

CITIES AND CIRCULAR ECONOMY FOR FOOD

SÃO PAULO, BRAZIL



ELLEN
MACARTHUR
FOUNDATION

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EXECUTIVE SUMMARY

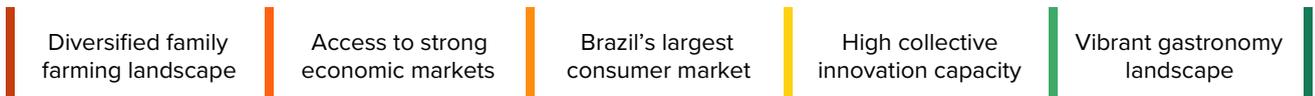
São Paulo, Brazil

São Paulo is a developing mega-hub situated at the heart of the São Paulo Metropolitan Region (SPMR), an economic powerhouse that accounts for approximately 18% of the country's GDP. It is Brazil's largest city and main consumer market. The region faces significant challenges associated with a landscape of profound disparities, and the food system is being increasingly regarded as an important vector for economic, societal, and environmental development. Valuable assets such as a thriving gastronomy landscape and a high innovation capacity from its numerous research institutions, universities and corporations, suggest that São Paulo is uniquely positioned to develop a distributed and inclusive regional food system based on the principles of a circular economy.

THE CITY OF **SÃO PAULO** CAN HARNESS THE THREE AMBITIONS DESCRIBED IN THE **CITIES AND CIRCULAR ECONOMY FOR FOOD** REPORT:

- 1) Source food grown regeneratively, and locally where appropriate
- 2) Make the most of food
- 3) Design and market healthier food products

THE FOLLOWING ASSETS COULD BE LEVERAGED TO BUILD A THRIVING CIRCULAR FOOD SYSTEM IN **SÃO PAULO**:



A CIRCULAR ECONOMY REDESIGN IN SÃO PAULO REPRESENTS A USD 140 MILLION+ OPPORTUNITY TO BUILD A REGENERATIVE, DISTRIBUTED AND SOCIALLY INCLUSIVE URBAN FOOD SYSTEM. The following benefits could be achieved in a scenario where local food production and sourcing is expanded using regenerative practices, 25% of municipal organic waste is processed into organic fertiliser for local farmers, and a portion of biosolids being processed in sewage treatment stations is valorised.¹



ECONOMY

USD 14 million

in value from recovered nutrients and avoided landfill costs; social inclusion and job creation through food production, and a thriving gastronomy



HEALTH

USD 67 million

in reduced health costs due to lower pesticide use with wide adoption of regenerative farming practices



SOIL HEALTH

USD 25 million

in avoided degradation, 110,000 tonnes of organic fertiliser produced to support regenerative farming



ENVIRONMENT

342,000 tonnes

GHG emissions reduction worth USD 39 million to society, and 46 million m³ of freshwater saved



CROP DIVERSITY

farmers grow a **wider range of crops** to serve São Paulo's gastronomy menus, while enhancing biodiversity and diversifying their own revenue streams

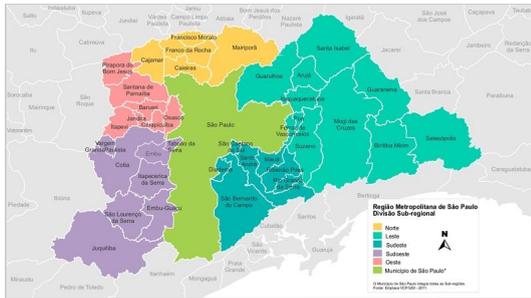
¹ All benefits are calculations by the Ellen MacArthur Foundation, see Appendix for further details



1. SÃO PAULO'S UNIQUE ASSETS

As Brazil's largest city and main financial centre, São Paulo fits the 'developing mega-hub' city archetype² and has a number of valuable assets, such as its high innovation capacity, that can be leveraged to accelerate the shift to a circular economy for food.

São Paulo is, in many ways, a city of national proportions. It is Brazil's most populous city as well as its main financial centre and hub for specialised services. The city of São Paulo is surrounded by the São Paulo Metropolitan Region (SPMR), which contains notable industrial hubs, as well as residential areas, agricultural land and native vegetation – the latter covers 37% of the metropolitan territory despite high urbanisation rates.³ São Paulo's metropolitan surroundings form a complex ecosystem that provides a unique setting for the city⁴ to realise a circular economy for food.

SÃO PAULO'S LOCATION	SÃO PAULO CITY AND METROPOLITAN DEMOGRAPHICS ⁵	
 <p>São Paulo is located at the heart of the SPMR, in the southeast of Brazil. Source: Emplasa.</p>	São Paulo population	12 million
	São Paulo population growth rate	0.55%
	SPMR population	21 million
	São Paulo urbanisation rate	99.1%
	Population density in São Paulo	7,657 persons/km ²
	Income per capita	USD 5,322
	São Paulo GDP	USD 176 billion
	SPMR GDP	USD 285 billion

² See *City Analysis Guide* for details on defining factors for each city archetype

³ EMPLASA (2016). *Visão da Metrópole - Subsídios para a Elaboração do PDUI Região Metropolitana de São Paulo*, <https://www.pdui.sp.gov.br/rmsp/wp-content/uploads/2016/03/Vis%C3%A3o-da-Metropole.pdf>

⁴ See Appendix for our definition of cities

⁵ IBGE Cidades (2018), <https://cidades.ibge.gov.br/brasil/sp/sao-paulo/panorama>

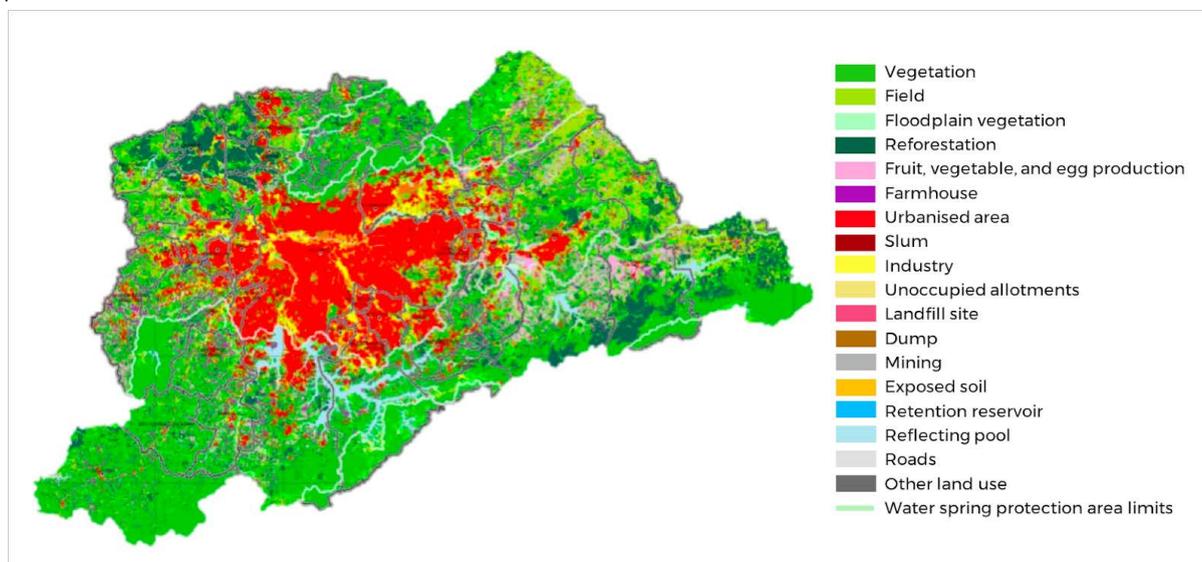
The São Paulo Metropolitan Region's unique assets include:

ACCESS TO MAJOR ECONOMIC MARKETS: the SPMR is a strategic region for Brazil that accounts for approximately 18% of the country's total GDP – if the SPMR was a nation in itself, it would be ranked by the World Bank as the forty-first largest economy in the world, above countries like Chile, Finland, Portugal and Greece⁶. While heavily dependent on road transport systems,⁷ the SPMR is exceedingly well-connected, converging key national routes for inter-state distribution of goods.

