

PARIS CLIMATE ACTION PLAN

TOWARDS A CARBON NEUTRAL CITY
AND 100% RENEWABLE ENERGIES

An action plan
for 2030
and an ambition
for 2050

For a fairer
and more
inclusive city

Together
for climate



ici, demain!
ensemble pour le climat



ici, demain!
ensemble pour le climat

Conceptualized by:
City of Paris, Green Parks
and Environment Urban
Ecology Agency

Designed by:
EcoAct

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*Making Paris
a carbon-neutral city
powered entirely
by renewable energy
by 2050.*

ANNE HIDALGO

MAYOR OF PARIS

Climate Change is one of the greatest challenges mankind has ever faced. In this ongoing race against time, the cities of the world have a key role to play – both as pioneers and prescriber.

As such in 2015 we, major world-cities united, pledged to tackle climate change during the climate summit for local leaders at Paris City Hall, the new climate air and energy Plan of the city of Paris heralds a strong ambition making Paris a carbon-neutral city powered entirely by renewable energy by 2050 at the latest. To achieve this, it is crucial to involve all territorial stakeholders - public and private entities, associations and citizens. Such is the challenge if we want to meet the targets set in the Paris Agreement at COP21.

Multiple tools are available to cities to accelerate ecological transition and reduce toxic emissions. There is a large array of solutions from thermal rehabilitation of buildings to green financing, from soft mobility to sustainable food supply,

from rich biodiversity to waste recycling. Paris engages in and embraces all of them in order to pave the way for a resilient city respectful of its environment.

This is the commitment that I undertake as Mayor of Paris and C40 Chair, vis-à-vis occasional and lifelong Parisians. And bearing in mind that Paris belongs to a basin where diversity is enrichment, I am committed to creating local partnerships with rural areas to promote the production of renewable energy production and short food circuits. For energy transition is a tremendous opportunity to reinforce solidarity and reciprocity among urban and rural dwellers.

Paris new climate plan will thus create the means of improving people's lives, by better securing their health and well-being, and providing them with new perspectives and particularly jobs. In doing so, it will fulfill Paris' promise as a city that both breathes and inspires.

CÉLIA BLAUDEL

DEPUTY MAYOR IN CHARGE OF ENVIRONMENT, SUSTAINABLE DEVELOPMENT, WATER, CANALS POLICY AND CLIMATE PLAN

Climate Change is already at work, taking a heavy toll on world population, especially on the most vulnerable ones. While the COP 21 – the international conference on climate change held in Paris in 2015 – contributed to raising collective awareness, the time has come now for us to undertake actions, for this is the greatest challenge mankind has to face.

As an elected official, I am committed to improving people's daily lives; I feel it is my duty to present a new climate air and energy Plan to take up current and upcoming challenges. Embracing a vision of Paris as a carbon-neutral city powered entirely by renewable energy by 2050 requires ambition, inventiveness and boldness. With more than 500 actions starting as early as today, the climate Plan paves the way to achieving zero greenhouse gas emissions by 2050, which implements the Paris Agreement.

To meet this objective we will have to be hard on ourselves as we will need to divide our energy consumption by two, to drastically develop renewable energies, to renovate buildings, and to change the way we consume, eat and commute. We must show creativity and innovation at a technical and social level, and invent new jobs and new forms of solidarity. These ongoing changes provide us with an opportunity to build a more open and fairer city, bridging towards both urban and rural territories and the major cities of the world.

Developed with the Parisians and for them, involving the driving forces of the territory and our neighbours, the Climate Action Plan invites everyone to commit fully to address climate change. We are all affected by this! Let's act here, tomorrow, together in favour of Climate.



*An opportunity
to build a more open
and fairer city.*





PREAMBLE

THE CLIMATE IS CHANGING, THIS IS THE REALITY

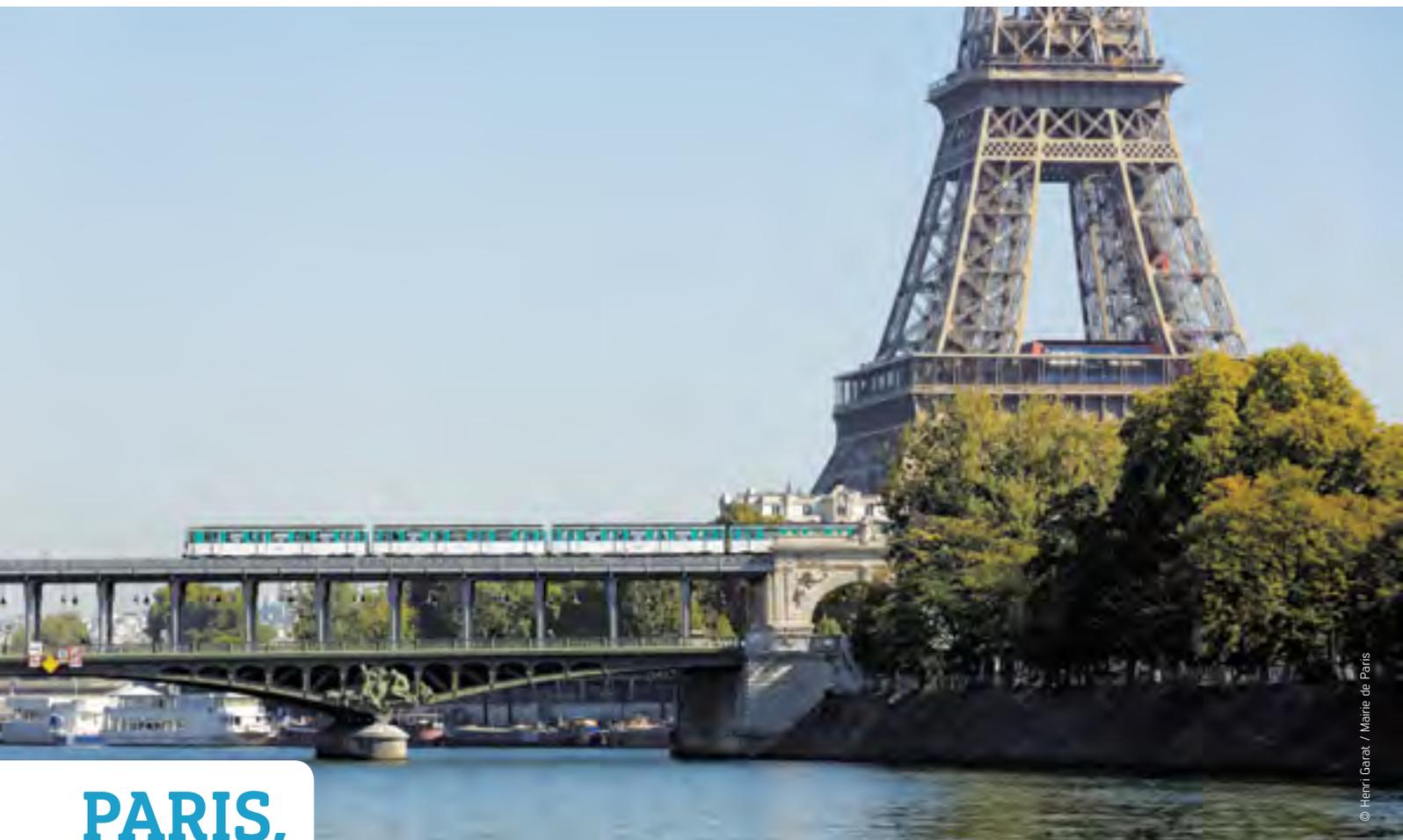
*It is influencing our ecosystems,
our cities and our lifestyles here in Paris
and throughout the entire world.*

On 12 December 2015, during the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21), 195 States adopted the Paris Agreement, which sets out to limit the average rise in global temperatures to well below +2°C, and strives to limit the increase to +1.5°C. Thanks to an unprecedented mobilisation of civil society and States, this Agreement was reached and entered into force exceptionally quickly on 4 November 2016.

The international community has sent out a strong signal to citizens, economic operators and members of civil society by setting the goal of achieving carbon neutrality by 2050 and by defining the transition towards a more environmentally and climate-friendly way of life as a universally shared vision.

Cities are dynamic ecosystems of our planet. They are already home to nearly 60% of the world's population, generate the most dynamic economic activity and emit 70% of global greenhouse gas emissions.

For the past ten years or so, thanks to their Climate Plans, cities have become the local leaders of the fight against climate disruption. At Paris City Hall on 4 December 2015, over 1,000 representatives of local governments signed the Paris Pledge for Action which encouraged States to adopt the Paris Agreement but, above all, committed them to cutting greenhouse gas emissions in their territories drastically (by 80%), to acquiring 100% renewable energy resources between now and 2050, and to improving the resilience of their cities to climate risks, now and in the future.



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PARIS, 10 YEARS OF CLIMATE ACTION

Back in 2007, Paris adopted a proactive and ambitious Climate Action Plan (Plan Climat) with a view to reducing greenhouse gas emissions in the long term. In this way, the City set a reduction target of 75% between 2004 and 2050¹ and a short-term target of 25% by 2020.

In the last 10 years, the carbon footprint² of the city has decreased by nearly 10%. This means that the first key step has been made: the increasingly steep curves of greenhouse gases and atmospheric pollutants have been reversed by the action taken by the City in the framework of the first Climate Plans and Air Quality Plans.

// AN EXEMPLARY LOCAL GOVERNMENT

In 2004, the City of Paris began assessing the impact of its activities in terms of greenhouse gases. In 2006, the Paris local government published its first greenhouse gas assessment, which revealed the most highly emitting sectors: public facilities (56%), public transport (20%) and consumer goods (24%). All in all, in 2014, the Paris local government's emissions amounted to less than 2% of the carbon footprint of the territory, at 262,000 tCO₂/year.

In 2007, an ambitious programme to renovate public property was implemented, starting with the renovation of Paris schools and heating systems. To date, 240 schools have been

renovated or are in the process of being renovated, which reduces their energy consumption by over 30%.

Launched in 2011, the public lighting renovation programme aims to reduce energy consumption in this sector by 30% with no decline in the quality of the service provided. Since 2004, a 23% drop in energy consumption has been observed, corresponding to 33 GWh or the equivalent of the energy consumption of the Greater Toulouse conurbation. This programme has already enabled a 33% reduction in the greenhouse gas emissions from public lighting.

At the same time, the City of Paris has facilitated the installation of local renewable energy and energy recovery facilities. Over a 10-year period, over 50,000m² of solar panels have been installed in the Paris area, including flagship projects such as the Halle Pajol (3,500m²), which is energy self-sufficient. Since 2015, municipal services have been powered by electricity generated from renewable sources.

What we eat matters: French agriculture accounts for over 20% of national greenhouse gas emissions. In Paris, the food consumed by

1- Based on 2004 levels

2- Carbon Assessment (Bilan Carbone®) methodology taking account of all emissions (direct and indirect) in the Paris area

Parisians and visitors generates annual emissions exceeding 4.7 million tCO₂, corresponding to 18% of the area's carbon footprint. That is why an ambitious food sustainability programme for catering services in Paris was implemented in the 2007 Climate Plan, with a view to reducing the carbon footprint of the 30 million meals served annually. By 2016, significant progress had been made: 17,000 tCO₂ avoided and 37.7% of sustainable foods (products derived from organic farming, local seasonal products and products with Labels and certifications) Paris has become the biggest public purchaser of organic foods in France.

Paris has become the biggest public purchaser of organic foods in France

To reduce the emissions from its transport systems, the Paris local government has adopted two consecutive Mobility Plans (*Plans de Déplacements*) that aim to cut greenhouse gas emissions by over 30% and reduce the associated atmospheric pollutants. In the last 10 years, the municipal fleet has been reduced by over 15% and government official cars can no longer be used. In 2015, all of the diesel-powered saloon cars and compact cars in the fleet were replaced

by electric, hybrid or petrol-powered cars. A programme to remove diesel-powered vehicles from the commercial vehicle fleet – including refuse collection lorries – is currently in progress.

Sometimes, reducing the territory's carbon footprint also means an increase in the local government's footprint due to additional investments. Since 2004, new separated waste collections have been carried out to improve the selective sorting system. This required the use of additional vehicles which have increased the local government's emissions (+7,000 tCO₂/year) but, in return, have contributed to reducing the territory's carbon footprint (-50,000 tCO₂/year) over the same period, thanks to selective waste sorting (cardboard, paper, glass, bio-waste, etc.).

All of these actions have enabled the local government to reduce its emissions by nearly 19% over a 10-year period. However, a proportion of these savings have been offset by the strengthening of the public service in Paris and an increase in the number of municipal facilities, accounting for net savings of 2% in 10 years. ■

// KEY PROJECTS FORMING THE BACKBONE OF THE LOW-CARBON TRANSITION IN PARIS

Since 2001, a policy of promoting sustainable mobility and reclaiming public land for active and shared mobility schemes has been implemented.

This has led to a reduction of over 50% for the majority of atmospheric pollutants and 39% for greenhouse gases. This policy has resulted in the development of cycle paths (+700 km), the creation of the Vélib' self-service bicycle-hire (23,600 bicycles) and the Autolib' self-service electric car-hire (1,100 stations) schemes in central and greater Paris, the extension of the Métro underground rail lines around Paris, and the creation of 24 km of tram lines.

Buildings are, by far, the biggest consumers of energy in Paris. Reducing building energy consumption has become a priority. Since 2008, social housing providers in Paris have been committed to a programme of reducing

the energy consumption of 55,000 dwellings by at least 30% by 2020. 36,200 dwellings have been renovated to date or are in the process of being renovated. In addition to the energy savings and reductions in greenhouse gases, the benefits include better thermal comfort for the residents in summer and winter, average savings of €360/year per household, and the creation of over 7,500 jobs.

To speed up the energy transition in Paris, the city and its partners (*Météo-France*, RATP, the *Compagnie Parisienne de Chauffage Urbain* and EDF) have created the Paris Climate Agency (*Agence Parisienne du Climat - APC*). Since 2011, the APC has been an indispensable local stakeholder in terms of the support it provides through renovation projects for residents of jointly owned properties, as well as for a large number of economic operators.



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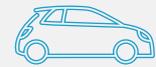
KEY FIGURES



+ 700 km
CYCLE PATHS

CREATION OF THE VÉLIB'

23,600
SELF-SERVICE BICYCLE-HIRE

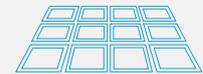


CREATION OF
1,100

STATIONS AUTOLIB'
SELF-SERVICE ELECTRIC CAR-HIRE



24 km TRAM LINES



50,000 m²
SOLAR PANELS
HAVE BEEN INSTALLED



CREATION OF
+ 7,500
JOBS



240 SCHOOLS
& **36,200** DWELLINGS

HAVE BEEN RENOVATED
OR ARE IN THE PROCESS
OF BEING RENOVATED

// PREAMBLE

Mobilising economic operators was one of the priorities of the 2012 Climate Plan which established the Paris Climate Action Charter (*Charte Paris Action Climat*), enabling large and small enterprises to voluntarily join the fight against climate change. To date, over 40 entities have signed the Charter and committed to reducing emissions by at least 750,000 tCO₂/year by 2020.

In total, the territory's carbon footprint decreased by nearly 10% between 2004 and 2014. These encouraging results demonstrate that ambitious and determined public action pays off. To maintain this momentum, the policies undertaken now need to be stepped up and all stakeholders in the Paris community (residents, users, visitors, companies and institutions) need to be involved in the low-carbon transition.

The city of Paris is highly sensitive to periods of extreme heat. To reduce the impact of urban heat

islands, a programme to promote the greening of Paris has added 70 hectares of gardens open to the public. In 2012, an assessment of Paris's vulnerability to the impacts of climate change was carried out. Its findings confirmed that Paris is relatively robust city in relation to future hazards (storms and flooding, etc.). Nevertheless, preparations must be made to adapt Paris to long periods of extreme heat (health risks, downgrading of the city's operations), periods of drought (water resources, river traffic) and flooding (interruptions to urban services). The adaptation strategy, adopted by the City Council of Paris in September 2015, defines 65 measures to strengthen the territory, reduce the impacts of these hazards, protect Parisians and plan for the future to make the city more resilient in response to climate change.

In September 2017, the City Council of Paris incorporated this strategy into a more a

comprehensive vision by adopting the first Paris Resilience Strategy in order to adapt the city to climate change, strengthen solidarity and facilitate inclusion.

Lastly, Paris's climate actions form part of a global approach, which is now enshrined in the Paris Climate Agreement and shared with many other stakeholders and territories within the Greater Paris Metropolitan Area, but also in France, Europe and worldwide. As climate challenges are, by their very nature, cross-border issues, they require collective and socially responsible actions at all levels, from local to global. The City of Paris has developed specific actions intended to benefit the most vulnerable populations, such as the City's contribution to the United Nations' Green Fund, and is actively involved in numerous local authority networks (Energy Cities, C40, etc.) in order to give cities a stronger voice in climate diplomacy. ■





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TOWARDS CARBON NEUTRALITY

This new Paris Climate Action Plan outlines a common future for a carbon-neutral city by 2050, which is adapted to extreme climate events and resilient in response to crises and shocks. It conveys a positive message for a sustainable and equitable city for everyone.

Carbon neutrality is one of the fundamental targets of the Paris Agreement. It consists of attaining zero net greenhouse gas (or zero net carbon) emissions, which means striking a balance between

our ecosystem's natural capacity to absorb greenhouse gas emissions and the irreducible emissions generated by human activities between now and 2050.

Carbon footprint of Paris in 2014 (million tonnes of CO₂)

■ Outer Paris emissions

■ Local emissions



AIR TRANSPORT
PASSENGERS + GOODS

8,7



FOOD CONSUMPTION

4,8



OUTER PARIS ON ROAD TRANSPORT

3,4



RESIDENTIAL

2,1



TERTIARY

2,0



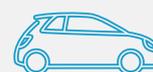
MATERIALS CONSTRUCTION

1,5



UPSTREAM ENERGY

1,3



TRANSPORT WITHIN PARIS

1,3



WASTE
0,4

INDUSTRY
0,1

Carbon reduction pathways of the New Paris Climate Plan

Paris's greenhouse gas emissions (25.6 million tonnes of CO₂ in 2014) can be divided into two major categories:

LOCAL EMISSIONS (6,0 MtCO₂ in 2014)

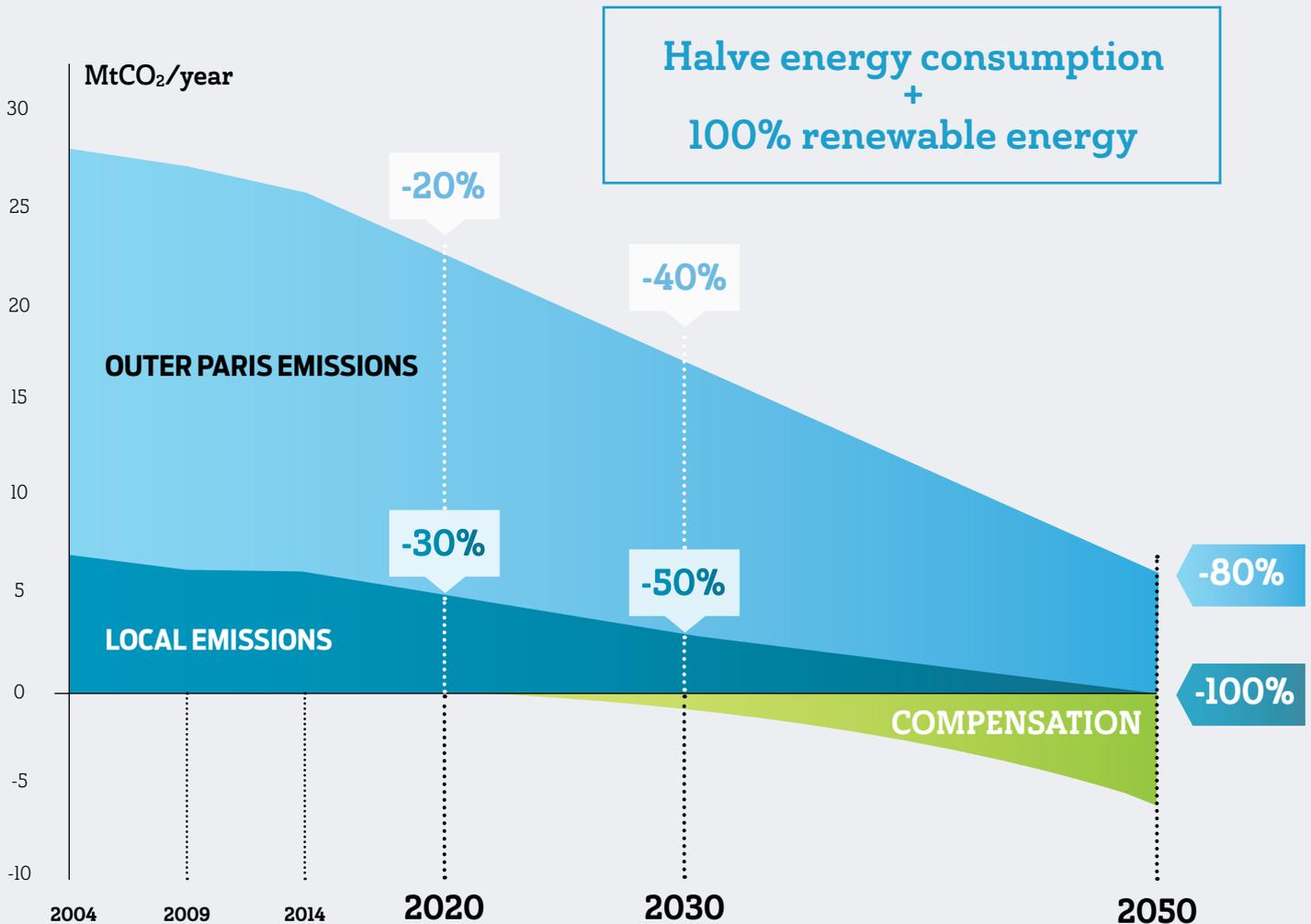
Direct emissions from Paris area related to the energy consumption of the residential, tertiary/service and industrial sectors, city centre transport and the emissions associated with the waste produced in Paris.

