PLANCLIMASP

Climate Action Plan for the Municipality of São Paulo 2020 - 2050

CIDADE DE SÃO PAULO

STATEMENT FROM THE MAYOR

In 2020, we celebrated the fifth anniversary of the Paris Agreement, a historic global treaty signed during COP-21, whereby the nations of the world pledged to keep the global temperature rise to a maximum of 2°C above pre-industrial levels and to promote efforts to further limit the rise in temperatures to just 1.5°C.

We are fully aware that cities are important allies in this process and that they are at the forefront of facing the issues and problems arising from climate change.

With this in mind, in September 2018, I signed the “Deadline 2020” Charter and made a commitment with the C40 Cities Climate Leadership Group to develop and implement an action plan that provided for the realization of consistent policies in line with the Paris Agreement.

Since then, we have updated the São Paulo Greenhouse Gas Emissions Inventory and have undertaken an immense project to build a Climate Action Plan that will set out a route towards neutralizing emissions.

I am delighted to present ClimatePlan SP, an ambitious Plan that synthesizes the efforts to neutralize greenhouse gas emissions in the Municipality of São Paulo by 2050. It sets out the actions necessary to strengthen resilience, increase our adaptive capacity and to reduce the social, economic and environmental vulnerabilities of the population of São Paulo.

I can proudly say that Climate Plan SP meets the rigorous planning criteria for the climate action of the C40 Cities Group and is compatible with the ambitions of the Paris Agreement. We offer our warmest thanks to this Cities Group for its competent and friendly advice, as well as to its financier the British Government.

By launching ClimatePlan SP, even in the midst of a pandemic, we intend to embrace our city's vocation for the pioneering, and we pledge to cooperate with the cities of the Global South in facing the crises of our time, without leaving anyone behind.

Finally, I should emphasize that our commitment here is not limited to the present moment. It is fundamentally a commitment to future generations for a more just society, founded on the pillars of innovation and democratic values. Only then shall we be sure of a more sustainable and resilient future.

Bruno Covas

Mayor of São Paulo

LETTER FROM THE C40 CITIES GROUP

São Paulo, “the land of drizzle” and the largest city in Latin America, has never shied away from the great climatic challenges it faces. The city was one of the founding members of the C40 Cities Group in 2005 and the first city in the Global South to host the Biannual Meeting of Mayors of the C40 Cities. In 2009, São Paulo was one of the first Brazilian cities to pass a Municipal Climate Change Law establishing specific mitigation goals.

In 2016, nations around the world ratified a historic global climate change agreement, the Paris Agreement, pledging to maintain the average global temperature within a maximum increase of 2˚C compared to pre-industrial levels and mobilize efforts to limit this increase to 1.5˚C. The Agreement also aims to strengthen countries' capacities to deal with the inevitable impacts of climate change through adaptation.

In 2018, Mayor Bruno Covas committed to the C40 Deadline 2020, an ambitious and global commitment to achieving zero net emissions and climate change resilience by 2050, taking on the Paris Agreement's most ambitious goal of limiting growth of global temperature to a 1.5°C increase. This commitment gave rise to the preparation of Climate Plan SP. The C40 is proud to support the city on every step of this journey, from training municipal public servants to regularly carrying out greenhouse gas inventories, to modeling future emissions scenarios, through stakeholder engagement, to identifying priority actions and the organization of specific training for city teams. We are pleased to confirm that our team has validated ClimatePlan SP as fully compatible with the C40 Climate Action Planning Framework, a methodology used by all network cities worldwide.

ClimatePlan SP establishes a clear vision for a greener and fairer future. Each of its five strategies involves actions to jointly respond to social, environmental and economic inequalities, so that São Paulo continues to be a city of opportunities that attracts people from all around, respecting diversity and fostering innovative solutions.

With the approval of Climate Plan SP, a new chapter begins in the collaboration between São Paulo and the C40. And we hope to work together with the city of São Paulo to implement ambitious climate actions for a green and fair recovery.

Mark Watts,

Executive Director, C40 Cities

WHAT IS CLIMATEPLAN SP

The temperature of planet Earth is rising, and this will cause a transformation in the way we live. There will be changes in the means of production and consumption, as well as new needs and ways of living in the city. Citizens and governments need to be prepared not to make decisions today that will cause regret tomorrow. The São Paulo Municipality Climate Action Plan of the (ClimatePlan SP) was developed to respond to this challenge, to guide the action of the municipal government to include the climate variable in its decision-making process and to show how the population can prepare itself to face the impacts of climate change.

Climate Plan SP starts from the principle that governmental decisions need to consider that climate change imposes alterations the available knowledge and practices implemented by the São Paulo City Council (PMSP). And that it is necessary to urge society to reflect on the impacts of climate change on its activities. To this end, it brings concrete proposals, which include actions to mitigate greenhouse gas emissions and adapt to the impacts of climate change to be applied now in the management of the city, involving all sectors of the municipal administration.

These proposals are an opportunity to promote more inclusive development, consistent with the social function of the city, to equitably distribute the burdens and bonuses of climate change, to contribute to the reduction of social inequalities and to guarantee sustainable development for future generations.

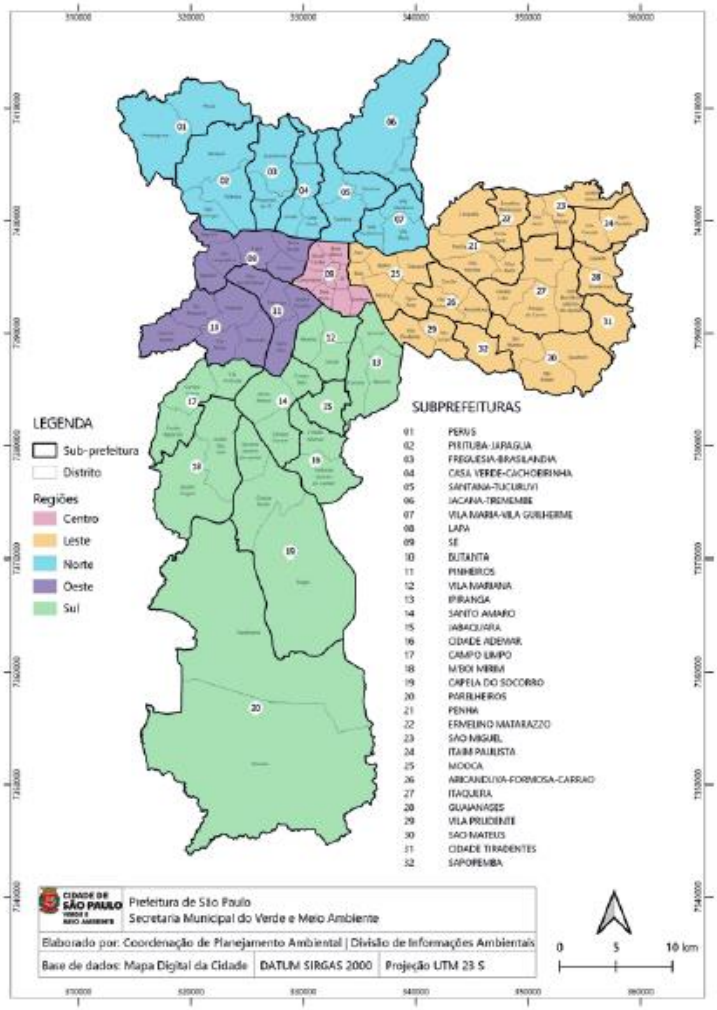
In developing this Plan, the City of São Paulo chooses to be a protagonist in responding to the challenges imposed by climate change and to lead the transition to a low-carbon economy. Alongside more than 100 cities worldwide and three other Brazilian cities (Curitiba, Rio de Janeiro and Salvador), it chooses to support compliance with the Paris Agreement, so that the increase in global temperature by 2100 is preferably limited to below 1.5°C. It chooses not to leave anyone behind!

MEGACITY OVERVIEW

ClimatePlan SP was designed for a city that brings with it the opportunities inherent to being the largest and richest in the country but that faces the challenges of reducing inequalities and vulnerabilities in order to increase its adaptive capacity.

- Capital of the State of São Paulo and center of the São Paulo Metropolitan Region (RMSP), which comprises 38 municipalities and has a population of 21.1 million people, about half of the State's population.
- Territory of 1,521.11 km², with an estimated population of 12,325,232 inhabitants in 2020.
- Divided into 32 sub-prefectures that administer 96 districts.

Figure 1: Municipality of São Paulo and borders of its sub-prefectures and districts



Source: Municipal Secretary for Green Policies and the Environment

- GDP of R$699 billion in 2017.

- Gini coefficient [1] of 0.53 in 2019.
- Municipal Human Development Index (HDI-M) of 0.805 in 2010[2]: 28th position among Brazilian cities.
- Paulista Social Vulnerability Index (IPVS): 13% of the population has an extremely low level of vulnerability, 39% very low, 17% low, 14% medium, 9% high and 7% very high. The population with high or very high vulnerability is found particularly in the peripheral regions, while the population with very low vulnerability is located in the central regions and in the west of the city.
- Highest number of abnormal agglomerations in the country (1,020), which are home to the second largest total number of people (1,280,400), representing 11% of the city's population.
- 99.32% of the population with drinking water supply and 99.81% with waste collection.
- 30.4% of its territory covered by Atlantic Forest vegetation. In the urban region, such vegetation is distributed in a fragmented and uneven manner.
- 735.99 km² of vegetation cover in 2020, or 48.18% of the territory with green areas.

CLIMATEPLAN SP VISION AND OBJECTIVES

VISION

By 2050, São Paulo will be a city less unequal and better prepared to respond to the impacts of climate change. It will be carbon neutral and will promote access to quality public services, providing well-being and inclusive and sustainable economic development for all.

[1] Measures inequality by income distribution, on a scale of 0 to 1 (0 means a situation of full equality and 1 the opposite).
[2] On a scale ranging from 0 to 1 (the closer to 1, the greater the development).

GENERAL OBJECTIVES

To put this vision of the city into practice, ClimatePlan SP is guided by two overall objectives:

1. Take the necessary political action to achieve by 2030 a 50% reduction in greenhouse gas emissions in the Municipality of São Paulo, compared to 2017 levels.

   Unconditional target: By 2030, the Municipality of São Paulo should reduce its greenhouse gas emissions by 20% compared to the base year of 2017.

   Conditional target: By 2030, the Municipality of São Paulo will reduce its greenhouse gas emissions by 50% compared to the base year of 2017, if actions involving decarbonization that are not under the control of the Municipality of São Paulo are carried out.

   Conditional target: By 2050, the Municipality of São Paulo will reduce its net greenhouse gas emissions to zero, if actions involving decarbonization that are not under the control of the Municipality of São Paulo are carried out.

2. Implement the necessary measures to strengthen the resilience of the Municipality, by reducing the social, economic and environmental vulnerabilities of the population of São Paulo and increasing its capacity to adapt.

To fulfill the Vision and the overall objectives, Climate Plan SP is structured as five strategies. Each of them has specific mitigation and adaptation objectives that are reflected in the 44 actions presented. The actions, in turn, respond to specific goals and performance milestones.

- (ICON) Aim for zero carbon by 2050
- (ICON) Adapt the city of today for tomorrow
- (ICON) Protect people and assets
- (ICON) Atlantic Forest, we need you!
- (ICON) Create sustainable work and wealth

GUIDELINES FOR CLIMATE ACTION

To achieve the goals and actions, the municipal government will observe the following guidelines:

1. **Integrated approach:** actions that reduce both climate risk and greenhouse gas emissions in order to use public resources efficiently.
2. **Prioritize and strengthen existing actions:** begin with actions already set out in sectoral plans, programs, and projects by inserting and enhancing their climate and inclusive potential.
3. **Take regret-free and win-win actions:** implement actions that are worthwhile or whose costs are relatively low in view of benefits and measures that bring wider social, economic and environmental benefits.
4. **Strengthen climate governance in the Municipality:** mobilize different internal and external actors to the City Council to implement integrated and intersectoral actions.
5. **Promote metropolitan and regional mobilization:** inspire and mobilize other municipalities to adopt actions to tackle climate change.