A LARGE INTERNAL CONSUMER MARKET: the region houses roughly 1 out of every 10 Brazilians in only 0.1% of the national territory.

HIGH RESEARCH AND INNOVATION CAPACITY: São Paulo is home to a highly educated workforce. Most corporate headquarters in Brazil are located in the city, which is also a hub for specialised services including technology, telecommunications, finance and specialised research. It is also home to the main campus of the University of São Paulo, a leading higher education institution in various fields including agriculture, and a number of other universities and research institutes.

Figure 1: Land use and occupation in the São Paulo Metropolitan Region. São Paulo is located at the centre of the São Paulo Metropolitan Region, which features a complex landscape of multiple land uses and is an economic powerhouse for Brazil.



Adapted from Emplasa (2014). [Atlas de Uso e Ocupação do Solo na Cidade de Cajeiros](#).

IMPORTANT CHALLENGES ASSOCIATED WITH URBAN SPRAWL: despite its undeniable relevance to Brazil's economy, the SPMR features a landscape of severe social inequality, where 4 million people are estimated to be living in conditions of either high or extreme social vulnerability.⁸ Years of intense demographic expansion have led to the region experiencing the significant challenges associated with urban sprawl. One such challenge is the segregation of part of the low-income population to precarious housing settlements in the areas surrounding São Paulo's city limits⁹ – these settlements are believed to accommodate 3 million people in the metropolitan area.¹⁰ The metropolitan natural systems have been equally affected by this transformation – see Box A.

⁶ Based on The World Bank ranking of global economies (10th September 2018),

<https://data.worldbank.org/indicator/NY.GDP.MKTP.CD>

⁷ EMPLASA (2016)

⁸ Fundação Seade. Índice Paulista de Vulnerabilidade Social (2010),

http://www.seade.gov.br/analises_estudos/indice-paulista-de-vulnerabilidade-social-ipvs-versao-2010/

⁹ SMUL (2016) - *Connect the Dots*, p. 19

¹⁰ EMPLASA (2016)

CLOSE PROXIMITY TO PERISHABLE FOOD PRODUCTION HUBS: an agricultural area in the SPMR that is widely spread over certified environmental protection units has approximately 5,000 farms¹¹ mostly producing leafy greens, vegetables, and fruits. In addition, 30% of the city of São Paulo's territory is classified as a 'Rural Zone', which includes both environmental protection areas and food production zones.¹²

A THRIVING GASTRONOMY LANDSCAPE: São Paulo is a widely recognised capital of gastronomy. It has over 23,000 restaurants and a number of innovative and well-known chefs who are already embracing aspects of the circular economy for food vision in their menus (see Box C).



BOX A: SURROUNDING NATURAL SYSTEMS SUPPORT LIFE IN THE CAPITAL

Fragments of native rainforest and important water springs in the SPMR form a natural ecosystem that supports life in São Paulo, but urban sprawl is placing these systems at risk. Disordered population growth has led to an increase in irregular housing settlements around important peri-urban water springs and environmental conservation areas, where 500,000 people are believed to be living in informal conditions¹³ and degrading the surrounding ecosystem. Consequences of this urban development trend have become evident over the years, with severe implications for the capital including an acute water shortage in 2013–15 .

Environmental and water source protection units have been established to limit land use in strategic locations containing native rainforest and water sources, which corresponds to approximately 18%¹⁴ of the metropolitan territory. These are divided into integral protection areas and units of sustainable use; the latter allows for economically viable and socially just land uses that promote the regeneration and conservation of the land's natural assets and biodiversity. Regenerative family farming qualifies as a viable option for these units of sustainable use.¹⁵

¹¹ Instituto Brasileiro de Geografia e Estatística (IBGE). *Censo Agro 2017* (2018), <https://censos.ibge.gov.br/agro/2017/>

¹² SMUL (2016)

¹³ EMPLASA (2016)

¹⁴ EMPLASA (2016)

¹⁵ Brazilian Federal Government. Law No.9,985 (2000), http://www.planalto.gov.br/ccivil_03/LEIS/L_9985.htm



2. URBAN AND PERI-URBAN FOOD PRODUCTION

The São Paulo Metropolitan Region displays an extensive diverse family farming landscape and current food production trends indicate great potential for circularity in the region, including a growing agroecology movement and the emergence of closed nutrient loop production systems in the urban capital's restaurants and corporate offices.

Family farming is the predominant mode of food production in the SPMR:

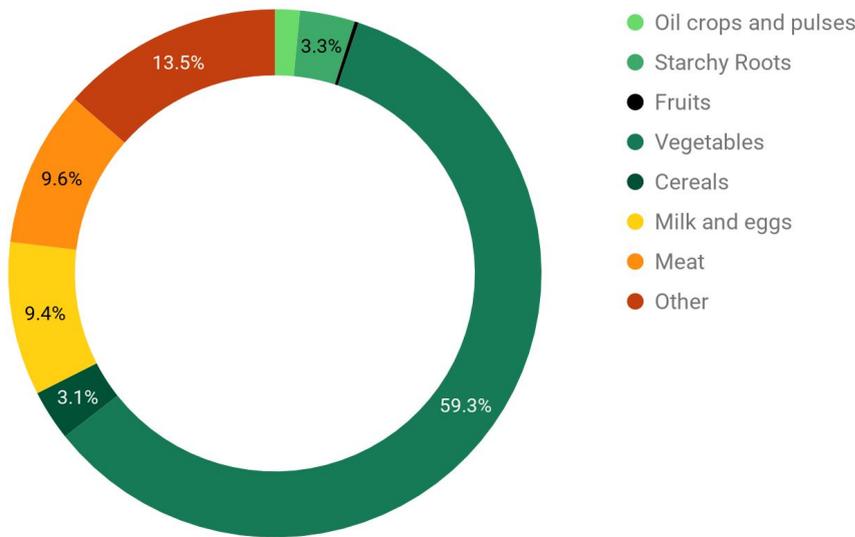
Approximately 15% of the metropolitan land surrounding São Paulo is dedicated to food production, an area equivalent to over half that of the capital itself. Food production in the peri-urban area occurs mainly through smallholder family farming and 10 cities among the top food producers in the region have 80–100% of their territory included in water source protection areas.¹⁶ A metropolitan agricultural area in the eastern sub-region accounts for almost 70%¹⁷ of the total regional food production and is Brazil's main production zone for leafy greens. Aggravated by urban sprawl, real estate speculation is driving the agricultural area and its production of perishables further away from São Paulo's consumer market.¹⁸

¹⁶ EMPLASA (2016)

¹⁷ Estimate based on 2017 Agricultural Census results (IBGE, 2018)

