footnote 17.

²¹. Value calculated based on a 1,000m² model unit that produces 6,452.71 kg/year and average consumption of 35.22 kg/year of vegetables per inhabitant in the Southern region. See: Hortas urbanas como uma estratégia de combate à fome nas cidades brasileiras. *Relatório Técnico* [Urban gardens as a strategy to combat hunger in Brazilian cities. Technical Report]. São Paulo: Instituto Escolhas, 2023." available [here](#).

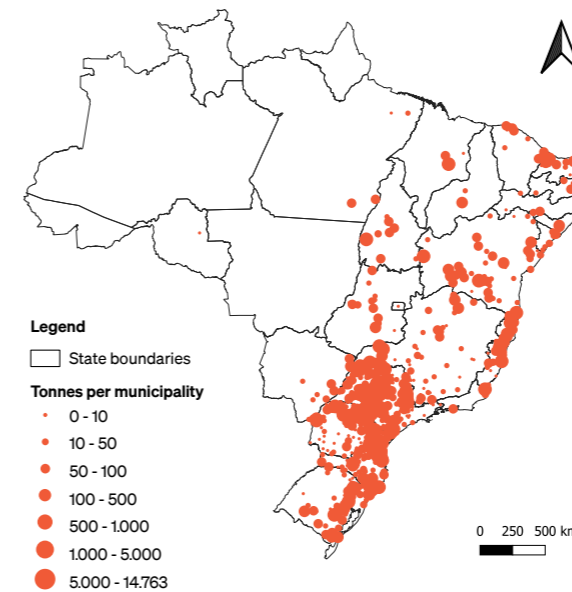
2. Distribution, commercialization, and access to food

CEASA Curitiba is the main food supply hub for the Metropolitan Region of Curitiba and the coastal subregion, standing out in the southern region of the country for the volume of food handled, its extensive infrastructure, and the number of jobs generated. The state of Paraná has five supply centers, with CEASA Curitiba being the only one located in the area covered by this study. CEASA Curitiba plays a strategic role in food distribution. In 2022²², it ranked as the sixth-largest supply center in Brazil²³ and the largest in the southern region in terms of volume received, totaling 874,778 tonnes of food sourced from 1,089 municipalities across all five regions of Brazil, as well as from eight countries in South America, North America, Europe, and Asia. Among the products traded in 2022, 44.8% were fruits (Map 5), 27.1% were root, tuber, bulb, and rhizome vegetables (Map 6), 18.6% were fruit vegetables (Map 7), and 8.0% were leaf, flower, and stem vegetables (Map 8).

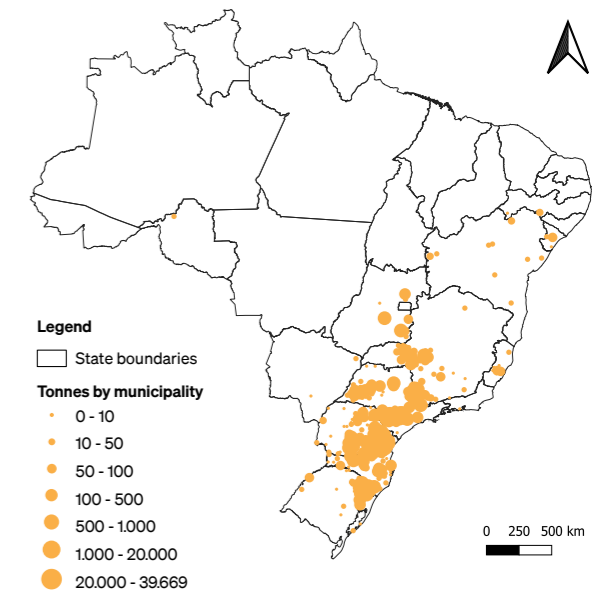


22. CONAB. B.I. do Mercado Atacadista de Hortigranjeiros [Horticultural Wholesale Market]. CONAB, 2022. Available [here](#). Accessed on: 23 Sept. 2023.
 23. Behind Ceagesp in São Paulo (2,973,338,032 ton), Ceasaminas in Belo Horizonte (1,798,465,737 ton), Ceasa-RJ in Rio de Janeiro (1,781,095,990 ton), Ceasa-PE in Recife (888,225,970 ton), and Ceasa-GO in Goiânia (879,819,793 ton) (CONAB, 2022).

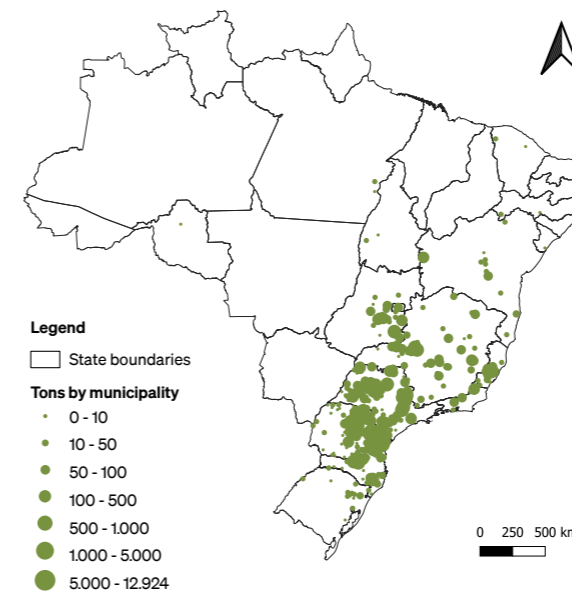
Map 5 – Fruits traded at Ceasa Curitiba, by municipality of origin – 2022



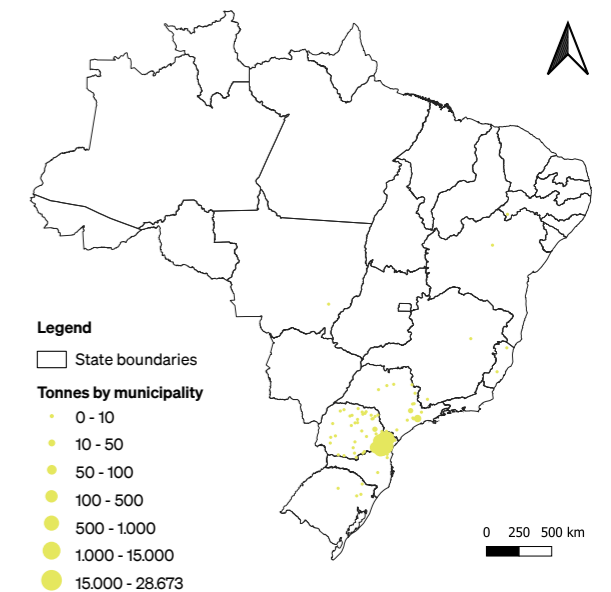
Mapa 6 – Vegetables (root, tuber, bulb, and rhizome) traded at Ceasa Curitiba, by municipality of origin – 2022



Map 7 – Fruit vegetables traded at Ceasa Curitiba, by municipality of origin – 2022



Map 8 – Vegetables (leaf, flower, and stem) traded at Ceasa Curitiba, by municipality of origin – 2022



Source: Prepared by the authors based on data from Conab (2022)²⁴.

24. CONAB. BI do Mercado Atacadista de Hortigranjeiros [B.I. of the Horticultural Wholesale Market]. Conab, 2022. Available [here](#). Accessed on: 23 Sept. 2023.