TIMELINE

CLIMATEPLAN IS THE RESULT OF A LONG TRAJECTORY TRAVELED BY THE MUNICIPALITY IN CONFRONTING CLIMATE CHANGE

Year	Action
1984	In 1984, the former Municipal Transport Collective Company (CMTC, which is the current SPTrans) signed an agreement with the State of São Paulo Basic Sanitation Company — SABESP, for the use of methane gas, originating from the anaerobic processing of sludge obtained by cleaning the bed of the Tietê and Pinheiros rivers, for the buses comprising its fleet. The experience did not go further due to technical feasibility problems, lack of financial resources for the adaptation of vehicles and the impossibility of expanding the number of stations for refueling the fleet in the territory of the Municipality.
1991	Law 10.950 published: concessionaires or permissionary public transport companies in the Municipality of SP, should replace buses or diesel oil-powered engines with other natural gas vehicles (NGV) within 10 years. This Law did not produce the necessary effect, since it did not provide for a conversion rate, engines and equipment were in the beginning of development, difficulty in logistics for the distribution of natural gas and lack of guarantees in the quality and quantity of fuel, etc.
	São Paulo was one of the founding cities of ICLEI - Local Governments for Sustainability (which at the time was named the International Council on Local Environmental Initiatives, which was subsequently changed but maintained the acronym), a network that brings together more than 1,700 cities worldwide.
1995	Inaugurated the first cycle paths through the Cyclist Project (at Av. Brig. Faria Lima, on Av. Sumaré and in some parks).
1998	Became part of the Mercocidades network, which brings together 286 cities located in Mercosur countries
2003	Contracted the preparation of the first greenhouse gas emissions inventory in the Municipality of São Paulo (carried out by Coppe/UFRJ)
2004	PMSP help lead the creation of the United Cities and Local Governments (CGLU) organization
	Inaugurated the first methane plant at the Bandeirantes Sanitary Landfill to generate electricity, the largest in the world at the time
2005	Joined the Metropolis Association, metropolitan arm of CGLU that is dedicated to strengthening governance in large cities
	São Paulo joined 17 other cities in the creation of what would become the C40 Cities Climate Leadership Group, which today brings together the mayors of 96 megacities from around the world, representing 11% of the world's population and 25% of its GDP.

	Established the Municipal Committee on Climate Change and Sustainable Ecoeconomics
2006	Created the PMSP Executive Group for Pro-Cyclist Cycling Improvements.
2007	The first international auction of carbon credits was held, generating $34 million for the PMSP.
2008	Inaugurated the second methane plant at the São João Sanitary Landfill to generate electricity.
	The second international auction of carbon credits was held, generating $38 million for the PMSP.
2009	The Municipal Policy for Climate Change was enacted, through Law 14,933 that established the mandatory use of non-fossil fuel by the municipal bus fleet by 2018, among other measures. It also consolidated the former Committee created in 2005 as the Municipal Committee for Climate Change and Ecoeconomics.
2011	The second greenhouse gas emissions inventory began for the period 2003-2009, then extended to 2010 and 2011 in the Energy and Waste sectors.
	Became the first city in the Southern Hemisphere to host the international meeting of cities (C40 Summit) promoted by the C40. From this work arose the document Guidelines for the Action Plan of the City of São Paulo for Mitigation and Adaptation to Climate Change.
	Published the document Guidelines for the City of São Paulo Action Plan for Climate Change Mitigation and Adaptation, prepared by the working groups established in the Municipal Committee for Climate Change and Ecoeconomics.
2012	Almost 10% of the municipal bus fleet uses only non-fossil fuels or very high proportions of them; these comprise the EcoFleet.
	Published the initial result of the 2003-2009 + 2010-2011 inventory.
2013	Began accelerated deployment of exclusive bus lanes.
	Launched the Summer Rainfall Preventive Plan, which has been drawn up annually since then.
2014	Strategic Master Plan (PDE), enacted by Law 16.050, formally recognizes as the strategic objective of the Urban Development Policy the mitigation of greenhouse gas emissions and adaptation to the impacts of climate change.
2015	São Paulo participates in a debate on the encyclical *Laudato Si* with Pope Francis, together with mayors from other major cities.
	Launched the Urban Mobility Plan for the Municipality of São Paulo (PlanMob).
2016	Deployed cycle lane system with a total extension of more than 400 km in São Paulo.
	Land Division, Use and Occupation Act (Law 16,402) establishes “incentives to promote sustainable construction aimed at reducing greenhouse gas emissions, reducing water and energy consumption, optimizing the use of

	public space and contributing to the improvement of environmental conditions”.
2017	Joined Group U20, organized by CGLU and C40, to unify the efforts of megacities in G20 countries and strengthen the urban and sustainable development agenda.
	Launched Municipal Plan for Conservation and Restoration of the Atlantic Forest (PMMA).
2018	PMSP signs the *Deadline 2020* commitment proposed by C40.
2019	The results of the third greenhouse gas emissions inventory, 20010-2017, for the first time carried out by the GPC methodology (*Global Protocol for Community Scale Inventories*) is published.
	The preparation of the São Paulo Municipality Climate Action Plan, ClimatePlan SP, began.
	Contracts signed with the companies operating the urban buses, with clauses for annual reductions of air pollutants.
	Law 17.104 establishes the Municipal Policy on Water Security and Water Management.
2020	Completed the elaboration of the Municipal Urban Afforestation Plan (PMAU) and the Plan for the Conservation and Restoration of Areas providing Environmental Services (PMSA).

City of São Paulo: historical records of the climate and climate change risks

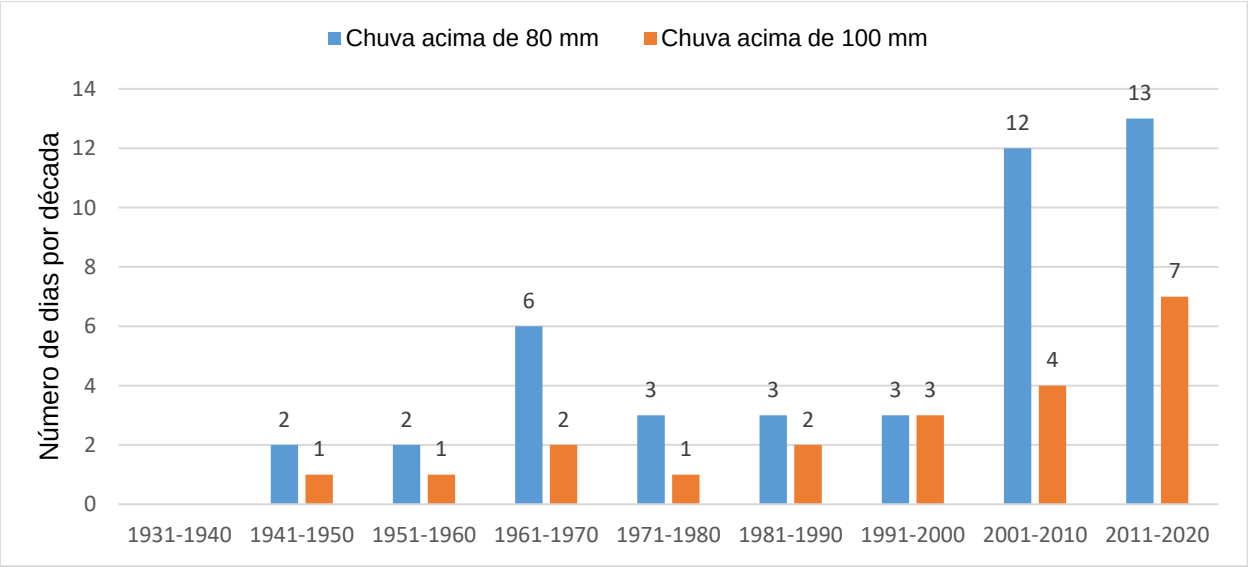
In urban areas of all sizes, risks and vulnerabilities associated with climate change have accelerated. Extreme weather events are already and will become more and more frequent. The projections of the Brazilian Panel on Climate Change (PBMC) indicate an increase in temperature of up to 2°C by the middle of the 21st century, which may reach 4°C by the end of this century in the Southeast region, along with an increase in rainfall, which may rise by up to 20%, 30% and 50%, in the periods 2010-40, 2041-70 and 2071-2100. However, although these projections correspond to the continuity of the historical trend, there is the possibility of a trend reversal and a decrease in total annual rainfall.

Vulnerability Study of Brazilian Megacities to Climate Change revealed an increase in the area susceptible to risk of floods and inundations of 254.45 km² by 2030 in the Metropolitan Region of São Paulo (RMSP), totaling 806.8 km² (24.8% of the total area), with an increase of 48.67 km² in areas susceptible to risk of landslides. The projection is that the total risk areas represent 2.15% of total urban areas in the RMSP.

The number of heavy and voluminous rains above 100 mm/day in the last 20 years exceeded the accumulated records of the previous six decades in the city of São Paulo. In addition to pointing out the increase in rainfall and the increase of consecutive dry days in large urban centers, data suggest that heavy rainfall is concentrated in fewer days, intertwined by longer periods without rainfall.

[TRANSLATION INSTRUCTIONS — In order to translate the graphic below, you will need to save in the same folder the xls. file titled Figure 2: Rains above 80 mm and 100 mm. By clicking on the image, you can directly access the graph for translation from the source.

Figure 2: Rains above 80 mm and 100 mm (meteorological station of the Institute of Astronomy, Geophysics and Atmospheric Sciences (IAG/USP).

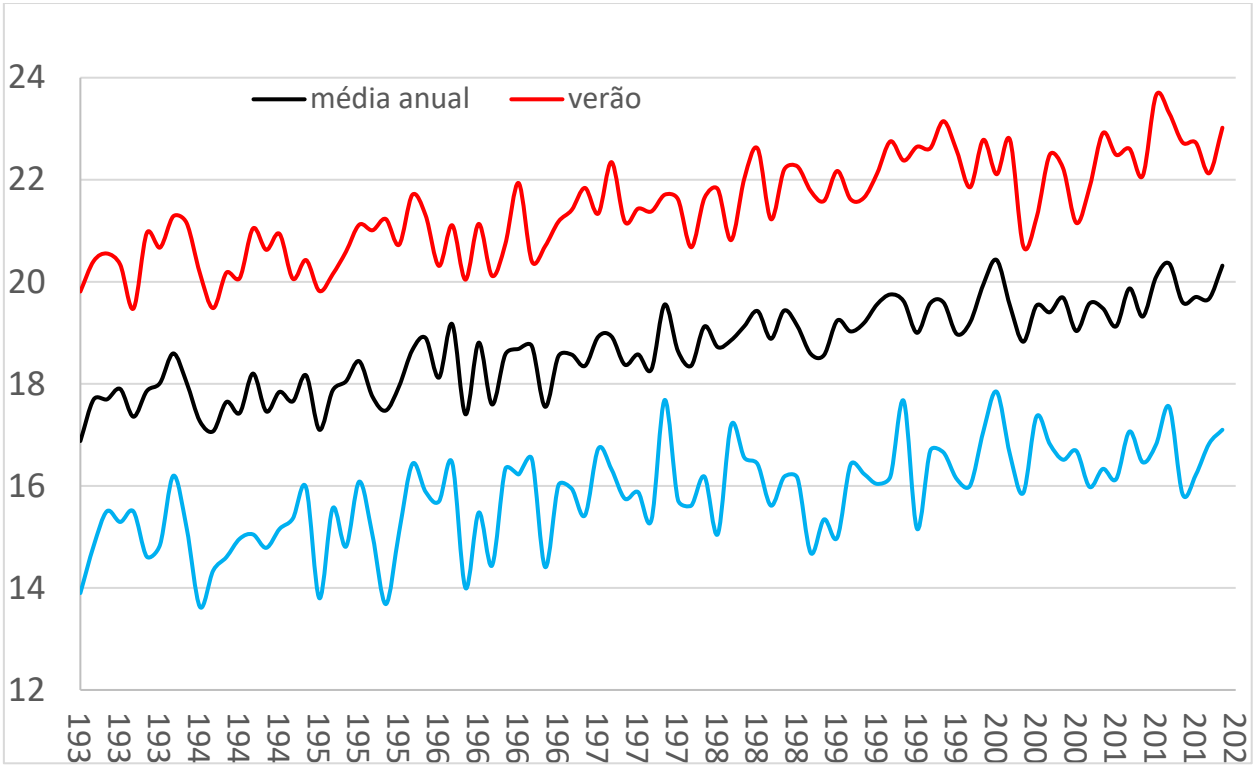


Source: Own elaboration from Marengo et al (2020)

There was an increase in average, minimum and maximum temperatures and average annual rainfall between 1933 and 2017. The average temperature increased 2.3°C, the average maximum temperature 2.1°C, the minimum average temperature 2.4°C, while precipitation increased by 511.8 mm in the annual total.