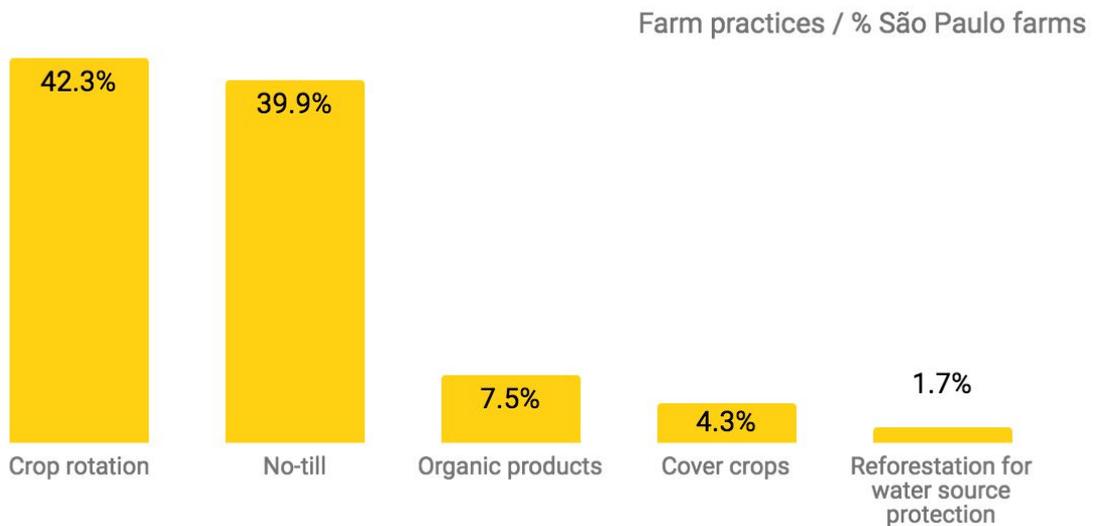
¹⁸ Instituto de Economia Agrícola (IEA). *Desafios da Agricultura em Áreas Fortemente Urbanizadas: a Região do Alto Tietê-Cabeceiras* (2015), <http://www.iea.sp.gov.br/ftp/iea/publicacoes/ie/2015/tec4-1215.pdf>

Figure 2: Top food items produced in the SPMR by number of farms.¹⁹ Vegetables (including leafy greens), dairy, and eggs are the top food items produced in the SPMR.



Although regenerative farming practices²⁰ can be observed in the peri-urban area, with roughly 40% of farms using no-tillage and crop rotation techniques, a significant proportion is still applying chemical fertilisers.²¹ Cover crops are currently leveraged by a small group of farms, despite the fact that 60% of land in the region is lacking in soil organic matter.²²

Figure 3: Regenerative farming in the SPMR.²³ Approximately 40% of metropolitan farms are already using crop rotation and no-till techniques but there is room to expand local uptake of regenerative practice



¹⁹ Estimate based on 2017 Agricultural Census results (IBGE, 2018). Production is based on the sum of food production units per food type in the municipalities forming the São Paulo Metropolitan region.

²⁰ Regenerative practices, as outlined by DrawDown, include multi-cropping, organic fertilisers, no pesticides, permanent crop cover, no-tilling, crop rotation. See the Appendix for more information on regenerative farming practices

²¹ IBGE (2018)

²² City of São Paulo – Inter-secretariat Committee for the City's Solid Waste Policy. *The City of São Paulo's Integrated Solid Waste Management Plan* (2014). <https://www.prefeitura.sp.gov.br/cidade/secretarias/upload/servicos/arquivos/PGIRS-2014.pdf>

²³ Estimate based on 2017 Agricultural Census results (IBGE, 2018). For an overview of regenerative farming see Figure 5 in the Appendix

An agroecology movement is growing in the capital, São Paulo:

Food production within the city of São Paulo is mostly concentrated in the southern and eastern sub-regions that comprise approximately 30% of the city's territory and are deemed the 'Rural Zone'. In this zone, an agroecology movement is progressively spreading with the support of city and state initiatives. This can be observed in the southern food production zone of Parelheiros where farmers transitioning to agroecology methods benefit from technical support provided by Houses of Ecological Agriculture and the first public purchasing contracts as part of the Municipal School Feeding Programme (see below).

A number of existing initiatives support São Paulo farmers who are already applying (or transitioning to) regenerative practices. These include:²⁴

- **HOUSES OF ECOLOGICAL AGRICULTURE:** two agroecology reference centres located in the main food production zones within the city of São Paulo offer specialised assistance to local family farmers transitioning from conventional methods to agroecology. They operate greenhouses producing seedlings to help with soil health in the transition process and provide refrigerated storage facilities to support commercial logistics.
- **SPECIAL FUND FOR THE ENVIRONMENT AND SUSTAINABLE DEVELOPMENT (FEMA):** awards grants for civil society projects aiming to enhance the city's natural environment and has allocated millions of Brazilian reals (BRL) to agroecology initiatives.
- **AGROECOLOGY TRANSITION CERTIFICATES:** the state and city of São Paulo signed an Agro-Environmental Best Practices Protocol for encouraging regenerative farming around water source protection areas in the city. Under this agreement, certificates are issued to identify farmers making the transition to agroecology production methods in direct sales points and for institutional purchases, making the overall transition process more economically viable.
- **SOCIAL MONITORING SYSTEMS:** farmers applying organic production methods who are unable to incur the high costs of organic certification in Brazil can benefit from social monitoring systems. These allow them to market products as organic in direct sales points, including São Paulo's 880+ street markets, although this does not apply to sales through large retailers.
- **SCHOOL FEEDING PROGRAMME:** São Paulo's addendum to the National School Feeding Policy includes specific targets for introducing food items from family farming, local and agroecological production in public purchases for school meals. In 2015, 1,747 family farmers benefited from USD 2 million in food acquisition contracts with the city of São Paulo and new bids have been secured since for local and organic or agroecology farming.²⁵ The programme's implementation plan foresees 100% organic or agroecology purchases for public school meals by 2026.²⁶
- **RURAL ROADS CONSERVATION PROGRAMME:** aims to provide better transport infrastructure for farmers in the Rural Zone without damaging the surrounding natural system.
- **AGRICULTURE PATROL:** offers local farmers access to shared farming equipment.

²⁴ SMUL (2016)

²⁵ SMUL (2016)

²⁶ CAISAN (2016)



BOX B: SALADORAMA – DEMOCRATISING ACCESS TO HEALTHY FOOD THROUGH LOCAL PRODUCTION

Saladorama is a social business, active in a number of Brazilian cities (including São Paulo) and Mozambique. It was created to foster healthy diets in vulnerable communities with limited access to fresh food and a culture oriented to the consumption of ultra-processed fast food. Beyond facilitating the practical availability of fresh food, Saladorama founder Hamilton Henrique strives to break the cultural barrier to healthy food in low-income communities, shifting old mindsets that place healthy diets as being out of reach for low-income individuals. By creating ecosystems of organic food production, kitchens for processing meals and delivery schemes within low-income communities, all driven by locals, Saladorama is able to sell affordable organic products, in their own words, ‘cheaper than fast food’. This, in turn, helps dismantle market and cultural disincentives to healthy diets.

There is an opportunity for social entrepreneurs like Hamilton Henrique to create thriving businesses that support a distributed and inclusive circular economy for food in São Paulo, by articulating local and regenerative production, using the available workforce and short-circuiting distribution needs to provide low-income communities with access to healthy food, nutritional literacy, and jobs.

In its urban centre, São Paulo displays a high concentration of corporate headquarters, many of which contain eateries of their own serving employees on a daily basis. [Dow Chemical](#) is one of them and is collaborating with Plant Fazendas Urbanas to ensure that the ingredients supplied to its eatery are produced in the office building’s rooftop garden using compost from its kitchen food waste to close nutrient loops and, at the same time, reducing food waste at the source based on a mindset-changing programme. The company also sources seedlings from smallholder farmers from the city surroundings, strengthening local agriculture and fostering social inclusion.

Food system transformation can help São Paulo achieve its food security, economic, societal and environmental development goals:

Local and regenerative food production is starting to play a more central role in São Paulo’s city agenda, as an enabler of nutritional security, as well as a driver for the local economy and societal and environmental development in the rural areas. It is positioned as a key enabler of nutritional security for São Paulo citizens in the city’s 2016 [Nutritional Security Plan](#), and the city-led [Gastronomy Observatory](#) acknowledges its fundamental role in supporting the flourishing local gastronomy sector that greatly contributes to São Paulo’s economy. The [Connect the Dots](#) initiative further reinforces the importance of local regenerative agriculture for São Paulo’s development, by outlining its role in protecting natural systems threatened by urban sprawl and conventional agricultural practices, and in promoting social inclusion through food production in the rural zones. The city has historically leveraged municipal public schools as a priority environment for piloting food-related initiatives and in addition to the [School Feeding Programme](#) that establishes requirements for including items from local and agroecological family farming in public school meal purchases, the city has established hundreds of [food gardens](#) in municipal school grounds where students have hands-on learning opportunities about nutrition, food production, and organic waste valorisation.²⁷ In 2017, it also launched an [Organic Waste Management Manual](#) for public schools looking to teach best practices on food waste prevention and to highlight the negative environmental impacts associated with incorrect disposal of discarded organic materials.