About one-third of the food traded at CEASA Curitiba in 2022 originated from the 36 municipalities of the Metropolitan Region of Curitiba and the coastal subregion, indicating the potential for promoting short food supply chains²⁵. From this region originate: 99.7% of leaf, flower, and stem vegetables (Map 8), 42% of fruit vegetables (Map 7), and 46.3% of vegetables classified as roots, tubers, bulbs, and rhizomes (Map 6). This proximity can reduce transport distances, CO₂ emissions, and losses along the supply chain. On the other hand, only 11% of the fruits traded at CEASA Curitiba originate from the Metropolitan Region of Curitiba and the coastal subregion; when considering the state of Paraná as a whole, this share increases to 19.6%. Most of the fruits (Map 5) come from São Paulo (27.3%), followed by Santa Catarina (13.8%), Rio Grande do Sul (8.6%), and Bahia (8%). At the same time, approximately 54,878 tonnes of food originating from the region were redistributed to other supply centers in

Brazil, with São Paulo and Rio de Janeiro together receiving 63.3% of this volume (19,000 tonnes and 15,700 tonnes, respectively).

Food circulation has a significant impact on mobility, road infrastructure, and CO₂ emissions. In the area supplied by CEASA Curitiba, an origin-destination survey conducted in 2017 identified a daily flow of 5,191 to 9,490 trucks, representing 25% to 36% of total vehicle traffic and affecting the performance of more than 10 public transport operators using this road network. Regarding food retail and food services, the Metropolitan Region of Curitiba and the coastal subregion together have 49,455 private establishments, classified as healthy (65%) or unhealthy (35%) depending on the type of food sold²⁶. Curitiba accounts for the largest share (50%), with 14,868 establishments classified as healthy and 10,200 as unhealthy, while access becomes increasingly limited in areas farther from the city center or with lower levels of urbanization (Map 9).

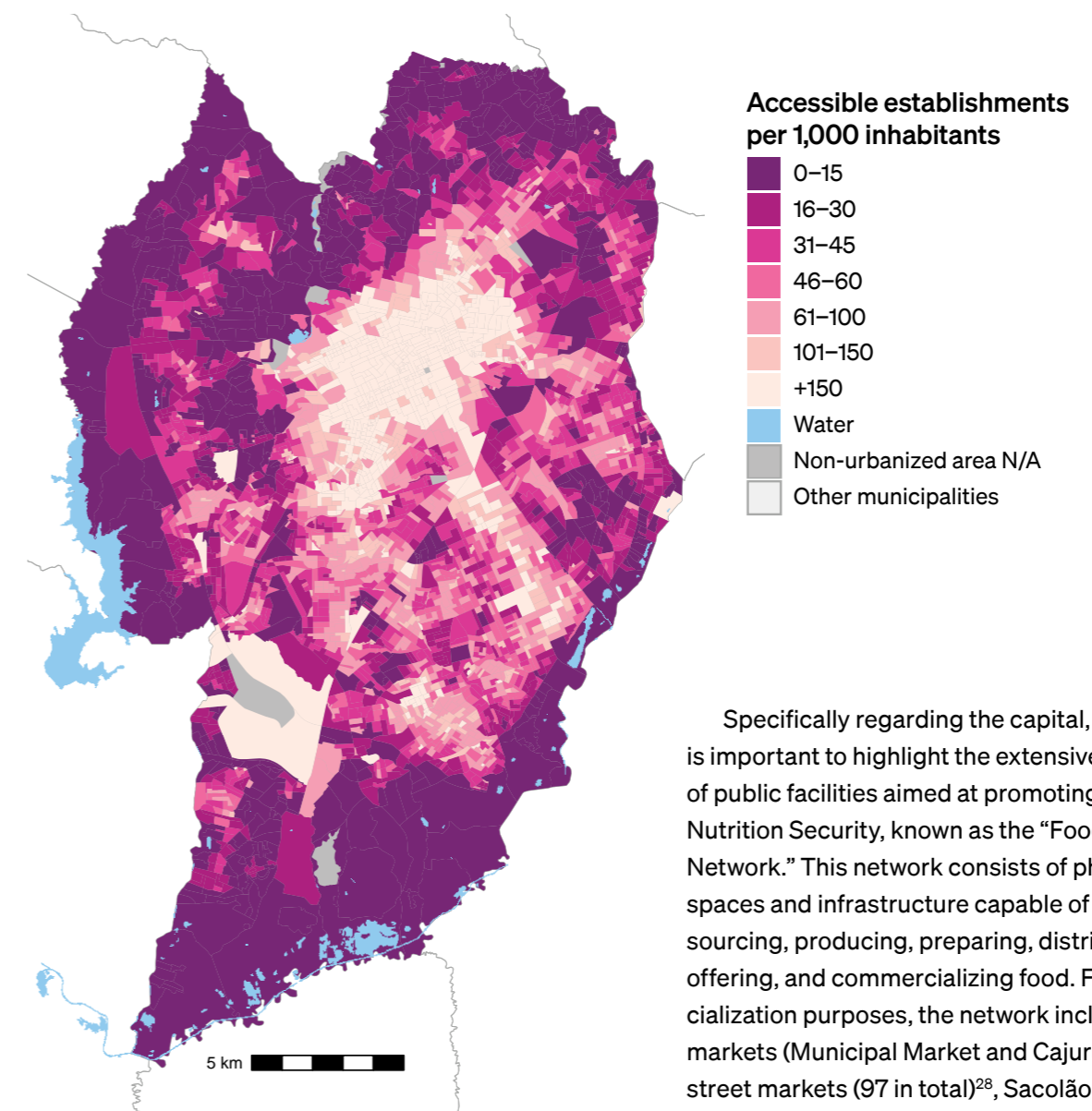


Sacolão da Família (municipal fresh produce market). Photo: José Fernando Ogura.

²⁵. The data provided by Conab refer to the municipality from which the product was dispatched to Ceasa, rather than to its place of production. The country still faces challenges in improving food traceability, particularly for fresh products, due to the lack of standardized systems, fragmentation of the production chain, and logistical constraints. These limitations hinder more precise environmental analyses and restrict consumers' ability to choose foods from nearby sources.

²⁶. Classification based on the methodology developed in the study: "MDS; IICA; FEALQ. Mapeamento dos Desertos Alimentares: acesso à alimentação saudável. Versão Preliminar [Mapping Food Deserts: Access to Healthy Food. Preliminary version]. 2024."

Map 9 – Private establishments offering healthy food accessible within a 15-minute walking distance (density per 1,000 inhabitants) in Curitiba



Source: MDS et al. (2024)²⁷.

Specifically regarding the capital, Curitiba, it is important to highlight the extensive network of public facilities aimed at promoting Food and Nutrition Security, known as the "Food Access Network." This network consists of physical spaces and infrastructure capable of collecting, sourcing, producing, preparing, distributing, offering, and commercializing food. For commercialization purposes, the network includes public markets (Municipal Market and Cajuru Market), street markets (97 in total)²⁸, Sacolão da Família outlets (11 units selling seasonal products at a fixed price per kilogram—BRL 3.99 as of January 2025), and Armazém da Família stores (35 units in Curitiba and 15 affiliated units in the Metropolitan Region of Curitiba, offering food and personal hygiene products at below-market prices)²⁹.