[TRANSLATION INSTRUCTIONS — To translate the chart below, you will need to save in the same folder the xls. file titled Figure 3: Average annual temperatures in the Municipality of São Paulo. By clicking on the image, you can directly access the graph for translation from the source.

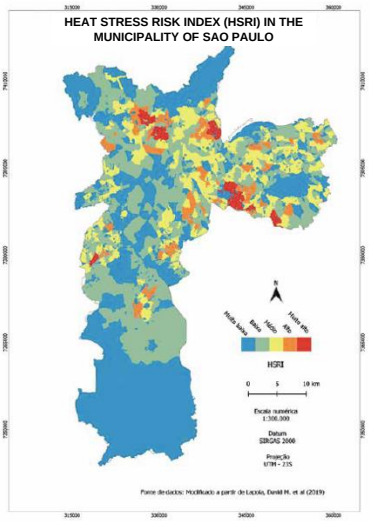
Figure 3: Annual average temperatures in the city of São Paulo, between 1933 and 2014.



Source: Own elaboration, 2020 (based on IAG/USP 2019 data).

The high temperatures associated with factors such as MHDI and spatial distribution of the population over 65 years, more sensitive to heat, among other variables, result in places of thermal stress, as shown in Figure 5 below:

Figure 4: Locations of risk of thermal stress in São Paulo.



Source: Own elaboration from Lapola, D.M et al (2019)

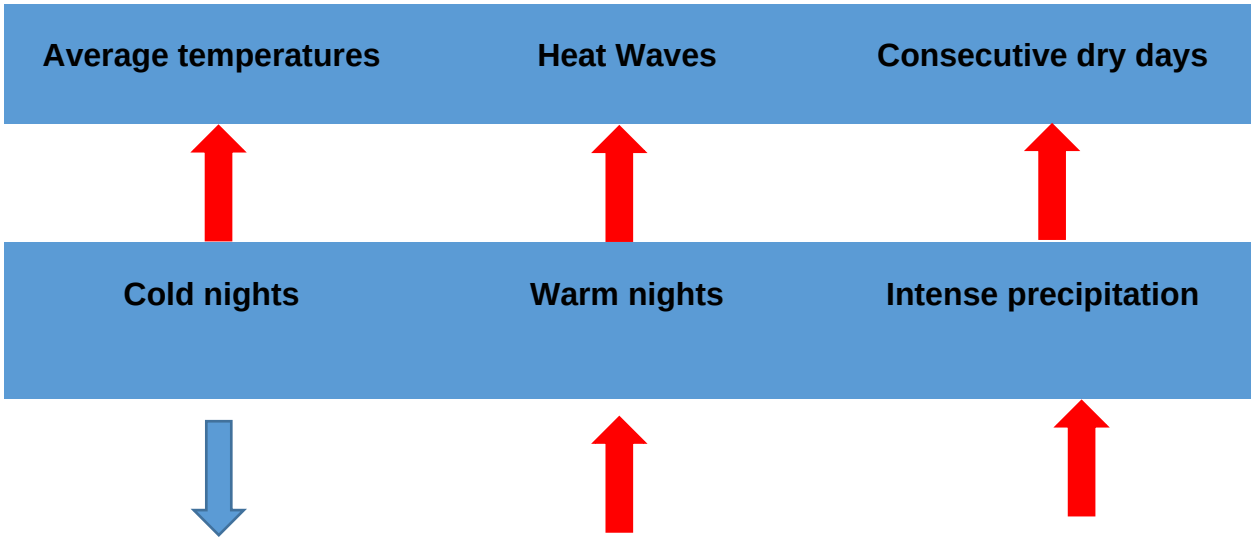
How to address the vulnerabilities

Climate change overlaps the historical vulnerability of the city, caused by the construction of an urban space over floodplains or the occupation of risk areas, among other variables. They affect the population differently, and those who caused the problem will not always be directly affected by it.

The vulnerability of the poorest populations to climate change creates a perverse cycle of intensification of poverty and an increase in inequalities. The absence of socio-economic conditions to cope with the impacts of climatic phenomena tends to result in loss of life, diseases, increased hunger, material and housing losses, elimination of means of production and sources of income, in addition to further hindering the access of these most vulnerable groups to public services. The increase in the adaptive capacity of the city to cope with the impacts of climate change means acting to reduce the causes of its vulnerabilities.

Main climate threats

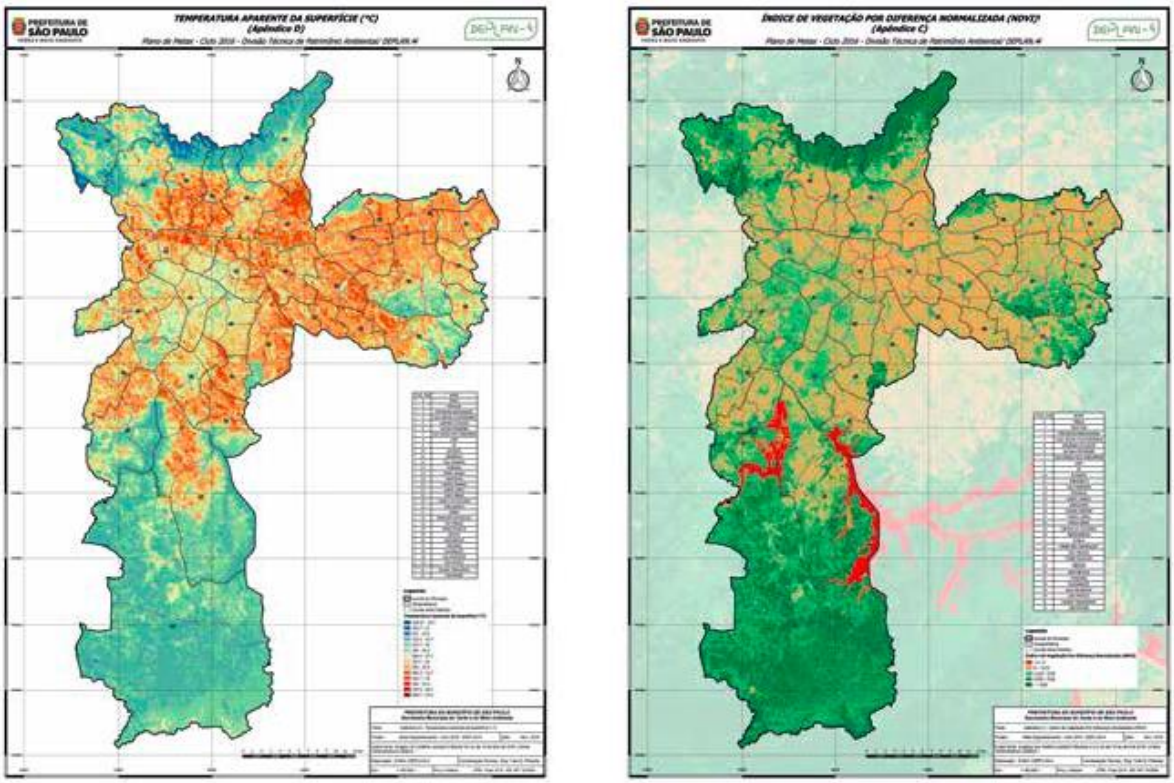
Figure 5: Summary of climatic projections up to 2100 for the Municipality of São Paulo.



Source: Elaboration C40 Cities (2020a), based on INPE/CPTec, 2014.

- Temperature increase: Projections show that, on the horizon up to 2030-2040, there may be an increase in average temperature, an increase in the number of hot nights, a decrease in the number of cold nights and more heat wave events. In addition, the data suggest an increase in average temperature between 2ºC and 3ºC by the end of the century.

Figure 6: Apparent surface temperature and its correspondence with the regions with the highest values of Normalized Difference Vegetation Index (NDVI) - 2016.



Source: Department of Green Policies and the Environment (São Paulo, 2016).

- Heat waves — The heat wave risk index is estimated to increase by 10% between 2010 and 2030 and to remain the same between 2030 and 2050, with no significant differences between the results of future scenarios analyzed, according to the Climate Risk Analysis report — São Paulo . During the 1960s and 1970s, periods of extreme heat did not reach 15 days a year, but they jumped to about 40 days in 2010 and 50 days in 2014. The heat wave threat is exacerbated by the heat islands, urban areas that trap heat and make the temperature higher than in the surroundings, depending on the urbanization patterns (building, waterproofing, paving, reduced amount of green areas, among others). In densely populated areas, heat islands act as an enhancer of the impacts related to extreme temperatures. In the Municipality of São Paulo, there are differences of up to 10°C depending on the location, with the highest temperatures in the central, more urbanized regions, and the lowest in the peripherial hills or near the large water reservoirs.

Figure 7: Threat of heat waves over the city of São Paulo, reference period 1981-2010, projected for 2030 and 2050.

Source: Climate Risk Analysis — São Paulo (C40, 2020).

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FIGURES FOR CLASSIFICATION	
VERY LOW	0.0 to 0.10
LOW	0.10 to 0.44
AVERAGE	0.44 to 0.66
HIGH	0.66 to 0.77
VERY HIGH	0,77 to 1.0

- Low relative humidity of air - There is a trend of gradual increase in days with low relative air humidity.

- Intensification of rainfall and floods: Intensification of heavy rainfall is expected in the same period, while there may also be an increase in consecutive dry days. That is, fewer days with rains, and when they occur, they will be stronger.

Figure 8: Annual evolution of total cumulative rainfall and average, minimum and maximum annual temperature for São Paulo.