THE CARBON FOOTPRINT OF THE TERRITORY (6,0+19,6 MtCO₂ in 2014)

Local emissions plus the upstream emissions³ produced prior to energy consumption, emissions associated with the food and construction sectors, and from transport outside Paris (including air transport).

In line with the goals of the Paris Agreement, by the horizon of 2050, the City of Paris undertakes to:

- **REDUCE LOCAL EMISSIONS BY 100%**, achieving the goal of zero emissions in Paris.
- **PROMOTE AN 80% REDUCTION IN THE CARBON FOOTPRINT** of Paris compared to 2004 levels and involve all local stakeholders in compensating for residual emissions in order to attain the zero net carbon target for the Paris area.



3- Upstream: transmission and distribution losses, amortization of energy facilities (creation, destruction)



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CREATING A SHARED VISION

This new Paris Climate Action Plan is the result of a significant, iterative and collaborative process that began in July 2016 with the publication of the review of the first 10 years of the Climate Plan.

The need for a very broad involvement of local stakeholders stems from the fact that private consumers are responsible for 75% of Paris's carbon footprint, generated by the activities of economic operators, Parisians and anyone who travels to Paris. Mobilising everyone has therefore become a major priority in the drafting of this new Plan.

Consequently, the consultation undertaken for the new Paris Climate Plan has been based on three cornerstones:

- The review of the first 10 years of actions⁴,
- The recommendation from the citizens' conference entitled "What individual and collective contributions can change our lifestyles?",

- The forward-looking study entitled "A new era for Paris"⁵ which outlines one of the possible trajectories required for Paris to become carbon-neutral by 2050.

From November 2016 to the end of March 2017, 700 people (citizens, professionals, associations, experts and City of Paris employees) were mobilised, over 100 hours of debates were organised, and 280 proposals were received from citizens and added to the 300 contributions from the economic, academic and non-profit sectors. A summary of the consultation⁷ was published on 5 April 2017.

This has been a crucial period for the development of a shared vision that is receptive to the desires and questions raised by the challenge of attaining a carbon-neutral city by 2050.

700 PROPOSALS RECEIVED

- Promoting renewables,
- Developing active forms of mobility (walking and cycling),
- Identifying climate ambassadors and student climate representatives,
- Facilitating the emergence of new professions such as neighbourhood eco-managers,
- Promoting property sharing and pooling,
- Creating citizens' observatories,
- Encouraging fun challenge events (carbon challenges, vegetarian challenges, etc.) and conviviality (annual dinners),
- Ensuring the existence of third-party workplaces and teleworking centres, establishing an annual personal carbon declaration,
- Improving the referencing of eco-friendly tourism structures.

4- <https://api-site-cdn.paris.fr/images/83843>

5- "Quelles contributions individuelles et collectives pour changer nos modes de vie ?"

<http://www.paris.fr/actualites/conference-citoyenne-les-voeux-des-parisiens-pour-le-climat-4504>

6- "Paris change d'ère" - <http://www.paris2050.elieth.com/>

7- <https://api-site-cdn.paris.fr/images/91103>



© Julien Paumelle

ZERO LOCAL EMISSIONS = 50% REDUCTION IN ENERGY CONSUMPTION + 100% RENEWABLE ENERGY

To attain zero emissions at the local level, Paris's energy consumption will need to be halved and 100% of the energy consumed will need to be of renewable origin by 2050.

// HALVING PARIS'S ENERGY CONSUMPTION BY 2050

To halve the amount of energy consumed in its territory, the City of Paris will prioritise housing renovations and reducing the use of transport modes that generate the highest levels of carbon emissions.

In 2014, Paris consumed more than 36 TWh of energy, with Paris's 110,000 tertiary/service and residential buildings accounting for 85% of this total. 95% of the buildings that will exist in 2050 have already been built or will be built in the near future. The first stage will consist of reducing the energy consumption by more than one third between now and 2030.

By 2050, more than one million dwellings and over 50 million m² of businesses, offices, hotels and public facilities will need to have been thermally renovated. National, regional and metropolitan strategies and facilitation

By 2050, more than one million dwellings and over 50 million m² of businesses, offices, hotels and public facilities will need to have been thermally renovated.

measures must be implemented to create the conditions required to attain this target. These renovations will enable significant reductions in the energy bills for buildings (hot water, heating and electricity) while also adapting them to more extreme summer weather conditions. Protecting the health of Parisians and workers by improving thermal comfort in summer and focusing on indoor air quality (natural cooling, ventilation, air conditioning provided by the urban cooling system, passive protection of building shells, etc.) is one of the priorities of the new Climate Plan.

As far as the mobility of people and goods is concerned, reducing energy consumption will require more rapid changes in behaviours and lifestyles (better vehicle sharing, more active mobility and fewer commuter journeys), the development of public transport and the phasing out of diesel and petrol-powered engines. This will make significant improvements to air quality and Parisians' health.

And finally, the best type of energy is the energy we do not consume. Substantial reductions in Paris's energy needs – by 35% in 2030 and by 50% in 2050 – will be essential to enable a progressive shift towards 100% renewable and recovered energy supplied to Paris. ■

// 100% RENEWABLE ENERGY

Carbon neutrality can only be attained if Paris obtains its energy from 100% renewable sources.

Paris's energy consumption was renewably sourced, and 5% of this was produced locally.

Between now and 2050, Paris wishes to promote the "right to clean energy for all". Just as they have the right to safe drinking water, all French people must have access to clean energy by 2050.

The City of Paris, which is the organising authority for energy distribution throughout its territory, will ensure the development of a 100% renewable and recovered energy distribution system. By 2050, the proportion of renewable energy consumed in Paris must increase from 17% in 2014 to 25% in 2020, 45% in 2030 and 100% in 2050.

To this end, the City of Paris has undertaken to speed up the greening of its urban heating network energy mix by setting a 75% renewable energy consumption target for the system in 2030 and 100% in 2050.

Fossil fuels emit substantial amounts of greenhouse gases and atmospheric pollutants. That is why the new Climate Plan has established the aim of progressively phasing out fossil fuels by 2030. ■

RELOCATION OF PRODUCTION AND INNOVATION

TO DRIVE THE ENERGY TRANSITION TOWARD A CIRCULAR ECONOMY APPROACH

The City of Paris intends to adopt a single approach to tackle two challenges: employment and climate.

Industry and ecology should be combined rather than opposed. In this way, environmental issues are forcing us to rethink the urban metabolism and the location of manufacturing sites in the city. Herein lies the challenge raised by the circular economy: we need to employ a different approach to developing the processes through which the city imports, consumes, converts and exports energy, materials and waste. By creating short supply chain, we can encourage the emergence of a low-carbon economy based on the creation of non-relocatable jobs.

The White Paper on the Circular Economy of Greater Paris and the report entitled "Manufacturing in Paris (*Fabriquer à Paris*)" propose numerous promising possibilities that Paris and its partners have started to implement. These include the need to set aside areas for production and urban services at the heart of the city to enable this new economy to develop according to the principles of the circular economy, proximity, and by encouraging the pooling of production tools and resources in response to environmental issues.

The City of Paris is mobilising its innovation ecosystem to find new responses to climate issues. Numerous programmes are being launched each month in Paris to speed up the development of innovative solutions that can contribute to the energy and ecological transition. In this way, the City is supporting several initiatives such as the Paris&Co sustainable cities incubator platform, the urban experiments being conducted by Urban Lab, and the DataCity programme on data-related solutions.

The Paris Climate Plan is an opportunity to examine possible future innovations, to prepare for them and to ensure that they will help to attain the City's climate-related goals. The digital revolution in particular offers the potential to speed up the dissemination of solutions to facilitate the energy transition. Through DataCity, and other projects such as CoRDEES⁸, the City is already involving its partners in the development of new ways to use data in response to climate change-related challenges. ■

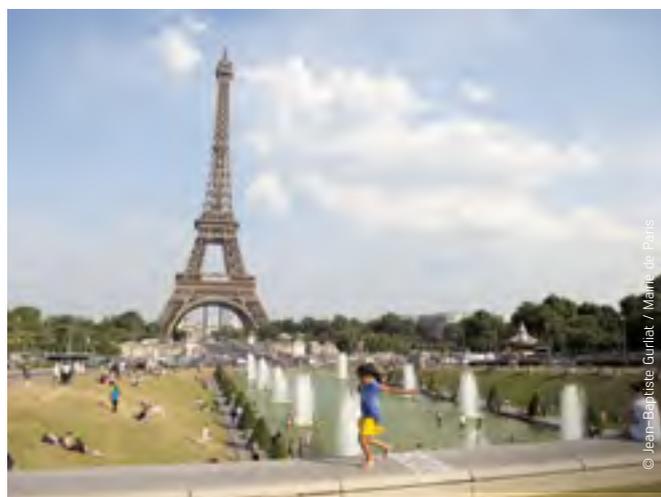
ADAPTATION, RESILIENCE AND SOCIAL INCLUSION

In Paris, we are already familiar with the first effects of climate disruption (more frequent heat waves and flooding). Studies carried out on the Paris climate show that over the next 100 years, periods of extreme heat will occur more regularly and be more intense; heavy rainfall will be more frequent as will drought phenomena, which will exacerbate the pressures on water resources. In this context, we must adapt the city and increase its resilience⁹. Consequently, the City's actions must be devised on two levels: supporting all Parisians in the energy transition, while also preparing them and protecting them.

It is essential that the energy transition is solidarity-based and excludes no one, and that the new services, future forms of mobility and energy-efficient dwellings of tomorrow are within everyone's reach. One of the challenges for the new Climate Plan is to reduce fuel poverty significantly by 2030. This blueprint for society will also generate jobs, innovations and career changes, and Paris will participate fully in this transition.

The new Paris Climate Plan is consistent with the main priorities of the resilience, biodiversity conservation and adaptation strategies¹⁰ adopted by the Council of Paris.

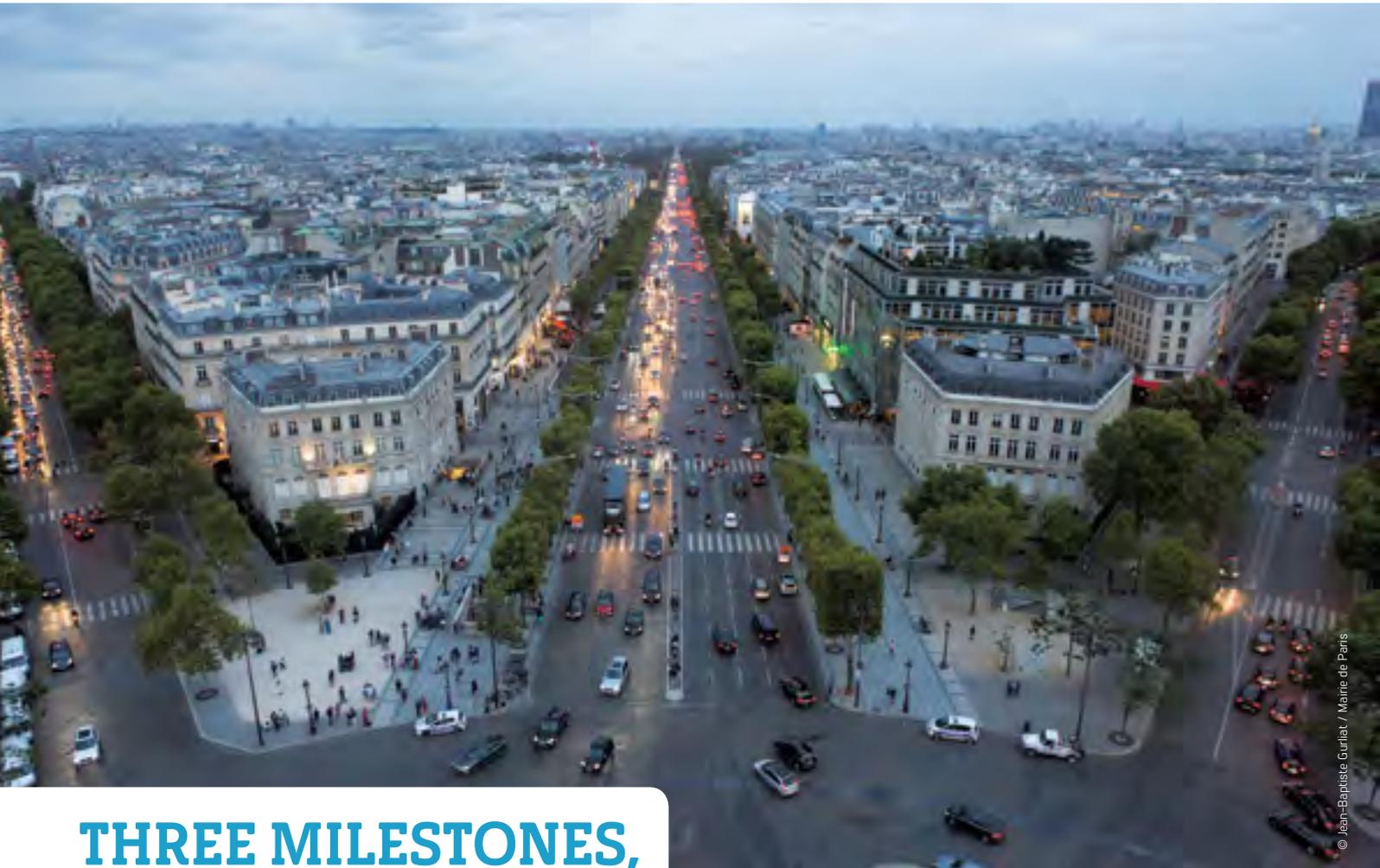
It is essential that the energy transition is solidarity-based and excludes no one.



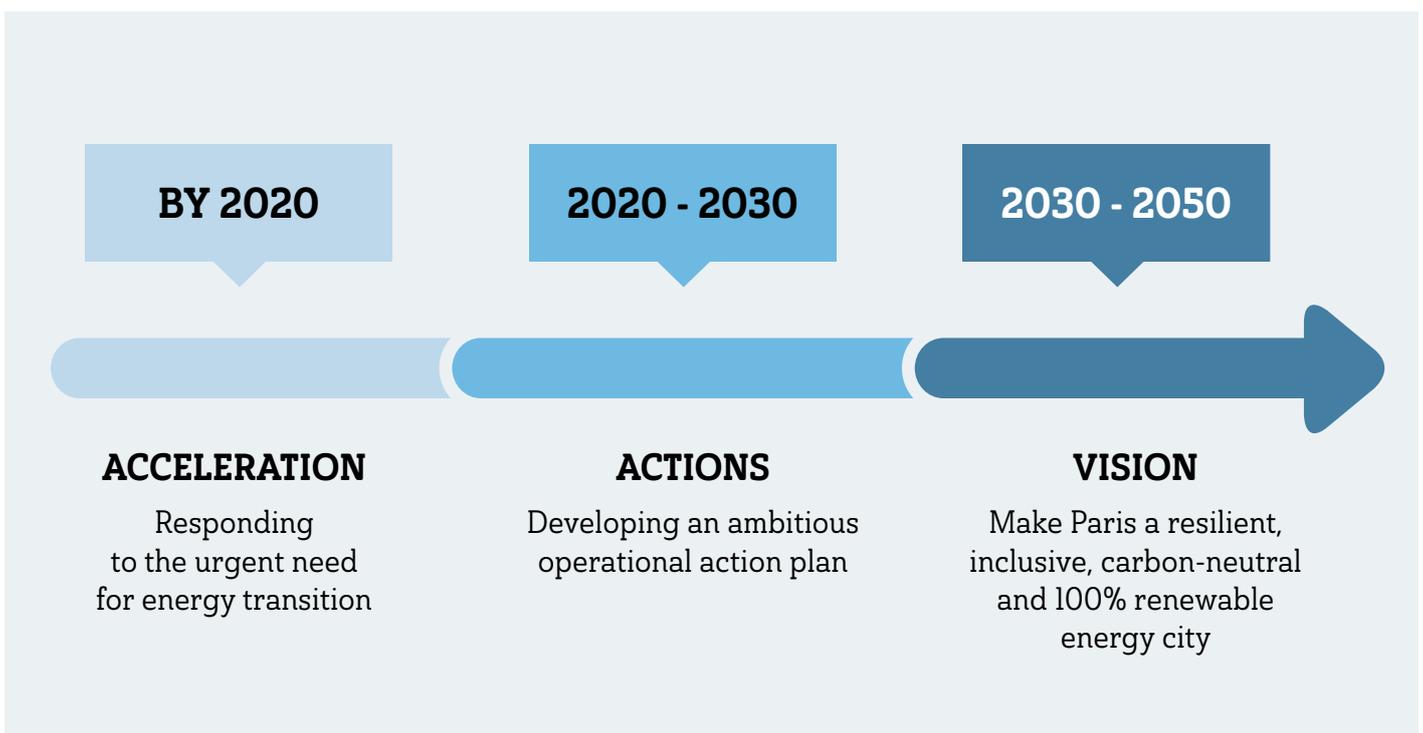
8- CoRDEES : CoResponsability in District Energy Efficiency and Sustainability

9- "Urban resilience is the ability of the people, communities, institutions, enterprises and systems in a city to survive, adapt and develop irrespective of the type of chronic events and severe crises they suffer".

10- Adopted by the Councils of Paris of September 2017, November 2011 and September 2015, respectively.



THREE MILESTONES, ONE URGENT NEED



ACCELERATION BETWEEN NOW AND 2020

RESPONDING TO THE URGENT NEED FOR ENERGY TRANSITION

To attain the targets set in the current Climate Action Plan, and in view of the reminders we have been given of the urgent need for energy transition, especially in the Deadline 2020 report published by the C40 in 2016, Paris will be required to undertake additional actions between now and 2020, which will reduce the emission reduction curve.

These acceleration actions concern measures such as the thermal renovation of buildings, renewable energy supplies, the development of tools for financing the energy and ecological transition of the Paris area, and the

mobilisation of the available data in order to develop new solutions to address the key issues in the Climate Plan. In addition to the public initiatives and in order to accelerate them, the City will be endowed with an Investment Fund for Energy Transition.

These actions will reduce emissions and consumption in Paris by 25% and ensure that 25% of the energy consumed is of renewable origin by 2020, compared to the situation in 2004.



ACTIONS FOR THE 2020-2030 PERIOD

DEVELOPING AN AMBITIOUS OPERATIONAL ACTION PLAN

The Climate Plan defines an operational action plan for 2020-2030, in line with the general targets for the territory, in terms of the reduction of emissions and energy consumption, the development of renewable energy, the definition of new regulations for digital innovation, adaptation to

climate change and the implementation of carbon offsetting and sequestration tools to accelerate the local transition. It will enable the attainment of carbon neutrality in 2050.

By 2030 Paris has set the following targets:



-50%*
of local greenhouse
gas emissions



-40%*
of the Paris
carbon footprint



-35%*
of energy
consumption



45%
of renewable energies
in the overall consumption,
including **10%** locally produced



Become a
ZERO
fossil fuel
and domestic heating oil area



Conform to the WHO
recommendations
ON AIR QUALITY

**Guarantee a pleasant living environment that is
adapted to the climate for all Parisians.**

* Compared to 2004

These major targets are applied to the different sectors and backed by a series of concrete measures developed on the basis of contributions obtained during consultations at workshops involving territorial stakeholders and addressing all of the City's considerations on these issues.

VISION FOR 2050

MAKE PARIS A RESILIENT, INCLUSIVE, CARBON-NEUTRAL AND 100% RENEWABLE ENERGY CITY

30 years is a very short time for such a major transformation of society. Certain initiatives need to be implemented over a long period.

The transformation of energy and food systems in Europe, France, Île-de-France and Paris will be a long-term process. The strategic choices must be made right now to ensure a successful outcome in 2050. It is also important to send out a strong and consistent signal to economic operators so that they can immediately include this transformation in their long-term development. We must also plan for an overall transformation that is based on the digital revolution and on innovations which are still in the pipeline in order to anticipate regulations that will ensure the proper use of these technologies and enable their mobilisation for the benefit of a shared project.

This transformation is not just beneficial for the climate; it is also a source of jobs, innovations, improvements to the living environment and to the health of inhabitants at the local level. Certain actions, such as reducing levels of atmospheric pollutants, will have rapid and permanent effects. In this way, compliance with the WHO recommendations by 2030 will guarantee the air quality for 2050. Other actions will occur in the longer term, such as the modification of behaviours and lifestyles.