²⁷. Prepared by the Public Policy Group (ESALQ/USP), the Geoprocessing Laboratory (POLI/USP) and the Center for Metropolitan Studies (CEM) within the framework of the Technical Cooperation Project for Food and Nutrition Security: availability and access to healthy food and the fight against rural poverty – IICA/BRA/17/001. Draft version - May 2024. MDS – Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome; IICA; FEALQ. Mapeamento dos Desertos Alimentares: acesso à alimentação saudável. Versão preliminar [Mapping Food Deserts: Access to Healthy Food. Preliminary version]. 2024.

²⁸. Public street markets take a wide variety of forms, including: daytime markets (35) and nighttime markets (17); organic markets (12 daytime, 2 nighttime); fish markets (2); gastronomic markets (2); coastal products markets (1); cooperative markets (1); direct sales by producers (1); and single-price markets (6). Under the "Nossa Feira" program, single-price markets sell fruits and vegetables at BRL 3.99 per kilogram.

²⁹. The program, in operation for 38 years, serves adults with a household income of up to five minimum wages, including individuals with special dietary needs. Currently, more than 394,000 families are registered, the vast majority with an income of up to two minimum wages.

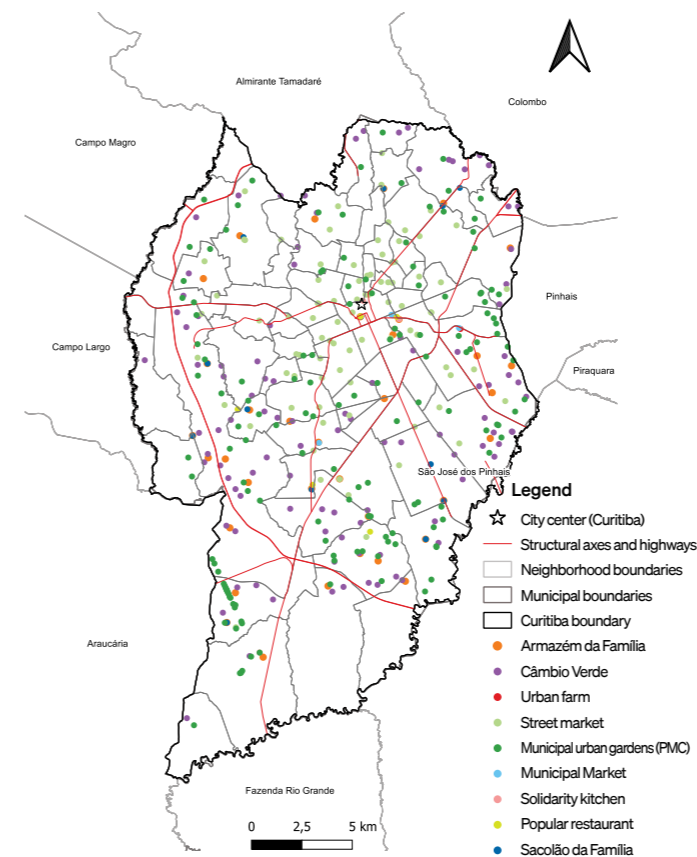
In terms of food provision, the network also includes five Popular Restaurants, which provide balanced meals at affordable prices³⁰, as well as the Mesa Solidária program, an intersectoral initiative that provides logistical support and space for meal distribution in partnership with civil society organizations, targeting populations in situations of vulnerability and social risk, particularly people experiencing homelessness. The network also

includes the Câmbio Verde program, which promotes the exchange of recyclable materials or used cooking oil for seasonal fruits and vegetables, and the Urban Community Gardens program, which coordinates, implements, and supports the maintenance of gardens aimed at self-consumption and commercialization. In addition to the municipal network, the study identified 52 solidarity kitchens³¹ and 13 community bakeries³² in Curitiba (Map 10).



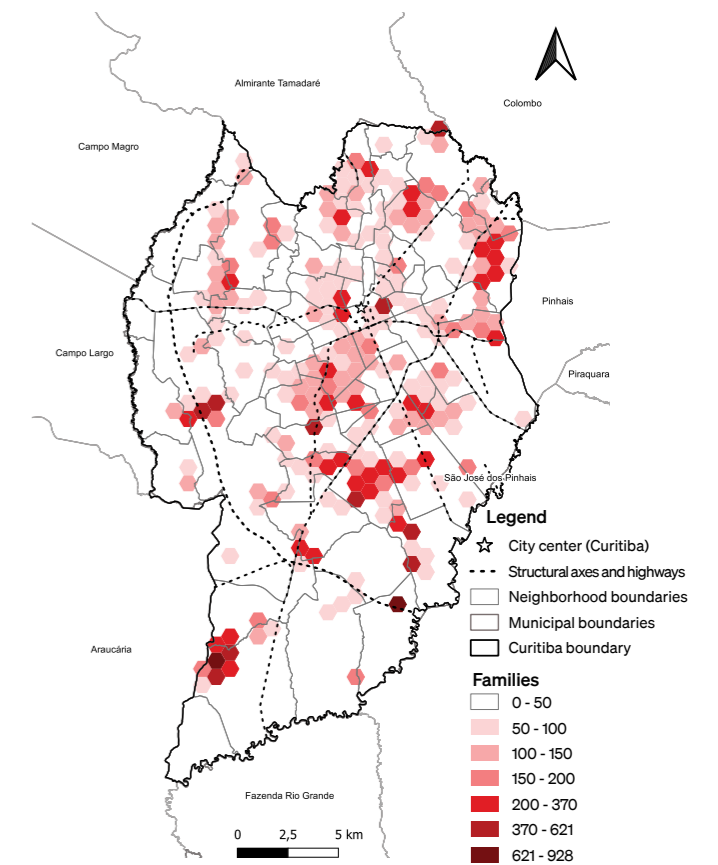
A child walking through a community garden in Curitiba. Photo: Daniel Castellano/SMCS.

Map 10 – Distribution of food and nutrition security facilities in Curitiba, 2023



Source: Prepared by the authors based on data from Ippuc – Geo (2024)³³.

Map 11 – Families living in poverty or extreme poverty registered with CadÚnico with reduced access (walking distances over 800m) to establishments of the SAN network with access to subsidized food



Source: Prepared by the authors based on data from Ippuc (2024)³⁴ and MDS (2024)³⁵.

Public facilities aimed at promoting Food and Nutrition Security aim to expand the availability of healthy food. However, this network still needs to be strengthened and expanded, with a focus on areas with higher levels of social vulnerability.

Map 11 identifies areas of the municipality with a concentration of families living in poverty or extreme poverty who lack adequate access to Food and Nutrition Security network facilities. The darker areas on the map, therefore, indicate priority areas for expanding the SAN network.

³⁰. A total of 4,700 meals are provided daily at BRL 3.00, in addition to 400 free meals for people assisted by the social assistance network.
³¹. MDS – Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. **Cadastro do Programa Cozinha Solidária**. Estratégia Alimenta Cidades [Registry of the Solidarity Kitchen Program. Alimenta Cidades Strategy]. (2024).
³². CEFURIA – Centro de Formação Urbano Rural Irmã Araújo. **Padarias Comunitárias do CEFURIA** [Community Bakeries of CEFURIA], 2024. Available [here](#). Accessed on: 15 Jan. 2025.

³³. See footnote 16.
³⁴. See footnote 16.
³⁵. MDS – Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. **Cadastro Único**, 2024.