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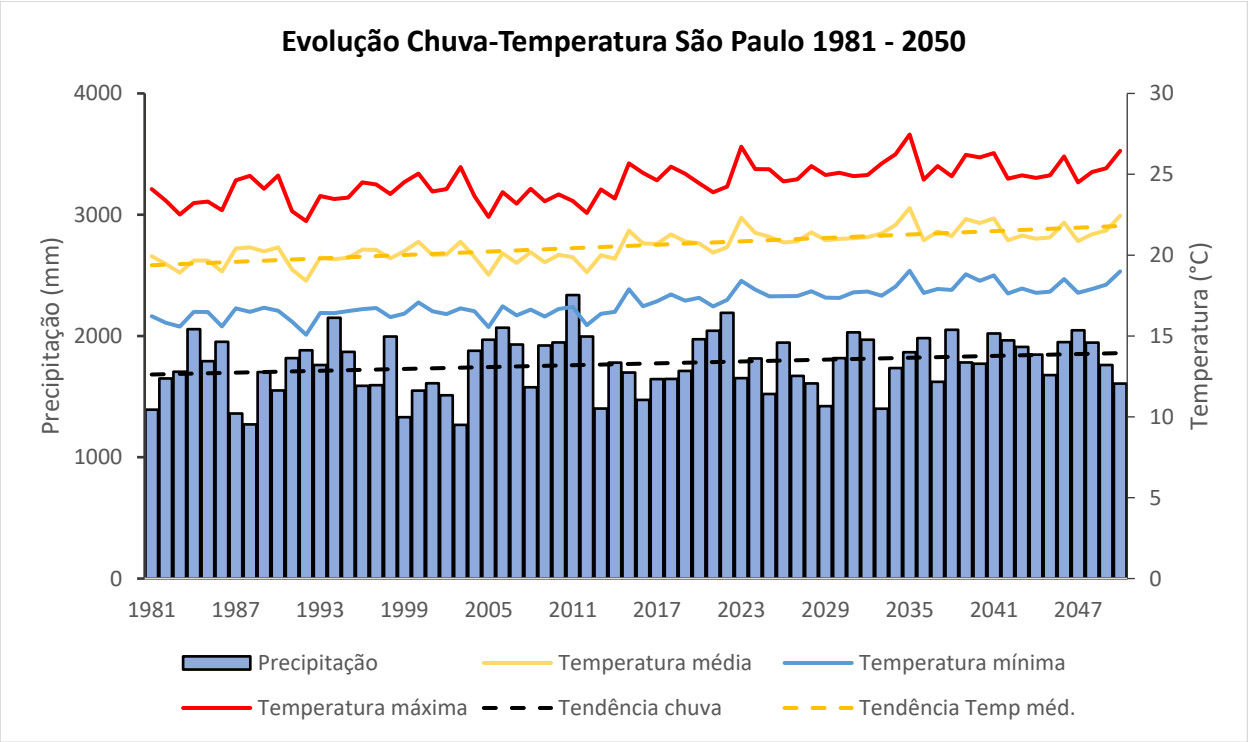

Drought - According to the report Climate Risk Analysis — São Paulo, which investigated rainfall indicators related to the threat of meteorological drought in seven macrobasins surrounding the RMSP, an average increase in the meteorological drought threat of around 34% is expected for the Municipality in the period between 2010 and 2030. In addition, it envisages a worsening of this threat in the medium term, with an increase of around 20% between 2010 and 2050.

Figure 9: Projected meteorological drought analysis (2030).

Source: Climate Risk Analysis — São Paulo (C40, 2020).

FIGURES FOR CLASSIFICATION	
VERY LOW	
LOW	
AVERAGE	
HIGH	
VERY HIGH	

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Figure 10: Analysis of projected meteorological drought (2050).

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Source: Climate Risk Analysis — São Paulo (C40, 2020).

Lightning - The number of lighting bolts has also been growing year by year in Greater São Paulo. In 1950, there were 51,000 a year. In 2018, they surpassed 127 thousand. The predominance of areas with much concrete and little green space helps to form the typical summer storms that are of short duration and high intensity, which particularly affect the eastern zone of the municipality.

Landslides — Between 2003 and 2010, the total number of areas at risk of landslides involving precarious settlements increased by 22.1% and locations within the risk area from different problems rose 14.8%. Of these, cases in high and very high risk situations increased by 8.6%.

Box: Impacts on health

Health is affected by the climate in two distinct, but interconnected ways. The first arises from the climatic condition itself, i.e. temperature variation, rainfall, winds, etc. that directly cause the conditions of mortality or morbidity. The second occurs indirectly, with the climate favoring the emergence of infectious diseases caused by vectors that generate physical, psychological and nutritional, etc. consequences .

In the RMSP, the best-known health problems caused by the climate range from drowning and injury to victims caused by flooding, to the ingestion of contaminated water, which can cause intestinal diseases and hepatitis, as well as leptospirosis from contact with contaminated water. Excessive rain carries diffuse pollution to the bodies of water, decreasing the quality of the available water supply. It also increases the likelihood of water-borne diseases and creates conditions for the proliferation of mosquitoes transmitting diseases such as dengue fever, yellow fever and malaria. These breeding sites can be accelerated by the increase in temperature, which favors the hatching of the larvae of mosquitoes. The increase in temperature and humidity of the air contributes to the proliferation of infectious agents, accelerates the cycle of reproduction of mosquitoes and transmission of pathogens.

In addition, it is observed that mortality increases when the temperature variation is around 5ºC higher in relation to the average temperature of a place, defining a thermal comfort zone. In São Paulo, the temperature at which fewest deaths occur is 22ºC. The thermal comfort zone is between 13ºC and 27ºC. Above these limits the risk of death significantly increases.

Figure 11: Ways in which climate change can affect human health.

Source: 5th IPCC Assessment Report (2014)

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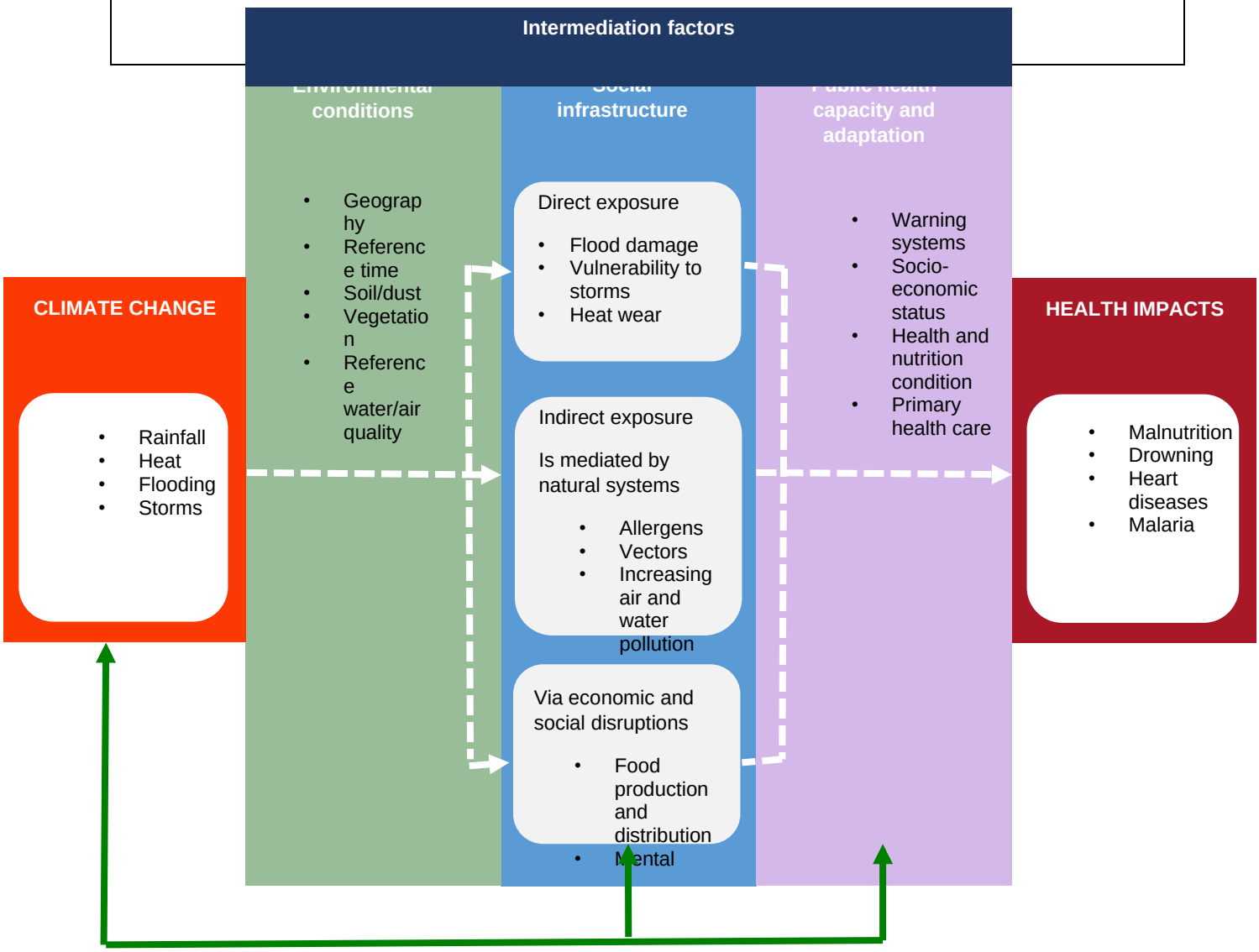
Intermediation factors
conditions
infrastructure
capacity and adaptation
CLIMATE CHANGE
Rainfall
Heat
Flooding
Storms
Geography
Reference time
Soil/dust
Vegetation
Reference water/air quality
Direct exposure
Flood damage
Vulnerability to storms
Heat wear
Indirect exposure
Is mediated by natural systems
Allergens
Vectors
Increasing air and water pollution
Via economic and social disruptions
Food production and distribution
Mental
Warning systems
Socio-economic status
Health and nutrition condition
Primary health care
HEALTH IMPACTS
Malnutrition
Drowning
Heart diseases
Malaria

BOX: Green areas as allies

Green areas contribute both to the maintenance of the quality of life of the city residents, by decreasing effects such as urban heat islands and air pollution, as well as reducing the risks of extreme events.

The fragments of Atlantic Forest present in the territory of the city are responsible for maintaining milder temperatures; they protect the springs, recharge aquifers and allow storage in reservoirs for consumption, energy generation, agricultural irrigation and fishing, among other activities. A recent study reveals that if an Atlantic Forest fragment of approximately 1 ha (10,000 m²) has 25% of its area deforested, the local temperature rises 1°C. If all the small remnants are deforested, the impact on the maximum local temperature can reach 4 °C, evidencing that deforestation promotes air heating on a local scale.

As a way to minimize and prevent the formation of heat islands, we recommend an increase in green areas in the city, thus raising the human thermal comfort in urbanized areas.

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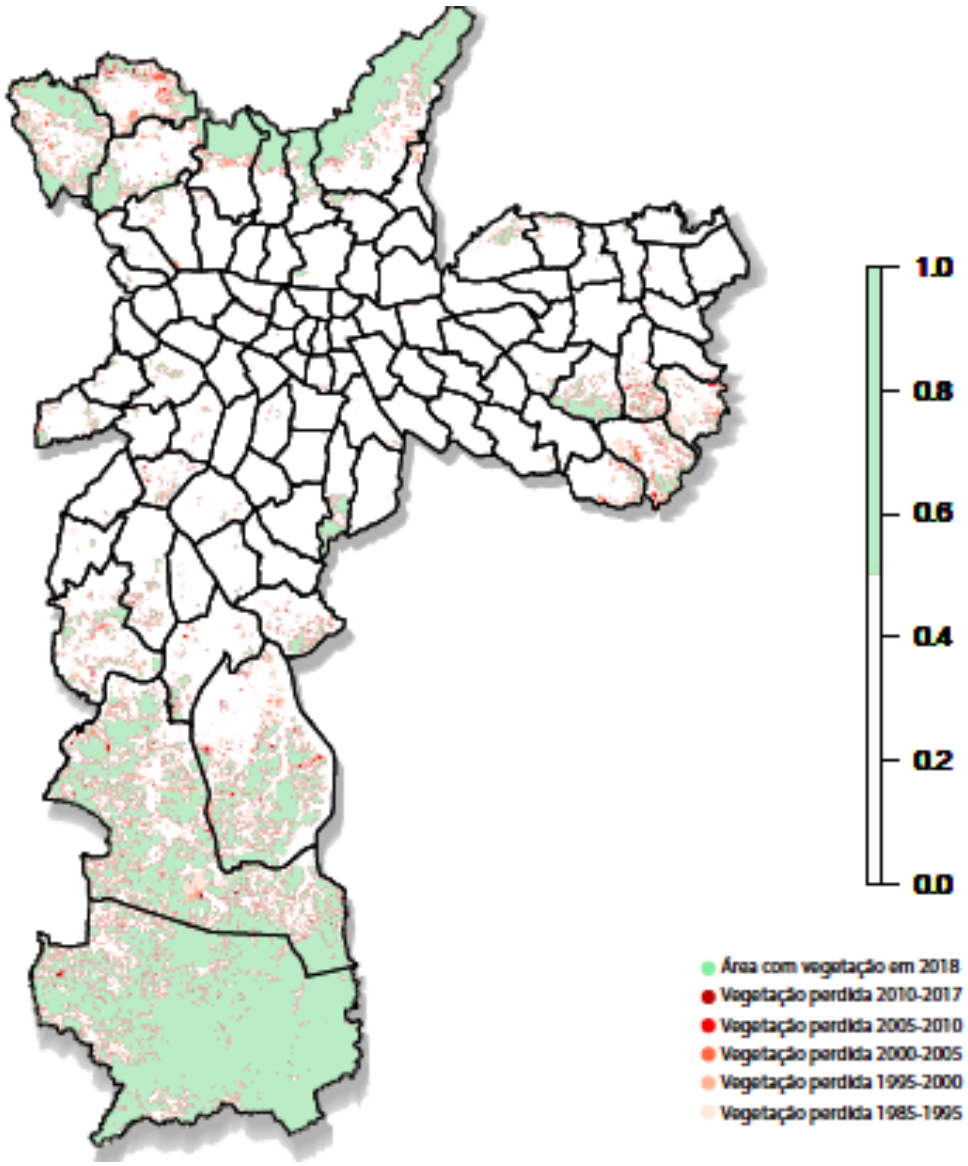
Figure 12: Vegetation cover remaining in São Paulo and loss of vegetation cover between 1985 and 2018.