This transformation is not just beneficial for the climate; it is also a source of jobs, innovations, improvements to the living environment and to the health of inhabitants at the local level.

By 2050 Paris has set the following targets:



Make Paris a
ZERO
local greenhouse
gas emissions area



- 80%*
of the Paris
carbon footprint



Commit the actors
of the Parisian territory
to offset the residual
emissions in order to reach

**CARBON
NEUTRALITY**



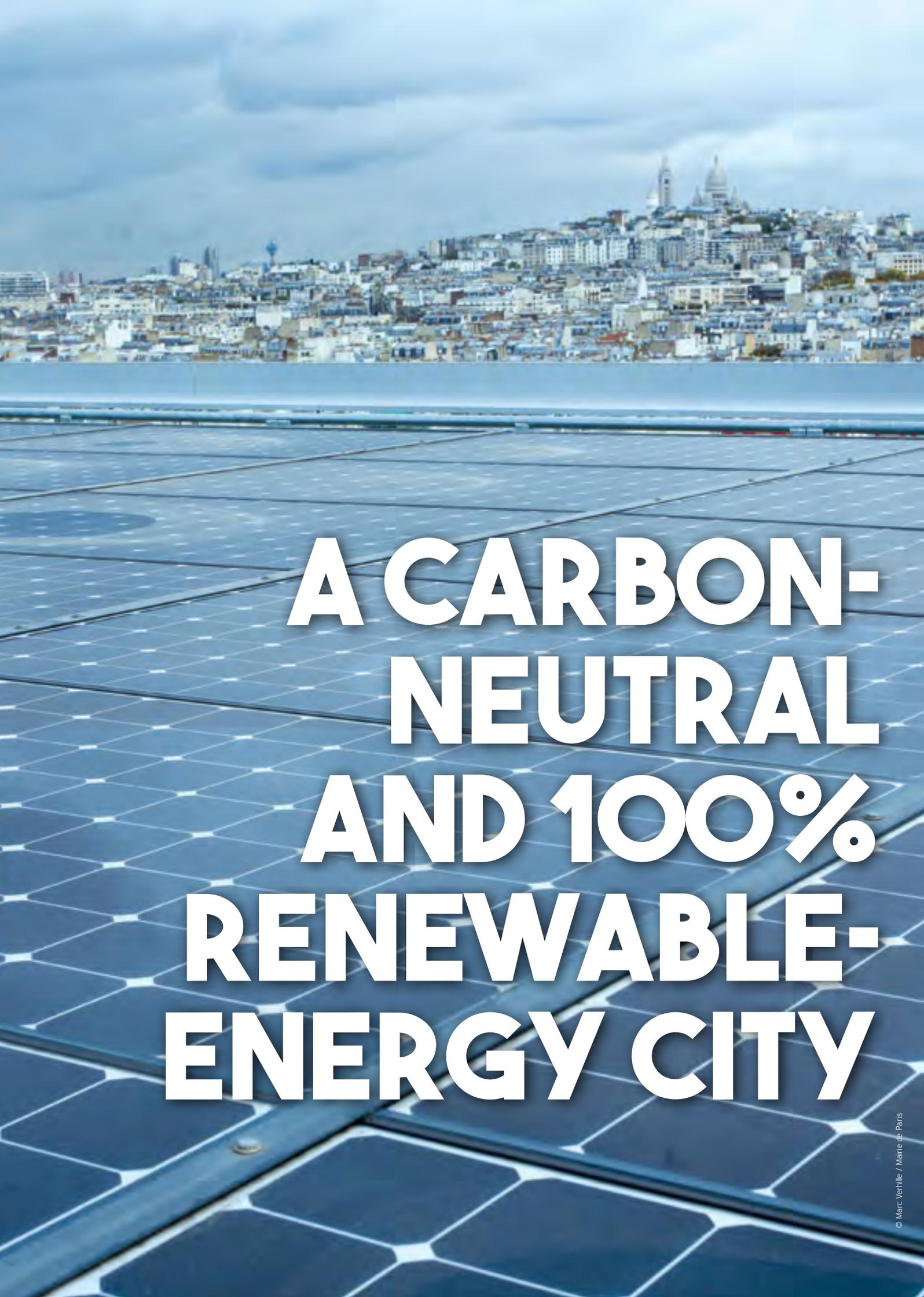
100%
renewable energies¹²
including 20%
locally produced



- 50%*
energy consumption
throughout the territory

Ensure the climate resilience of Paris
and carry out a socially fair transition.

* Compared to 2004

An aerial photograph showing a vast field of blue solar panels in the foreground, leading to a dense urban cityscape in the background. The city features numerous buildings and a prominent white dome, likely a cathedral, under a cloudy sky.

**A CARBON-
NEUTRAL
AND 100%
RENEWABLE-
ENERGY CITY**



© Julien Paumelle

ENERGY

PARIS: A SOLAR, 100% RENEWABLE-ENERGY CITY AND A KEY PLAYER IN FRENCH RENEWABLES

A very significant proportion of greenhouse gas emissions is generated by the consumption of fossil energy: fuels for cars, lorries and aircraft, fuel oil and gas for heating buildings and a proportion of electricity production, etc.

Changing to an energy system powered by 100% renewable and recovered energy sources¹³ will therefore lead to a dramatic reduction in greenhouse gas emissions, enabling the reduction of many risks associated with energy production and supply while promoting locally exploitable resources. The Paris energy transition in order to attain the 100% renewable energy target requires a radical transformation of the current energy system at both local and national levels. Indeed, the Paris energy system is still largely dependent on fossil

fuels (oil, gas, etc.), and electricity, which is the main form of energy consumed in Paris, is primarily produced outside the capital in a centralised manner.

To attain this 100% renewable energy target, it is essential to reduce energy needs by making thermal improvements to buildings, adopting more frugal behaviours and using more energy-efficient technologies and equipment. The target will consist of halving energy consumption between now and 2050.

The target will consist of halving energy consumption between now and 2050.

13-The following references to "100% renewable energy" include recovered energy.

// A CARBON-NEUTRAL AND 100% RENEWABLE-ENERGY CITY

Paris will progressively emerge from the fossil fuel era, with renewable energy sources taking their place. The Paris area benefits from substantial renewable energy resources – particularly geothermal and solar – that will need to be exploited. Paris aims to attain the target of producing 20% of its renewable energy requirement locally by 2050, which will guarantee its energy security, and to develop a more resilient, low-carbon model. The transformation of the Paris energy system is also based on the energy systems and grids (heating, cooling, gas and electricity) that supply its territory. That is why the City of Paris will be working with operators to guarantee the development of an energy supply based on smart networks, which

Changing to an energy system powered by 100% renewable and recovered energy sources

will optimise the adjustment of 100% renewable energy production according to the consumption, to balance supply and demand.

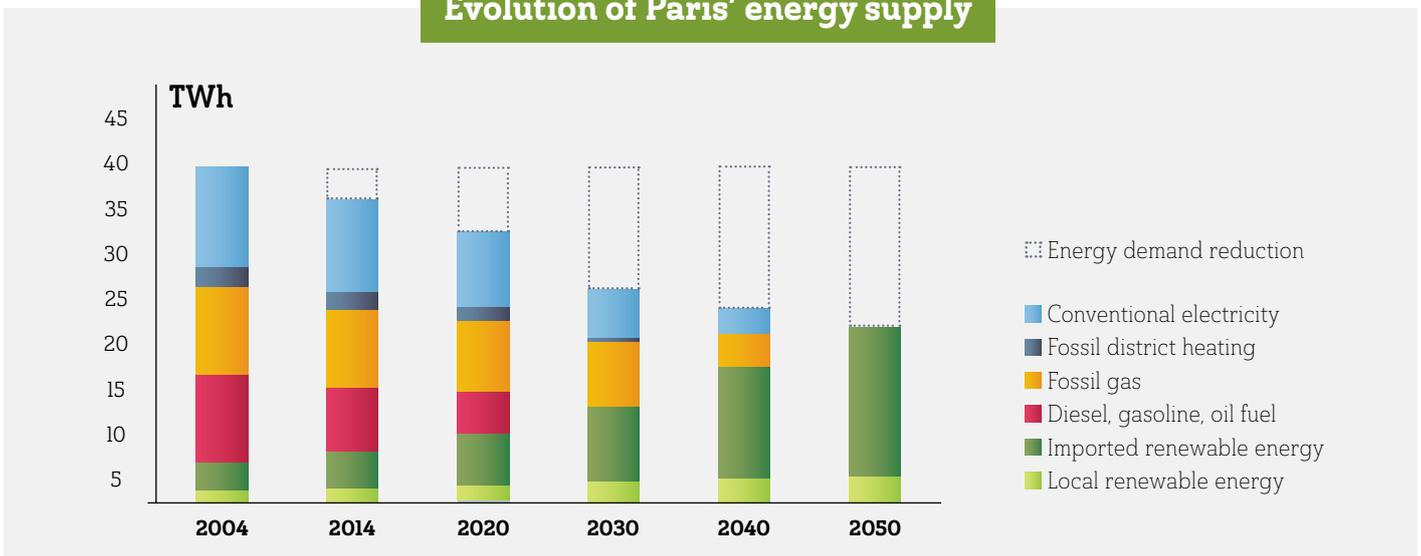
Due to their density, urban areas cannot achieve energy self-sufficiency. This is because renewable resources (biomass, wind, sun, etc.) are situated in all regions. An energy system powered by 100% renewables is therefore decentralised and will inevitably require new collaborations between territories and their stakeholders, in order to share common goals and interests, take joint control of their energy-related futures, exploit these resources optimally and strengthen the principles of solidarity. By promoting the target of 100% renewable energy supplies, the City

of Paris is seeking to forge new, win-win territorial partnerships with local authorities and also invest in developing the production of renewable energy outside the city.

By developing this new 100% renewable energy model within its territory, the City of Paris is championing the cause of the right to clean energy for all Parisians, which aims to ensure universal access to effective and sustainable energy services, improve energy efficiency and increase the use of renewable and recovered energy. ■

The right to clean energy for all Parisians.

Evolution of Paris' energy supply



// A CITY THAT DEVELOPS ITS COMPETENCIES AND ITS OPERATIONAL RESOURCES FOR THE PUBLIC ENERGY SERVICE

To ensure the implementation of its policies, the City of Paris intends to establish a local energy governance system and consolidate its operational resources.

Paris will be advocating a decentralised energy model, including at the national and European levels, which will allow cities to regain direct control of networks and grids and favours the inclusion of renewable energy in the local energy mix with a policy of solidarity between territories via energy grids and networks. Key issues also apply at the metropolitan area level, e.g. to ensure the optimal management of the different networks and grids, promote exchanges of energy and information between different areas, develop innovative solutions and pool costs.

Managing the energy transition requires the production and management of substantial

amounts of data. Data management is therefore a strategic challenge to ensure the reliability of analyses, share the key issues among the stakeholders and provide guidance for decisions. Consequently, the City of Paris will be establishing a public Energy Data Service to enable the general public and the energy transition process to benefit from the new opportunities arising from the digital revolution: free access to their data for users, assistance with controlling energy consumption and managing energy grids and networks, in addition to support for public policies. It will be run by the Paris Climate Agency.

The organisation of this public service will also address data management issues, including maintaining the confidentiality of personal data, on the one hand, and accessing reliable and anonymous data in open data format, on the other, to prevent the *de facto* privatisation of their

exploitation. This public data service will also contribute to the personalised advice given to users who request it via the Paris Climate Agency, and will also produce in-depth analyses intended to facilitate the efficient management of public policies and provide guidance for different stakeholders (e.g. monitoring of fuel poverty, observation of data relating to the consumption of buildings, or the mapping of energy resources on the smallest possible scale). This public service will be developed in association with the existing stakeholders and schemes, such as the project to supervise local government energy consumption which is currently being rolled out - whose data will be hosted on the City of Paris's Data Centre and shared with the partners concerned -, the provision of metering data by energy distributors, the Paris Urbanism Agency (*Atelier Parisien d'Urbanisme*), etc. ■

// A CITY THAT PRODUCES RENEWABLE ENERGY ON ITS OWN SOIL

Obtaining 100% renewable energy supplies firstly requires the mobilisation of all available resources within the Paris area itself.

Paris benefits from a reasonably high level of average sunshine (over 1,600 hours in 2017), a figure that is set to rise due to climate change. In this context, Paris is seeking to exploit the opportunity associated with its high-density built environment to rethink the use of its roofs, which will be used as solar energy production sites, possibly in association with other uses such as the planting of green roofs and urban agriculture. Today, Paris has over 50,000m² of solar panels in operation. Conforming to the 100% renewable energy trajectory will require nearly 20% of roofs in Paris to be equipped with solar power units by 2050. Associated with innovative storage systems, a rise in self-consumption and the continuously diminishing cost of installations, solar power is a priority factor for the development of renewable energy in Paris.

Paris has very rich architectural heritage which needs to be enhanced and promoted, while facilitating energy production. The Paris Local Land Use Plan (*Plan Local d'Urbanisme – PLU*) already includes mechanisms for developing renewable energy production in harmoniously integrated schemes. To speed up the development of the solar industry in Paris, the City will be strongly advocating the removal of regulatory obstacles that are still excessively restricting the rollout of solar projects on a larger scale.

The citizens' interest in solar energy production is also being stimulated by new models, such as self-consumption, which the City of Paris is hoping to support, in particular by participating

Paris will be supporting the creation of citizens' cooperatives

in the definition of a more consistent and effective framework for collective self-consumption – a mechanism that brings together different consumers (private individuals, enterprises, etc.) who share the energy they produce. To this end, changes to the legislative framework will need to be made in order to take account of the specificities of the Paris area and to ensure the support of the operators of energy networks and grids via the inclusion of collective self-consumption in concession contracts.

To help Parisians take ownership of the carbon-neutrality strategy and participate fully in the attainment of this target, Paris will be encouraging citizens to participate in the production of renewable energy. In this way, the City of Paris will be supporting the creation of citizens' cooperatives that sponsor solar power unit projects, by identifying suitable roofs.

stored underground. There are several geological formations in the Paris basin which can be exploited to supply heating and cooling systems for buildings. From surface plants just a few metres deep to boreholes drilled through aquifers at depths of over 800 metres, geothermal energy is developing thanks to a range of highly diverse technologies that Paris has learned how to exploit to its advantage. In the future, the City of Paris is planning to continue exploiting geothermal energy and supporting these types of projects with a view to generating nearly 330 additional GWh of power on an annual basis between now and 2050. There are plans to drill a new geothermal borehole in the Albion formation in the future Bercy-Charenton Designated Development Zone (ZAC), which could be added to the existing plants in northeast Paris and Clichy-Batignolles. To maximise the resources and ensure territorially balanced production, the City will examine the expediency of installing another geothermal plant between now and 2025.

+ LOCAL GOVERNMENT +

A NEW SOLAR POWER PLANT IN THE BOIS DE VINCENNES

To support the sector and set an example, the City of Paris will continue to invest in urban solar power plants, as at the Halle Pajol. Between now and 2020 a large-scale solar power plant of between 5,000 and 10,000m² will be installed in the Bois de Vincennes flower park. The City will look into the possibility of incorporating solar shade structures in public spaces, which combine the benefits of energy production with protection against extreme heat.

In addition to solar energy, there are substantial geothermal resources in the Paris area. This involves the recovery of energy generated and

+ LOCAL GOVERNMENT +

THE PARIS HORTICULTURAL PRODUCTION CENTRE

The City of Paris's Horticultural Production (Centre de Production Horticole), situated in the municipality of Rungis, consumes more energy than any other municipal site (for heating greenhouses in which seedlings and flowers are produced). Major improvements are being made to increase its energy efficiency and reduce its consumption by 40%. In addition, the heating system will be completely renovated between now and 2020, with the use of geothermal energy being examined, as this renewable energy source could cover 20 to 25% of the Horticultural Production energy demand.

Conforming to the 100% renewable energy trajectory will require nearly 20% of roofs in Paris to be equipped with solar power units by 2050.



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// A CARBON-NEUTRAL AND 100% RENEWABLE-ENERGY CITY

When renewable energy is mentioned, wind turbines, solar power and biomass immediately come to mind, but to attain the renewable energy production targets for its territory (8% of consumption by 2020, 10% by 2030 and 20% by 2050), Paris must show ingenuity and also exploit "recovered" energy sources.

Many processes generate heat which can be recovered and exploited to supply heating networks or buildings directly. There are numerous opportunities for energy recovery in the Paris area which will be developed in the future.

+ LOCAL GOVERNMENT +

RECOVERY OF CALORIES

The City of Paris has already conducted experiments on the recovery of heat from wastewater and data centres and its use for heating municipal swimming pools (at Aspirant Dunand and Butte-aux-cailles). It will continue to invest in this sector and is planning to establish a project to recover heat from the sewers around the Town Hall in the 11th district by 2020, for example.

Between now and 2030, the City of Paris will be striving to intensify the recovery and exploitation of energy within its territory. It will issue calls for projects to test and develop underground heat recovery systems. At the same time, Paris will be advocating heat recovery for operators producing substantial energy resources (laundries, data centres, bakeries, etc.). ■

This involves the recovery of energy generated and stored underground.



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// A CITY THAT IS SUPPLIED WITH RENEWABLE ENERGY VIA SMART GRIDS AND NETWORKS

In addition to the energy produced within its territory, Paris's energy supplies are mainly based on the energy distribution grids and networks. These highly extensive infrastructures (over 12,000 km of electricity, gas, heating and cooling grids and networks) are therefore a major driving force for the energy transition.

As the organising authority for energy distribution, the City of Paris will ensure that its grids and networks develop in a balanced manner to improve the distribution of production and promote the pooling of resources through interconnections. From 2018, Paris will publish a heating and cooling Master Plan – a decision-making support tool designed to identify grid and network development possibilities and organise planning in favour of the greening of energy mixes. The Energy Master Plan will subsequently include gas and electricity in order to continue the greening of networks and grids at the City of Paris and Greater Paris Metropolitan Area levels.

The City of Paris will define binding targets for the share of renewables in the energy mix supplied

by these different grids and networks in order to attain the 100% renewable energy target by 2050. These targets will be enshrined in the Master Plan, which will be adopted by the City Council of Paris and in the future energy supply contracts that will be entered into between 2018 and 2025 (expiry dates of the current concession contracts).

The urban district heating system, which is currently the main vector for renewable energy in Paris, with a mix based on over 50% of renewable and recovered energy since 2016, will be developed, by increasing the density of connections in proximity to the existing network and by developing hot water loops to recover the local resources when new neighbourhoods are developed, for example.

The conversion to renewable energy will also be stepped up with the complete phasing out of coal between now and 2024. Gas and

heating oil-fuelled power plants in Paris, which provide auxiliary production during winter peak consumption periods, will be converted to renewable energy sources by 2030 (biogas and biofuel). The City of Paris will also support the creation of new renewable heat production units, powered by waste (including biowaste), biomass and recovered heat.

In addition to the main production tools (biomass, biogas production, hydrothermal and geothermal), Paris intends to develop and support local projects to ensure a 100% renewable energy-based power supply, diversify the energy mix and increase the resilience of the energy system by developing decentralised production. Solar energy and heat recovery offer significant potential for renewable energy production given the high density of Paris's built environment.

As periods of extreme heat are expected to become more frequent and intense due to climate disruption, essential cooling needs will

All of Paris's energy networks and grids will be transformed into smart systems between now and 2030

increase in the years to come and will account for nearly 10% of energy consumption by 2050.

To improve the performance of the networks while incorporating renewable energy, the network operators (distributors and suppliers) must turn towards innovative solutions such as optimised and smart systems. These cutting-edge technologies offer new opportunities for the efficient management of energy networks and grids, and enable the development of predictive, preventive and corrective solutions for faster fault detection, fewer losses, better coordination of network maintenance and improved management of critical situations. The City of Paris will be working with network operators to carry out information and energy management campaigns directed at Parisians. It will rely on feedback from the CORDEES¹⁴ operation in Clichy-Batignolles, which aims to develop an energy system management platform at the neighbourhood level that will allow for the real-time monitoring and optimisation of energy production and consumption. This operation will be used to test a new form of energy governance for all of the stakeholders in a neighbourhood.

From a more general perspective, all of Paris's energy networks and grids will be transformed into smart systems between now and 2030.

By adopting responsible consumption practices, citizens will participate in the regulation of the Paris energy system. In this way, the management of power demands will be improved with sufficient anticipation of the energy needs to direct the supply towards low-carbon or carbon-free sources. From 2018, with the aim of optimising consumption, the City of Paris will join forces with network operators to launch pilot load-shedding projects that consist of not consuming electricity for a certain period, or of postponing its consumption. The aim is to avoid consumption peaks which entail the use of auxiliary production means that often use fossil fuels. ■

To achieve energy savings of at least 50% by 2030.

+ LOCAL GOVERNMENT +

SMART NETWORKS AND MUNICIPAL ASSETS

Between now and 2020, the City of Paris will be defining smart network management tools for its own property assets, enabling the real-time management of uses and the maintenance of a balance between the energy available in grids and networks and energy consumption.

+ LOCAL GOVERNMENT +

PARIS, THE CITY OF LIGHT

With over 200,000 light sources, the "City of Light" has initiated Paris's first innovative and energy-efficient smart network. The energy performance contract for public lighting will enable a 30% reduction in the system's energy consumption between now and 2020. The City of Paris intends to continue investing in order to achieve energy savings of at least 50% by 2030 and to use public lighting facilities (street furniture and electrical connections), to develop new services (environmental and traffic sensors, shade structures, etc.). To save energy, the City of Paris will focus on the maintenance of the grid and the substations as this generates energy savings.