3. Food consumption

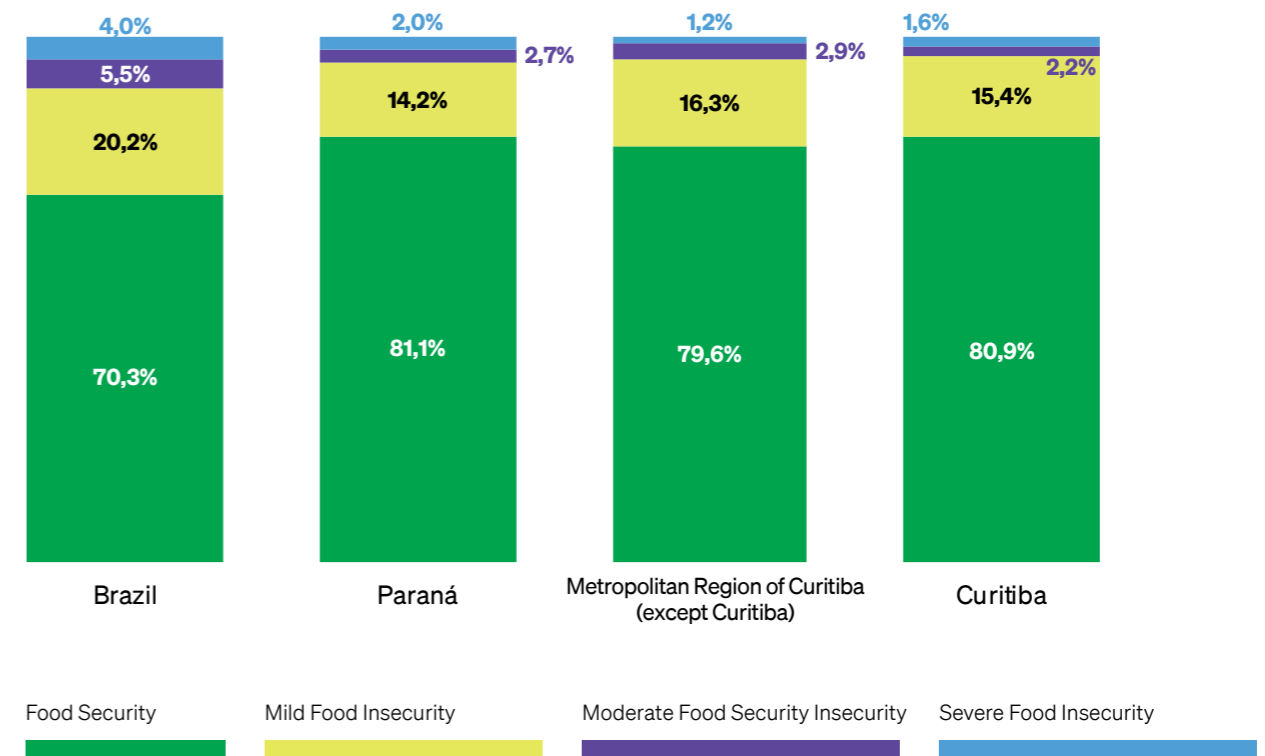
While 70.3% of the Brazilian population is food secure³⁶, Curitiba and its Metropolitan Region record rates of 80.9% and 79.6%, respectively³⁷. The data do not cover the coastal subregion. Mild food insecurity, associated with difficulties in maintaining a quality diet or uncertainty about future access to food, affects 15.4% of the population in Curitiba and 16.3% in the rest of the Metropolitan Region (Figure 4). Although lower than the national average (20.2%), this percentage remains higher than in the rest of the state of Paraná, which records 14.2%. Moderate and severe food insecurity affect 3.8% of the population in Curitiba and 4.1% in the rest of the Metropolitan Region.



³⁶. According to the Brazilian Food Insecurity Scale (EBIA), four levels are distinguished: food security (full and regular access to food), mild food insecurity (concern or uncertainty about future access to food), moderate food insecurity (quantitative reduction in food consumption), and severe food insecurity (hunger).

³⁷. IBGE – Instituto Brasileiro de Geografia e Estatística. (2023) PNAD Contínua – Pesquisa Nacional por Amostra de Domicílios Contínua (2023): **Segurança alimentar** (microdados) [PNAD Continuous – Continuous National Household Sample Survey (2023): Food security (microdata)]. Available: [here](#). Accessed on: 25 Aug 2024.”.

Figure 4 – Percentage distribution of the population according to household food security situation in Brazil, Paraná, Metropolitan Area (except the capital), and Curitiba, in 2023



Source: prepared by the authors based on data from IBGE (2023)³⁸.

In the Metropolitan Area of Curitiba, food insecurity affects some population groups disproportionately, such as the elderly, women, brown, black, yellow, and Indigenous people.

- 33.3% of severely food insecure people in the Metropolitan Area of Curitiba are elderly (except in the capital Curitiba). This is the same percentage that affects the adult population, even though the elderly represent only 12.6% of the population of the Metropolitan Area of Curitiba (except Curitiba) and 44.6% of adults.

- Women, representing 50.7% of the population of the Metropolitan Area of Curitiba (except the capital itself), are disproportionately affected by severe food insecurity (66.7%), with the percentage of affected men being 33.3%.
- In the capital, yellow and Indigenous people represent only 1.4% of the population, but account for 9.1% of cases of severe food insecurity. The same applies to brown and Black people (24.2% of the capital’s population and 30.3% of severe food insecurity cases).

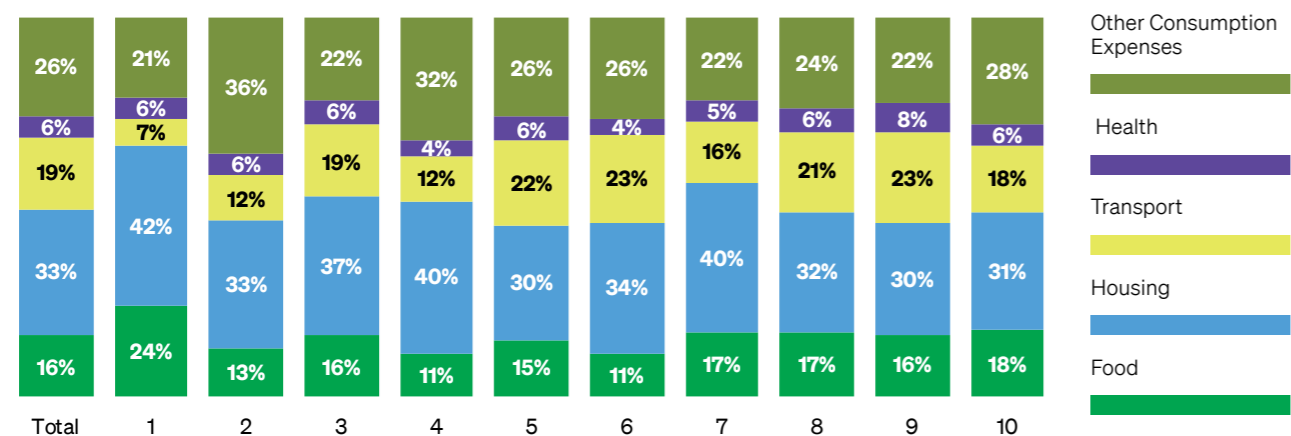
³⁸. IBGE – Instituto Brasileiro de Geografia e Estatística. (2023) PNAD Contínua – Pesquisa Nacional por Amostra de Domicílios Contínua (2023): **Segurança alimentar** (microdados) [PNAD Continuous – Continuous National Household Sample Survey (2023): Food security (microdata)]. Available: [here](#). Accessed on: 25 Aug 2024.”.