Source: Climate Risk Analysis — C40 (2020) with Mapbiomes data (2020).

GREENHOUSE GAS EMISSIONS IN THE MUNICIPALITY OF SÃO PAULO: CURRENT STATE AND FUTURE SCENARIOS

The Greenhouse Gas Emissions Inventory of the Municipality of São Paulo 2010-2017 brought subsidies to ClimatePlan SP, with data that allow us to analyze the contribution of different sectors, establish a baseline, predict future emissions, set mitigation targets and provide data to support policies and actions aligned with the São Paulo Municipal Climate Change Policy. For the first time, the *Global Protocol for Community Scale Inventories*(GPC), , based on the IPCC, was adopted, but with a scope-based approach to estimate sectoral emissions produced within city limits (scope 1 or territorial) and the use of energy provided via the distribution network (scope 2), as well as city-induced emissions that take place outside its territory (scope 3).

The Inventory was prepared in GPC/Basic Mode, which includes the emission sectors called Transport, Stationary Energy and Waste. It was submitted to an external verification process by consultants and validation by the C40, and was presented in June 2019 at the Municipal Committee for Climate Change and Ecoeconomics. The base year for ClimatePlan SP and for the elaboration of future emissions scenarios was 2017.

The estimated greenhouse gases were CO_2, N_2O and CH_4. CO_2 is used as a reference to establish the heating power of other greenhouse gases, which are referred to as carbon dioxide equivalent (CO_2e) through their Global Warming Potential.

Emissions by sector

The inventory shows an increase in total emissions from 2010 to 2014, with a subsequent decrease in 2016 and a return to increase in 2017.

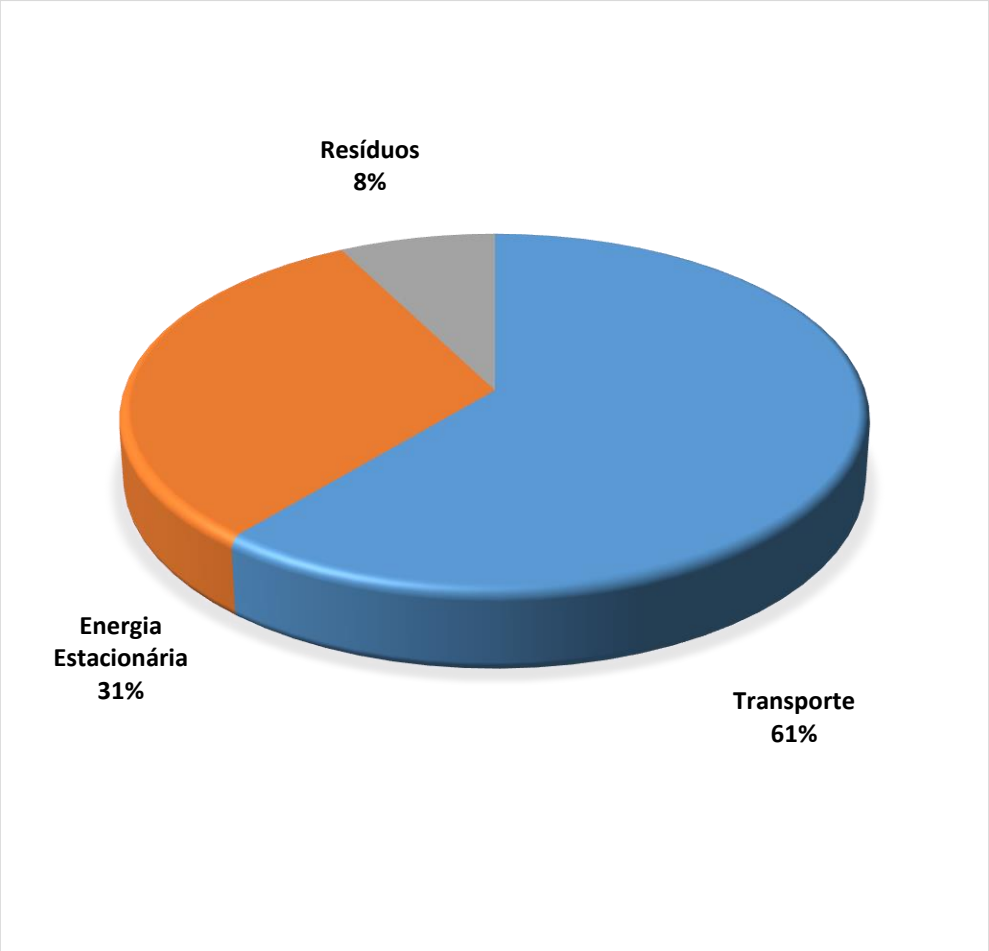
Table 1: Greenhouse gas emissions by GPC sectors.

Table 3: Greenhouse gas emissions by GPC sectors.								
Sector	2010	2011	2012	2013	2014	2015	2016	2017
	tCO2e							
Transport	8,360,264	9,208,935	9,827,120	9,680,368	9,857,796	9,128,019	9,327,073	9,576,663
Stationary energy	3,934,335	3,369,432	4,525,151	5,391,165	6,467,228	5,668,816	4,298,196	4,584,272
Waste	1,070,858	1,065,079	1,067,610	1,175,788	1,200,046	1,233,217	1,285,942	1,257,136
TOTAL	13,365,457	13,643,446	15,419,881	16,247,320	17,525,070	1,.030,052	14,911,211	15,418,071

Source: Own elaboration

Figure 13: Cumulative emissions 2010 - 2017 by sector.

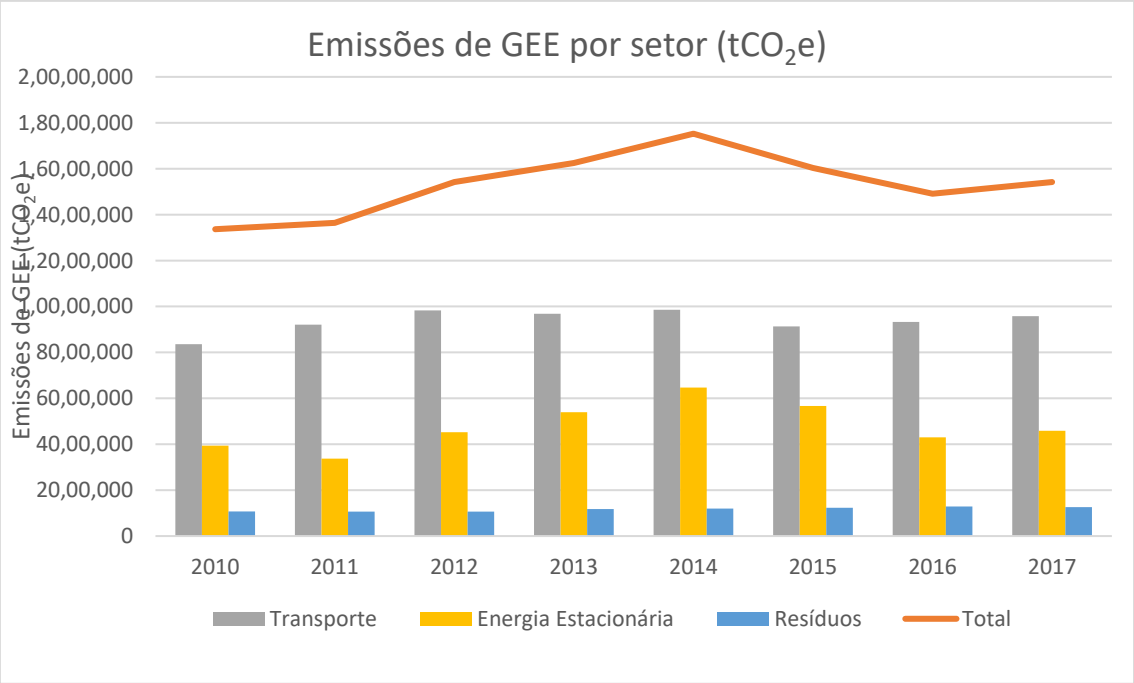
NOTE FOR TRANSLATION — To translate the graphics below, please access the xls file titled Figures 13 and 14



Source: Own elaboration

Figure 14: Greenhouse gas emissions by GPC sectors.

NOTE FOR TRANSLATION — To translate the graphics below, please access the xls file titled Figures 13 and 14



Source: Own elaboration

The Transport sector, especially the road subsector, is the main source of emissions. Next comes the Stationary Energy sector, with emphasis on electricity. Emissions from the Waste sector are the lowest; however, they rose throughout the period.

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Emissions by energy source

To enable the comparison of quantities, greenhouse gas emissions were estimated by activities, energy sources and fuels, with indication of the respective sectors. The following tables show emissions in the Municipality by sources and sectors in decreasing order of magnitude, with 2017 as the base year.

Table 2: Industry GHG emissions Transport.

Subsector	Source	2010	2011	2012	2013	2014	2015	2016	2017
		tCO_2e							
Road	Normal Petrol	4,074,182.1	4,917,758.5	5,440,815.8	5,326,708.3	5,362,578.9	4,594,739.6	4,770,912.6	4.968,148.5
Road	Diesel oil	3,814,344.6	3,900,405.4	3,969,649.2	3,911,059.7	3,827,528.9	3,831,929.0	3,758,033.5	3,719,488.3
Rail	Diesel oil	43,867.8	47,310.4	68,834.8	79,980.0	280,568.8	317,170.3	470,985.7	555,957.2
Road	Natural gas	260,762.5	221,846.1	202,134.5	180,241.7	161,309.7	144,285.4	143,788.1	152,716.0
Road	Hydrated ethanol	112,911.5	82,957.1	76,729.9	88,170.8	96,522.5	119,793.4	101,434.6	91,747.1
Subway Line	Electricity	28,115.8	16,391.2	36,511.1	53,631.2	75,151.3	69,880.1	44,534.0	47,784.9
CPTM Rail	Electricity	10,654.8	7,207.9	16,467.0	23,834.2	35,715.0	32,100.8	20,596.5	23,702.0
Trolleybus	Electricity	1,134.3	627.2	1,535.9	2,451.1	4,053.6	3,830.1	2,496.9	2,829.0
Waterway	Diesel oil	0.0	140.8	150.6	0.0	76.3	0.0	0.0	0.0
Aviation	Aviation petrol	1,523	1,523	1,523	1,523	1,523	1,523	1,523	1,523
Aviation	Aviation kerosene	12,768	12,768	12,768	12,768	12,768	12,768	12,768	12,768

Source: Own elaboration.

Table 3: Emissions from subsectors in the Stationary Energy sector.