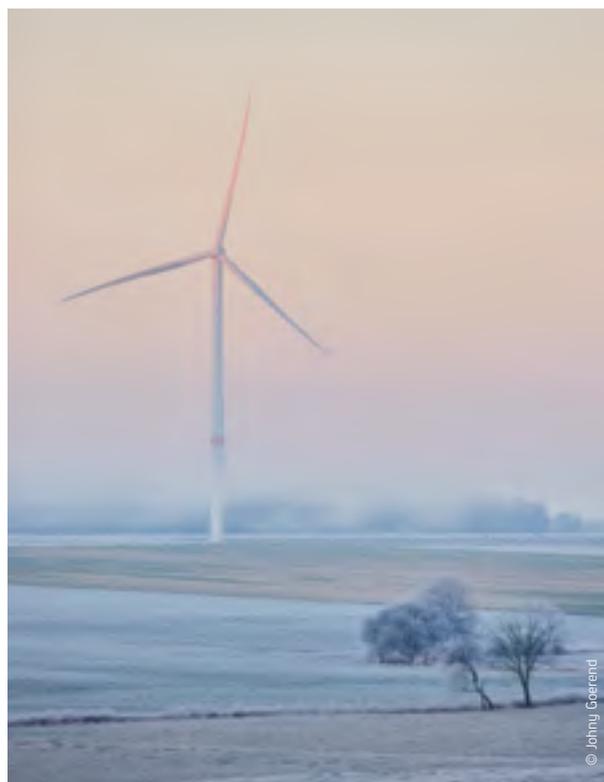
// A CITY THAT ESTABLISHES TERRITORIAL PARTNERSHIPS TO ATTAIN ITS 100% RENEWABLE ENERGY TARGET

To attain its 100% renewable energy target and become carbon-neutral, Paris must support and contribute to the funding of renewable energy production outside its territory. Indeed, even if it halves its needs, the French capital will need to continue "importing" over three-quarters of its required energy supplies.

Consequently, the city is committed to supporting the transition towards a 100% renewable energy system at the national and European levels and, in particular, to participating in the development of the following supplementary production capacities, which will be required to cover 100% of the Paris area's needs by 2050:

- 50 km² of solar panels by 2050
- 3,000 wind turbines by 2050
- 9 TWh of biogas by the horizon of 2030

Participating in the "greening" of energy that will be distributed via local, national and European networks (e.g. the electricity grid) is a marvellous opportunity to assert solidarity between all territories (producers, consumers, neighbours, etc.) by developing new forms of partnership and more direct cooperation.



// A CARBON-NEUTRAL AND 100% RENEWABLE-ENERGY CITY

Development of renewable energy production via Énergies Posit'If

Énergies Posit'If is a mixed-ownership company (*Société d'Économie Mixte – SEM*). It is the fruit of a partnership between local authorities and groups of authorities in the Île-de-France region and leading financial operators, with a view to generating new models for performing energy renovations in the collective housing sector and projects for renewable energies production. To date, the City of Paris has contributed nearly 10% of the capital. The main role of the mixed-ownership company is to provide support for residents in jointly owned properties and for social housing bodies in the different stages of ambitious energy renovation projects. This operator also aims to invest in the development of renewable energy projects, such as the biogas plant at Dammarie-les-Lys (Seine-et-Marne).

To promote Paris's aim to become a national player in renewable energy production, investment in production tools will be required. The recapitalisation of Énergies Posit'If in 2018 will enable the financing of renewable energy production capacities outside Paris in order to decarbonise the Paris energy mix. In this way, it will also contribute to the mitigation targets of the Metropolitan Climate Plan.

Paris will be engaging in cooperation projects with rural territories.

+ LOCAL GOVERNMENT +

INVESTMENT IN RENEWABLES OUTSIDE THE CITY OF PARIS

The City of Paris and its operators possess land reserves outside the French capital that provide an opportunity to develop renewable energy production and carbon sequestration capacities. In addition to its strategy of investing in renewable energies on its own territory, the City – in association with the local authorities concerned – will investigate the potential for renewable energy production and the creation of carbon sinks offered by its properties outside the city centre, which will play a crucial role in the attainment of the zero net emissions target.

To supplement its own investments in renewable energy production facilities and generate momentum in the Greater Paris Metropolitan Area and in the regions, from 2020, the City of Paris will be engaging in cooperation projects with rural territories. It will provide financial and technical support to promote the development of renewable energy projects. These partnerships will be formalised in the form of signed agreements and will strengthen the solidarity between territories through the implementation of win-win projects.

The assertion of the desire to procure 100% renewable energy supplies on the energy supply market is also a powerful lever that will offer these sectors an outlet for their energy and will contribute to transforming the business model for energy. Since 2016, electricity-purchasing contracts for municipal buildings and the Paris public lighting system have required the electricity supplied to be of 100% renewable origin. At the same time, only 0.10% of Parisians have

subscribed to a green electricity supply service. Therefore, the challenge for Paris is to generate momentum in the campaign to attain the 100% renewable energy target. Between now and 2030, the City of Paris must encourage Parisians and local economic operators to subscribe to renewable energy supplies by informing them on a regular basis and by issuing reminders of the attractions and benefits of a 100% renewable energy territory.

+ LOCAL GOVERNMENT +

GREEN ENERGY PURCHASING

The City of Paris will continue the process of making greener energy purchases by supporting renewable energy production through the purchase of “green” certificates. From 2018, it will be seeking to extend membership of its purchasing group to its public partners and will be reporting on its experiment in order to initiate the creation of new purchasing groups for other public and paraprofessional institutions.

This requirement will also concern the supply of gas for Paris's district municipal councils and the urban heating network, and it will be gradually extended to all forms of municipal consumption in order to support and boost the development of the renewable gas sector.

Paris, in association with other local authorities including the Greater Paris Metropolitan Area, will also examine the expediency of creating a cooperative operator for renewable energy supplies between territories for local authorities, which would promote a new form of partnership with rural areas, taking account of energy vectors and the issues affecting them. ■

// A CITY THAT SUPPORTS INNOVATION FOR RENEWABLE ENERGY PRODUCTION

To position itself favourably on the path towards carbon neutrality, the City of Paris is intending to kick-start and prepare for the introduction of new technologies by issuing calls for projects and research & development challenges and providing funding for the concrete implementation of highly promising projects.

For example, the City is interested in the prospects for the exploitation of hydrogen of renewable origin, the capture of CO₂ emitted by industrial sites such as biomass and waste energy recovery plants, and the development of “green” digital services that use energy sparingly and efficiently, recover the heat generated and use renewable energy supplies.

With regard to renewable and recovered energy, the public water operator *Eau de Paris* will launch a study to experiment with the use of micro- and pico-turbines in the drinking water supply network, together with studies on the installation of sensors in the network, which will make its actions consistent with a shared, “smart water” strategy. *Eau de Paris* will also launch the “Non-drinking water, heat transfer fluid” solution and will continue with the projects currently under consideration in this field, particularly in the Saint-Vincent-de-Paul Designated Development Zone (ZAC). ■

+ LOCAL GOVERNMENT +

ENERGY MODERATION IN THE DIGITAL SECTOR

After cutting down on the use of paper, we shall now turn our attention towards the responsible use of digital technologies. In 2018, the City of Paris will develop a “digital diet” training programme adapted to each employee and each department. This is because we store thousands of emails, attachments and documents on our servers, which increases Paris's energy burden and saturates the networks. Therefore, it is essential for each of us to learn how to archive our documents and to inform employees about the legal storage periods that apply to certain files.



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MOBILITY

PARIS, THE CITY OF SHARED, ACTIVE AND CLEAN TRANSPORT

In response to the development of the Greater Paris Metropolitan Area and changing lifestyles, the City is constantly reinventing its transport modes for people and goods in a determined effort to move towards zero carbon and pollution-free mobility systems.

The vitality and attractiveness of Paris means that the city-centre transport sector is responsible for 17% of all energy consumption in the Paris area and 24% of its greenhouse gas (GHG) emissions. In Paris, half of the daily road traffic passes through the metropolitan area outside Paris itself, which implies that a certain number of the actions described in this chapter are intended for inclusion in the Metropolitan Area Climate, Air and Energy Plan.

The transport sector (road, rail, river and air) is also the biggest source of air pollution, since at the Île-de-France level it emits two-thirds (64%) of nitrogen oxides (NO_x), more than one-third (40%) of fine particulate matter at the PM_{2.5} level (35% of which is associated with road traffic) and one-third (34%) of fine particulate matter at the PM₁₀ level (28% of

which is related to road traffic)¹⁵. 95% of all fine particulate matter emissions associated with the combustion of fuels for road vehicles originate from diesel-powered vehicles. Transport – primarily motorcycle and scooter emissions – is also the main source of ozone pollution peaks in the Île-de-France region.

Since 2004 and the publication of the first Carbon Inventory, the City has managed to reduce the environmental footprint of this sector by implementing a proactive development policy for public transport and clean and active mobility: -39% greenhouse gas emissions in Paris, -30% car traffic, -50% fine particulate matter. Paris benefits from a well-developed public transport system, an extensive network of cycle paths, and inland waterway routes along the River Seine and its canals. Paris is also connected to French and European regions via a dense and high-quality

rail network. These assets, strengthened by the strong desire to transform the personal and goods transport systems in the capital city, will facilitate the responses to the fundamental issue of carbon neutrality in Paris.

Because transforming the transport sector is one of the most important environmental and societal challenges, the City of Paris will continue to implement an ambitious policy for the mobility of goods and people, by placing citizens and enterprises at the heart of its project.

To achieve its goals, the City will take action to improve personal mobility and urban logistics while promoting innovation in transport. By also taking steps to improve air quality and, more generally, the living environment, it will use different tools to attain carbon neutrality in the transport sector by 2050.

// A CITY THAT REGULATES AND REDUCES CAR PRESENCE

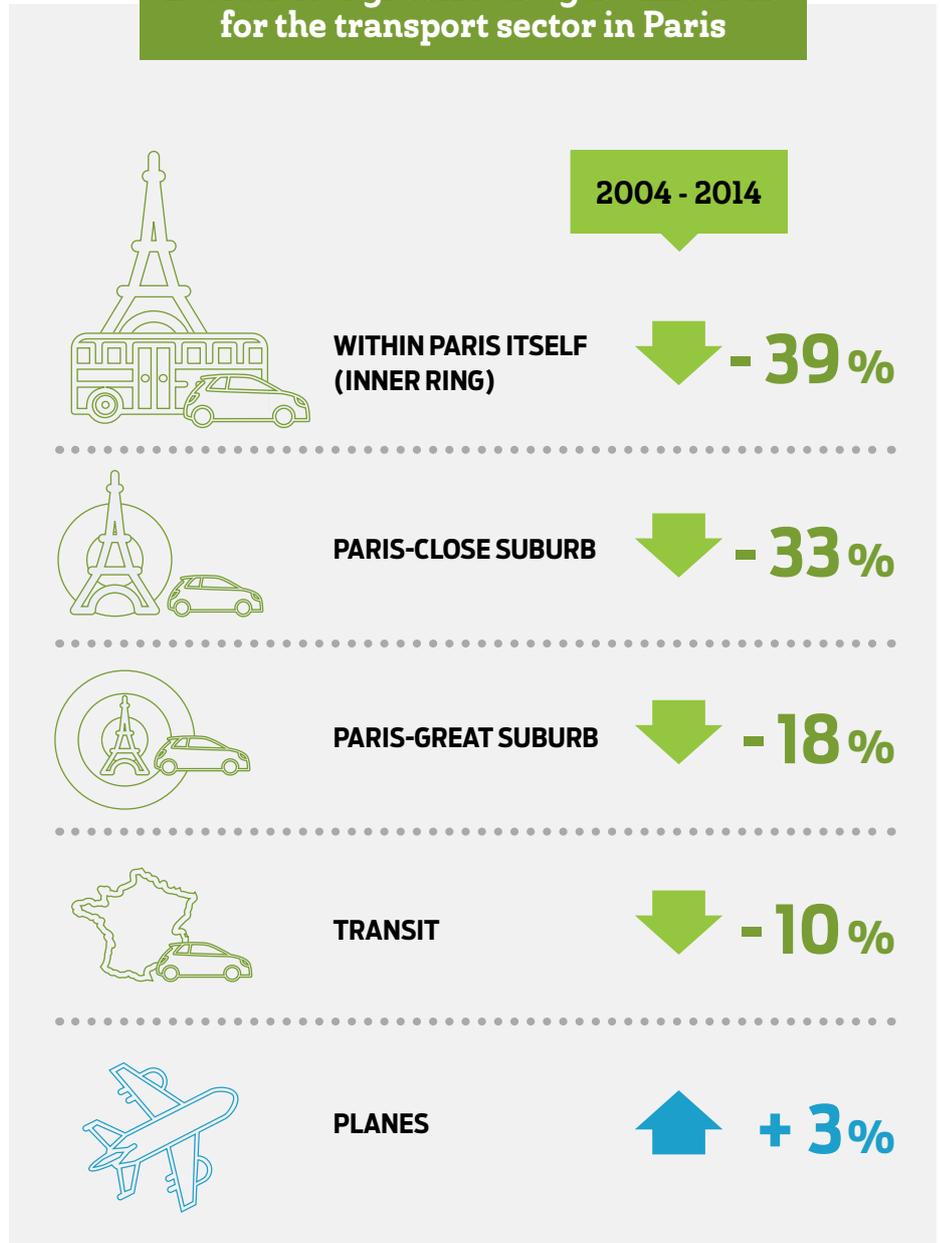
Between now and 2050, Paris is aiming to complete the transition from the era of highly polluting private cars to that of clean, active and shared transport modes. We will need to speed up the burgeoning cultural change that consists of moving on from the perception of the private car as an item of private property to the development of a range of complementary mobility services in which use takes precedence over ownership.

A significant improvement in air quality and in the living environment of inhabitants will inevitably require the transformation of the fleet of the most highly polluting vehicles. Following on from the plan to combat atmospheric pollution, which was launched in 2014, the City of Paris has set itself the target of phasing out diesel-powered mobility by 2024 and petrol-powered mobility by 2030. In addition to the reduction in greenhouse gas emissions and improvement in air quality, these actions will also help to reduce the presence of cars in the city and road traffic-related noise, giving inhabitants the opportunity to take ownership of public spaces and improve their quality of life.

Towards a Low Emissions Zone throughout the Greater Paris Metropolitan Area

On 15 January 2017, Paris established the first Low Emissions Zone (*Zone de Circulation Restreinte - ZCR*) in France. The French capital has been preparing since 2015 to implement this government scheme which aims to limit access to central Paris by highly polluting vehicles by means of Crit'Air stickers which indicate the level of pollution emitted by vehicles. The categories of vehicles authorised to travel will change in several stages (2017, 2019, 2021-2022), to ensure the progressive implementation of the scheme until the Zero Diesel in Paris target is attained in 2024. In an approach based on territorial partnerships with areas outside the Paris city limits, the City of Paris will be negotiating with The Grand Paris metropolitan authority (*la Métropole du Grand Paris*) to extend the ZCR to the metropolitan area in compliance with the Breathable Cities (*Villes Respirables*) strategy¹⁶. To ensure the effectiveness of this Low Emissions Zone, an automated monitoring and penalty scheme will be considered in partnership with Police Headquarters. At the same time, the City will be further strengthening the ZCR scheme within its territory between now and 2030 with the aim of attaining the target of zero petrol-powered vehicles in Paris by 2030.

Evolution of greenhouse gas emissions for the transport sector in Paris



The City of Paris has set itself the target of phasing out diesel-powered mobility by 2024 and petrol-powered mobility by 2030.

16- Villes Respirables: a call for projects launched by the French government in 2015 to promote the development of innovative projects to improve air quality, in which the Greater Paris Metropolitan Area was an award-winner.

+ LOCAL GOVERNMENT +

AN EXEMPLARY FLEET AND PRACTICES

The Paris Local Government Mobility Plan (Plan de Déplacement des Administrations Parisiennes – PDAP) lists more than 20 actions designed to promote an exemplary municipal fleet and practices.

Having already reduced the number of light vehicles in its fleet by nearly 30% between 2011 and 2016, the City of Paris, among other actions, is now planning to:

- Eliminate diesel-powered vehicles from the municipal fleet between now and 2020. Over €120 million have been earmarked for these investments during the 2014-2020 term of office.
- Replace 1,200 light petrol-powered vehicles – i.e. 90% of the fleet – with clean vehicles (NGV, electric, hydrogen-powered, etc.) by the end of 2020.
- Seek alternative solutions to petrol for certain vehicles (pavement-cleaning machines, etc.) in association with manufacturers.

This transformation of the municipal fleet is accompanied by several actions to change the local government’s mobility practices, by adapting working conditions to prevent unnecessary journeys, encourage walking and cycling, the use of public transport or car sharing, and by training employees in environmentally friendly driving techniques, etc.

The future of the Paris ring road must be envisaged from the perspective of a radical change in mobility within the Île-de-France region, with the completion of the Grand Paris Express.

Financial incentives and support measures

Financial incentives and support measures are required to encourage professionals and households to invest in low-carbon vehicles and to adopt active forms of mobility. The City has currently established a scheme that provides grants and support for Parisians who stop using their old vehicles, for professionals and SMEs, for young drivers and for owners of condominiums to promote the installation of bike shelters and electric charging stations. The Metropolitan Council has established a complementary scheme called “Métropole Roule Propre” (Clean Travel in the Metropolitan Area). The City of Paris will look into the possibility of introducing different parking prices according to vehicle emissions to be introduced in 2020, which goes a step further than the current provision of free parking for electric vehicles by introducing positive pricing based on Crit’Air stickers: the cleaner the vehicle, the cheaper the parking.

It will examine the opportunities for broader-based pricing of public land use in preparation for the regulations required for driverless vehicles, in particular. The aim will be to encourage the development of mobility and logistics services using fleets of clean vehicles that are optimised to reduce the number of unladen journeys. A fair pricing system should integrate a fair share of the costs relating to road use, congestion and pollution.

Inventing a new role for data-driven regulation of mobility

The City will support initiatives promoting the improved regulation of mobility services in order to provide a better response to the targets set for sustainable mobility and logistics. It will encourage

operators which develop digital platforms that match the supply and demand for transport (car pooling, personal transport, bicycles and scooters, station-free vehicle sharing, deliveries, etc.) to sign up to schemes under shared regulations with the public authorities. The City will support data-sharing solutions enabling regulation for optimised traffic management, reduced public land use and promoting the use of renewable energy supplies (electricity, gas and hydrogen).

Preparing to transform the Paris ring road

The future of the Paris ring road must be envisaged from the perspective of a radical change in mobility within the Île-de-France region, with the completion of the Grand Paris Express automated underground railway system offering new transport capacities and bypassing central Paris from suburb to suburb. This will promote a redistribution of employment in Île-de-France region, a progressive reduction in the number of private vehicles, the development of shared mobility modes and technological revolutions in the transport sector such as the development of autonomous transport, in addition to new ways of working that reduce the number of commuter journeys (development of teleworking and co-working areas). With the development of e-commerce, goods transportation is undergoing major changes that will need to be considered.

The Mobility 2030 policy, launched in the framework of the Metropolitan Forum, should lead to an international consultation, under the aegis of the Forum, for the proposal of scenarios to transform the metropolitan area’s motorways by 2024, in order to improve their operation and their urban and environmental integration, and with the longer-term aim of initiating more ambitious transformations. ■



// A CARBON-NEUTRAL AND 100% RENEWABLE-ENERGY CITY

// A CITY WHOSE RESIDENTS ARE REGAINING CONTROL OF PUBLIC SPACES

The City of Paris has a dense traffic network, with no urban obstacles, which facilitate journeys made on foot or by bicycle. The transformation of the urban space must continue to offer the best conditions for pedestrians, cyclists and other low-carbon mobility modes.

Providing more space for pedestrians

In 2016, the Council of Paris adopted a vast project to redevelop Paris's emblematic squares with the aim of placing the activities of pedestrians and cyclists at the heart of the city's priorities. This initiative sets out to decongest the squares, ease access to public transport and intermodality, create welcoming green spaces that people will want to linger in, promote the architectural and historical heritage of the squares, facilitate cultural and sporting activities and simplify the journeys of cyclists and pedestrians.

Over half of all journeys within central Paris are made on foot. To increase the number of continuous footpaths and simplify pedestrian access to the road system while facilitating access to public transport and improving the conditions for walking, the Paris Pedestrian Strategy (*Stratégie Paris Piéton*) was adopted in 2017.

In line with this approach, the "Paris Breathes" (*Paris Respire*) scheme will provide "breathing spaces" (*espaces de respiration*) for Parisians and visitors in all districts of Paris, on every Sunday and public holiday between now and 2024. This will contribute to improving the safety of pedestrians and cyclists in these areas and to developing a more inclusive local lifestyle in these districts. Implementation of "green streets" (*rues végétales*) and "quiet streets" (*rues apaisées* – where soft mobility primes) in all districts between now and 2020 will also contribute to this policy of providing an ever-increasing number of breathing spaces.