Situations of food insecurity are mainly associated with insufficient income to guarantee adequate food. Low-income families in the Metropolitan Area of Curitiba face more severe challenges in meeting essential expenses such as food, housing, and personal transportation³⁹. In 2018, the average expenditure on food in the

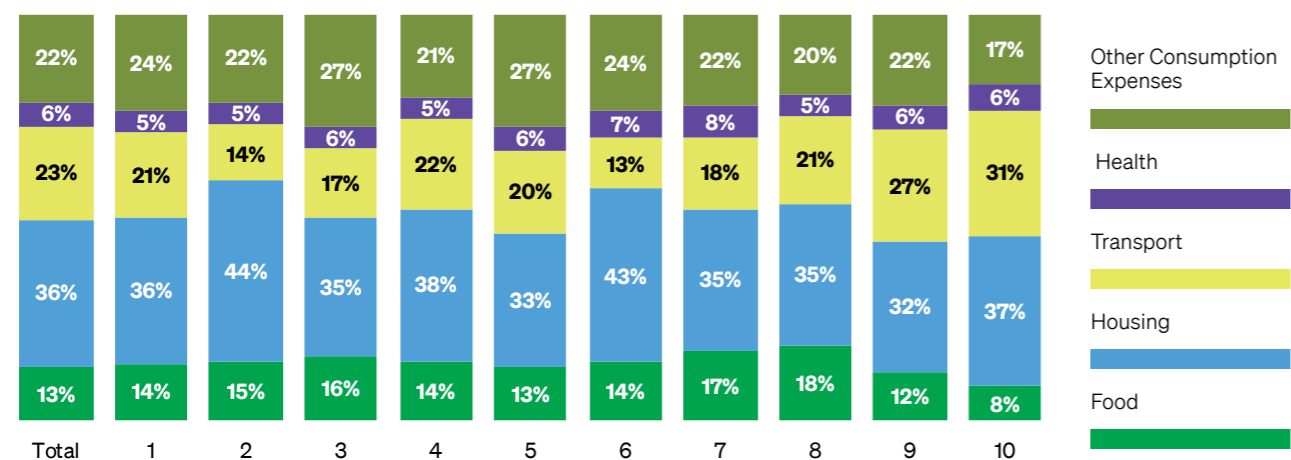
Metropolitan Area of Curitiba (except Curitiba) reached 16% of the total household consumption expenditure. For families with a lower monthly per capita income - equal to or less than BRL562 - the percentage reaches 24%. The percentage of spending on food in the capital is lower, averaging 13% of total expenditure (Figure 5).

Figure 5 - Percentage distribution of monetary and non-monetary consumption expenditures, by decile of per capita household income, 2018

Metropolitan Region of Curitiba (except the capital)



Curitiba



Source: Prepared by the authors based on data from IBGE (2018)⁴⁰.

NOTES: (1) Unit of analysis - all values presented are per capita household values. (2) The set of consumption expenditures also includes the following groups: personal hygiene and care; education; clothing; recreation and culture; tobacco; personal services; and miscellaneous expenses. (3) Income deciles range from less than or equal to BRL 562 in the first decile to more than BRL 3,525 in the last decile for the Metropolitan Region of Curitiba (excluding Curitiba), and from less than or equal to BRL 651 to more than BRL 4,787, respectively, for Curitiba.

³⁹. Household expenditures were organized into income deciles, considering specific geographic breakdowns: Curitiba; the Metropolitan Region of Curitiba (excluding the capital); and the Metropolitan Region of Curitiba as a whole. In cases where the urban sample was insufficient, the data were supplemented with state-level information, including rural areas. Based on data from: IBGE - Instituto Brasileiro de Geografia e Estatística (2018). POF - Pesquisa de Orçamentos Familiares: Microdados [POF - Family Budgets Survey: Microdata].

⁴⁰. IBGE - Instituto Brasileiro de Geografia e Estatística (2018). POF - Pesquisa de Orçamentos Familiares: Microdados [POF - Family Budgets Survey: Microdata].

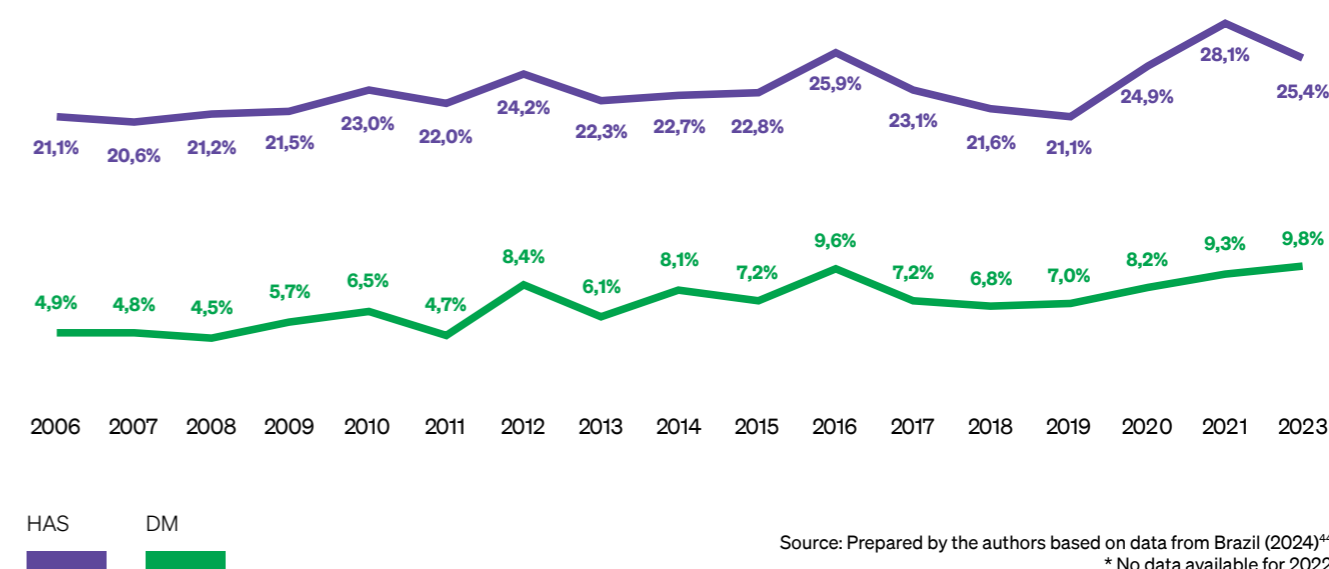
In household food expenditures in the Metropolitan Region of Curitiba, meat, offal, and fish (16%); beverages and infusions (12%); milk and dairy products (10%); and baked goods (9%) were the predominant items in 2018. Vegetables and fruits accounted for only 3% and 4%, respectively.

According to the Vigitel survey (Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey), conducted by the Ministry of Health in 2023, only 25% of individuals aged 18 or over in Curitiba consume five or more daily portions of fruits or vegetables⁴¹. The 2019 National Health Survey⁴², conducted in Brazilian state capitals, identified an inverse relationship between household income and the consumption of ultra-processed foods⁴³ among the adult population of Curitiba. Lower-income groups, in

per capita terms, tended to consume up to four times more ultra-processed foods than higher-income groups. The opposite pattern is observed for foods such as vegetables, fruits, legumes, and nuts, whose consumption increases from 12% among those earning up to one-quarter of the minimum wage per capita to 30% among those earning more than five minimum wages.