Subsector	2010	2011	2012	2013	2014	2015	2016	2017
	tCO_2e							
Residencial	1,648,762	1,424,507	1,930,178	2,276,554	2,600,087	2,342,261	1,953,490	2,095,435
Commercial	938,701	757,006	1,151,007	1,574,955	2,142,585	1,827,322	1,205,015	1,316,276
Industrial	1,112,707	990,949	1,208,501	1,235,376	1,306,376	1,131,033	912,367	914,926
Government	100,406	61,438	124,591	157,543	225,411	199,496	126,722	139,323
Fugitive emissions from natural gas	51,137	41,034	58,635	74,028	79,312	78,630	45,218	56,638
Water and sewage	33,239	20,413	49,748	71,912	112,946	89,783	55,138	61,461
Agriculture	468	745	1,870	725	499	290	195	214
Other	48,914	73,340	621	71	13	0	50	0

Source: Own elaboration.

Table 4: Emissions from energy sources in the Stationary Energy sector.

Subsector	2010	2011	2012	2013	2014	2015	2016	2017
	tCO_2e							
Electricity - residential	569,717	341,831	790,394	1,142,788	1,537,975	1,328,164	892,388	1,025,834
LPG - Residential	861,228	846,082	892,564	866,422	820,045	779,475	793,722	787,409
Electricity - commercial	470,411	280,700	655,179	1,020,458	1,591,274	1,419,808	864,677	972,525
Natural gas - industrial	517,836	536,161	524,582	486,043	442,451	414,075	399,434	404,953
Natural gas - residential	217,729	236,418	247,104	267,257	242,042	234,610	267,380	282,192
Electricity - industrial	205,365	115,727	253,910	360,881	493,871	401,553	236,379	259,169
Natural gas - commercial	126,748	131,376	130,704	137,775	149,330	141,681	148,746	158,168
Diesel oil - industrial	208,578	177,409	212,165	224,091	238,124	186,598	169,043	156,081
LPG - commercial	68,357	75,784	79,939	129,348	142,661	135,296	128,383	130,292
Electricity - government	48,555	28,712	67,534	97,015	140,964	128,580	80,431	89,466
LPG - industrial	70,707	78,777	80,104	86,792	87,393	81,570	74,223	66,644
Electricity - water and sewage	33,239	20,413	49,748	71,912	112,946	89,783	55,138	61,461
Fugitive emissions from natural gas	51,137	41,034	58,635	74,028	79,312	78,630	45,218	56,638
Electricity - street lighting	29,473	17,104	38,172	54,085	78,412	68,337	42,677	47,330
Diesel oil - commercial	253,823	254,225	267,587	280,028	232,742	59,852	39,983	34,481
Fuel oil - commercial	19,363	14,921	17,598	7,346	26,578	70,684	23,226	20,809
Natural gas - cogeneration	9,032	7,039	7,003	6,603	7,692	11,783	10,326	14,623
Fuel oil - industrial	99,204	74,522	128,365	67,692	32,627	31,737	20,500	10,706
Electricity - own consumption	1,986	1,314	2,372	3,274	4,218	3,718	2,461	2,750
LPG - government	1,886	963	1,748	2,181	2,165	818	1,030	1,214
Diesel oil - government	19,640	14,170	17,068	3,861	3,632	1,573	2,484	1,188
Electricity - rural	432	289	653	341	426	290	191	214
Lighting kerosene - industrial	853	489	68	401	238	188	100	125
LPG - agriculture	4	1	292	385	0	0	3	0
LPG - others	48,409	72,810	30	0	0	0	0	0
Diesel oil - other	504	530	592	71	13	0	50	0
Diesel oil - agriculture	32	455	925	0	73	0	1	0
Lighting kerosene - residential	88	176	116	88	25	13	0	0

Source: Own elaboration.

Table 5: Emissions by sources in the Waste sector.

Source	2010	2011	2012	2013	2014	2015	2016	2017
	tCO_2e							
Landfills	557,493	575,143	636,655	675,805	701,570	728,256	775,568	775,671
Sewage	512,758	489,061	429,994	499,052	496,768	500,441	510,095	481,017
Incineration	608	874	962	930	1,708	4,520	279	281
Composting	0	0	0	0	0	0	0	167

Source: Own elaboration.

Future emission scenarios and opportunities for mitigation actions

The modeling of emissions scenarios for ClimatePlan SP was made possible by the use of the *Pathways*[3] tool. The results and reflections of the scenario modeling process are based on the analysis of three scenarios (trend, ambitious and extended), arising from the methodology proposed by C40:

What happens if nothing is done?

Trending scenario (also known as *business-as-usual* - BAU): Assumes a situation of "non-action" and absence of efforts — by the Municipality, other levels of government and private actors — to reduce emissions. The scenario considers only the probable behavior of emissions in relation to estimates of population and economic growth of the city and does not consider any mitigation action.

The results point to an increase of 107.8% in emissions in 2050 compared to the base year 2017, at an average annual growth rate of 2.2%. For 2050, the Transport sector shows the highest increase (119.8% compared to 2017), followed by Stationary Energy (112.8% compared to 2017). The Waste sector, for its part, shows an increase of only 3.8%. Figure 15 shows the growth of emissions by sector for the 2030, 2040 and 2050 horizons, compared to the base year 2017.

[3] The *Pathways* tool prioritizes the most impact actions to mitigate emissions in urban contexts of the C40 cities.

Figure 15: Emissions by sector for the trend scenario. Base year and 2030, 2040 and 2050 horizons.

HERE WILL BE INSERTED A GRAPH — FIGURE 63

Source: Own elaboration, from the analysis in the *Pathways* tool. C40 Cities (2020d)

From the projected emissions for 2050, scenarios II (Ambitious) and III (Extended) were elaborated. For each of these scenarios, assumptions were established for the types of simulated strategy in the *Pathways* tool.

What can be done to reduce emissions in São Paulo?

Ambitious scenario: Contemplates the effect of ambitious but feasible and viable actions in future years to bring the city of São Paulo closer to emissions neutrality. The scenario also considers policies and actions already set out in other municipal or federal plans and policies, as well as market trends (technological changes, efficiency gains or fuel exchange).

In this scenario, there is a 21.2% reduction in total GHG emissions in 2030 and 29.9% in 2050 compared to 2017 levels.

Table 6: Reduction (%) by subsector, year of analysis compared to base year 2017.

	2030	2040	2050
Stationary energy	-4.9	11.8	28.0
Transport	-35.1	-56.2	-66.7
Waste	19.3	24.1	23.5

Source: Own elaboration. Data extracted from the *Pathways* tool. C40 Cities (2020d)

Figure 16: Ambitious scenario reductions.

[Here will be inserted a graph - Insert Figure 65:

Source: Pathways *Tool* calibrated for São Paulo, Ambitious Scenario. C40 Cities (2020d)

Figure 17: Remaining emissions, 2050 — ambitious scenario.

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Source: Pathways *Tool* calibrated for São Paulo, Ambitious Scenario. C40 Cities (2020d)

Figure 18: Ambitious Scenario 2030

	Premises
Stationary Energy 	86% of the national renewable power matrix (hydraulic, solar, wind and biomass); 3.5% of residential buildings equipped with photovoltaic distributed generation systems; 6.5% of commercial buildings equipped with photovoltaic distributed generation systems.
Buildings 	100% street lighting with LED lamps; 100% of the buildings using LED lamps; 19% of residential buildings and 6% of commercial buildings with solar water heating; 100% of new buildings with high efficiency cooling and ventilation technologies.
Mobility and transport 	4% of all trips in the city carried out by bicycle; 50% of the municipal bus fleet using zero emissions technology; 25% reduction in individual car journeys as main mode compared to OD 2017; 57% reduction of fossil fuel passenger cars; 14% fleet of passenger vehicles powered by zero emissions technology.
Solid wastes and liquid effluents 	Recycling 34% of all paper waste generated in the city; Recycling 25% of all plastic waste generated in the city; 39% deviation of all food waste intended for landfill treatment; 100% deviation of pruning waste intended for landfill treatment; Universalization of sewage treatment.

Source: Pathways *Tool* calibrated for São Paulo, Ambitious Scenario. C40 Cities (2020d)

Figure 19: Actions needed to achieve the ambitious scenario.

	What is within reach of the city?	What else must happen?
Energy 	The city does not have competence on the energy issue. It can only take actions to raise awareness and publish the energy consumption of buildings. It can mobilize efforts to revise the existing regulatory framework.	The installed capacity for wind power generation is expected to double compared to 2017 and solar energy is expected to represent 3% of the national electric matrix by 2029, according to EPE's Decennial Energy Expansion Plan 2029. Review of the compensation model for the use of the distribution network, so as not to reduce the attractiveness of distributed generation and not to burden others.
Buildings 	The city can stimulate change by regulating energy efficiency criteria in buildings as well as the adoption of sustainable building technologies and standards in its buildings.	The adoption of high efficiency standards by the industry for air conditioning equipment, according to Ordinance 234/2020 of the National Institute of Metrology (INMETRO), is an example of advancement in the pursuit of greater efficiency of the electrical electronic products available on the market.
Mobility and transport 	The city must invest in infrastructure for active mobility and accessibility. Progressively replace the municipal bus fleet with clean alternatives. Make feasible Zero Emissions Zones and logistics terminals to stimulate the adoption of zero emissions vehicles.	The expansion of the subway will attract more passengers to public transport. Vehicle fleets in the city are expected to stabilize by 2025. The progressive introduction of hybrid and electric vehicles will reduce the consumption of automotive gasoline in the city.
Solid wastes and liquid effluents 	By 2030, the city must build two ecoparks, universalize the selective collection and double the number of registered cooperatives. All pruning waste should be composed or treated by biodigestion.	The recovery of recycled waste by industry is expected to increase. A drastic reduction of single-use plastic is expected as a result of municipal regulation. Initiatives for composting *in situ* in residences and commercial buildings.

Source: C40 Cities (2020d).

What else needs to be done for a carbon-neutral city by 2050?

Extended scenario: Identifies the strategies needed to achieve emissions neutrality, which currently rely on actions with high political, institutional, technical, social and economic barriers to being implemented. This scenario makes it possible to point out the main challenges for the city to achieve emissions neutrality in 2050, as well as ways to be considered for updating and reviewing ClimatePlan SP. The scenario starts from the understanding that the municipality should mobilize the necessary efforts to enable actions that depend on actors outside the City Hall - other levels of government, the private sector and citizens.

In this scenario, the city of São Paulo would achieve a reduction of 55% in 2030 and 91% in 2050, compared to emissions from the base year 2017.

Figure 20: Extended Scenario Emission Reduction Potential in relation to the Trending Scenario

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Source: Pathways *Tool* calibrated for Sao Paulo, extended scenario C40 Cities (2020e)

Table 7: Estimated emissions for 2030, 2040, and 2050 in the Extended Scenario and total reduction compared to base year 2017.

	2030	2040	2050
Estimated Emissions Scenario II (tCO_2e)	6,688,095	2,526,785	1,354,260
Reduction compared to 2017 (%)	-55.0	-83.0	-90.9

Source: Own elaboration. Data extracted from *Pathways* Tool calibrated for São Paulo, extended scenario C40 Cities (2020e)

Table 8: Reduction (%) by subsector and year of analysis — Extended Scenario compared to base year 2017.

	2030	2040	2050
I. Stationary energy	-44.1	-72.0	-87.4
II. Transport	-66	-95.2	-98.6
III. Waste	-16.3	-35.5	-48.0

Source: Own elaboration. Data extracted from *Pathways* Tool calibrated for São Paulo, extended scenario (C40 Cities (2020e)

Figure 21: Extended Scenario - Additional key assumptions compared to the ambitious scenario.