The car-free day, launched in September 2015, has been revealed to have a positive impact on the quality of life: public spaces made available

for active modes, less noise and pollution. During the 2017 edition which was extended to the entire city, Airparif – the association responsible for monitoring air quality in Île-de-France – observed a reduction in nitrogen dioxide (NO₂) levels of up to 25%. Bruitparif recorded a drop in noise of up to 2.7 decibels, corresponding to the halving of perceived noise. The enormous popularity of this outstanding event and these positive indicators have encouraged the City of Paris to extend the scope of this scheme each year. Between now and 2020, the City will be working with the Police Headquarters and metropolitan area stakeholders (Grand Paris metropolitan authority, adjacent municipalities, etc.) on extending the car-free day with a view to involving other metropolitan areas.

Reducing traffic for active mobility

Paris will allocate the resources required to make it a 100% cycle-friendly capital, which will involve facilitating cycling on all routes in Paris and developing new cycle paths, providing more bicycle parking spaces and reducing the speed limit to a maximum of 30 km/h on all roads apart from the main routes, for a 100% cycle-friendly Paris by 2020.

A 100% cycle-friendly Paris by 2020

Adapting the city to active mobility also requires an examination of ways to use the road system in a more innovative and efficient manner (for example adjustment of traffic lights to the speed of cyclists, removal of traffic lights, widespread implementation of the "give way to cyclists" rule).

At the same time, and because driving styles can have a significant impact in terms of pollution, the City will be advocating that from 2020, driving schools start training their students in eco-friendly driving limited to 30 km/h in Paris. This measure will help to reduce the atmospheric pollution emissions associated with the braking of vehicles, in particular.

That is why the City of Paris will be supporting the development of teleworking sites.

Developments to reduce the number of commuter journeys

The Paris region holds the national record for the time spent travelling to and from work. This situation has a negative impact on its inhabitants' quality of life and on the attractiveness of the area. Teleworking, combined with a better distribution of economic activities, is an effective response to mobility and quality-of-life issues, and also contributes to revitalising areas that have fewer employment opportunities and economic activities. That is why the City of Paris will be supporting the development of teleworking sites at the metropolitan area level through the creation of third-party premises in public and private buildings. ■

+ LOCAL GOVERNMENT +

BUROLIB'

The City has been developing the "Burolib'" system for its employees since 2016, in which several work rooms equipped with computers and connected to the City of Paris's internal network are accessible all day long. This enables employees to manage their journeys more efficiently and avoid wasting time on transport between meetings. By 2030, each of the City's administrative buildings will possess at least one area of this type. In addition, the City of Paris will support the creation of teleworking premises for employees living in the outer suburbs. Lastly, by 2020, in order to set an example as ambassadors of the City, Paris's elected representatives and municipal employees will be required to use low-carbon modes (train or electric car) for all professional journeys of less than 3 hours by train.

The City will provide a broader and diversified range of mobility offerings, while promoting the interoperability of clean and shared mobility modes.



// A CITY THAT ENCOURAGES CLEAN, SHARED AND TRANQUIL MOBILITY

The reduction of car traffic will be accompanied by the provision of alternative transport modes and schemes to raise the awareness of users in order to facilitate the adoption of a new approach to mobility. The City will provide a broader and diversified range of mobility offerings, while promoting the interoperability of clean and shared mobility modes.

Towards shared mobility for fewer cars in the city

Shared mobility modes such as car-pooling, car-sharing and collective taxis are currently booming and are an effective way to reduce the number of vehicles in the city. The City of Paris wants to develop these new offerings and encourage their development by facilitating their use. In this way, the City intends to support car sharing which allows people to dispense their private vehicles. To this end, the City is planning to reserve more parking spaces for car sharing between now and 2020. In collaboration with metropolitan area stakeholders and government departments, it will also be looking into the possibility of reserving all or part of the left-hand lane of the Paris ring road for vehicles with at least two occupants.

Low-carbon public transport

Paris has set itself the target of running low-carbon public transport services by 2025. For the past few years, Paris public transport operators have been incorporating low-carbon technologies into their vehicles and this process will need to be stepped up. The City is involved in the development of public transport in the Île-de-France region, in particular by financing key structural network projects such as the extensions of lines 11 and 14 and of RER (Regional Express Railway) line E to the west.

The Grand-Paris Express project will make a significant contribution to increasing the attractiveness of public transport and make it easier for many metropolitan area residents to stop using their private cars.

Attaining this target will require a policy of significant investment in mass public transport. In this perspective the City of Paris will campaign for a reduction of VAT on public transport.

The City will extend the establishment of rapid transit lines (RTL – electric buses) in order to offer high-performance alternatives to the private car. By 2020, Paris will have an RTL that extends the T3 tramline in a loop around the Maréchaux boulevards, and another rapid transit line will be in the development stage in the “*Quais Hauts*” area of the right bank of the River Seine.



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In addition, an inter-station RTL will be gradually created with completion scheduled for 2024. Finally, the City will be joining forces with *Île-de-France Mobilités* (regional transport organisation authority), *Voies Navigables de France* (VNF) (French navigation authority) and HAROPA (the alliance which brings together the harbours of Le Havre, Rouen and Paris) to establish a clean-engine river shuttle service for passengers before 2030.

Towards a single travel pass

Facilitating intermodality and developing multimodal travel practices are two conditions for the promotion of more intensive public transport use. With these aims in mind, the City will urge *Île-de-France Mobilités* to create a single travel pass by 2020. This pass must make it easy for users to combine different modes of public transport (bus, tram, underground, regional express railway) as well as Autolib' and Vélib'. The addition of other services (car-pooling, car-sharing and taxis) may also be envisaged. In order to encourage the modal shift of the occasional travels towards public transports, the City will call for the extension of connection possibilities with the regular transport ticket (ticket t+) between underground, tram, bus and regional express railway.

Putting the bicycle at the heart of Parisians' lives

Buoyed by the success of the Vélib' self-service bicycle hire scheme and the development of the electric bicycle, cycling – an indisputably environmentally friendly and economical means of transport – has become an increasingly

popular mobility mode in its own right. To support this development, the Paris Cycling Plan (*Plan Vélo de Paris*) was approved in 2015 with the aim of creating new infrastructures and providing new services to triple the modal share of cycling, and setting the target of 15% of journeys being made by bicycle. On this account, a major structural East-West and North-South network – the Express Bike Network (*Réseau Express Vélo – REVe*) – is being developed. From 1st January 2018, Parisians, Île-de-France residents and visitors have access to a new Vélib' system. Available throughout the Greater Paris Metropolitan Area, eventually 30% of these bicycles will be electrically assisted to enable users to travel farther. To round off its Vélib' service, the City will be supporting the development of new cycling-related services such as the cargo bike hire for families or shopping, the corporate bike service and do-it-yourself repair workshops. It will be urging *Île-de-France Mobilités* (SNCF and RATP) to allow bicycles to be transported more easily on the regional express railway and in trains, and for the creation of a metropolitan area network of cycle paths to supplement the Paris Express Bike Network. In addition, to facilitate journeys by bicycle, cyclists will be allowed to ride through certain parks at reduced speed. The City will create more than 10,000 new bike parking spaces, including in securely locked bicycle boxes, throughout the Paris area, and especially in stations and near amenities (museums, libraries, cultural and sports centres, etc.). Finally, in order to teach future users good cycling safety practices, between now and 2025, the City will be introducing urban cycling training for young Parisians before they leave primary school. These solutions, which are valuable services for citizens, will empower cyclists and allow them to make the most of cycling in Paris. ■

// A CITY THAT SUPPORTS LOW-CARBON URBAN LOGISTICS THROUGH TO THE LAST MILE

The rapid growth of new models of consumption such as e-commerce is accelerating the expansion and development of urban logistics. In the urban environment, the management of logistics is particularly complex given the fragmented and heterogeneous nature of the flows.

Today, the majority of logistics hubs are situated on the outskirts of the main areas of consumption, which causes additional congestion, pollution and greenhouse gas emissions. The City of Paris intends to tackle these issues by establishing a well-organised, sustainable and coordinated urban logistics system, comprising multimodal infrastructures at the heart of the city, in order to reconcile economic vitality with the preservation of air quality and the living environment of Parisians.

A plan for low-carbon logistics in Île-de-France

Between now and 2020, the City of Paris, in association with the Île-de-France Region, the Grand Paris metropolitan authority and the seven other *départements* in Île-de-France, intends to establish a system of governance for urban logistics that is adapted to the area. This organisational system will define a low-carbon logistics plan for Île-de-France with the aim of coordinating the stakeholders' actions. It will promote the development of a partnership-based approach among the stakeholders in order to optimise transport flows and direct them towards centralised, multimodal infrastructures.

The Paris ring road remains one of the area's main transit routes for goods transport, with 70,000 lorries using it per day. The City of Paris requests a new study on the creation and scope of a charge on heavy goods vehicles, in association with the Prefecture of Paris, the Île-de-France region and the Greater Paris Metropolitan area.

Multimodal logistics platforms at the heart of the city for low-carbon freight

Between now and 2030, new multimodal logistics platforms with automated interconnections will be progressively built in the city centre and in different parts of the metropolitan area. The new Chapelle International hub to the north of Paris is an excellent example of this strategy – a genuine urban project reconciling economic activities, housing and logistics at the heart of a single neighbourhood. From 2018 onwards, this logistics hub will accommodate the equivalent daily capacity of two trains, corresponding to 40 traditional semi-trailer-loads of goods to be delivered throughout the entire capital. This project will generate environmental benefits with 13,700 fewer lorries entering Paris each year, for a reduction of 560 tonnes of CO₂, in addition to reducing noise and atmospheric pollution. Five other hubs based on this model should also be built in Paris between now and 2030. By 2020, Paris wants the Grand Paris metropolitan authority to provide the impetus for an urban logistics governance system that is adapted to the territory, in collaboration with the Île-de-France region, and covering the entire regional territory, thus promoting the emergence of other multimodal logistics hubs. The aim of these hubs is to develop the massive arrival of goods by train and organise deliveries to the final customer using low-carbon transport modes (electric vehicles, natural gas vehicles, delivery tricycles, etc.). At the same time, new Urban Logistics Sites will be developed in Paris between now and 2030 to create a network of logistics sites situated at the heart of the city, as close as possible to the final consumers, and enabling a reduction in the number of vehicles on the roads and the use of clean or active modes for the final delivery miles. Under these conditions, the rail network, which is currently mainly devoted to passenger transport, must be developed.

The City of Paris reasserts the need to maintain the reversibility of the *Petite Ceinture Ferroviaire* (former circular railway line) – a legal condition for its opening to the public – and the potential for its adaptation for other uses according to the wishes of the City, its partners and its inhabitants.

THE BERCY CHARENTON DESIGNATED DEVELOPMENT ZONE

An important site for experiments targeting low-carbon freight transportation.

The Bercy Charenton Designated Development Zone (ZAC) is an important site for experiments on creating an industrial and small-business ecosystem covering environmental, property-related and logistical issues.

Areas will be reserved for local small-scale production, as the project provides business areas relating to new forms of business on a 7,500m² site (sharing economy, circular economy, collaborative economy, etc.). The former *Gare de la Râpée* train station could also be used for small business and logistics functions. A new logistics centre forming part of the Designated Development Zone and situated at the entrance to the town, directly accessible via the A4 motorway and the Paris ring road and with excellent rail links, will handle flows of goods prior to their delivery to the final destinations or to urban logistics areas throughout Paris. It will be developed on three levels: the first connected to a railway spur, the second accessible by road from an interchange, and the third with a possible tramway connection. This makes the Designated Development Zone a key strategic centre for developing rail access to central Paris and moving towards low-carbon freight transportation.

In addition to rail freight, inland waterway freight on the River Seine and its canals constitutes an alternative to road traffic and is a key ecological development issue for goods transport in Paris. Thanks to its energy efficiency, inland waterway transport consumes five times less fuel than road transport and 2.5 times less CO₂ per tonne transported. Between now and 2030, river freight must be developed in partnership with the French inland waterways authority (*Voies Navigables de France – VNF*), the municipalities situated alongside the canals and HAROPA. At present, the Île-de-France inland waterway network is far from being saturated: its traffic could be tripled, which would remove 2 million lorries from the road network. Although it generates significant environmental benefits, improvements must be made to the vessels used for transporting inland waterway freight, as their engines are still highly polluting. The City will also be lobbying the French government to promote low-carbon freight transport, with a particular emphasis on the development of clean-engine technologies for barges.

Easing parking conditions for professionals

In Paris, the difficulties of temporary parking for professionals have a negative impact on traffic flows. To remedy this problem, the City of Paris

will consider whether to enshrine the obligation to create a “service” parking space for deliveries and services, or any other scheme liable to meet such a need, in its Local Land Use Plan (PLU). These spaces could also be used by medical and personal care services, breakdown services and delivery firms.

In addition, to enable professionals to carry out deliveries in public areas without disrupting the traffic, the city will create the Prolib’ parking system service by 2024. This network of spaces, bookable online and in advance, will give priority access to low-carbon vehicles.

A City that encourages low-carbon road freight transport

Heavy goods vehicles account for only 5% of the distance travelled in Île-de-France, but they are responsible for 31% of the nitrogen oxide emissions generated by road transport. To reduce the impact of road freight transportation on air quality, the City, in consultation with the Île-de-France region, will be campaigning for the implementation of a dissuasive kilometre-based price scale for HGVs travelling in Île-de-France by 2030. This scheme would enable carriers to be taxed according to the number of kilometres travelled and the type of vehicle. The goal would be to reduce road haulage in Île-de-France, while also cutting the number of unladen journeys.

At the same time, to support changes in practices by logistics operators, the City will create a “Clean Carrier” quality label, to be awarded to contractors that undertake to provide low-carbon services. ■

+ LOCAL GOVERNMENT +

CLEAN LAST MILE

The last mile is the part of goods transport that has the biggest impact in terms of greenhouse gas emissions. That is why the City of Paris will be increasing the inclusion of environmental clauses promoting the use of clean last-mile modes in all of its delivery contracts between now and 2020. In the framework of the second Paris Local Government Mobility (Plan de Déplacement), adopted at the start of 2017, there are plans to encourage contract holders to favour active mobility modes or the use of “clean vehicles” and, failing that, to require the use of vehicles that conform to minimum pollution standards, and an end to the use of diesel-powered vehicles.



// A CARBON-NEUTRAL AND 100% RENEWABLE-ENERGY CITY

// A CITY THAT SUPPORTS CLEAN ENERGY SECTORS AND INNOVATION FOR LOW-CARBON MOBILITY

Mobility will undergo its biggest revolution in the past century. Paris supports the national target of phasing out diesel and petrol-powered vehicles and is intending to become a pioneering city in this transition. To do so, it will need to become an area for innovation and experimentation in new solutions to enable the massive introduction of cleaner mobility modes: electric, hydrogen, green gas, etc. with a view to ending diesel mobility by 2024 and petrol by 2030.

More sectors to supply the city with clean energy

The City of Paris has set itself the target of attaining the 100% renewable energy goal in transport by 2050. To kick-start the transformation of vehicle energy supplies in the area, at least 10 low-carbon energy supply points will be developed throughout the metropolitan area between now and 2024. Drivers of low-carbon vehicles powered by green electricity, renewable gas, hydrogen or other energy sources will be able to use these stations.

Still quite rare just a few years ago, electromobility is currently developing rapidly in large urban areas. Although electric mobility does reduce the direct impacts on air quality, its massive development raises questions about supply capacities and the production resources required to meet this demand for electricity. Consequently, to raise users' awareness of their resource-management responsibilities, the City will be engaging in a dialogue with energy suppliers with the aim of eventually developing a pricing system with a sliding scale for recharging electric and hybrid vehicles, in which an incentive rate will be provided to encourage slow recharging.

Adaptations will need to be made to integrate these peak demand periods into the operation of the grid. At the same time, the City undertakes to ensure that, by 2030, it will only authorise the installation recharging terminals powered by guaranteed renewable electricity supplies in public areas, as it has committed to do for the power supplies of its own buildings. In addition, to supplement the vehicle recharging network in public areas, the City of Paris will continue to subsidise the installation of recharging terminals in condominiums and underground car parks.

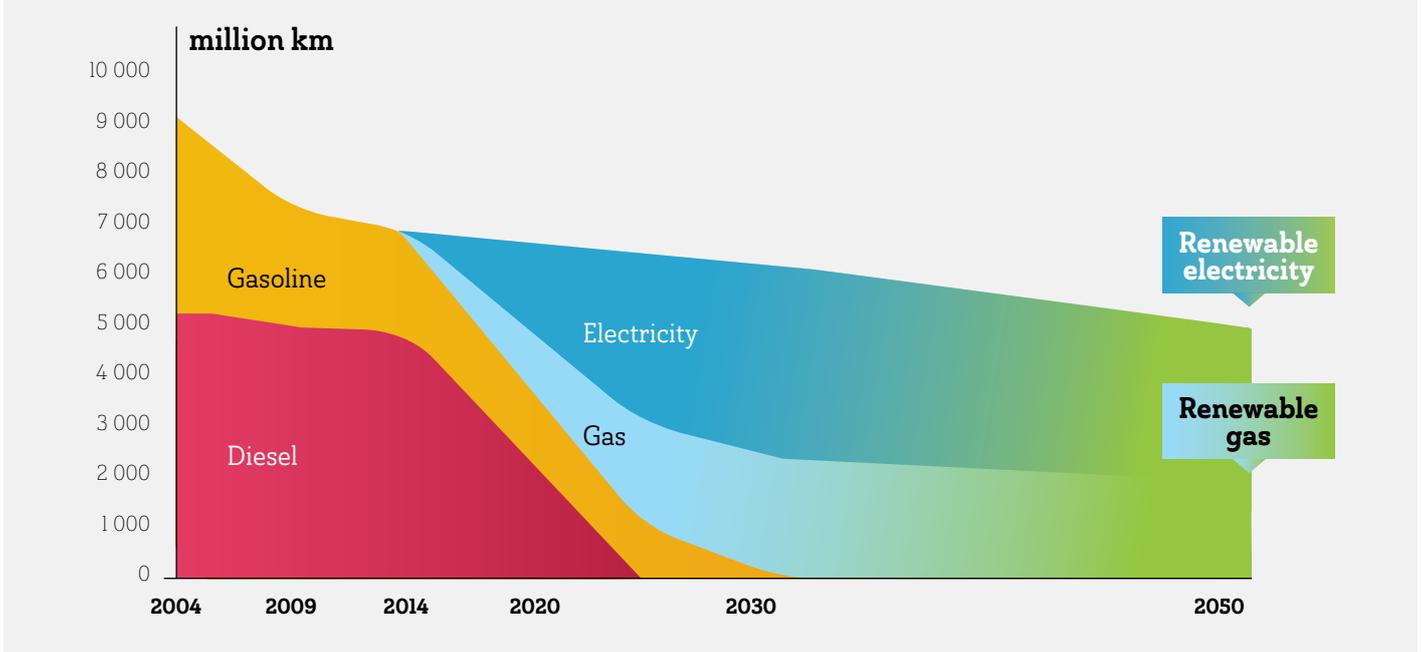
Paris in the hydrogen era

The growth of the electric car market foreshadows the development of hydrogen – currently a rapidly expanding sector for vehicle energy storage and supply applications. To maintain this momentum and ensure the development of renewable hydrogen supplies (produced by water electrolysis), the City of Paris will draft a hydrogen development strategy. This will incorporate support for research into the development of the most innovative technologies, an adapted low-carbon production process, an extensive and safe distribution system throughout the entire area, an information policy for territorial stakeholders and a monitoring system for hydrogen consumption.

Mobility will undergo its biggest revolution in the past century.



Energy source evolutions for the local on-road transportation



Development of driverless vehicles

The City intends to use the development of driverless vehicles to further reduce the carbon footprint of transport in Paris. These electric vehicles offer environmental benefits because they are programmed to consume less energy and do not emit greenhouse gases. Driverless vehicles feature integrated technologies that enable them to communicate among themselves, analyse the situation in real time and anticipate different scenarios. The first experiments have revealed positive impacts on traffic on motorway sites. Improvements and refinements are still required in order to optimise their use in cities where they can contribute to reducing congestion and improving traffic flows. The City of Paris will launch the development of driverless shuttle vehicles within the public transport network by 2024. At the same time, an experiment will be conducted on low-carbon driverless cars with a view to promoting the widespread integration of this transport mode between now and 2030.

Development of driverless shuttle vehicles within the public transport network by 2024.



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Reducing carbon emissions in long-distance journeys

Although it does not directly concern traffic in Paris, the use of air transport by Parisians for their recreational or professional purposes is a major component of the overall greenhouse gas assessment in Paris (6.2 million of CO₂ equivalent). Paris is one of the rare cities to include air traffic emissions in its carbon assessment and intends to advocate the need to improve the environmental footprint in this sector. That is why the City of Paris, with the backing of C40 cities, will challenge aviation sector professionals to develop a sustainable alternative to the use of kerosene as an aviation fuel, following the example of the first biofuel-powered flights on the Paris-Toulouse line. The City will also be advocating improvements to technical performance in the civil aviation sector.

Paris, with the backing of C40 cities, will challenge aviation sector professionals to develop a sustainable alternative to the use of kerosene as an aviation fuel, following the example of the first biofuel-powered flights on the Paris-Toulouse line. The City will also be advocating improvements to technical performance in the civil aviation sector.