²⁷ There were 509 operational units in 2017, with another 83 in the implementation phase, and 200 in the pipeline. City of São Paulo. (2017). *Education Department doubles the programme that establishes food gardens in schools*, <http://www.capital.sp.gov.br/noticia/secretaria-da-educacao-dobra-programa-de-hortas-em-escolas-1>



3. URBAN FOOD CONSUMPTION

A thriving gastronomy landscape in the cosmopolitan urban centre contrasts with longstanding food insecurity challenges in São Paulo, where the food basket cost is equivalent to as much as 49% of average annual income.

HOW MUCH DO PEOPLE IN SÃO PAULO SPEND ON FOOD? The average São Paulo household spends approximately 49% of their annual income on food.²⁸

HOW DO PURCHASES IN STORES VERSUS RESTAURANTS COMPARE? According to the latest population census, stores and street markets account for 55% of household food spend whereas 45% is spent in restaurants.²⁹ Eating out is part of the São Paulo lifestyle and is becoming ever more frequent. Between 2005–10, food consumption in restaurants, bars, and eateries grew 12.5% while food consumption at home grew only 1.5%.³⁰

WHERE DO PEOPLE BUY THEIR GROCERIES? While there is insufficient data available to determine what portion of food consumed in São Paulo is sold through large retailers, the latest official family spending survey estimates this as 41% at country-level for Brazil.³¹

CONSUMING FOOD GROWN LOCALLY: Limited data currently exists to determine what portion of the food consumed in São Paulo is produced locally. However, information about food products entering its largest food distribution centre suggest that São Paulo's food supply is largely dependent on other Brazilian states. This exposes citizens to supply risks, given that the city relies predominantly on a road transport system. In 2018, a nationwide truckers' strike disrupted food supply across Brazil and its effects were seen in São Paulo. During this period, the only items to have maintained a regular supply and low market³² price variations were vegetables and leafy greens produced in the neighbouring metropolitan agricultural area,³² where farmers have closer access and more alternative routes into the city.

²⁸ Intersyndicate Department for Statistics and Economic Studies (DIEESE) (2018). *Food basket prices fall in most capitals for the second consecutive month*. <https://www.dieese.org.br/analisecestabasica/2018/201808cestabasica.pdf>

²⁹ IBGE. *Pesquisa de Orçamento Familiar* (2009), Table 3293. <https://sidra.ibge.gov.br/tabela/3293>

³⁰ Data Popular (2015). <https://exame.abril.com.br/economia/consumo-na-periferia-de-sao-paulo-crece-mais-que-no-centro/>

³¹ IBGE (2009)

³² Information provided by the São Paulo State General Warehousing Company (CEAGESP) (2018)



BOX C: SÃO PAULO GASTRONOMY

São Paulo is a culinary hotspot. It has 23,000 restaurants³³ serving food from across the globe, including fourteen Michelin-starred establishments.³⁴ Its position as a gastronomic destination is widely recognised and in 2018 it was named the Capital of Gastronomic Culture by the Ibero-American Academy of Gastronomy. It is therefore unsurprising that the city's gastronomy is an essential part of the local culture and a source of pride for *paulistanos* (as São Paulo's citizens are known). The city also recognises its economic relevance and in 2018 São Paulo's Economic Development Department launched the Gastronomy Observatory, aiming to strengthen the city's entire food and gastronomy value chain.³⁵

With televised cooking programme participations, Netflix show appearances, impressive social media followings and, naturally, great reviews, an influential group of 'celebrity chefs' is emerging out of São Paulo and a number of them are already embracing individual aspects of the vision for a circular economy for food. To name a few, MasterChef Brasil celebrity judge **Paola Carosella** is known to buy food directly from local São Paulo farmers using agroecology production methods for her restaurant Arturito,³⁶ as does **Gabriela Barretto**, another São Paulo-based chef and head of Chou and Futuro Refeitório. Michelin-starred chef **Alex Atala** is looking to eliminate avoidable food waste using innovative recipes in his restaurant Bio³⁷ while promoting debate around food system challenges in his annual seminar Fru.to.

São Paulo could leverage the fact that it is home to exceptionally inventive chefs and respected universities and research institutions alike to channel food innovation towards creating food that is healthy for both people and the environment, does not generate waste, and is optimised for nutrient cycling. Aside from the expected environmental and health benefits, this would further reinforce São Paulo's identity as a culinary destination and potentially boost the local agrifood and tourism industries.

FOOD INSECURITY ISSUES: contrasting with São Paulo's cosmopolitan image is an underprivileged portion of the population that still finds that their food choices are limited by the high relative cost of the food basket, which amounts to nearly half the average per capita income and is further stressed by large and frequent price variations in some of its basic components.³⁸ Another food insecurity challenge is the concentration of food distribution channels (street markets, supermarkets, restaurants) in the more affluent central area of the city. This creates food deserts in its extremities where a low-income population is less likely to consume fruits and leafy greens on a regular basis,³⁹ and more likely to consume excessive amounts of affordable and easily available ultra-processed alternatives.

³³ City of São Paulo. *The City of São Paulo launches the Gastronomy Observatory to strengthen the local gastronomy and food culture* (20th October 2018), <https://www.prefeitura.sp.gov.br/cidade/secretarias/desenvolvimento/noticias/?p=265733>

³⁴ Michelin. *São Paulo restaurants* (25th September 2018), https://www.viamichelin.com/web/Restaurants/Restaurants-Sao_Paulo_-_Sao_Paulo-Brazil

³⁵ City of São Paulo. *The City of São Paulo launches the Gastronomy Observatory to strengthen the local gastronomy and food culture* (20th October 2018), <https://www.prefeitura.sp.gov.br/cidade/secretarias/desenvolvimento/noticias/?p=265733>

³⁶ Veja São Paulo. *Regiões da capital se destacam por produção de vegetais orgânicos* (25th September 2018), <https://vejasp.abril.com.br/cidades/paraleiros-produtores-rurais-organicos-escolas-municipais/>

³⁷ Eater. *Inside Bio, Brazilian Superstar Alex Atala's Ambitious Take on All-Day Dining*, <https://www.eater.com/2017/5/19/15659258/alex-atala-bio-restaurant-sao-paulo-open-photos> (17th October 2018)

³⁸ Instituto de Economia Agrícola. *Preços Diários*, <http://ciagri.iea.sp.gov.br/precosdiarios/Variacoes.aspx> (27th September 2018)

³⁹ City of São Paulo - Intersecretarial Chamber for Food and Nutritional Security (CAISAN). *1st Municipal Food and Nutritional Security Plan 2016/2020* (2016), p 22-24 <https://www.prefeitura.sp.gov.br/cidade/secretarias/upload/trabalho/PLAMSANVERSAOFINALcompleta.pdf>

4. ORGANIC WASTE AND BY-PRODUCTS

Organic waste represents one half of total municipal solid waste generation in São Paulo. Today, this volume is almost entirely destined to end up in landfill due to the lack of separate organic waste collection infrastructure and limited visibility over large generators.

Households in the city of São Paulo produce approximately 5.5 million tonnes of solid municipal waste each year.⁴⁰ Addressing the organic portion would mean dealing with half of the city's municipal solid waste, yet most of this value is not captured as currently this material stream is almost entirely landfilled. As existing landfill sites in the SPMR gradually reach the end of their 'shelf life' and competition for land intensifies, solid waste management becomes an increasingly pressing issue for the city.