Poor diet is directly associated with higher rates of overweight and obesity and is a risk factor for non-communicable diseases (NCDs), such as diabetes and hypertension. In Curitiba, hypertension affects one-quarter of adults, increasing from 21.1% in 2006 to 25.4% in 2023. The proportion of adults with diabetes doubled over the same period, reaching nearly 10% in 2023 (Figure 6).

Figure 6 - Percentage of adults (≥18 years) reporting a medical diagnosis of systemic arterial hypertension (SAH) and diabetes mellitus (DM) in Curitiba, 2006-2023



Source: Prepared by the authors based on data from Brazil (2024)⁴⁴. * No data available for 2022.

⁴¹. Brasil, Ministério da Saúde. (2024). Vigitel - Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico. 2006-2023 [Vigitel - Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey. 2006-2023]. Available [here](#).

⁴². IBGE - Instituto Brasileiro de Geografia e Estatística (2019). **Pesquisa Nacional de Saúde** - PNS [National Health Survey]. Available [here](#).

⁴³. According to the Dietary Guidelines for the Brazilian Population (*Guia alimentar para a população brasileira*), issued by the Ministry of Health, ultra-processed foods are those whose production involves multiple stages and processing techniques. They typically contain a large number of ingredients, including substances used exclusively in industrial processing, as well as culinary ingredients. These foods are nutritionally unbalanced, and their formulation encourages overconsumption. Examples include filled cookies, soft drinks, instant noodles, and snack foods. Definition available in: Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. **Guia alimentar para a população brasileira** [Dietary Guidelines for the Brazilian Population] / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. - 2. ed., 1. reimpressão. - Brasília: Ministério da Saúde, 2014*.

⁴⁴. Brasil. Ministério da Saúde. Sistema de Vigilância Alimentar e Nutricional - SISVAN. **Estado Nutricional** (microdados): 2008-2022 [Food and Nutrition Surveillance System (SISVAN). Nutritional Status (microdata): 2008-2022]. Brasília: Ministério da Saúde, 2024. Available [here](#). Accessed on: 26 July 2024.

4. Waste Treatment

Across the different activities that make up the food system—production, processing, distribution, commercialization, and consumption—there are losses, waste, and the generation of residues. Strategies to reduce these effects aim to maximize the use of inputs, products (food), and co-products from each stage of the food system by utilizing surpluses and properly treating waste.

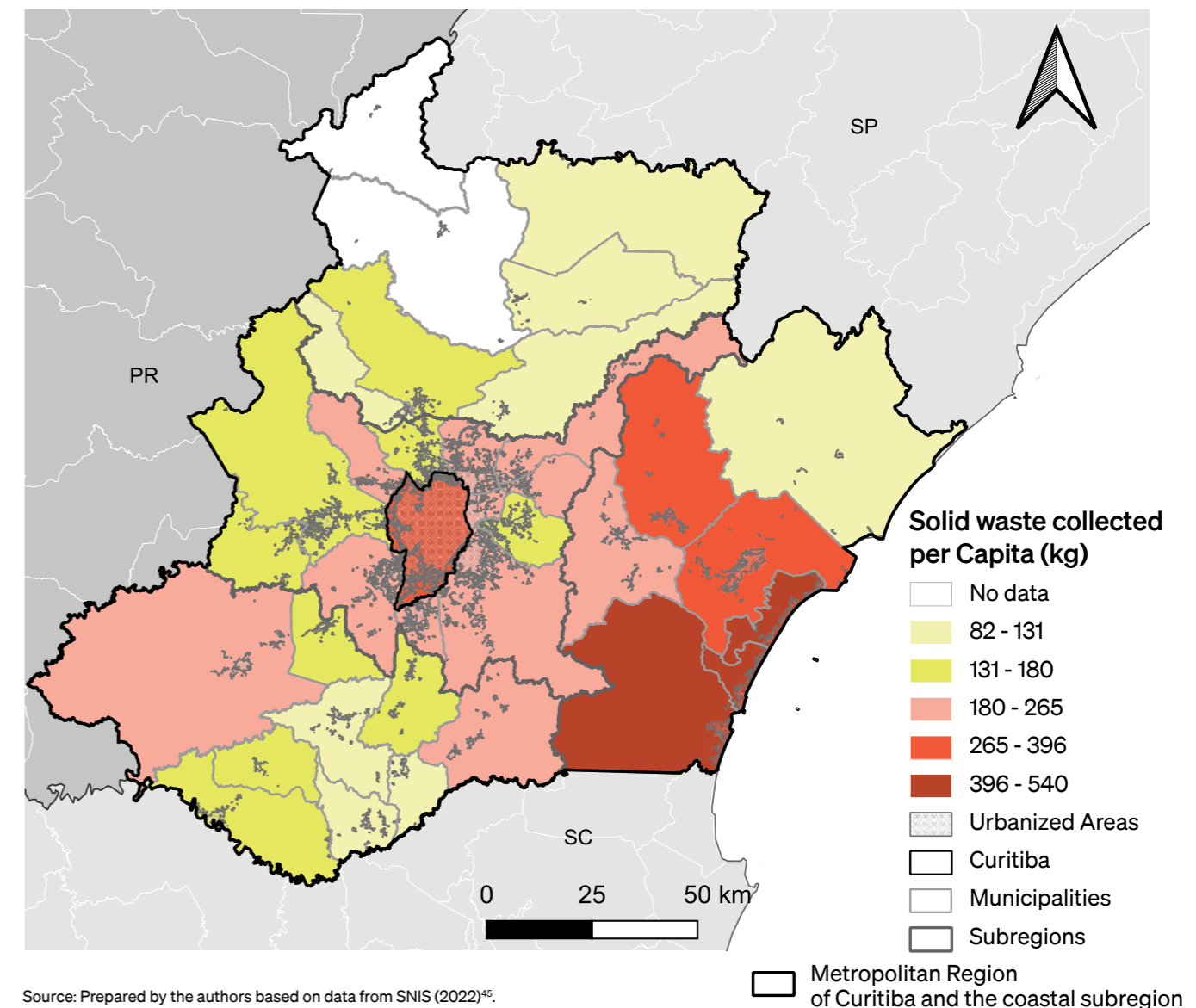


In 2022, the total volume of household organic waste and public urban solid waste collected by municipalities in the Metropolitan Region of Curitiba and the coastal subregion reached 1,027,800 tonnes, with Curitiba accounting for 53% of this total (548,844 tonnes). The second-largest volume was recorded in São José dos Pinhais (8%, or 80,318.5 tonnes), followed by Paranaguá (6%, or 57,711 tonnes) and Colombo (5%, or 49,620 tonnes). At the other end of the distribution, municipalities with the lowest

volumes collected include Campo do Tenente (0.10%, or 1,078 tonnes), Tunas do Paraná (0.07%, or 752 tonnes), Adrianópolis (0.07%, or 708 tonnes), and Guaraqueçaba (0.06%, or 607 tonnes).

Coastal municipalities such as Guaratuba, Pontal do Paraná, and Matinhos stand out in terms of per capita waste collection, with annual volumes of 540 kg, 473 kg, and 461 kg per inhabitant, respectively. Curitiba ranks sixth, with 309 kg per capita per year (Map 12).