To improve the living environment, air quality, and put an end to the different sources of pollution generated by helicopters, the City of Paris has decided against renewing the Heliport concession, which expires in 2024, and will replace this highly polluting facility with an extension of the Parc Suzanne Lenglen.

As rail transport emits far fewer greenhouse gas emissions than aircraft for short journeys or those of moderate length, Paris will be lobbying the French government to implement a strategy to strengthen the European rail network. ■



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BUILDINGS

A 100% ECO-RENOVATED PARIS WITH LOW-CARBON AND POSITIVE-ENERGY BUILDINGS

In response to the increase in the population and to the economic development of its territory, while reducing its ecological footprint, Paris must innovate to optimise the shared use of buildings and enable new practices.

As a consequence of the high population density, the residential and tertiary/service sectors are responsible for 80% of energy consumption and over 20% of the carbon footprint of the Paris area. They are also the second-biggest source of air pollution after transport, primarily as a result of fuel oil-powered heating systems.

Over a ten-year period, the City of Paris has managed to reverse the trend and progressively reduce the environmental impact of buildings in Paris: between now and 2020, 30,000 social housing units and 300 schools will have been renovated and more than 50,000 dwellings in jointly owned properties will have been helped to complete their renovation formalities. As 80% of the building stock was built before the introduction of the first thermal regulations in 1974, and less than 1% of new floor area is constructed each year, renovating buildings in a sustainable manner remains a key issue in the efforts to attain carbon neutrality in Paris.

The renovation of 1 million dwellings between now and 2050

The renovation of 1 million dwellings between now and 2050 is a massive challenge that requires a faster rate of execution while further improving the quality. It also requires the involvement of all stakeholders in this sector – particularly the government – for the implementation of regulatory and financial tools. Innovative financing solutions will be deployed to address the need for investment, which remains one of the main obstacles to action.

A 100% eco-renovated city of Paris also addresses the key fundamental issue of fuel poverty by guaranteeing healthy accommodation that allows residents to heat their homes properly while controlling the cost.

All new buildings built in Paris will be low-carbon and positive-energy designs. The key issues of the protection of our architectural heritage, the environmental impact of projects and the use of environmentally friendly materials will be at the heart of these large-scale projects.

This is also a massive source of local jobs requiring support for the organisation of local sectors for the performance of energy renovation projects and for the recycling and re-use of construction materials.

Pursuing the goal of 100% low-carbon building stock also implies changing practices in relation to buildings. Involving users and encouraging them to take responsibility for their energy consumption, combined with “smart” energy management systems are key to obtaining results that match the ambitions.

Over the next 30 years, Paris will continue to accommodate new residents, with an additional 200,000 Parisians expected between now and 2050. To cope with the housing shortage, the City has already set ambitious targets in terms of increasing the housing supply and improving the allocation of building surface areas.

All new buildings built in Paris will be low-carbon and positive-energy designs.

// A CITY THAT PROVIDES THE IMPETUS FOR MASSIVE BUILDING RENOVATIONS

The building stock in Paris is generally ageing, and 70% of the buildings are particularly energy-inefficient. In response to this situation, the City of Paris is setting all territorial stakeholders the aim of renovating 100% of the existing building stock to make it compatible with very low energy consumption standards between now and 2050. In the housing sector in particular, the City is aiming to reduce energy consumption by one-third between now and 2030 and to halve it between now and 2050 in relation to 2004.

Similar efforts must be made with tertiary/service sector properties. An important stage in this process could be completed with the planned introduction of an obligation to carry out energy renovations leading to minimum energy savings of 25% for existing buildings with a surface area of 2,000m² or more, pursuant to the Law on Energy Transition for Green Growth (*Loi de Transition Énergétique pour une Croissance Verte – TECV*).

Regulations commensurate with the challenges of energy transition

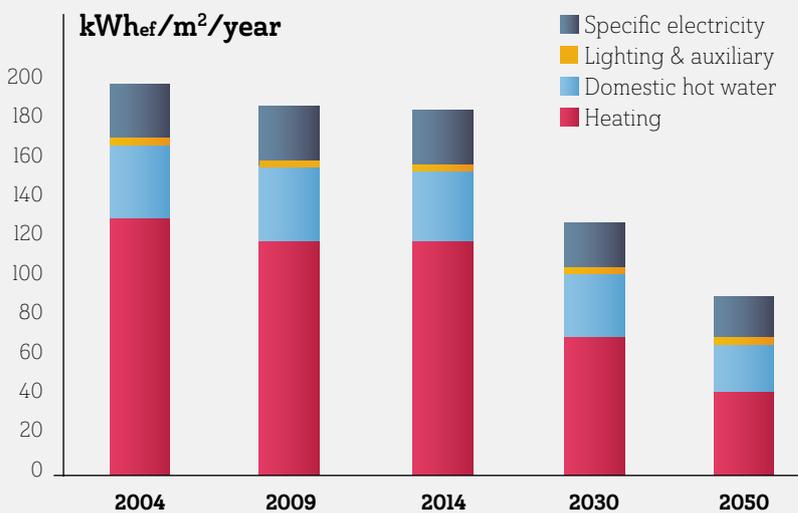
The ambitious targets for energy renovation in private housing stock can only be attained if the entire regulatory and operational framework is adapted in line with the long-term goals of the TECV Law. In particular, the City of Paris will be campaigning for the French government to implement a genuine national strategy to renovate the existing building stock in compliance with very low consumption standards. Inspired by the New York model which imposes a maximum level of consumption for buildings, this strategy could be developed by imposing a binding obligation to renovate buildings according to a predefined schedule: between now and 2030 for buildings in energy classes F and G, and by 2040 for buildings in energy classes D and E.

This strategy presupposes the development of ambitious thermal regulations incorporating a carbon component, summer comfort and indoor air quality requirements for the existing buildings.

Social housing at the heart of an ambitious renovation programme

With over 230,000 housing units on 1st January 2016, the housing stock belonging to Paris's social housing providers represents a key challenge for this renovation policy. The City of Paris will continue to support social housing providers in their efforts to renovate their stock on a massive scale. The target is to reduce energy consumption by 35% in all social housing stock by 2030 and 50% by 2050 in relation to 2004, taking account of all improvements made.

Changes in energy consumption in housing by 2050



To achieve these targets, the City will continue to finance the renovation of 4,500 housing units per year in compliance with the low consumption standard. The average savings target will be increased to 60%¹⁷ for all of the operations submitted by social housing providers from 2018 onwards, maintaining the maximum target of 80 kWh/m²/year and the requirement of the best performance standards through an energy qualification. The number of renovations will be increased to 5,000 housing units per year as of 2020, which, in particular, will require the housing providers' investment capacities to be guaranteed by the State.

For energy-efficient jointly owned properties that also offer summer comfort

Aiming to renovate all homes in Paris between now and 2050¹⁷ will require the completion of renovations at a rate of 40,000 private dwellings per year with minimum savings of 50% from 2030, keeping the maximum target of 80 kWh/m²/year and the requirement of the best performance standards through an energy qualification.

The energy-efficiency projects of residents of jointly owned properties in Paris currently receive support from the City and the Paris Climate Agency, in particular via the "Eco-rénovons Paris" scheme which contributes to reducing energy consumption and combating fuel poverty. This programme and those carried out by the APC will need to be stepped up and adapted in

order to boost the rate of energy renovations. All stakeholders in this sector must be firmly committed to this process. Joint ownership associations will also be encouraged to play an active role in energy-improvement works on jointly owned properties.

Require the completion of renovations at a rate of 40,000 private dwellings per year

To improve air quality, the City of Paris will communicate with Parisians and encourage them to replace fuel oil-powered central heating systems with energy supplies emitting lower levels of greenhouse gases and air pollutants.

Eco-renovation in the tertiary/service sector

Paris's tertiary/service sector building stock occupied 60 million m² of space in 2016. The renovation of these premises, which often accommodate a variety of companies in a single building, is a particularly important issue for the attainment of our targets. The major specialised operators and large corporations must continue to renovate their assets and will be able to benefit from the impetus provided by the Paris Climate Action Charter¹⁸. In addition, the City of Paris will establish a specific support programme for renovations carried out by small-scale tertiary/service sector operators (e.g. shops, self-employed professionals, etc.) after 2020. This programme will require special support in view of the complexity of decision-making for work carried out in this sector, as reflected by the "Eco-rénovons Paris" operation already in force of buildings in the private housing sector.

17- For the 5 uses in the *Réglementation Thermique* (RT – Thermal Regulations) 2012, i.e. heating, DHW, lighting, air conditioning and auxiliaries.
18- See Section V. MOBILISATION for further information about the Paris Climate Action Charter

Reinforced control on the limited use of lighting at night time for the service sector buildings

Since the 1st July 2013, the night time lighting of non residential buildings (business premises facades and offices, front windows of shops or exhibitions, display cases) is limited in order to reduce light pollution and energy consumptions. The City of Paris will keep checking that the regulation is properly implemented by mobilising its brigade against uncivil behaviours.

Development of the professional energy renovation sector

The Territorial Energy Renovation Platform (*Plateforme Territoriale de Rénovation Énergétique – PTRE*), run by the APC with support from ADEME (French Environment and Energy Management Agency) and the City of Paris, sets out to encourage the energy renovation of jointly owned properties on a massive scale by targeting joint property owners and renovation professionals. This resource publicises exemplary projects and qualified professionals. The platform provides access to a network of certified operators as well as a communication and promotional channel aimed at private individuals. The City of Paris will maintain its support for the APC with a view to bringing together building-industry operators and creating a collective brand to promote the ambitious energy renovations being carried out in the area.

At the same time, the City of Paris will be supporting the implementation of the decree requiring insulation work whenever building façade restoration is carried out in order to systematise the inclusion of energy performance in compliance with heritage protection requirements. The mass implementation of energy renovation projects will also give the City of Paris an opportunity to engage in discussions with the French government on how to reconcile heritage protection with energy renovation by involving professionals in

the development of products that are compatible with the architectural quality of the built environment in Paris.

Financing energy renovation

One of the keys to attaining ambitious building energy renovation targets consists of encouraging the emergence of financing solutions for projects adapted to meet the needs of different types of property owners (households, residents in jointly owned properties, landlords and housing bodies, institutions and companies). One of the options chosen by the City of Paris is to encourage third party financing. This system designates an overall support solution for the energy renovation of jointly owned properties, which includes the performance of studies, the selection of service providers, the financing of the operation and post-renovation monitoring. The third-party financing body advances the sum required by property owners to finance their projects. The reimbursement of this sum is facilitated by the savings made on energy bills. In 2013, the City of Paris supported and participated in the creation of a mixed-ownership company – *Energies Posit'If* – for this purpose. After four years of campaigning for a change in the national regulations to authorise the use of this type of financial arrangement, the mixed-ownership company was authorised to offer its third-party financing solution to residents in jointly owned properties in 2017. The City will continue its active involvement with this operator and may participate in the recapitalisation of the company in 2018 in order to support its development.

At the same time, the City and the Metropolitan Area will examine the expediency of creating an operational public fund for financing energy renovation. This would enable the provision of direct financial support for inhabitants by capitalising on feedback from different actions carried out¹⁹ by the City and its partners on this subject. This scheme would also enable work to be carried out in partnership with financial operators in order to encourage them to finance the renovation of buildings in the metropolitan area. ■

Encouraging the emergence of financing solutions for projects adapted to meet the needs of different types of property owners.



+ LOCAL GOVERNMENT +

RENOVATION OF MUNICIPAL FACILITIES

The renovation of municipal buildings sets an example for the population and encourages institutional and private owners to follow suit.

The efforts already undertaken will be continued with the renovation of another 60 primary schools for a total of 300 institutions (out of 600) renovated by 2020, while increasing the energy saving target to at least 40%.

In addition, the City is setting ambitious renovation targets for its most energy-inefficient buildings with a view to reducing the energy consumption of its entire building stock by 40% in 2030. In this perspective, it will launch a long-term renovation programme for its most energy-inefficient buildings including 300 primary schools, 40 secondary schools and 15 swimming pools. Between now and 2050, the energy consumption-reduction targets will be progressively increased to 60%. The Municipal Investment Programme (Programme d'Investissement de la Mandature – PIM – 2020) will form part of this trajectory and the City of Paris is intending to employ management and funding methods to raise the required funds. To raise the profile of this ambitious renovation programme, energy certificates will be awarded in recognition of any major renovations, which will be adapted according to the programme of work carried out.

From 2020 onwards, projects to build new municipal buildings subject to the Thermal Regulations shall meet passive energy requirements (E+C- label). Projects exceeding 5,000m² shall conform to the maximum requirements of this label (passive or positive-energy buildings). In addition, the energy label of all City of Paris buildings shall be displayed in their lobbies.

+ LOCAL GOVERNMENT +

INTRACTING

The City of Paris is seeking to diversify the sources of funding for the renovation of its buildings. To this end, between now and 2020, it will develop the "intracting" model to finance projects with the energy savings that result from them. Within the local authority, this will take the form of an internal contract between the Finance and Purchasing Department, the operational Departments and the district municipal councils in order to channel the amounts corresponding to energy savings into energy performance projects, which will initiate a virtuous cycle.

19- Decree no. 2016-711 of 30 May 2016 on insulation work in the event of building façade restorations, roofing repairs or the development of premises for residential occupation.



// A CITY THAT ENCOURAGES THE WIDESPREAD CONSTRUCTION OF NEW BUILDINGS TO THE HIGHEST PERFORMANCE STANDARDS

To guarantee a high level of performance in construction, the City of Paris will be influencing professionals by relying on regulatory requirements in both the environmental excellence and innovation fields.

Increasingly efficient new builds

From 2018 onwards, all new builds in Paris must conform to the regulatory consumption target of 50 kWh_{pe}/m² floor area/year, and the Energy 3 and Carbon 1 requirements of the Positive-Energy & Carbon Reduction (E+C-) Building reference standard as well as the best performance standards through an energy qualification, while aiming for energy neutrality. These performance targets will be incorporated into the Social Housing Funding Circular from 2018.

To keep Paris on course to attain its target of carbon neutrality, all new builds must incorporate a significant proportion of renewable or recovered energy into their supplies, corresponding to 60% of their energy needs between now and 2030 and 100% by 2050.

The City will advocate the granting of an "experimentation permit" covering the re-use of materials as well as energy and environmental performance and characteristics. If the French

government supports this scheme and authorises its development, it will allow for the waiving of some of the rules in force by setting actual performance targets instead of theoretical obligations that currently impose restrictions on building design without always guaranteeing the expected performance levels. In addition, the City of Paris will participate in the national debates on how to change the thermal regulations in order to incorporate ambitious targets into a future revision of the Local Land-Use Plan (PLU). In this way, the city will encourage the drafting of regulations that take account of several scenarios of use and comfort (summer and winter comfort, air quality and acoustics) and include the carbon footprint throughout the entire building life cycle, while also taking the adaptability of buildings for new uses into consideration. It will also support the consideration of the building's capacity to store energy and manage load shedding in order to adapt to power demands for the available production and to promote renewable and recovered energy integration.

An innovative supply of flexible and reversible buildings

In addition to implementing technical building performance measures, a rethink of uses and

practices will also be required to adapt buildings to rapidly changing lifestyles. Consequently, the City of Paris will be asking real-estate operators to ensure that the new building supply is designed with reversibility and versatility in mind. The aim is to enable a building to accommodate several functions (family dwellings, hostels, offices and workshops, etc.), which can change over time without the need for renovations, major upgrading or demolition and rebuilding – operations synonymous with high levels of greenhouse gas emissions. For reason, by 2030, the target will be for 30% of the office space produced to be reversible, rising to 50% by 2050. To encourage changes in practices and to stimulate innovation, the City, in partnership with Paris&Co, will look into the development of calls for innovative projects and will seek to encourage the adoption of its approach by public and private partners. It will step up its incentives for innovation in public construction and major renovation contracts from 2018 onwards. ■

A rethink of uses and practices will also be required to adapt buildings to rapidly changing lifestyles.

// A CITY THAT IMPROVES ENERGY MANAGEMENT FOR THE MORE EFFICIENT USE OF BUILDINGS

The halving of energy consumption by 2050 will depend on constant efforts to make consumers aware of their responsibilities in their practices and on monitoring the performance of technical installations over time.

Changing the role of building caretakers to improve the management of uses and practices

The management of uses and practices requires the dissemination of accessible and high-quality information to residents concerning eco-friendly behaviours and best practices at the local level. Building caretakers develop their expertise in their dealings with residents on a daily basis in relation to issues concerning the running of buildings and appear to be ideally placed to act as local advisors. The City of Paris will strengthen the key role of building caretakers by supporting their professional development. It will use the range of training courses derived from the partnership developed by the APC and the social housing providers and extend it to joint ownership associations. ■

+ LOCAL GOVERNMENT +

MASTER PLAN FOR THE ENERGY EFFICIENCY OF PUBLIC BUILDINGS

In 2020, the City of Paris will draft a Master Plan for the Energy Efficiency of Public Buildings (Schéma Directeur de Performance Énergétique des Bâtiments Publics) in order to optimise the management of its property assets. The reference standards for the buildings will be updated and shared to increase the involvement of users. At the same time, 100% of municipal construction projects will benefit from the digital modelling of building data (BIM) by 2025 to optimise the management and sharing of building design and operational data.

+ LOCAL GOVERNMENT +

36 ENERGY AMBASSADORS

The City of Paris will be appointing 36 energy ambassadors to work in the field in its public building stock between now and 2020. Their role will be to act as liaison people for site managers, technicians, managing departments and district municipalities with a view to reducing energy consumption.



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// A CITY THAT REDUCES HOUSING INEQUALITIES AND ENCOURAGES SOCIAL LINKS

The building supply will develop to take account of new lifestyles incorporating the shared use of spaces and services. The challenge for Paris is to become an easier place to inhabit, more socially responsible and more energy-efficient, particularly from the perspective of reducing inequalities and eradicating fuel poverty.

Combating fuel poverty means combating climate change

It is generally agreed that households which devote more than 10% of their income to expenditure on energy in their dwellings are in a situation of fuel poverty. Approximately 77,000 households suffer from fuel poverty in Paris.

In its specific response to this issue, between now and 2020, the City of Paris will draft a territorial pact to combat fuel poverty, in partnership with territorial stakeholders with the aim of reducing fuel poverty by 20%. On the basis of a precise and shared local diagnosis taking account of all actions undertaken to date, the partners (City, ANAH, DRIHL, IDF Region) will define a targeted action plan aiming to establish a fuel poverty prevention policy that will propose technical solutions as well as social support. The pact could, for example, be backed by a Social Support Fund for Energy Management Improvements (*Fonds Social d'Aide aux Travaux de Maîtrise de l'Énergie (FSATME)*), which is designed to help tenants and owner-occupiers on low incomes finance the performance of energy management improvements.

The City of Paris, in association with the Energy Voucher scheme (*Chèque énergie*) to be implemented by the government in 2018, will also endeavour to adapt the allocation of its grants and interventions to support struggling Parisian households (energy component of the Solidarity Fund for Housing [*Fonds de Solidarité pour le Logement – FSL*], grants and actions by the City of Paris's Social Welfare Centre, local social services, etc.). In addition to providing financial support for the payment of bills, these schemes also cover actions to prevent fuel poverty risks through the management of uses and practices and the improvement of energy efficiency, in particular. In this way, the City's partners – especially the energy suppliers – will be called upon to improve ways of tackling fuel poverty.

Paris will draft a territorial pact to combat fuel poverty

Towards a larger housing supply and a better allocation of residential space

To tackle the shortage of housing in its territory, the City of Paris wants to take action to reduce the number of vacant dwellings. Between now and 2020, the City will be introducing a “tax on vacant dwellings and an accommodation tax on second homes” in an effort to put vacant or occasionally occupied dwellings back on the market. In addition, to meet the need for greater accommodation capacities for vulnerable people, the City of Paris will be systematically seeking to make temporarily vacant building available for use as emergency accommodation centres.

Towards user-friendly shared spaces

In response to the lack of residential space, new ways of living are gradually emerging. The sharing of accommodation in dwellings and the shared use of common areas are becoming more widespread. These ways of living enable the reduction of housing costs and the sharing of larger areas. The City of Paris will be approaching planners, property developers and construction operators to promote common and shared spaces (working rooms, libraries, workshops, laundry rooms, etc.) in new buildings while ensuring that the creation of these new spaces does not increase the cost of the housing. The aim of this strategy is to pool uses and facilities and create social links, particularly between generations. ■

+ LOCAL GOVERNMENT +

MULTIPLE USES AT EVERY LEVEL

The City of Paris is also striving to improve the allocation of its occupied spaces. From 2020, the energy performance of buildings will be taken into consideration in the planning of different activities in public facilities. Furthermore, the City will impose a “multi-purpose” criterion for any designs of new municipal facilities, with the aim of attaining the target of 10% adaptable and multi-purpose facilities by 2025. Lastly, the City will ensure that any new construction of public facilities is accompanied by optimisation efforts, so that the total volume occupied by municipal assets remains stable or diminishes between now and 2030, while continuing to develop its range of public services.

The aim of this strategy is to pool uses and facilities and create social links.