The collection system is overseen by the municipal solid waste management authority AMLURB and covers residential and public areas. The system divides the city into a northern and a southern subsection, each operated by a contractor that is responsible for waste collection, treatment and destination. Large commercial generators are not covered by the system and are instead required by law to hire private waste management services, resulting in a lack of visibility and control over this volume of organic waste generated in the city. This regulation also states that separate collection is mandatory for five waste categories, but the organic variety is not one of them.⁴¹

Pilot initiatives addressing municipal organic waste have been tested:

In the 2014 Solid Waste Management Plan, the city stated its ambition to implement separate organics collection through the municipal waste collection system, but this has not yet been realised. The plan proposes a set of strategies to divert 100% of organic waste from landfill by 2023 and compost 70% of the total volume.⁴² This composting initiative includes a combination of different-sized composting facilities, community composting projects, and composting at household level for organics separated at the source as well as mechanical biological treatment (MBT) for indiscriminate waste streams – only some of which have been tested to date.

While the indiscriminate treatment of household organics results in a lack of visibility for São Paulo over the value of this relevant material stream, including the portion of avoidable food waste in it, a number of city initiatives have been tested addressing food waste prevention and organic waste valorisation. Among these are [Composta São Paulo](#),⁴³ a 2014 home composting pilot initiative that involved 2,000 domiciles in the city, [Banco de Alimentos](#) which redistributes discarded edible food to people in need, and the [Sustainable Food Markets](#) initiative (see Box D).

Large generators are an untapped source of high-quality organic waste streams:

São Paulo also has a new opportunity in sight for capturing organic waste from large generators. A project backed by Climate and Clean Air Coalition and led by ABRELPE, aiming to mobilise large generators around separate organic waste collection, will create an Eco Park in the southern region of São Paulo. The park will include a composting facility for treating organic waste separated at the source, which will generate high-quality compost for use on local family farms. The opportunity in valorising organics from large generators has also been acknowledged by the private sector and Suez is building a facility in collaboration with Impacto Energia in the southeastern zone of the metropolitan

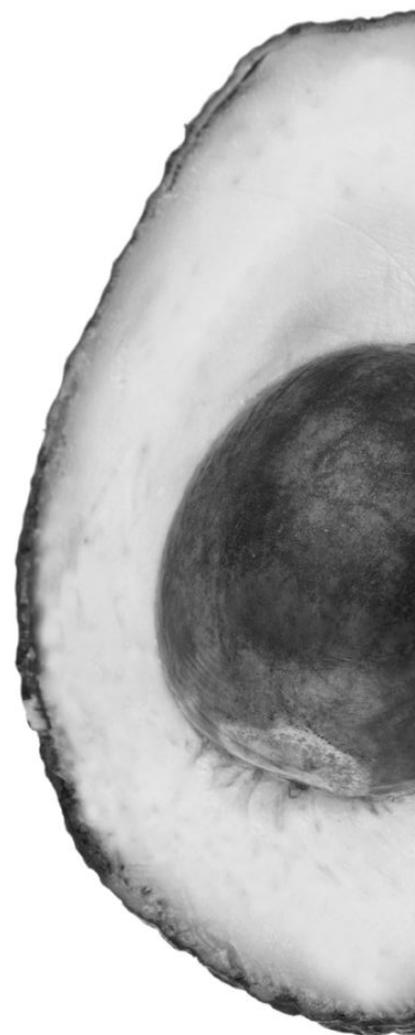
⁴⁰ Information provided by Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais – ABRELPE (October 2018)

⁴¹ City of São Paulo (2009),

<https://leismunicipais.com.br/a/sp/s/sao-paulo/lei-ordinaria/2009/1497/14973/lei-ordinaria-n-14973-2009-dispoe-sobre-a-organizacao-de-sistemas-de-coleta-seletiva-nos-grandes-geradores-de-residuos-solidos-do-municipio-de-sao-paulo-e-da-outras-providencias>

⁴² City of São Paulo – Inter-secretariat Committee for the City's Solid Waste Policy (2014)

⁴³ The project has not been renewed to date despite positive indications revealed by the research



area for valorising organic waste from neighbouring large generators into bioenergy and biofertiliser for local food production.



BOX D: SUSTAINABLE FOOD MARKETS

Since 2015, the city of São Paulo has run the Sustainable Food Markets initiative, designed to collect and valorise organic waste from municipal food markets in São Paulo via a network of decentralised composting sites. Five composting sites have been delivered to date, with a combined capacity to process food waste from 20% of São Paulo's food markets.⁴⁴ City authorities aim to expand the network of decentralised composting sites so that they cover the total volume of organics generated in municipal street markets by 2020, diverting an estimated 500,000 tonnes of organic waste from landfill each year.⁴⁵ While the compost generated by the existing units is not necessarily applied in local food production to date, an agreement was signed in 2018 to create an additional site in the food production zone of Parelheiros in the south of São Paulo,⁴⁶ and the resulting compost is to be offered to local farmers.

As plans to expand the initiative develop, São Paulo could further support the transition to a circular economy for food by ensuring that resulting compost from food markets is directed to local farmers applying regenerative practices, as per the Parelheiros example. In defining the location of new composting sites and food markets, the city could also prioritise the food production zones, unlocking multiple benefits. With markets located nearer food production, local farmers can optimise the sales of their produce and have more time available for farming. This would also contribute to addressing the city's food insecurity challenge by increasing access to healthy food in areas that are underserved by food distribution channels. It would also allow São Paulo's restaurants to take advantage of a more biodiverse and regenerative local food production for their gastronomy menus.

A metropolitan sewage system treats only 66% of the total volume of sewage generated in the city of São Paulo:

The city of São Paulo is served by a metropolitan sewage system operated by the São Paulo state sanitation company, Sabesp – a designated contractor. Its governance model consists of shared responsibility, by the State of São Paulo and the different municipalities within the SPMR, over water and sewage flows in the system.

While the city of São Paulo has a reasonable coverage (approximately 92% of total households⁴⁷), discontinuities in the metropolitan sewage system result in only 65.6% of the 220,760 tonnes of sewage generated annually by the city being actually processed in designated treatment facilities.⁴⁸ The resulting biosolids are deposited in two landfill sites – one within the city limits and another located in the neighbouring city of Caieiras⁴⁹ – further stressing spatial issues associated with urban sprawl. The volume of sewage not covered by the metropolitan system flows into local rivers and streams causing contamination.

⁴⁴ City of São Paulo. *Prefeitura inaugura quinto pátio de compostagem na cidade em Ermelino Matarazzo*.

<http://www.capital.sp.gov.br/noticia/prefeitura-inaugura-quinto-patio-de-compostagem-na-cidade-em-ermelino-matarazzo> (15th January 2019)

⁴⁵ Reis, V. City of SP launches 2nd composting site and promises another 15 by the end of 2020, G1 (28th September 2018),

<https://g1.globo.com/sp/sao-paulo/noticia/2018/09/28/prefeitura-de-sp-inaugura-2o-patio-de-compostagem-e-promete-outras-15-ate-o-final-de-2020.ghtml>

⁴⁶ City of São Paulo. *City of São Paulo encourages family farming that provides organic food for school meals* (23rd May 2018),

<http://www.capital.sp.gov.br/noticia/prefeitura-incentiva-agricultura-familiar-que-fornece-organicos-para-merenda-escolar>

⁴⁷ City of São Paulo - Inter-secretariat Committee for the City's Solid Waste Policy (2014)

⁴⁸ Agência Nacional das Águas (ANA). *Atlas de Esgotos* (2013),

http://portal1.snirh.gov.br/arquivos/Atlas_Esgoto/S%C3%A3o_Paulo/Relatorio_Geral/S%C3%A3o_Paulo.pdf

⁴⁹ City of São Paulo – Inter-secretariat Committee for the City's Solid Waste Policy (2014)

5. INVESTIGATING THE BENEFITS OF A CIRCULAR ECONOMY FOR FOOD IN SÃO PAULO

Note: All calculations for the following benefits are based on estimated global benefits applied to the region. See City Analysis Guide for further details on the factors used to calculate the estimated benefits.