	2030	2050
Energy	**19%** of all buildings in the city equipped with photovoltaic distributed generation systems	92.6% of the national renewable power matrix (hydraulic, solar, wind and biomass energy); 71% of all buildings in the city with distributed generation systems.
Buildings	100% of all new buildings using electricity for cooking; 100% of new buildings using solar or electric systems for water heating.	82% of buildings using solar and electrical systems for water heating; 86% of homes using electricity for cooking; 100% of buildings equipped with high efficiency electronics.
Mobility and transport	64% reduction of fossil fuel passenger cars; 22% of the fleet of cargo vehicles powered by zero emission technology; Only 15% of trips use the car as the main mode; 4.8% of all trips are carried out by bicycle.	100% of the fleet of passenger vehicles powered by zero emissions technology; 65% of the fleet of cargo vehicles powered by zero emissions technology and the remaining 35% by B100 biodiesel; Only 10% of journeys use cars as the main mode; 10% of all trips made by bicycle.
Solid wastes and liquid effluents	17% reduction in the volume of solid waste generated in the city; 54% of all paper and plastic waste sent for recycling; 17% of organic residues treated by anaerobic digestion.	30% reduction in the volume of solid waste generated in the city; 90% of all paper and plastic waste sent for recycling; 71% of organic residues treated by anaerobic digestion 100% of domestic effluents treated by anaerobic systems with use of biogas to generate energy.

Source: Pathways *Tool* calibrated for São Paulo, Extended Scenario. C40 Cities (2020e)

OUR ROUTE UP TO 2050 — STRATEGIES AND ACTIONS

The main result of ClimatePlan SP is a set of 43 detailed actions with implementation goals and milestones. These actions were designed both to reduce greenhouse gas emissions in the Municipality (mitigate) and to adapt the city to current and future climate change.

ClimatePlan SP's actions were planned and prioritized in alignment with major policy objectives, plans and programs of the various sectors of government, in addition to those established by the Municipal Basic Law and the Municipal Climate Change Policy. The actions comprise five strategies:

BOX: The strategies are:

Aim for zero carbon by 2050

Adapt the city of today for tomorrow

Protect the city of today for tomorrow

Atlantic Forest, we need you!

Create sustainable work and wealth

In addition, ClimatePlan SP, as a long-term plan, chose to start from the current concrete situations from the perspective of the transformations that are necessary, highlighting the difficulties and benefits of these paths. The proposed actions are not exhaustive in themselves, but rather are catalysts for other actions. As a plan that has a necessary revision at least for each new elected government, ClimatePlan SP can also be constantly improved.

All actions are detailed in the **full document** for ClimatePlan SP, from key information for its effective implementation, including:

- A full description of each action;
- To which existing plans and legislation the actions are linked;
- Which are the leading secretariats responsible for its implementation;
- Implementation deadlines, considering the estimated years of start and completion:
    - Short-term actions implemented between 2021 and 2024;

    - Medium-term actions whose implementation deadline is between 2025 and 2032;
    - Long-term actions whose implementation deadline is between 2033 and 2050.
- Wider social benefits, indicated according to the alignment of each action with the 2030 Agenda for Sustainable Development;
- Indicators for its monitoring, implementation milestones and the need for future studies and analyses.

AIM FOR ZERO CARBON BY 2050

ClimatePlan SP proposes actions aimed at: minimizing the avoidable use of means of transport; promoting active mobility and zero emissions; increasing the adoption of renewable energy sources instead of fossil fuels in transport and in residential, commercial, institutional and stationary uses for lighting, cooling, water and environmental heating, cooking; improving the energy efficiency of buildings and equipment; and reducing waste generation and adapting treatments. Such measures should be adopted as soon as possible and as effectively as possible.

Goals until 2025

- Impose energy-efficiency criteria for buildings in the Construction and Building Code, according to national energy conservation programs, and promote the green economy in the construction, industrial and services sectors;
- Increase the share of renewable photovoltaic distributed generation to 3.5% in residential buildings and 6.5% in commercial buildings;
- Promote the construction of social housing with improved ventilation and natural lighting patterns in the Municipality of São Paulo.

Goals until 2030

- Expand reforms and improvements for energy efficiency to the entire portfolio of buildings in the city;
- Increase the share of renewable photovoltaic distributed generation to 3.5% in residential buildings and 6.5% in commercial buildings;
- Increase the supply of formal jobs in the regions of the Municipality of São Paulo with the highest deficit;

- 70% of travel in the Municipality made using public transport or via active modes;
- Increase participation in the modal matrix of trips made on bicycles from 0.8% (2017) to 4% (2030);
- 50% of municipal buses with zero emissions (Law 16.802/2018);
- By 2028, reduce emissions of air pollutants by municipal buses (particulate matter — 90%, NOx — 80% and CO_2 fossil — 50%) compared to base year 2016, as determined by the Municipal Climate Change Policy;
- Legally establish and mark out a Zero Emission Zone in the Municipality of São Paulo;
- Promote the regulation for sharing of electric vehicles in the Municipality of São Paulo;
- Decrease by 50% the disposal of recyclable solid waste to landfills;
- Universalize the composting process of organic waste from fairs and municipal pruning in the Municipality of São Paulo;
- Increase the capacity of composting yards to 100,000 tons per year.

Goals Until 2040

- 100% of the fleet providing services to the PMSP with zero emissions;
- 100% of municipal buses with zero emissions (Law 16.802/2018).

Goals Until 2050

- Increase the share of renewable photovoltaic distributed generation to 13% in residential buildings and 24% in commercial buildings;
- 78% of trips in the Municipality made using public transport or via active modes;
- 8% of trips in the Municipality made by bicycle;
- Implement four ecoparks for the management of urban solid waste in the Municipality.

Table 9 Implementation deadlines for the actions of the Zero Carbon Strategy.

NOTE FOR TRANSLATION — Please translate the tables contained in the xls file titled Tables 9 - 13

BOX: Example of action in the Aim for Zero Carbon strategy

Action 11: Ensure that 100% of the fleet used by the City Hall (or outsourced) is zero emission by 2040.

São Paulo City Hall should use its market power to encourage the automobile industry and set an example for society in the transition to a zero emission fleet in the city. The action aims to replace 50% of the owned or outsourced fleet with zero emission vehicles by 2030 and 100% of the fleet by 2040.

ADAPT THE CITY OF TODAY FOR TOMORROW

The central objective of adaptation measures is the construction of a resilient city, through the reduction of social and infrastructural vulnerability, so that vital functions can be maintained in the face of the impacts of extreme events. To this end, they will increase the supply of popular housing; create new jobs in the green economy; increase the infiltration of rainwater and green areas; minimize flooding and inundations; favor and increase the provision of ecosystem services. They also seek to prevent and reduce exposure to the effects of extreme weather events, from the reduction of vulnerability in areas prone to flooding and public and private real estate developments, in addition to improving and strengthening the Municipal Civil Defense System in terms of its prevention, forecasting, alert, monitoring, protection, assistance and recovery activties in the face of climate change.

Goals until 2025

- Improve environmental quality assessment indices;
- Increase soil permeability in municipal public facilities and spaces;
- Raise potential and priority public places suitable for projects with nature-based solutions (NbS) and incorporate these practices into public drainage works;
- Review the Land Division, Use and Occupation Act, with the inclusion of the analysis of critical flooding zones;
- Make observances related to mitigation and adaptation actions to climate change part of the environmental licensing requirements of the Municipality of São Paulo;
- Strengthen the governance of Municipal Civil Defense through the structuring, implementation and monitoring of the Early Warning and Detection System for Civil Defense Risks.

Goals until 2030

- Expand and ensure the monitoring of urban planning instruments that focus on climate change adaptation and mitigation actions;
- Expand and strengthen the Clean Stream Program.

Goals Until 2050

- Expanding housing supply for low income in the Municipality of São Paulo.

Table 10: Implementation deadlines for the actions of the Adapt the City of Today for Tomorrow Strategy.

BOX: Example of Action in the Adapt the City of Today for Tomorrow Strategy

Action 23: Increase the use of nature-based solutions (NbS) in drainage infrastructure works

The use of nature-based solutions (NbS) should be increased in drainage infrastructure works. These works require hydraulic dimensioning, which is hampered by uncertainty in climate forecasts for São Paulo. In addition to this uncertainty, and considering that the Drainage Plans (linked to the Master Plan for Rainwater Drainage and Management) have already incorporated rainfall with a return period of 100 years, the reconciliation of the grey infrastructure of traditional works with nature-based solutions emerges as a solution that increases the flexibility of drainage management in São Paulo, contributing to the minimization of flooding and inundations. In addition, the green- blue infrastructure is permeable, favoring the natural processes of recharging aquifers, and also supports cooling the temperature. Moreover, it is necessary to transform the existing project culture from the perspective of increasing temperature and the potential contribution of concrete structures to this.

PROTECTING PEOPLE AND PROPERTY

The city of São Paulo aims to become safer and more sustainable and build efficient preparedness and prevention processes, with the aim of protecting people and urban infrastructure, especially the most vulnerable and exposed to the risks and threats of extreme weather events. To this end, it developed plans to minimize socio-environmental vulnerabilities, such as lessening and reducing poverty and housing deficit, seeking to achieve the Sustainable Development Goals (SDG), integrate all direct and indirect units of the municipal administration and improve public services in order to assess the current infrastructure and make it more appropriate and resilient in the face of the potential increase of climate threats.

Goals until 2025

- Empower civil servants in themes of adaptation to climate change;
- Make climate change one of the guidelines of the Municipal Arbovirus Contingency Plan;
- Implement 27 sentinel units of the Environmental Health Surveillance Program Related to Populations Exposed to Air Pollution;
- Expand the Basic Health Units with the Healthy Green Environments Program (PAVS) implemented, in order to promote in their coverage territories the climate change guideline and thus reduce vulnerabilities;

- Strengthen the fight against food waste, increasing food security;
- Establish traffic outage protocols in extreme weather events and the Traffic Service Outage Alert System.

Goals until 2030

- Drought Contingency Plan elaborated and implemented.

Table 11: Deadlines for implementation of the Protecting People and Assets Strategy actions.

BOX: Example of action of the Protecting People and Assets strategy

Action 34: Expand the Green and Healthy Environments Program (PAVS) to all basic health units (UBS), enhancing the incorporation of climate change issues

By 2025, the Green and Healthy Environments Program (PAVS) should be expanded to all basic health units (UBS), enhancing the incorporation of climate change issues. The program aims to promote the health of the population and improve their quality of life through the dissemination of information about the environment in which the person lives, as well as by promoting attitudes aimed at preservation, conservation and environmental recovery. It is well-established in the territories and a programmatic structure that can be expanded, enhancing the promotion of educational actions related to climate mitigation and adaptation.

ATLANTIC FOREST, WE NEED YOU!

São Paulo should support cross-sectional public policies aimed at promoting the increase, conservation and preservation of green areas, in order to maintain ecosystem services and promote adaptation to extreme events, especially for the population most vulnerable to the threats of climate change.

Goals until 2025

- Conducting studies to define tree species resilient to climate change;
- Production of climatically resilient seedlings;
- Elaboration and availability of the Municipal Environmental Heritage Areas Registry;
- Beginning of implementation of the Plan for the Conservation and Restoration of Areas providing Environmental Services (PMSA), the Municipal Urban Afforestation Plan (PMAU) and the Municipal Plan for Protected Areas, Green Areas and Free Spaces (Planpavel).

Goals Until 2050

- Complete mapping of springs in the Municipality;

- Publication of the plan for protection and restoration of springs and watercourses.

Table 12: Deadlines for implementing the actions of the Atlantic Forest, We Need You! Strategy

BOX: Example of action of the Atlantic Forest, we need you! strategy

Action 38: Strengthen resources and instruments for the conservation of biodiversity, natural capital, ecosystem and environmental services

The means and instruments for the conservation of biodiversity, natural capital, ecosystem and environmental services should be strengthened, in order to avoid reaching points of no return. More specifically, the action aims to: adopt nature-based solutions for the various sectoral policies, whenever possible; guarantee sources of funding, both public and private, for the full implementation of the PSA instrument and other instruments and actions to encourage the preservation and recovery of biodiversity and ecosystem services; improve the institutional and operational capacity of the PMSP for the implementation and continuous monitoring of biodiversity conservation actions, natural capital and ecosystem services; ensure the implementation of the four green plans: Municipal Atlantic Forest Plan, Municipal Plan for the Conservation and Restoration of Areas providing Environmental Services, Municipal Plan for Protected Areas, Green Areas and Free Spaces, Municipal Afforestation Plan; stimulate more sustainable economic activities, compatible with the conservation of biodiversity, natural capital and of ecosystem services; ensure that the urbanization actions of precarious settlements, housing supply and similar adopt proposals with increased permeability of soil and green areas capable of decreasing environmental modification or predation.