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URBAN PLANNING

A CARBON-NEUTRAL, RESILIENT AND PLEASANT CITY TO INHABIT

Urban Planning and land-use planning are essential tools for transforming the city in order to develop clean mobility, improve air quality, increase the number of natural areas within the city and improve the living environment of Parisians.

At present, 10% of the territory is undergoing urban renewal. These 10 km² of space are experimental laboratories for the Paris Climate Plan, as they enable the testing of innovations in renewable energy, energy efficiency and the natural cooling of neighbourhoods.

In the past 10 years, Designated Development Zones such as Fréquel-Fontarabie (11th district) and Clichy-Batignolles (17th district) have seen the emergence of positive-energy buildings, the installation of over 40,000m² of solar panels, greater public transport provision, the development of green spaces and the pedestrianisation of certain streets, accompanied by the development of economic areas and employment centres close to housing. These

new neighbourhoods allow for the bridging of some of the old urban divides (creation of links with neighbouring municipalities, former railway complexes, etc.) and the recreation of social links and cohesion.

The lessons learned from the construction of these new eco-neighbourhoods have enhanced the Local Land-Use Plans through the creation in 2016 of article 15 on local energy efficiency.

The challenge in the future will be to succeed in becoming a more energy-efficient and lower-carbon city, while also improving Paris's adaptation to climate change and reconciling these requirements with other key sustainable city issues: developing an attractive city that is pleasant for Parisians to reside in and for visitors

to spend time in. Efforts will be made to control the urban density, with the aim – whenever possible – of not exceeding the current maximum density. The transformation of office space into housing is a priority and the local authority will use every means at its disposal to achieve this objective. The creation of "breathing spaces" is another priority. There will be systematic efforts to preserve open ground and create new areas of open ground.

The City of Paris is counting on using planning documents and urban development as strategic tools to drive the ecological transition of its territory: it would like to strengthen the regulatory component while intervening further upstream in development operations.

// A CITY THAT ADAPTS PLANNING DOCUMENTS TO SPEED UP THE ENERGY TRANSITION

Urban planning documents establish the local rules and guidelines for land-use planning and construction.

These documents must include the targets for energy transition and the adaptation of the built environment to the effects of climate disruption. Paris was one of the first municipalities in France to create an article dedicated to these issues (Article 15) in its Local Land-Use Plan in 2016, and it will continue to strengthen its aims in the different planning documents, at the regional (Master Plan for the Île-de-France Region), metropolitan area (Coherent Territorial Planning Scheme) and local (Local Land-Use Plan) levels, with a particular emphasis on the development of new digital tools.

A Local Land-Use Plan with a stronger approach to energy-climate and urban greening issues

Planning documents are a way to anticipate changes in construction industry practices and urban functions. Among these documents, the Paris Local Land-Use Plan (PLU) is a powerful regulatory tool for improving the living environment of all Parisians by promoting the adoption of a sustainable conception of Urban Planning. Modifications to the regulatory provisions of the Paris PLU in 2016 have already made changes to the application of the Climate Plan targets, particularly in terms of energy efficiency and renewable energy production.

Today, Article 15 of the PLU defines the obligations imposed for construction work, projects, installations and developments vis-à-vis energy and environmental performance. The City of Paris is continuing to look for new regulatory levers to strengthen the inclusion of renewable energy and energy performance in the PLU. Consequently, from 2020 onwards, Development and Programming Guidelines (*Orientations d'Aménagement et de Programmation – OAP*) on Energy-Climate issues will be considered with a view to setting energy performance, renewable energy production, carbon neutrality and climate change adaptation targets for developers and builders.

The OAPs are components of the PLU; they describe the manner in which the city plans to develop and renew areas within its territory. A thematic OAP applying to the entire territory would limit the need for successive amendments of the PLU while adding greater flexibility for the inclusion of renewable energy and energy performance schemes in the appraisal process for the granting of urban development permits.

With regard to urban greening, the PLU also establishes obligations for construction work, projects, installations and developments. These provisions will contribute to increasing the proportion of urban greening in the new or existing built environment throughout the Paris area: green roofs and walls, areas planted on slabs or in open ground, etc.

Improving the local authorities' verification procedures concerning the implementation of provisions in the PLU

Today, local authorities have the ability to incorporate energy performance criteria into planning but there is no way for them to monitor their implementation or to sanction any failure to do so. Therefore, the City of Paris will be asking the French government to change the law on the monitoring of implementation of the provisions of the PLU and on the sanctioning of those that fail to do so.

Helping stakeholders implement innovative energy schemes

From 2018, when applications for urban development permits are submitted, the City of Paris and the APC will be strengthening their advisory services for energy savings and the implementation of the Climate Plan for applicants, and increasing the attention paid to the energy component of projects when reviewing applications for permits. To supplement this range of advisory services, they will be jointly coordinating discussion groups to identify innovative technical, legal and organisational solutions and will be broadly sharing any feedback. ■

Attractive city that is pleasant for Parisians to reside in and for visitors to spend time in.



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// A CITY USES NEW OPERATIONAL TOOLS TO COORDINATE SUSTAINABLE CONSTRUCTION AND DEVELOPMENT LOCALLY

In its new neighbourhoods to be developed, Paris will be establishing operational tools prior to the design of projects in order to improve the energy governance of development operations with the aim of attaining carbon neutrality. In neighbourhoods undergoing urban renewal, the City will be supporting the renovation of public spaces and buildings.

Towards carbon neutrality for all new urban projects

Development operations are a way to experiment with innovative solutions for climate change mitigation and adaptation. In this way, the latest operations such as Clichy-Batignolles, Boucicaut and Fréquel-Fontarabie have acted as laboratories for the city of the future.

To the north of the 14th district of Paris, the Saint Vincent-de-Paul Designated Development Zone (ZAC) will be the first urban project that sets out to be carbon-neutral and resilient.

Between now and 2025, an initial evaluation of these projects will be carried out with a view to consolidating and encouraging the widespread implementation of a carbon neutrality-based approach in urban development and renewal operations. All new urban projects launched from 2030 onwards will be carbon-neutral throughout their entire life cycle, i.e. from the extraction of the raw materials for construction through to waste disposal. The major development operators will be systematically required to integrate sites for services enabling lower-carbon forms of mobility (bike stations, logistics areas, etc.).

// A CARBON-NEUTRAL AND 100% RENEWABLE-ENERGY CITY

In a perspective of adapting to climate change, the City of Paris is making it compulsory for developers to take account of the major climate issues for Paris: heat waves, the heat island phenomenon, heavy rainfall, flooding and drought. To this end, requirements will be systematically included in the major urban projects in Paris, particularly in terms of mitigating the heat island phenomenon and anticipating heavy rainfall phenomena.

Digital tools driving new urban development targets

Before 2020, the City of Paris will develop a three-dimensional Geographic Information System (GIS) in the framework of the "3D Paris" project. The 3D GIS will facilitate the development of digital models of buildings and neighbourhoods integrated into their urban environment. In this way it will provide support for urban project consultation and joint development tools. These tools will also support the next revision of the Local Land-Use Plan and its application.

The city will examine the feasibility of incorporating all relevant data concerning networks and flows (energy, water and materials), in addition to digital models of buildings and structures (Building Information Modeling - BIM), into the 3D GIS, especially for development projects, in order to make the 3D GIS a tool to facilitate

the energy and ecological transition. This study will set out to determine which are the most appropriate tools to accompany the "3D Paris" project by helping to assess the environmental impacts of urban projects and facilitate the participative design of projects by means of the 3D views and opportunities

to interact with stakeholders, inhabitants and residents. It will also contribute to the definition of data-sharing obligations, in particular via the BIM, which will help commit the stakeholders to performance obligations. The data disseminated will concern actual energy performance (taking account of uses, practices and comfort), greenhouse gas emissions throughout the entire life cycle and other environmental impacts (air quality, acoustics, materials used, work site, water cycle, etc.) and should be used to commit the operators involved to meeting specific obligations.

Management and assessment of urban development operations

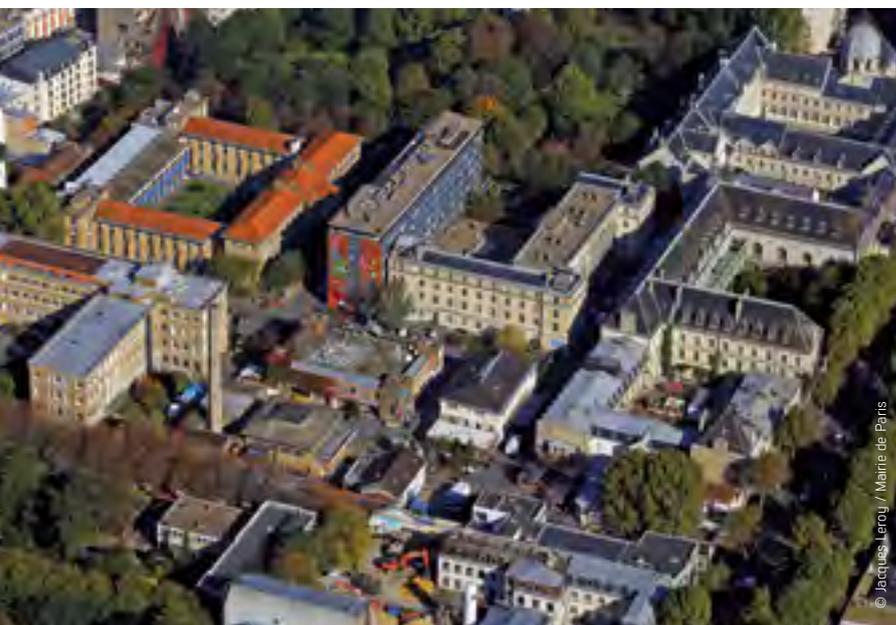
Development operations contracted by public authorities are reviewed in an annual financial report whose purpose is to provide information for the local authority. The aim is to adapt this report to include criteria, data and environmental

as well as financial technical evaluation processes. Eventually, this will enable the City of Paris to publish an annual review of the three dimensions – technical, financial and environmental – of projects and construction work carried out throughout the entire duration of the operation.

The Saint Vincent-de-Paul Designated Development Zone will be the first urban project that sets out to be carbon-neutral and resilient

In addition, the setting of more stringent energy and climate targets will require the improvement of scoping documents: strengthening of climate, air and energy clauses and criteria in design contracts, specification of targets in development concession agreements and obligations in property tax transfer agreements.

The City of Paris will experiment with a total cost-based approach on a renovation project between now and 2020. The total cost-based approach means that the sum of the investment, operational and maintenance costs over a given period will be taken into consideration in the design of projects. Within a broader approach, the total cost of a development project also takes account of the positive and negative impacts of the operation on the territory, such as protection of the environment, social development and quality of life, etc. The total-cost-based approach will contribute to the selection of projects targeting low-carbon development. ■



// A CITY THAT IS CHANGING THE SCOPE OF ITS DEVELOPMENT POLICIES AND MOVING BEYOND THE BUILDING DIMENSION

With a longstanding commitment to the energy renovation of buildings in the city and after transforming its urban development areas into experimental laboratories for the Climate Plan, the City of Paris is now adopting a neighbourhood-based approach to move beyond the building level in its methods to design, build and manage the carbon-neutral city between now and 2050.

By opting for a systemic approach on a larger scale than the initial project, development and renovation operations may become sources of positive externalities for an entire neighbourhood: energy performance, financial savings and economies of scale, attractiveness, new mobility solutions, etc.

“Concerted Renovation Zones”

Starting in 2018, in connection with the “*Eco-rénovons Paris*” strategy, the City will experiment with a scheme enabling the pooling of energy renovation projects in the form of a Concerted Renovation Zone (*Zone de Rénovation Concertée – ZRC*). This will consist of facilitating the networking of project sponsors at the neighbourhood level and encouraging the pooling of financial and technical resources for the renovation and management of several buildings. On the basis of the experimentation coordinated by the Paris Climate Agency in three areas situated in the 13th, 18th and 19th districts, this new scheme will enable the creation of an operational Concerted Renovation Zone between now and 2020, and the roll-out of the scheme to several groups of energy-inefficient buildings by 2030.

Temporary urban development involves the creation of temporary urban projects on vacant sites or in unoccupied buildings.

Preparing for the emergence of new “energy facilitator” and “eco-manager” roles

Keeping the energy promises made in relation to eco-neighbourhoods while ensuring energy performance and comfort for users, and reducing energy consumption at the neighbourhood level while involving all stakeholders in the process from the design stage through to the users, are key issues that developers and local authorities need to address today for a successful ecological transition.

From 2018, the CoRDEES²⁰ project will endeavour to meet these challenges by combining the new possibilities offered by digital technology with a new business model for energy governance and management at the neighbourhood level. This project proposes the appointment of an energy facilitator for the neighbourhood in Clichy-Batignolles. His or her role will be to propose technical recommendations for the energy transition, ensure cooperation between stakeholders and assist users with the adoption of the different schemes. He or she will also coordinate the creation and implementation of new services for this neighbourhood. The project must define a new business model that will ensure the energy facilitator becomes a permanent post. The governance system established will also aim to introduce a principle of joint responsibility shared by the different stakeholders, from the developer through to the final user in order to guarantee the attainment of environmental performance targets. The facilitator will use a data analysis platform with systemic, real-time analysis to improve the coordination of production and demand. He or she will also maintain links between the developer, if there is one, and the municipality, and will propose a range of services to benefit the community and encourage behavioural changes.

The APC use its expertise and the accumulated feedback to help define the mission of managers of energy use, experiment with a series of tools and select those most likely to contribute to the eventual emergence of professional energy facilitators. From 2020, the APC will help to improve the post holders’ competencies by establishing a partnership with the *École Nationale Supérieure d’Architecture* of Paris-Belleville and the *École des Ingénieurs de la Ville de Paris (EIVP)*, to create a mandatory training course on the management of energy use.

Eco-managers may be appointed in each Concerted Renovation Zone. Their work could be partly financed by energy savings. They could contribute to the greening of the neighbourhood, keep an eye on vulnerable people during heat waves, facilitate the lending or hiring of property and equipment such as bicycles between residents, manage a mini-urban logistics hub, carry out the pre-collection of certain types of waste or transfer bulky waste items to waste sorting and recovery centres. From 2018, an initial experiment is planned in the Paris Nord Est Designated Development Zone, based on a project developed by developers and notaries. In partnership with several stakeholders, the APC will help to define and promote this role on a larger scale, consolidate its business model and establish a suitable training course together with Paris universities and associations. For new operations, the developers, in the framework of their duties, will be responsible for supporting the transition towards these new professions.

Between now and 2020, experiments with these new posts will be carried out in two different settings: in a development operation and in a housing block to be renovated. The aim will be to determine the most suitable form of governance and the associated funding methods to ensure the long-term existence of these posts.

The need to develop initiatives to strengthen social links at the neighbourhood level has already led to the creation of new professions such as the neighbourhood concierge and the local coordinator. Their role is to provide shared and collaborative services at the neighbourhood level. Steps will be taken in 2018 to incorporate an “Air, Energy and Climate” advisory component into these existing local service offerings.

In this same perspective of creating neighbourhood ties and regenerating local civic and cultural life, temporary urban development projects are emerging. Temporary urban development involves the creation of temporary urban projects on vacant sites or in unoccupied buildings.

The projects are varied: housing by collectives, artistic and cultural projects, shared green spaces, etc. To develop these types of projects, the City of Paris will support the emergence of new professions associated with this temporary urban development. ■



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WASTE

TOWARDS ZERO NON-RECOVERED WASTE AND A CIRCULAR ECONOMY IN PARIS

Our changing modes of production and consumption have led to a significant increase in the production of waste by enterprises and households. Although the weight of the average Parisian dustbin has been dropping in recent years, it has doubled since 1940, increasing from 239 kg per inhabitant to 485 kg in 2015.

The environmental impacts and the financial costs of waste collection and processing have prompted the City of Paris to implement a waste reduction and recovery strategy. As a consequence, the City launched its first Waste Prevention Plan (*Plan de Prévention des Déchets - PPD*) back in 2006 to inform Parisians about waste reduction and sorting. As a result, the weight of the dustbin was reduced by 70 kg per Parisian between 2006 and 2016. In 2017, the City of Paris has continued its proactive approach by launching a new Local Household and Similar Waste Prevention Programme (*Programme Local de Prévention des Déchets Ménagers et Assimilés - PLPDMA*) which consolidates the actions carried out in order to reduce household and similar waste (HSW)²¹ by 10% between 2010 and 2020, and has drafted its first Circular Economy Plan (*Plan Économie Circulaire*) which was adopted in July 2017.

In accordance with the PLPDMA, the Climate Plan will give fresh impetus to waste management

in Paris by redesigning the current system. In order to reduce the production of waste at source substantially, the City of Paris is supporting the development of new distribution methods (bulk, deposit and packaging-free systems, etc.), combating food waste, advocating the development of urban composting and encouraging event organisers to adopt exemplary behaviour.

To attain the “zero non-recovered waste” target, it will also be necessary to improve sorting procedures in order to recycle and recover 100% of the waste that can be recovered. To this end, stakeholders in the area will need to sort all their waste efficiently and adopt the habit of repairing items. In line with the Paris Compost Plan (*Plan Compost Parisien*), biowaste will become an energy and agricultural resource. While “zero non-recovered waste” is an ambitious target, it can be achieved with the involvement of all stakeholders in the area.

“ZERO WASTE” STRATEGY

- 1 // Reduce
- 2 // Re-use
- 3 // Recycle & Recover



21- Non-hazardous waste from households or industrial enterprises, craftspeople, businesses, schools, hospitals, tertiary services, and collected under the same conditions.

// A CITY THAT IS REDUCING ITS PRODUCTION OF WASTE AT SOURCE

The City of Paris's campaigns to analyse the dustbins of Parisian households show that three-quarters of their contents could be avoided by implementing reduction measures at source, and by the re-use or recovery of waste. The most abundant sources of waste are packaging (37%) and food waste (22%)²². Both of these can be reduced by implementing prevention measures, i.e. actions carried out upstream during product manufacturing and distribution phases, and while these goods are being purchased and used by consumers.

Towards packaging-free distribution

Current distribution methods are based primarily on the use of "disposable" packaging. To encourage Parisians to reduce the weight of packaging in their dustbins, distribution companies need to move towards systems based on re-use, such as deposit schemes or bulk sales. To promote the rapid development of this business model, the City of Paris will provide support for the opening of "bulk sales" shops, i.e. that do not provide disposable packaging, with the target of having one 100% bulk sales shop for 100,000 inhabitants in 2030. These business models have two positive impacts: they produce less packaging and help to reduce food waste by encouraging each consumer to purchase only what he or she needs. In the same way, the City will continue to promote the consumption of tap water, which is high-quality water available at a universally accessible price and does not produce any packaging waste

Combating food waste

Each year in France, 10 million tonnes of food intended for human consumption are lost or wasted²³. The theoretical value of these products is estimated at €16 billion. In Paris, food waste is three times above the national average, partly due to the high level of tourist activity. In relation to the number of inhabitants, each Parisian throws away 26 kilogrammes of food per year on average²⁴.

To combine the fight against food waste with the provision of food aid, all food markets held in Paris must implement a recovery-transformation-donation scheme between now and 2030. This solution will consist of collecting unsold items that are still consumable from vendors and redistributing them through specialised local associations.



+ LOCAL GOVERNMENT +

COMBATING FOOD WASTE

In 2015, the City of Paris adopted a Plan to Combat Food Waste (Plan de lutte contre le gaspillage alimentaire) with a reduction target of 50% between now and 2025. In this context, a charter to tackle food waste in Paris's local authority canteens and restaurants has been drawn up. By 2020, all school administrations must have signed this Charter that formalises the managers' commitment to implement concrete actions (recipes using leftovers, donation of remaining meals to associations, etc.). This will be followed by the widespread implementation of anti-waste measures in all types of local government institutional catering.

"Zero-waste" events: from 100% disposable to 100% reusable

Paris is an open and dynamic city that hosts numerous events which have a by no means insignificant impact in terms of food waste and the production of waste. In 2016, the City published an Eco-responsible Event Charter and between now and 2020, it will be striving to make its provisions more binding, while the use of digital tools will facilitate the development of paperless ticketing, for example.

"Low-carbon" construction sites

Construction and renovation projects generate large flows of materials and waste that have an impact on greenhouse gas emissions and air pollution. However, these materials can be re-used in many different ways; for example, old plaster can be recycled to produce new plaster, rubble can be used in embankments and earthworks for roads, etc. To minimise the environmental impact, the possibility of renovation must be systematically considered before resorting to demolition. In addition, the City of Paris will be encouraging all projects to adopt circular economy principles in order to attain the target of 50% "zero landfilled-waste construction sites" by 2030 and 100% by 2050. It also wishes to promote the use of materials that emit fewer carbon emissions throughout their life cycles, such as locally produced wood, and has set the targets of 30% of projects being dry-process operations by 2030 and 50% by 2050. To this end, the City of Paris will be implementing ways to encourage these practices, particularly by looking into the possibility of introducing provisions that could increase the constructability of sites. In addition, prior to any demolition or dismantling, an analysis of the potential for reusing materials will be carried out.

22- According to the 2015 analysis campaign.

23- ADEME study: <http://www.ademe.fr/sites/default/files/assets/documents/pertes-et-gaspillages-alimentaires-201605-rapport.pdf>

24- According to the 2015 dustbin analysis campaign.