SCENARIO A

What if São Paulo re-localised food production while moving towards regenerative practices?

DETAILED DESCRIPTION

The metropolitan agricultural area already produces a significant volume of fresh food, and only 54% of the existing peri-urban cropland would be needed to fulfil the city's total demand for fruits, vegetables, and leafy greens. Re-localising food production in São Paulo could offer its citizens a more resilient food supply, which would be less vulnerable to shock incidents such as the 2018 truckers' strike. Local production could also make food more affordable and widely available, as well as offering a source of income for the vulnerable population in the rural urban fringes and, equally importantly, a means of their reintegration into the social and economic dynamics of the city. This would address two of the city's 2020 goals: to improve its position on the Food Insecurity Map from medium to low and to create jobs for its underprivileged population through production.⁵⁰

While approximately 40% of peri-urban farmers currently use no-till and crop rotation practices, the agroecology movement in São Paulo, supported by city and state government initiatives, indicates that in time further support mechanisms and incentives could help all local farmers adopt regenerative practices. Public procurement alone could generate enough demand for 71,500 hectares of regenerative cropland (equivalent to 73% of the total peri-urban cropland) provided that the city of São Paulo adopts purchasing guidelines favouring local and regenerative food production.⁵¹ Food service, brands, retailers and processors can also create demand for locally and regeneratively grown food. For example, **Carrefour** has set ambitious targets in its global Act for Food campaign, which includes multiplying and strengthening existing direct purchase relationships with local farmers as well as doubling the amount of organic products in store by 2020 and reducing its price premium compared to conventional products.

BENEFITS

If all cropland in the SPMR was farmed regeneratively, the following benefits could be generated each year:



Healthier citizens:

USD 67 million cost saving in health due to reduced pesticide exposure and lower air pollution



Avoided soil degradation:

USD 25 million worth of soil saved from degradation in conventional farming practices. Alongside avoided irregular housing settlements that also threaten the natural environment



Climate change mitigation:

92,000 tonnes of greenhouse gas avoidance, worth USD 10 million to society



Water savings:

46 million m³ freshwater saved, relieving the pressure on local water sources that are already threatened by urban sprawl



More diverse crops and revenue streams:

farmers grow a wider range of crops to serve São Paulo's gastronomy menus, while enhancing biodiversity and diversifying their own revenue streams

⁵⁰ City of São Paulo (27th September 2018). *Programa de Metas 2017-2020*. <http://programademetas.prefeitura.sp.gov.br/>

⁵¹ Based on calculations by the Ellen MacArthur Foundation, see Appendix for further details

SCENARIO B

What if 25% of solid organic waste was diverted from landfill and used to support local regenerative farming every year?

DETAILED DESCRIPTION

São Paulo's municipal waste collection system manages approximately 2.4 million tonnes of organic waste annually.⁵² Preventing avoidable food waste is key. Nevertheless a significant opportunity lies in capturing and valorising organic material flows. While the city's Integrated Solid Waste Management Plan outlines a strategy for valorising approximately 70% of total organic waste generated annually, the combined processing capacity forecast in its agreements with contractors operating solid waste management and brush (valid through 2024) would realistically cover 25% of the total volume.⁵³

BENEFITS

Capturing only 25% of the total volume of organic waste generated in São Paulo every year could create the following annual benefits:


Economic savings and new revenue streams:

584,000 tonnes of organic waste diverted from landfill, allowing the city to capture USD 8 million in value from avoided landfill costs and USD 1.1 million in value from recovered nitrogen and phosphorus. This would also help São Paulo achieve its 2020 waste diversion goal in under one year instead of four


Nutrient-rich organic fertiliser for cropland:

97,000 tonnes of organic fertiliser offered to local farmers per year,⁵⁴ which could easily be absorbed by less than 1% of arable land within 50 km of the capital


Climate change mitigation:

211,000 tonnes of avoided GHG emissions, which is equivalent to more than 1.3 times the city's 2020 target for reducing GHG emissions by its bus fleet, and worth USD 23.8 million to society

While residential organic waste represents the largest proportion of total municipal organics, the potential for their valorisation at scale is hindered by the lack of a separate household organic waste collection system and of available resources for establishing treatment facilities with sufficient capacity to treat them. However, the city is already taking its first steps towards capturing these benefits, with the Sustainable Food Markets initiative expecting to divert up to 500,000 tonnes of organics from landfill each year by 2020, augmented by the projects looking to capture the value in organic waste streams from large generators. The latter could be further reinforced and brought to scale by relevant policy instruments and by acknowledging organics as a separate element of municipal waste collection in the municipal law that regulates large generators, as well as establishing incentives and/or requirements for its collection and valorisation. By doing so, São Paulo could considerably increase the volume of organic waste captured and valorised in the city and obtain greater visibility over organic waste generation by large generators.

⁵² City of São Paulo –Inter-secretariat Committee for the City's Solid Waste Policy (2014)

⁵³ According to analysis by the International Solid Waste Association (2016). *Strategy for organic waste diversion – collection, treatment, recycling and their challenges and opportunities for the city of São Paulo*

⁵⁴ Guaranteeing compost quality would require enforcing organics separation at the source

SCENARIO C

What if a portion of sewage entering treatment stations was valorised into biofertiliser for local farmers?

DETAILED DESCRIPTION

Only 66% of the total sewage volume generated by the city of São Paulo is treated and then the resulting biosolids are currently sent to landfill sites that take up valuable space in the metropolitan region. In addition to the spatial and environmental challenges associated with the current sewage system, valuable nutrients are being wasted that could otherwise be used by local farmers transitioning to regenerative practices and replacing chemical fertilisers for soil fertility enhancement. A pilot facility run by the same sewage management concessionary in the city of Botucatu, in São Paulo state, is already processing biosolids from sewage sludge into biofertiliser that has been approved for agricultural use⁵⁵ and this experience could be leveraged by São Paulo, with multiple associated benefits.

BENEFITS

Processing a portion of biosolids from sewage treatment centres serving the city of São Paulo into biofertiliser could generate the following annual benefits:



Economic savings, new business models and revenue streams:

maximising the value of the biosolids from the metropolitan sewage system while providing valuable inputs could save USD 4 million in avoided landfill costs and capture USD 2.8 million in value from recovered nitrogen and phosphorus



Nutrient-rich biofertiliser for cropland:

202,005 tonnes of biofertiliser for agricultural use



Climate change mitigation:

40,000 tonnes of avoided GHG emissions, worth USD 4.5 million to society

Innovative treatment methods are being developed by engineers and academics around the world, such as the use of algae to extract micronutrients from sewage sludge, and these could be incorporated to further improve the quality and safety of the sewage by-products. Further benefits could also be achieved by investing in infrastructure to capture all sewage generated in the city.

The circular economy offers a USD 140 million+ opportunity to connect existing city food initiatives around a common vision for food system transformation in São Paulo:

The scenarios outlined in this document offer an insight into the potential benefits for São Paulo in transitioning to a circular economy model for food. Over USD 140 million in economic, environmental and health benefits could be captured every year in comparison to the current linear approach, which would also help the city achieve some of its 2020 goals a lot faster. This approach also demonstrates a potential to promote social inclusion in São Paulo's vulnerable areas through food production and with amplified access to healthy food, build a more resilient food supply, and reinforce the city's reputation as a world-class capital of gastronomy. A number of city initiatives are already aiming to address individual aspects of this food system redesign, and the circular economy offers a powerful common vision to connect these in a systemic approach where that they are not only complementary, but mutually reinforcing.