CREATE SUSTAINABLE WORK AND WEALTH

São Paulo should be more inclusive, connected to global value chains and harness their potential and protagonism. Challenges, such as the transition from fixed capital in a high-emission, consumption-based economy to a new zero-emission economy must be overcome. The adoption of communication strategies, involving all of society to promote cultural change and political and social engagement, will be the aim in this process. The city must make efforts to seek sustainability and to progressively reduce negative externalities of economic activities, enabling the constant improvement of current practices and implementing new value chains.

Goals until 2025

- Implementation of the Municipal Economic Development Plan;

- Technical standard established to favor the adoption of reusable packaging by the industrial and service sectors;
- Elaboration and implementation of the Municipal Environmental Education Program, including the topic of climate change;
- Organic agricultural production active and incorporated into the food market;
- Drawing up and annual update of the Municipal Registry of Organic Community Urban Gardens;
- Implementation of legislation establishing criteria for the implementation of organic community urban gardens in public areas;
- Mapping of organic community urban gardens in public free spaces of the Municipality of São Paulo incorporated into the Sampa+Rural Platform.

Table 13: Deadlines for implementing the actions of the Create Sustainable Work and Wealth Strategy.

BOX: Example of action of the Create Sustainable Work and Wealth strategy

Action 42: Strengthen environmental and socially sustainable economic activities in the rural area of the Municipality of São Paulo, especially local, family and organic food production.

Environmental and socially sustainable economic activities should be strengthened in the rural area of the Municipality of São Paulo, especially local, family and organic food production. To this end, economic activities should be promoted that include job creation, gender equality, youth integration, maintenance of the rural landscape and the conservation of areas providing environmental services. Among the activities identified are: organic and agroecological agriculture in rural areas, through technical training of farmers and strengthening value chains, providing increased value added to agricultural production and the implementation of economic instruments to encourage conversion agroecological, including payment for environmental services (PSA); community-based entrepreneurship and existing cooperatives, or those which are to be created; short circuits for marketing products *in natura* and processed from the rural area of the Municipality.

The implementation of strategies and actions that lead São Paulo to be a city with lower emissions and more resilient to climate change depends fundamentally on the awareness of society about the need and urgency of transformations in the contemporary way of life aiming for sustainability and the construction of a more equitable and ecologically balanced society.

Because of this, environmental education is fundamental to help the transformation of values, behaviors, feelings and attitudes to be achieved by all, permanently and continuously. This implies the interiorization of knowledge, with critical sense and awareness, so that everyday practices are perceived, evaluated and modified, and that transform the way we see and relate to the environment in which we live.

This approach permeated the planning of ClimatePlan SP and is present in the National Policy on Climate Change (2009), National Environment Policy (1981) and the Federal Constitution (1988), basic instruments that guide the public policies of states and municipalities.

Governance

ClimatePlan SP focused on laws, norms, policies, projects, programs and plans of the Union, State and Municipality to structure itself. The actions presented in all strategies indicate the normative basis on which they are structured.

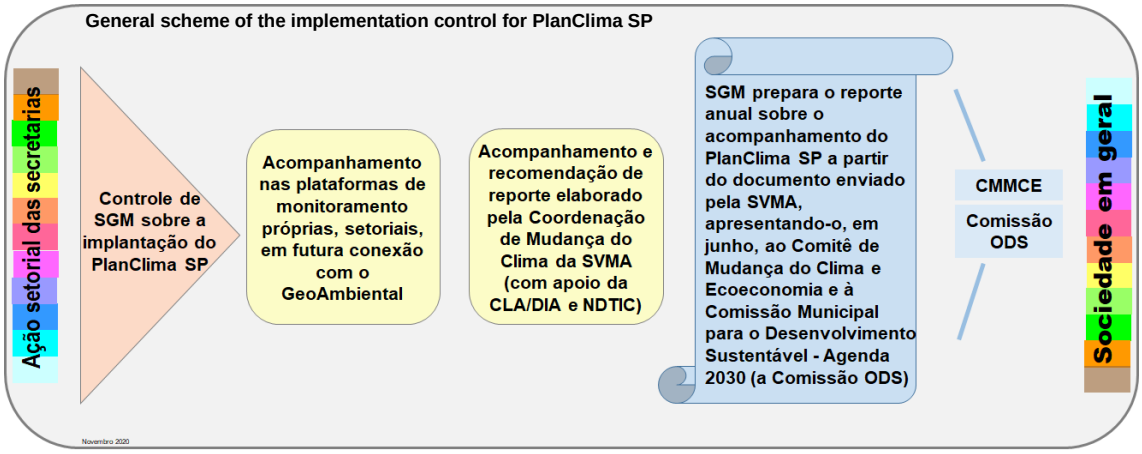
Although the Municipality has had a Municipal Climate Change Policy since 2009 (Law 14.933/2009), the law does lay down the obligation to elaborate and execute plans. But, in its article 5 the law established a target for 2012 of 30% reduction of greenhouse gas emissions of the Municipality in relation to 2005 levels. It also established that goals should be set by law two years before the end of each commitment. However, the difficulties of identifying responsibilities of the Municipality in relation to emissions make it impossible to use mitigation targets as set out in this law.

The management of ClimatePlan SP will be exercised by the Municipal Government Secretariat, which will make annual communications of its implementation to the Municipal Committee for Climate Change and Ecoeconomics and to the Municipal Commission for Sustainable Development — Agenda 2030 (known as the SDG

Commission). The responsibility for the implementation of each action, however, will lie with the secretariats involved.

NOTE — THE FIGURE BELOW WILL BE TRANSLATED LATER — JUST TRANSLATE THE TITLE AND SOURCE

Figure 22: ClimatePlan SP Implementation Control.



Source: Own elaboration.

Monitoring, evaluation and reporting

The implementation of ClimatePlan SP actions, with the incorporation of its vision and objectives, will extend over thirty years (2020-2050), i.e. almost eight municipal administrations. During this period, the main strategic planning instruments of the Municipality should focus on the actions and priorities established in the Plan, aiming at neutrality of emissions by 2050 and increasing the adaptive capacity of the city and its inhabitants to climate risks.

The Monitoring, Evaluation and Reporting System for ClimatePlan SP (MAR ClimatePlan SP System) seeks to recognize the experience accumulated by the City Council through the use of monitoring systems already incorporated in the city's routine, supporting the advancement of actions to improve the production and management of data in implementation of the Plan. To this end, municipal actions should progressively incorporate the evaluation and monitoring of emissions in their elaboration.

However, it is intended that in two years the monitoring of ClimatePlan SP will be carried out by the GeoEnvironmental platform, whose implementation process has been underway since October 2020.

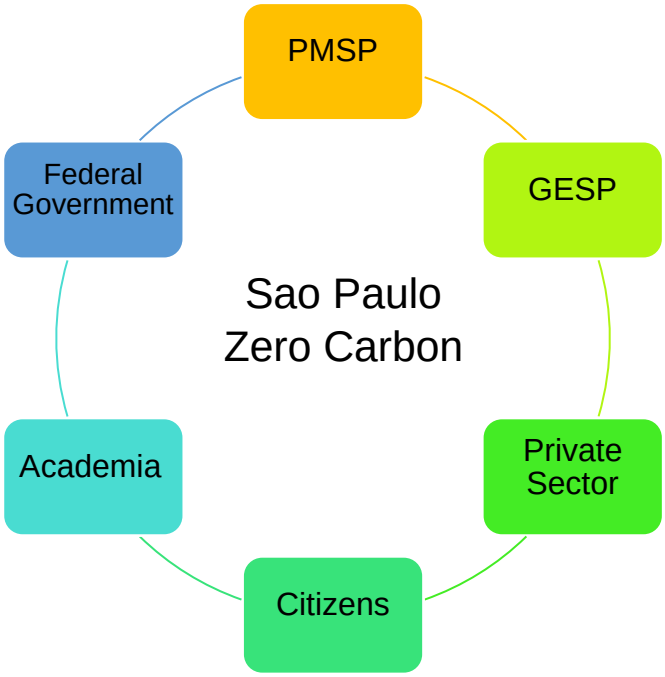
The review of ClimatePlan SP will be carried out in the first year of each elected government (except in the year 2021), in association with the Multiannual Plan and the Goals Program, or in other periods, when necessary.

A COLLECTIVE PROJECT

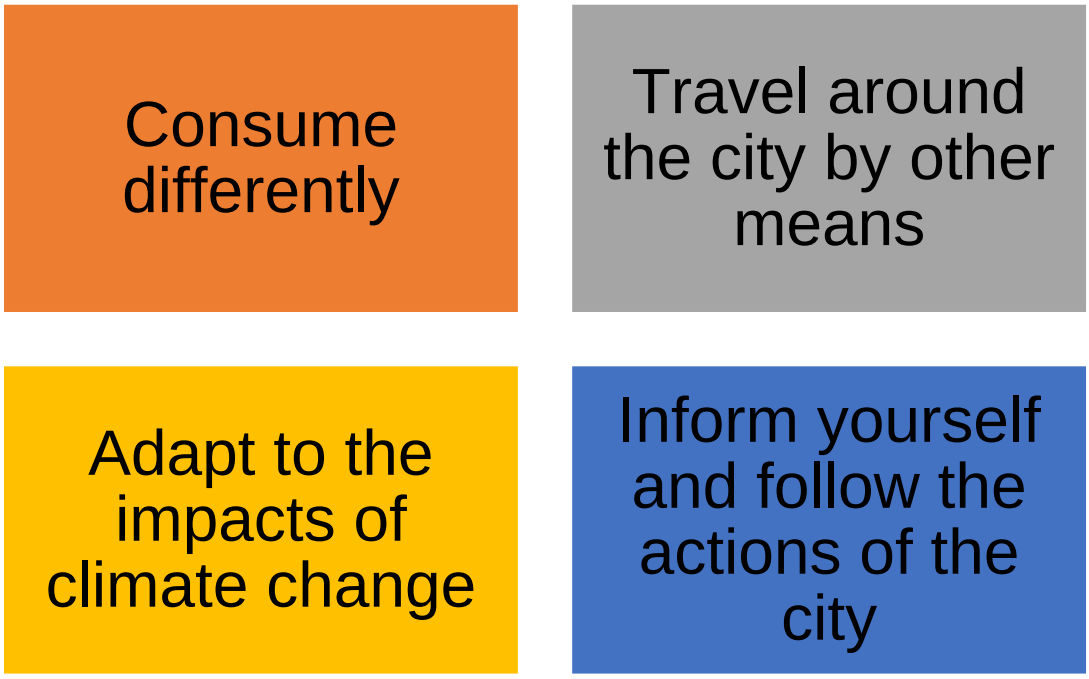
Several of the actions proposed in ClimatePlan SP depend on people's adherence, such as reducing waste production and recycling by selective collection or composting. Others may encounter resistance - such as the implementation of bus corridors, bike lanes and zero emission zones - and require promotion of participation and public engagement for their effectiveness. This engagement can also contribute to the conscious reduction of global greenhouse gas emissions related to goods produced outside the city and imported for consumption by São Paulo, over which the municipality has little scope to control through its actions.

That is why, in order to achieve several of its goals, the City Council must join forces with the State Government, the Federal Government, citizens, the private sector and academia.

Figure 23: São Paulo Zero Carbon is the fruit of everybody's actions



Individual transformations can also support this process and scale up to pressure actors to achieve major transformations. ClimatePlan SP calls for the population of São Paulo to collaborate. Changes in our way of living in the city can contribute to the advancement of the agenda established by ClimatePlan SP:



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