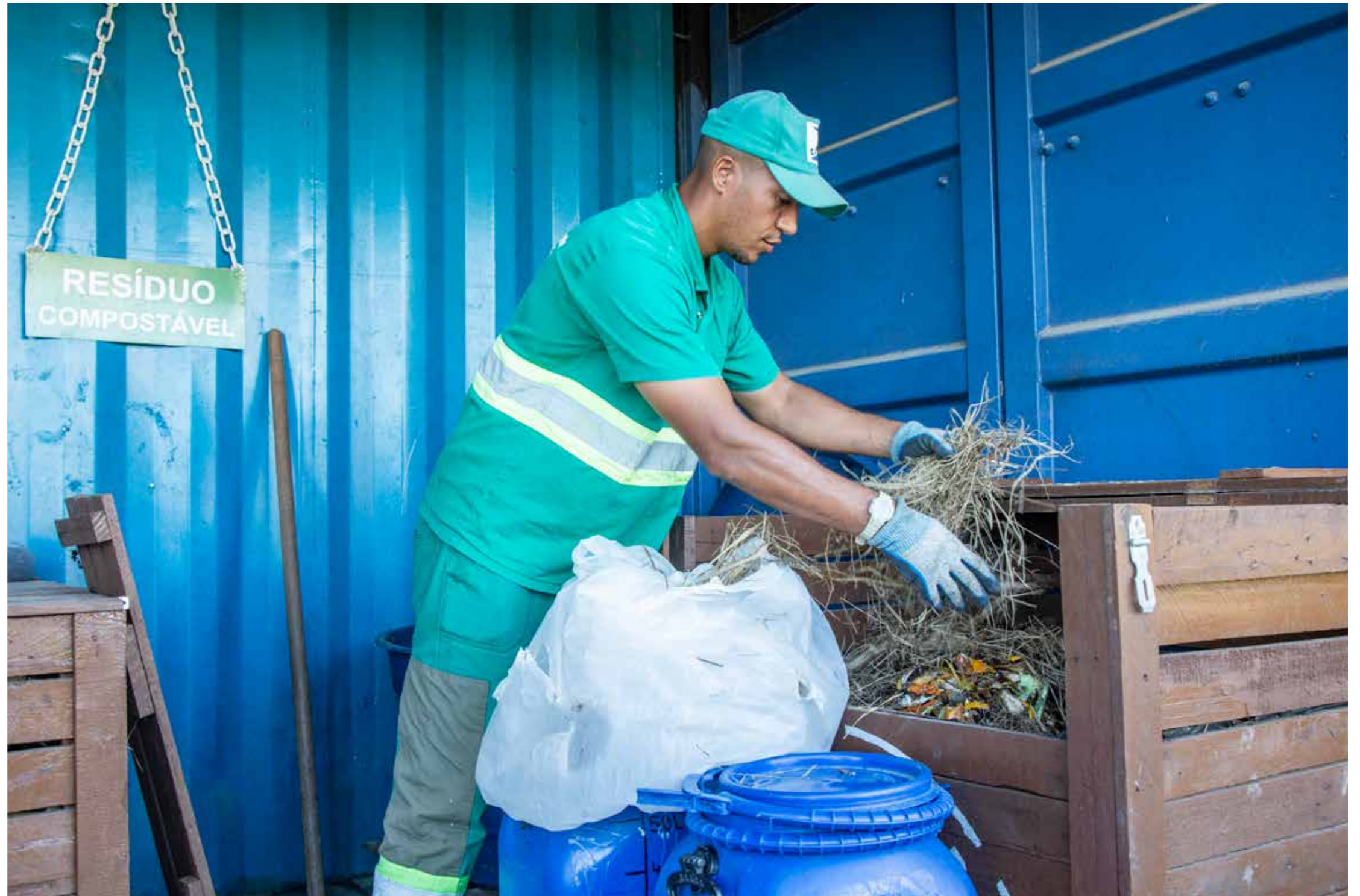
Map 12 – Total solid waste collected per capita in the Metropolitan Region of Curitiba and the coastal subregion, 2022



Source: Prepared by the authors based on data from SNIS (2022)⁴⁵.

⁴⁵ SNIS – Sistema Nacional de Informações Sobre Saneamento. **Série Histórica** [Historical Series]. Brasília, DF: SNIS, 2022. Available [here](#). Accessed: Apr 19, 2024.

Solid waste can be divided into three fractions: organic, recyclable (dry), and residual waste. The first two can be reused for various purposes and transformed, returning as inputs for different economic activities. Only the third and smallest fraction (residual waste) should be sent to landfills. Organic matter, which currently accounts for 40%⁴⁶ of the waste sent to landfills⁴⁷, is estimated at 411,120 tonnes. This organic fraction generates an annual cost of approximately BRL 38.7 million⁴⁸ for landfill disposal. This amount could be reduced if the waste were redirected to alternative services, such as composting programs. Recovering this waste could generate 10,278 tonnes of compost using only 10% of the material currently sent to landfills⁴⁹. In turn, this organic compost could be used as an input for food production in the region.



Municipal Composting Program of the City of Curitiba at the Érico Veríssimo Ecopoint, Alto Boqueirão neighborhood. Curitiba, 7 June 2023. Photo: Ricardo Marajó/SMCS.

⁴⁶. Average calculated based on the total volume of municipal solid waste sent to the Estre landfill, the company providing services to the Intermunicipal Consortium for Urban Solid Waste Management – Curitiba Metropolitan Region (Conresol). In: "CURITIBA. Secretaria Municipal do Meio Ambiente (SMMA). Gravimetria dos materiais destinados ao Aterro Sanitário ao longo dos anos (2012–2021) [Gravimetric analysis of materials sent to the landfill over time (2012–2021)]. Unpublished. Curitiba: SMMA, 2022".