⁵⁵ According to Brazilian legislation, compost from human waste is classified as the lowest quality category ('D class') and can be applied in agriculture with limitations as to the type of cropland

APPENDIX

DEFINING LOCAL FOR SÃO PAULO

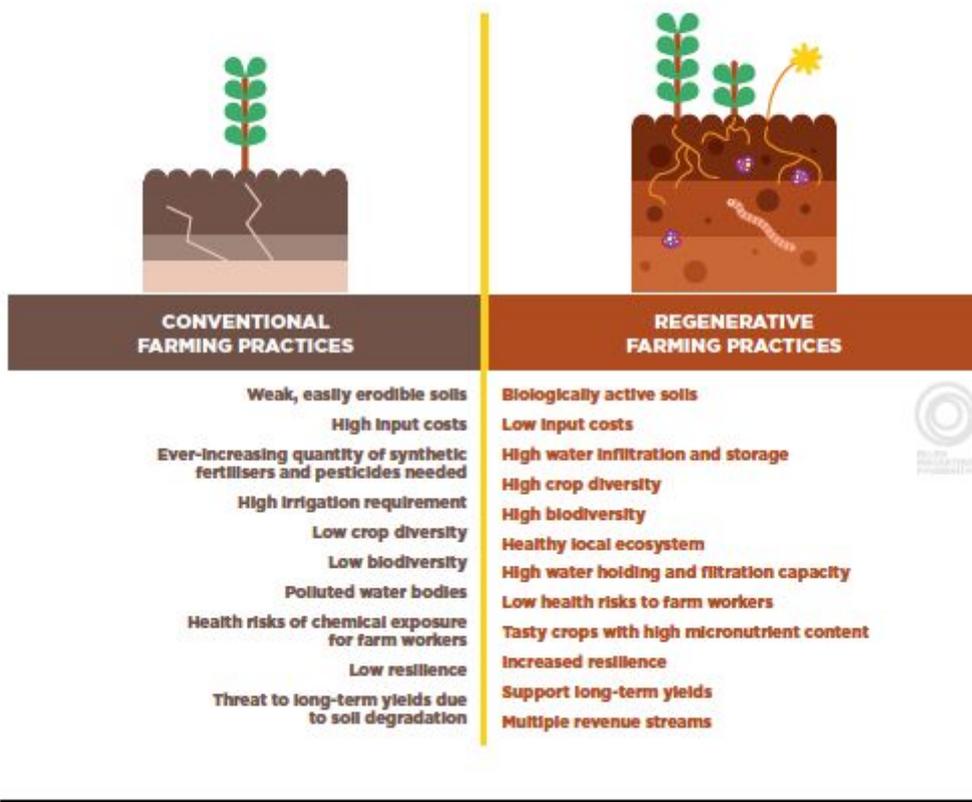
For the purpose of this analysis, the urban area is defined by the municipality of São Paulo, while the remainder of the São Paulo Metropolitan Region (SPMR) accounts for the peri-urban area. The peri-urban area covers 38 municipalities over 6,426 km² and shares important linkages with the metropolitan capital, including but not limited to flows of food and organic waste, daily commuters, and important water sources that are responsible for São Paulo's water supply.

FURTHER BACKGROUND INFORMATION ON REGENERATIVE FARMING PRACTICES

The figure below displays expected long-term outcomes from the use of conventional practices when compared to the use of comprehensive regenerative farming practices. This figure is from page 27 of the *Cities and Circular Economy for Food* report, where further information about regenerative practices can be found.

FIGURE 5: REGENERATIVE FOOD PRODUCTION SUPPORTS NATURAL SYSTEMS.

The outcomes of conventional farming practices tend to degrade ecosystems and pollute the air and waterways, whereas regenerative practices rebuild and enhance ecosystems while preserving air and water quality.



SCENARIO A: REFERENCE DATA AND INFORMATION

- Benefits were calculated for the 108,833⁵⁶ hectares of cropland in the SPMR using benefit factors derived by the *Cities and Circular Economy for Food* team for global modelling calculations
- See additional *City Analysis Guide*'s benefit factor table for details
- Benefits are quantified in comparison to conventional practices, as defined in the full *Cities and Circular Economy for Food* report (see figure 5 above from the report)
- Public purchasing potential was calculated for São Paulo's total annual food spend of USD 80,467,909 (2017),^{57,58} based on the School Feeding Programme experience

SCENARIO B: REFERENCE DATA AND INFORMATION

- Benefits were calculated for composting 25% of São Paulo's annual organic waste generation volume, using benefit factors derived by the *Cities and Circular Economy for Food* team for global modelling calculations
- See additional *City Analysis Guide*'s benefit factor table for details
- Target No.24 of São Paulo's 2017-20 plan⁵⁹ refers to reducing the total volume of solid waste sent to landfill during this period by 500,000 tonnes, which is less than the projected volume of organic waste that would be diverted from landfill annually in this scenario
- Annual landfill cost savings⁶⁰ from valorising 25% of São Paulo's organic waste calculated based on the difference in cost per tonne of the landfill model⁶¹ in comparison to composting⁶²

ORGANIC WASTE MANAGEMENT				
Organic Waste Stream	Volume (t/y) ⁶³	Targets set out in the 2014 Plan ⁶⁴	Collection scheme	Treatment type and output
Residential	2,190,000	34% of São Paulo households to have separate organics collection by 2020, with the remaining volume of mixed organic waste undergoing MBT and anaerobic digestion (AD) treatment before going to landfill	No separate organics collection offered by the curbside municipal collection system, to date	Landfilled after undergoing treatment for odour neutralisation
Street markets	182,500	Create a network of decentralised, low technology composting facilities across city districts to treat this material stream, by 2016	20% of São Paulo street markets have separate food waste collection for treatment for composting ⁶⁵	Food waste from the units with separate collection is processed in small-scale composting sites. Five have been delivered and more are expected by 2020 ⁶⁶
TOTAL CITY COLLECTION	2,372,500			
Large generators	Unknown	None	Private contractors, no separate organic waste collection	Unknown

⁵⁶ (IBGE). *Censo Agro 2017* (2018)

⁵⁷ City of São Paulo (11th October 2018). Portal da Transparência, http://rsp.prefeitura.sp.gov.br/default.aspx?rsviiew=Despesa241_RtpClassDespConta&Prj=SJ2224

⁵⁸ A 0,27 rate was considered throughout for converting values from BRL to USD – based on 3rd January 2019 conversion rates from Banco Central do Brasil (Brazilian Central Bank)

<https://www.bcb.gov.br/acessoinformacao/legado?url=https:%2F%2Fwww4.bcb.gov.br%2Fpec%2Fconversao%2Fconversao.asp>

⁵⁹ City of São Paulo (17th October 2018). Programa de Metas 2017-2020, <http://programademetas.prefeitura.sp.gov.br/o-que-e>

⁶⁰ A 0,27 rate was considered throughout for converting values from BRL to USD – Banco Central do Brasil (2019)

⁶¹ ISWA (2016)

⁶² CCAC MSWI – Climate and Clean Air Coalition Municipal Solid Waste Initiative and ISWA – International Solid Waste Association (2016). EVALUATION AND RECOMMENDATION REPORT OF THE PILOT COMPOSTING PLANT IN THE LAPA DISTRICT OF THE CITY OF SÃO PAULO. p.14, http://www.waste.ccacoalition.org/sites/default/files/files/assessment_lapa_composting_plant- sao paulo.pdf

⁶³ City of São Paulo – Inter-secretariat Committee for the City's Solid Waste Policy (2014)

⁶⁴ Ibid.

⁶⁵ City of São Paulo (15th January 2019). *Prefeitura inaugura quinto pátio de compostagem na cidade em Ermelino Matarazzo*. <http://www.capital.sp.gov.br/noticia/prefeitura-inaugura-quinto-patio-de-compostagem-na-cidade-em-ermelino-matarazzo>

⁶⁶ Ibid

SCENARIO C: REFERENCE DATA AND INFORMATION

- Benefits were calculated using benefit factors derived by the *Cities and Circular Economy for Food* team for global modelling calculations, assuming the creation of two processing facilities producing biofertiliser (one in each of the sewage treatment facilities serving the city of São Paulo) with individual processing capacities of 25 tonnes of sludge per day (similar to the Botucatu pilot plant)
- See additional *City Analysis Guide*'s benefit factor table for details
- Annual landfill cost savings⁶⁷ calculated based on the difference in cost per tonne of the landfill model⁶⁸ in comparison to composting⁶⁹
- 16:11 conversion rate for compost production per the Botucatu experience⁷⁰

SEWAGE COLLECTION & TREATMENT				
Coverage	Volume (t/y) ⁷¹	Treatment rate (%) ⁷²	Treatment type ⁷³	Destination ⁷⁴
Captured by the metropolitan sewage system	193,067	65.6%	Secondary treatment: conventional activated sludge involves oxygenation to break down organic matter with >80% efficiency rate in organic matter removal	East Treatment Centre (city of São Paulo), Caieiras Waste Treatment Centre (City of Caieiras)
Not captured	23,962	0%	None	-

⁶⁷ A 0,27 rate was considered throughout for converting values from BRL to USD – Banco Central do Brasil (2019)

⁶⁸ ISWA (2016)

⁶⁹ CCAC MSWI – Climate and Clean Air Coalition Municipal Solid Waste Initiative and ISWA - International Solid Waste Association (2016). EVALUATION AND RECOMMENDATION REPORT OF THE PILOT COMPOSTING PLANT IN THE LAPA DISTRICT OF THE CITY OF SAO PAULO, p.14,

http://www.waste.ccacoalition.org/sites/default/files/files/assessment_lapa_composting_plant- sao paulo.pdf

⁷⁰ Fernandes Martins, S., *Análise Econômica da Produção de Lodo de Esgoto Compostado para Uso na Agricultura* (2016)

https://repositorio.unesp.br/bitstream/handle/11449/144598/martins_sf_me_labo.pdf?sequence=5&isAllowed=y

⁷¹ National Water Agency (ANA) (2017). *Sewage Atlas - Water Basin Depollution, São Paulo Municipal Sewage Report*.

http://portal.snirh.gov.br/arquivos/Atlas_Esgoto/São_Paulo/Relatorio_Geral/São_Paulo.pdf

⁷² ANA (2017)

⁷³ City of São Paulo – Inter-secretariat Committee for the City's Solid Waste Policy (2014)

⁷⁴ Ibid.

NOTE ABOUT THIS SÃO PAULO CITY STORY AND THE FULL REPORT

The *Cities and Circular Economy for Food* (2019) report was designed to initiate a deeper exploration of the role that cities, and the businesses and governments in them, can have in the creation of a circular economy for food. It acknowledges cities as only one key driver of change among many others. It advocates the circular economy as one of several approaches that can support the development of a healthier and regenerative food system.

The city chapters were developed to demonstrate how cities around the world could benefit from applying the vision set forth in the report. The conclusions draw on an extensive analysis of the current regional food system, and benefit calculations are based on estimated global benefit factors applied to the local context. See *City Analysis Guide* for further details on the research process and factors used to calculate the estimated benefits.

The authors of this city chapter collected information from a number of articles, publications, and reports, and consulted more than 20 experts during its preparation. However, uncertainties remain within the document as the scientific understanding of the various components of a circular economy for food supply continues to evolve.

The document does not intend to provide diet recommendations or advice on food consumption, although it does highlight the role that food system players have in offering healthy foods with positive environmental impacts.

DISCLAIMER

The São Paulo city story has been produced by a team from the Ellen MacArthur Foundation. The city benefit calculations use global factors supplied by SYSTEMIQ as part of the global *Cities and Circular Economy for Food* report analysis. Those were applied to the local context in order to estimate the potential benefits for São Paulo in transitioning to a circular economy for food model. The Ellen MacArthur Foundation makes no representations and provides no warranties in relation to any aspect of the city story including regarding the advisability of investing in any particular company or investment fund or other vehicle. Whilst care and attention has been exercised in the preparation of the city story and its analyses, relying on data and information believed to be reliable, neither the Foundation nor any of its employees or appointees shall be liable for any claims or losses of any nature in connection with information contained in this document, including, but not limited to, lost profits or punitive or consequential damages.

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The full São Paulo city story can be found at:

<https://www.ellenmacarthurfoundation.org/our-work/activities/cities-and-circular-economy-for-food>

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CORE PROJECT TEAM

ELLEN MACARTHUR FOUNDATION

Andrew Morlet, Chief Executive
Rob Opsomer, Systemic Initiatives Lead
Clementine Schouteden, Project Lead
Emma Chow, Project Manager
Nick Jeffries, Case Study Programme Manager
Luisa Santiago, Brazil Lead
Del Hudson, North America Lead
Aurélien Susnjara, Research Analyst
Camille Gillet, Research Analyst
Marco Meloni, Research Analyst
Victoria Almeida, Brazil Associate, Lead Author

SYSTEMIQ

Martin Stuchtey, Managing Partner
Jaap Strengers, Senior Associate
Lauren Boutillier, Associate
Tilman Vahle, Associate
Florian Fesch, Intern
Lisa Griebel, Intern
Mayra Buschle, Working Student

SÃO PAULO CONTRIBUTORS

AB INBEV (AMBEV BREWERY)

Filipe Barolo, Environment Sustainability Manager

Richard Lee, Corporate Sustainability Manager

ABRELPE

Carlos R.V. Silva Filho, Executive Director

BASF SOUTH AMERICA

Emiliano Graziano, Corporate Sustainability Manager

CARREFOUR BRASIL

Felipe Luiz Alves, Sustainability Specialist

CEAGESP – GENERAL WAREHOUSING COMPANY OF SÃO PAULO STATE

Flávio Godas, Economist

CETESB – ENVIRONMENTAL AGENCY OF THE STATE OF SÃO PAULO

Flávio de Miranda Ribeiro, Manager, Department of Public Policy in Solid Waste and Resource Efficiency

COCA-COLA BRASIL

Andréa Valle Mota, Sustainability Director

IMPACTO ENERGIA

Danilo Trevisan, Director of Development and Technology

INSTITUTO ARQFUTURO

Beatriz Vanzolini Moretti, Project Developer

MORADA DA FLORESTA

Victor Hugo Argentino de Moraes Vieira, Project Coordinator

PAULISTA STATE UNIVERSITY "JÚLIO DE MESQUITA FILHO" / ENGINEERING SCHOOL OF BAURU

Gustavo Henrique Ribeiro da Silva, Professor, Environmental and Sanitary Engineering

PLANT FAZENDAS URBANAS

Le Andrade, Founding Partner

Jean Roversi, Founding Partner

Jeison Cechella da Silva, Entrepreneur

SISTEMA B BRASIL

Flavia Pascowitch, Communications and Community Manager

Tatiana Mendizabal, Business and Strategic Alliances Manager

UNILEVER BRASIL

César Maida Freire, Sustainability and Communications Manager

Luísa de Moura Roberto, Marketing Coordinator

Michael Amorim de Oliveira, Sustainability Coordinator

UNIÃO DE HORTAS COMUNITÁRIAS DE SÃO PAULO

Claudia Visoni, Member

FURTHER CONTRIBUTORS

ELLEN MACARTHUR FOUNDATION

Ian Banks, Editorial Lead

Joe Iles, Editor

Jocelyn Bleriot, Executive Officer; Head,
International Institutions & Governments

Clementine d'Orion, Network Manager

Sarah Churchill-Slough, Design and
Branding Manager

Ross Findon, Media and Social Media Manager,
Systemic Initiatives

Katie Schuster, Communications Executive,
Systemic Initiatives

Alix Bluhm, Communications Manager,
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