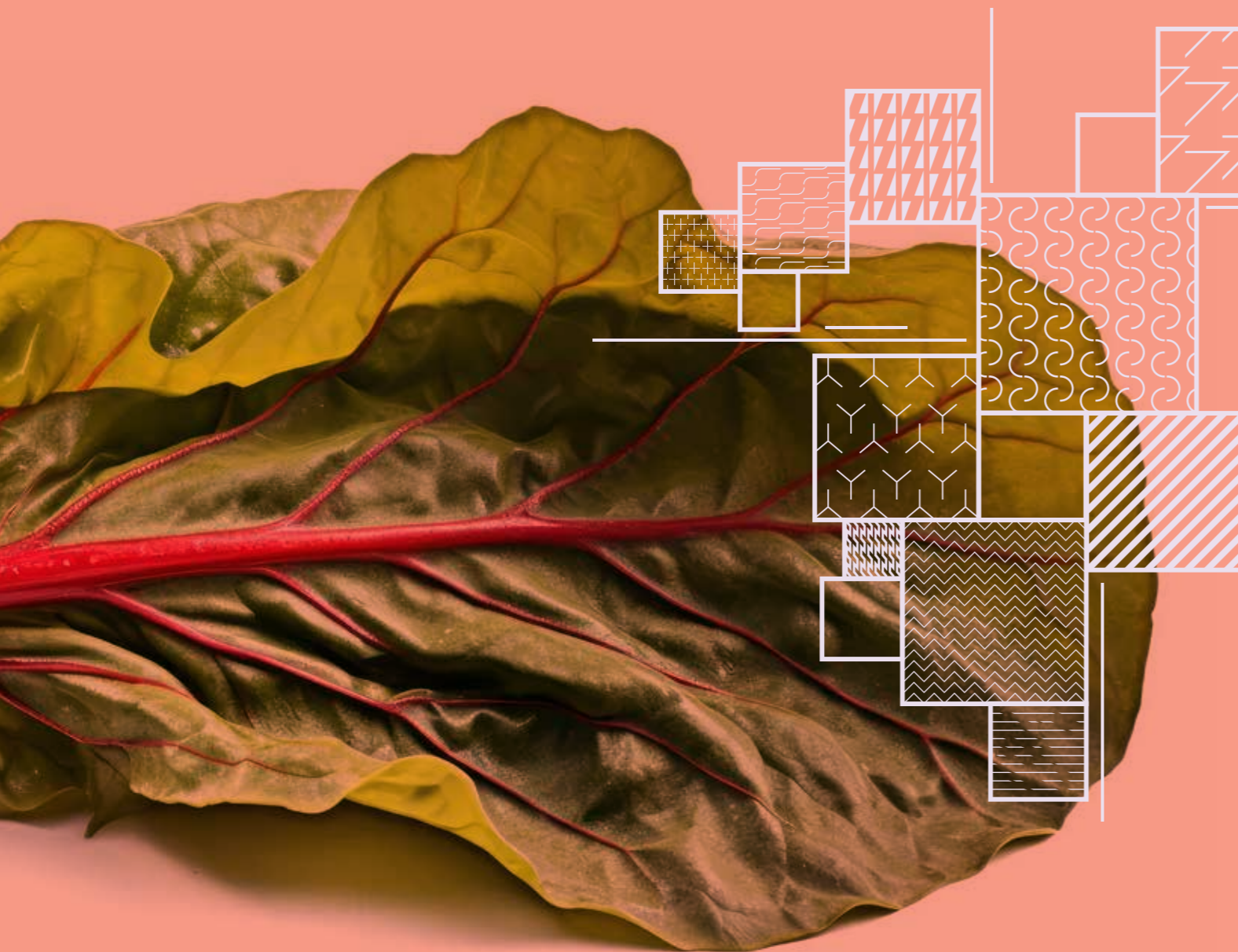
⁴⁷. A significant share of organic waste is due to food waste: nearly one-fifth of all food produced globally is wasted. It is estimated that 60% of this waste occurs at the household level, 26% in food services, and 13% in food retail. The average amount of food waste per capita is 72 kg per person per year in developing countries and 79 kg in developed countries, according to United Nations Environment Programme (2024), Food Waste Index Report 2024. Nairobi. Available [here](#). In addition to the loss of economic and natural resources and the inefficient use of natural resources from a distributional perspective, food waste increases the generation of solid waste, leading to higher greenhouse gas emissions and increased waste management costs.

⁴⁸. The estimate of organic waste (40% of total waste sent to landfills) was multiplied by the cost per tonne (BRL 94.16) established by Conresol in 2024 for landfill disposal.

⁴⁹. Estimated generation of 1 kg of compost for every 4 kg of organic waste, based on the experience of Curitiba's Municipal Secretariat for Food and Nutrition Security (SMSAN).

5. Conclusion

Curitiba, the Metropolitan Region, and its coastal subregion have significant potential to make the transition to more sustainable and healthy food systems.



The figures presented demonstrate this through:

- regional food production capable of supplying the population, supporting the development of short food supply chains that can reduce food losses and CO₂ emissions in distribution, while also generating local employment and income.

- strong urban agriculture in Curitiba, integrated into a broad food supply network that includes various public food and nutrition security facilities. This network can serve as a reference for other municipalities in the region.

- food security levels above the national average. The capital stands out nationally as a reference in public policies promoting healthy and sustainable food systems, combining food production, food and nutrition security, job and income generation, the use of idle land, social mobilization, and sustainable practices.

The data analysis also highlights important challenges that Curitiba, the Metropolitan Region, and the coastal subregion must address in order to advance the transition toward more sustainable and healthy food systems. The findings point to a decline in the production of key foods for food security, such as beans, a significant reduction in the number of family farming establishments, and the ageing of producers.

In terms of food distribution, the high volume of freight traffic in the region significantly impacts mobility, road infrastructure, and CO₂ emissions, particularly in the municipality of Curitiba. Regarding access to food, despite the extensive network of food and nutrition security facilities and supply infrastructure, the data show

that Curitiba still has areas with limited access to establishments offering healthy food. In terms of consumption, severe food insecurity remains a concern among certain population groups. There is also a notable increase in the incidence of diet-related non-communicable diseases.

How can regional urban planning contribute to making food production, distribution, commercialization, and consumption in Curitiba, the Metropolitan Region, and the coastal subregion healthier and more sustainable?

Urban planners and public policy managers in the municipalities of Curitiba, the Metropolitan Region, and the coastal subregion can develop a range of initiatives with positive impacts on local and regional food systems, based on an integrated approach that acknowledges territorial inequalities. Food systems can be integrated into regional planning through urban policy instruments such as the Integrated Urban Development Plan (PDUI) for Curitiba, the Metropolitan Region, and the coastal subregion; Master Plans; zoning regulations; Compulsory Parceling, Building, or Use (PEUC); and the right of pre-emption. Examples include:

- 1 **Planning the implementation of public food and nutrition security** facilities in areas with limited access to fresh or minimally processed foods;

- 2 **Removing restrictions and creating incentives for agricultural practices within urban zoning** to stimulate local food production;

- 3 **Promoting the sustainable use of idle urban spaces and vacant land** for agroecological practices, agroforestry systems, and composting, including as a strategy for restoring degraded Permanent Preservation Areas;

- 4 **Ensuring public policies that strengthen urban agriculture in vulnerable areas**, such as the integration of urban gardens within Social Interest Housing developments;

- 5 **Using instruments that promote the social function of property (such as PEUC) to encourage the use of idle land for urban agriculture**, composting, and related activities; idle landowners can be notified and encouraged to put their properties to such uses.

- 6 **Using instruments such as the right of pre-emption to acquire strategic areas for food production** or to implement other food security policies;

- 7 **Encouraging commercial establishments that offer healthy food** while discouraging those that sell ultra-processed and unhealthy products through zoning and licensing regulations;

- 8 **Creating “healthy food zones” in strategic areas**, such as near schools, including urban gardens, farmers’ markets, public SAN facilities, and spaces for sports and leisure; these initiatives may involve civil society and the private sector, such as school communities, responsible consumption groups, and local businesses;

- 9 **Promoting dialogue and integrated actions among municipalities in the region to foster a more sustainable and healthy regional food system**, engaging different actors such as farmers, traders, industry, and consumers; within the Integrated Urban Development Plan (*Plano de Desenvolvimento Urbano Integrado* - PDUI), this may include delimiting a metropolitan reserve of agricultural land, promoting the diversity of actors and practices within the food system, and supporting a transition toward pesticide-free territories or integrated composting policies;

- 10 **Improving metropolitan infrastructure and logistics for food transport and distribution**, reducing inequalities in producers’ access to markets, lowering costs, and expanding access to healthy food for the population.

6. Technical sheet

This study was jointly developed by Instituto Escolhas, the Institute for Research and Urban Planning of Curitiba (IPPUC), and the Municipal Secretariat for Food and Nutrition Security of Curitiba (SMSAN).

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