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Effectively combating planned obsolescence strategies

The City of Paris will be campaigning at the national level to strengthen the provisions of the 2015 Energy Transition Law (*Loi de transition énergétique*) that defines planned obsolescence as “all of the methods used by a vendor with the aim of deliberately reducing the useful life of a product in order to increase the frequency of its replacement” and penalises these practices. It is a question of strengthening the provisions of this law to oblige firms and producers to abandon the strategy of planned obsolescence. The legislation must ensure that a product cannot be marketed without a certificate of durability, recyclability and reparability.

Initiatives promoting re-use

Today, many goods (electronics, furniture, clothing, etc.) are still being thrown away simply because they have fallen out of favour, despite being fully operational or easy to repair. To combat this “throwaway” culture, the City of Paris will encourage the emergence of new consumer habits among all Parisians by promoting the repair and re-use of items, or by stimulating the debate on how to share them. To this end, it will be supporting the extension of sorting and recovery centres in Paris with the target of establishing 20 recycling centres and associated repair workshops (*recycleries*) in the area by 2020. recycling centres and associated repair workshops are intended as depots for unused goods or equipment that are still in working condition but no longer required by their owners. The aim is therefore to give these items a second life by reconditioning them for sale or by passing them on to the recycling industry. Between now and 2020, a study will be commissioned on the creation of a “Remanufacturing in Paris” cluster capable of carrying out the large-scale collection of discarded materials and items with a view to repairing or “remanufacturing” them in small production runs. ■

The city of Paris will support the growth of the existing recycling centers to 20 centers in 2020.

+ LOCAL GOVERNMENT +

“ZERO NON-RECOVERED WASTE” CONSTRUCTION SITES

In order to ensure the recovery of construction waste and its re-use in the form of materials, projects carried out in the City will become “zero non-recovered waste” construction sites by 2020, as set out in the Circular Economy Plan. 5 to 10 sites that are representative of the diverse methods of construction will be identified to disseminate the best solutions.

+ LOCAL GOVERNMENT +

A RE-USE EXCHANGE SCHEME

The City of Paris's different departments have stocks of equipment (furniture, maintenance equipment, tree grilles, etc.), and construction materials (paving stones, granite, etc.) for which they no longer have any use. An exchange scheme for the re-use of these materials will be set up between the City and private operators in order to find them a second life.

// A CITY THAT IS STEPPING UP THE SORTING AND SYSTEMATIC RECOVERY OF ALL WASTE

Most people are aware of the positive effects of sorting in terms of its environmental and social benefits. Indeed, when waste is properly sorted, it is a source of positive externalities for the community: resources in terms of materials and energy, financial savings for the local authority and therefore for its inhabitants, etc. However, only 17% of the one million tonnes of waste produced by stakeholders in Paris is recycled and nearly 80% is incinerated as residual household waste.

Sorting and separated waste collection on a large scale

Many factors come into play with regard to users' sorting behaviour, including the "perceived" capacity to establish an efficient sorting system. That is why it is essential to clarify sorting instructions and facilitate access to collection systems.

In response to this issue, the City of Paris will advocate uniform sorting instructions for all areas, and especially at the metropolitan area level. This standardisation of instructions will require the implementation of a targeted and localised communication plan. The fondness that people might have for their place of residence is also a factor in the success of sorting, and so it is important to carry out highly localised awareness-raising operations. In addition, time will be devoted to after-school activities to raising awareness about sorting actions and the fight

against food waste to ensure that each pupil is aware of these issues.

The dissemination of clear and uniform sorting instructions will be accompanied by the widespread installation of sorting systems in all public areas, including the "Trilib" system with the aim of obtaining the installation of 1,000 sorting stations in Paris by 2020. Each type of waste will be associated with the corresponding recycling process, as the separated collection of biowaste will be progressively generalised.

Adapted collection and processing systems

Sorting is only an appropriate solution if proper recycling and processing systems have been established. Certain types of waste, such as industrial waste (IW), which is very varied as it originates from a wide range of activities (shops, industries, private and public services), are collected by private operators. As a consequence, the City of Paris lacks clear information about the typology and volume of this type of waste, which makes it more difficult to organise dedicated collection and processing systems.

To optimise the management of all types of wastes, the City of Paris will ask the Île-de-France Regional Waste Observatory (*Observatoire Régional des Déchets d'Île-de-France - ORDIF*) to create a waste barometer specific to each business sector by 2030, which will allow for the

identification and quantification of waste flows to facilitate the development of specific and adapted collection and processing systems.

In the same perspective of optimisation, the City will negotiate with the Grand Paris metropolitan authority with a view to initiating the collaborative mapping of waste in the metropolitan area for economic operators in order to facilitate their waste management and reduction.

Alternative ecological wastewater treatment solutions such as separated urine management will also form part of the experiments conducted by the City in certain eco-neighbourhoods between now and 2030. The installation of urine collection systems at the source can reduce the flows of nitrogen-rich and phosphate-rich nutrients entering wastewater treatment plants and the River Seine, and cut water consumption by reducing the flushing of toilets. Therefore, the separation of wastewater at the source is also a promising solution in terms of adaptation to climate change and the responsible consumption of natural resources. If separated urine collection is implemented on a large scale and it is processed appropriately, the recovered nutrients could be used as an agricultural resource.

In addition, the City will encourage the organisation of sectors concerned with the processing, recycling and/or the re-use of technologies relating to the energy transition in Paris, especially those associated with solar panels and energy storage systems.



100% recovered organic waste

Composting is a solution enabling the re-use of food waste and its conversion into natural fertilisers for plants and gardens. Since 2010, the City of Paris has been helping inhabitants and public institutions to implement the collective composting scheme at the level of individual housing blocks. To extend these practices, the City of Paris adopted a Compost Plan at the start of 2017 and since this time, the 2nd and 12th districts have been experimenting with the collection of food waste. A "P'tit Bac" (Little Container) and "P'tit Sacs" (Little Bags) have been distributed to each participating household. Collections are carried out twice a week by the City in a specific brown container kept in waste bin storage areas. With a view to minimising the proportion of residual household waste and recovering biowaste, the City of Paris is committed to implementing the widespread collection of food waste between now and 2020. It will also be installing collective composters outside residential blocks and public facilities: the aim is to establish 1,000 composting sites by 2020.

In this perspective, in 2016, the City of Paris joined the national "Compost plus" network of many different local authorities involved in the recovery of biowaste and dedicated to returning these materials to the earth. By replacing soil conditioners made from fossil or synthetic materials with compost produced by recycling organic waste which is then made available to farmers, the use of this organic recycled material will contribute to reducing greenhouse gas emissions.

The collected organic waste will be partly used for energy recovery in Paris. In 2018, studies will begin to examine the opportunities for energy recovery from used edible oils. Groups of researchers will be asked to conduct research into the potential of such a recovery process. Between now and 2020, the City will also test the operation of a micro-methanisation plant in a densely developed urban environment with the support of ADEME and the Regional and Inter-Departmental Energy and Environment Directorate (DRIEE). The biogas produced by the plant will be used to produce heat or electricity. Biogas production will also be developed on a larger scale via the combined production of biogas from sewage sludge and biowaste in a single plant. The City of Paris, in association with Sycotm (Inter-Municipal Household Waste Processing and Recycling Syndicate) has set itself the target of establishing medium-sized biogas production solutions on its territory between now and 2030.

The City of Paris is also asking Sycotm to develop organic waste recovery facilities (biogas production and industrial composting) in the metropolitan area, including the installation of a high-capacity biogas plant. These facilities will be capable of processing these new waste flows whose volumes will inevitably increase with the obligation to implement separation at source for all by 2025 imposed by the Law on Energy Transition for Green Growth (TECV).

The City will also test the operation of a micro-methanisation plant

Incentive strategies

The Zero Waste Paris strategy requires careful considerations of the incentives to be employed in the specific context of Paris. Incentive pricing could contribute to encouraging Parisians to change their habits and lead to better management of their waste. At this stage, the mechanisms suggested by ADEME (incentive charging and incentive household waste removal charge) and feedback from local authorities that have implemented such systems point towards the great complexity of any possible implementation in the Paris area (very high density, almost exclusively collective housing, presence of a double sorting system in public spaces and bin storage areas, etc.).

Between now and 2020, the City will look into the possibility of implementing incentive schemes that could be seen as attractive opportunities to ramp up the reduction of waste and the improvement of sorting.

The City of Paris will advocate the introduction of a tax on printed advertising materials for commercial purposes with the aim of compelling firms and manufacturers to limit their paper production. The proceeds from this tax will, as a priority, contribute to the processing, recycling and recovery of paper waste. ■

The aim is to establish 1,000 composting sites by 2020.



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FOOD

PARIS, A SUSTAINABLE FOOD CITY

Feeding urban populations around the world is a major challenge for the 21st century, given increasing pressure on natural resources due to the impact of climate disruption. In 2050, the number of people living in cities will represent nearly 80% of the global population, with a strong impact on the carbon footprint of these cities.

The food sector is responsible for almost 18% of the Paris carbon footprint. In 2014, all of these emissions were related to activities outside the city, namely the production, transport, and processing of food products.

The Climate Plan's objectives for food aim to increase the advantages of Paris's food system (a balanced and high quality diet, dense and diverse commercial fabric, a historical agricultural basin) and reduce its vulnerabilities (local agricultural activities are not well structured, the supply is highly dependent on fossil fuels, limited food self-sufficiency).

To improve Paris' food self-sufficiency, it is necessary to preserve agricultural land in France and protect farmland in the Île-de-France region, to ensure its percentage does not go below the current threshold of 48%. We also need to expand urban agriculture. Furthermore, we must secure the capital's food supply by diversifying our supply modes and increasing

the share of deliveries via electric and active modes, or inland waterway transport to 50%.

Lastly, agricultural production in the Île-de-France region must become more environmentally friendly. The goal is for 20% of usable agricultural land to use organic methods by 2030, with an increase to 30% by 2050.

Efforts from both producers and consumers to move the current agricultural system towards more environmentally friendly agriculture must go hand-in-hand with a shift in behaviours and habits towards more virtuous and diets with less meat. Paris will foster these changes by raising awareness among Parisians and economic operators, and working in partnership with the agri-food industry. The City's objective is to reduce Paris' greenhouse gas emissions from food by 40% by 2030, so that Paris can serve as a model of responsible food consumption.

The food sector is responsible for almost 18% of the Paris carbon footprint.

Food system in Paris

GREENHOUSE GAS EMISSIONS DUE TO THE FOOD CONSUMPTION OF HOUSEHOLDS



18%

A MINIMAL DEPENDANCE ON EXTERNAL FOOD SUPPLY



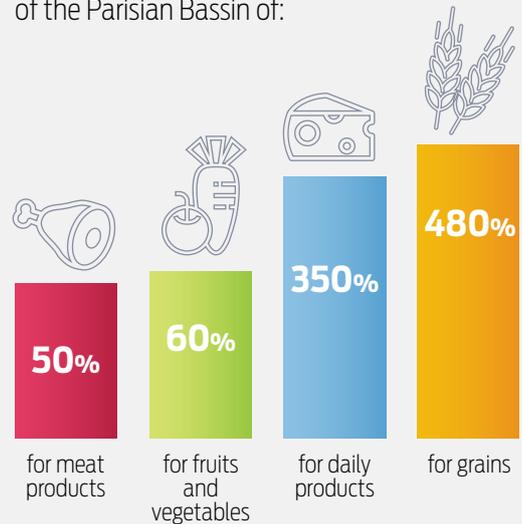
660 Km

Average supply distance for foods



VERY LARGE FOOD PRODUCTION CAPABILITIES AROUND PARIS

With the potential autonomy of the Parisian Bassin of:



// A CITY THAT SUPPORTS THE DEVELOPMENT OF SUSTAINABLE AGRI-FOOD CHANNELS AND STRENGTHENS ITS FOOD SELF-SUFFICIENCY

Paris is inherently dependent on other areas to feed our 2.2 million residents, 1 million non-Parisian workers, and the 280,000 tourists who visit the capital each day.

Around 70% of food products consumed in Paris come from France, particularly from the Parisian Basin (Hauts-de-France, Normandy, etc.), which produces most of the cereals and meat products. Nevertheless, Paris still imports food from far away (Europe, Africa, Central and South America, Asia), particularly fruits and vegetables. Increasing the local production of Paris' food supply, even to a small degree, is possible in the Paris Basin as long as we increase the complementarity and improve the organisation of our sustainable agricultural channels. This will require strengthening the link between consumers and producers and eliminating barriers that hinder changes to the local agricultural system.

Short supply chains and local production

Short food supply chains are critically important, as they promote the vibrancy of our agricultural land, reconnect consumers to producers, and reduce greenhouse gas emissions from agriculture. In collaboration with *Eau de Paris*, which is planning for a 67% increase in organic agriculture and a 60% increase in sustainable surfaces in its water catchment areas by 2020, the City will create partnerships between our institutional catering services and farmers in these catchment areas, starting in 2017. The City will also promote local short supply chains through the creation of Community Supported Agriculture (*Association de Maintien de l'Agriculture Paysanne – AMAP*) programmes in interested schools in 2018. Lastly, we will establish partnerships with rural or peri-urban towns and cities to strengthen connections between the city and the countryside.

The City will evaluate ongoing experiments to establish sustainable and community-oriented food markets and will examine opportunities to create new ones, particularly in the City's priority neighbourhoods, where both social and environmental issues must be addressed. These new markets will of course take account of the existing food supply, especially open-air markets.

By offering seasonal products that are locally sourced, and therefore have a lower carbon footprint, these sustainable and community-oriented food markets will help create a sustainable distribution network for high-quality products. These markets will be accessible to all, and in this way will give all Parisians better access to healthy products. They offer a solution that respects the work of farmers by offering them a fair price while also remaining affordable for the greatest number of people.

Furthermore, Paris will continue to develop eco-friendly urban agriculture in the city. As part of this objective, the City will support various urban agriculture and permaculture projects in areas of open ground and on the walls and roofs of municipal buildings. The City will also mobilise all stakeholders, partners, and property owners in Paris through calls for projects. One example is the first "Parisculteurs" project launched in 2016 to encourage Parisians to participate in greening the city, as part of the "Objective 100 hectares" charter. The second season was launched in 2017.

The City of Paris will support and take the necessary steps to develop, promote, and recognise these eco-friendly urban agriculture projects via a certification programme or an appropriate label.

Educating consumers about agricultural professions and production techniques

The City will work to strengthen connections between Parisian consumers and local producers. We will provide information about urban agriculture and raise awareness about agricultural professions and food by setting up urban educational farms in large green spaces within central Paris. We will continue to support the development of community gardens in Paris. We will also encourage Parisians to get involved in permaculture, which is a form of ecological food production that can be employed even in very small areas. By 2017, we will create permaculture training courses at the *École du Breuil*, in connection with the *Ferme de Paris* organic educational farm and through gardening workshops.

Experimenting with new forms of governance and new forms of more sustainable production and consumption.

Cooperation with other cities in Europe and around the world to promote sustainable food and agriculture for all

Cities and local governments around the world are focusing on food and agriculture in response to 21st century challenges. Much like Paris, these municipalities are experimenting with new forms of governance and new forms of more sustainable production and consumption. Cooperation among these cities is essential to foster experience sharing and joint actions.

Current regulations for local and organic agriculture (the inability to mention origin in public procurement, subsidy mechanisms in the European Common Agricultural Policy etc.) can hinder efforts to make agricultural systems more sustainable. To give citizens access to high-quality, local food and ensure that by 2030, 50% of food consumed in Paris originates from the Paris Basin (and 75% by 2050), the City of Paris will act as a mouthpiece, at the European and international levels, for local authorities committed to developing local organic agriculture and sustainable food. With this aim in mind, early 2018, the City participated in the creation of

the Organic Cities Network Europe, a network of European cities that will dialogue with European authorities to make positive regulatory changes. The City will also continue to work closely with other proactive cities and participate in working groups via the Milan Urban Food Policy Pact²⁵ and C40 networks.

Guaranteeing the food supply even in periods of crisis

As part of the Resilience and Adaptation Strategies, the City will ensure the security of the capital's food supply during periods of crisis (natural, social, or technological disasters, etc.). The goal is to facilitate communication between crisis management services, operators, distributors, as well as the State regarding available food stocks and their locations. ■



Promote the vibrancy of our agricultural land, reconnect consumers to producers, and reduce greenhouse gas emissions from agriculture.

25- <http://www.milanurbanfoodpolicypact.org/>

// A CITY THAT ADOPTS A LOW-CARBON DIET

Like the French diet in general, the “Parisian diet” is characterised by its world-renown gastronomic heritage. It also stands out for its lower animal protein content, higher proportion of organic ingredients, as well as more processed and ready-made products.

There are also strong disparities between the most affluent, educated residents and residents in precarious situations, which require particular attention. Adopting a low-carbon diet in Paris involves both increasing the Parisian tendency to consume high-quality, lower-carbon food and ensuring that everyone has access to this diet. Not only is this good for the environment and the climate, it is also healthy, fresh, balanced, and affordable.

Sustainable food consumption and the promotion of new practices

Since 2011, the City has used the Paris Health Nutrition programme to encourage consumers, the food service industry, and distributors to consume high-quality, lower-carbon food. This food should also be local, seasonal, and organic, to the extent possible.

The current trend towards the use of processed food is increasing, while the consumption of raw, seasonal ingredients is limited. Yet even low-cost processed foods are generally more expensive than fresh raw ingredients. The City will therefore implement awareness-raising measures, particularly for the poorest residents, to promote meal preparation using raw seasonal ingredients and raise the profile of legumes – a cheap source of protein that emits little greenhouse gas. Cooking workshops and presentations in indoor and outdoor markets will also be offered.

Much like the expansion of sustainable and community-oriented food markets across Paris, a key objective for the City is to give everyone access to varied, balanced, and sustainable food, all while supporting producers. In this way, the City is committed to ensuring that the least affluent residents have access to healthy food. To promote access to raw, fresh, and local ingredients for the least affluent Parisians, we will set up collective kitchens for people in shelters, hotels, or without enough room to cook.

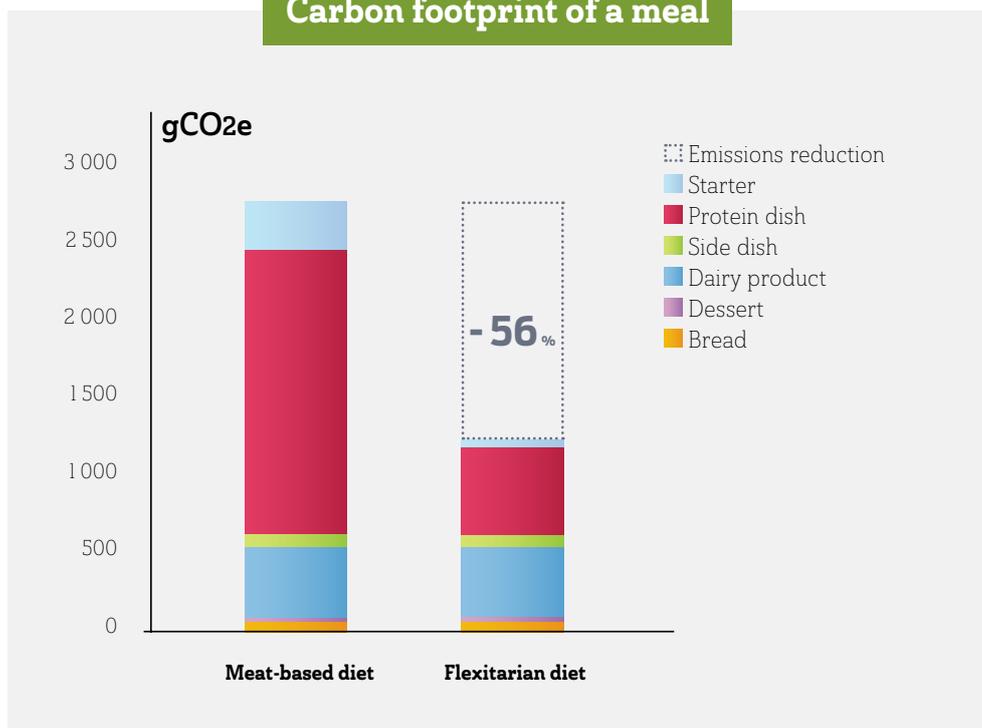
The flexitarian diet and access to vegetarian meals

To attain targets for reducing greenhouse gas emissions from food, citizens will need to adopt a more “flexitarian” diet. This involves eating more vegetables and less meat and fish, while prioritising local, high-quality and short supply chains. In addition to ensuring a lower environmental impact, producers earn a higher income.

The City of Paris will thus work with local stakeholders to ensure that everyone has access to meals with more plant-based products, in compliance with nutritional needs. We will also encourage restaurant owners to offer more vegetarian dishes, as part of our goal for all Paris restaurants to include a complete vegetarian meal on their menu, as the City has done in its own municipal dining facilities.

We will also invite institutional catering professionals to participate in the organisation of a Veggie day (without meat or fish) to raise awareness about the need to reduce meat consumption in favour of more plant-based options, which have a lower environmental impact. This event could also be replicated in neighbourhoods, in collaboration with schools and Paris’ institutional catering services to educate participants about sustainable food.

Carbon footprint of a meal



Citizens will need to adopt a more “flexitarian” diet.



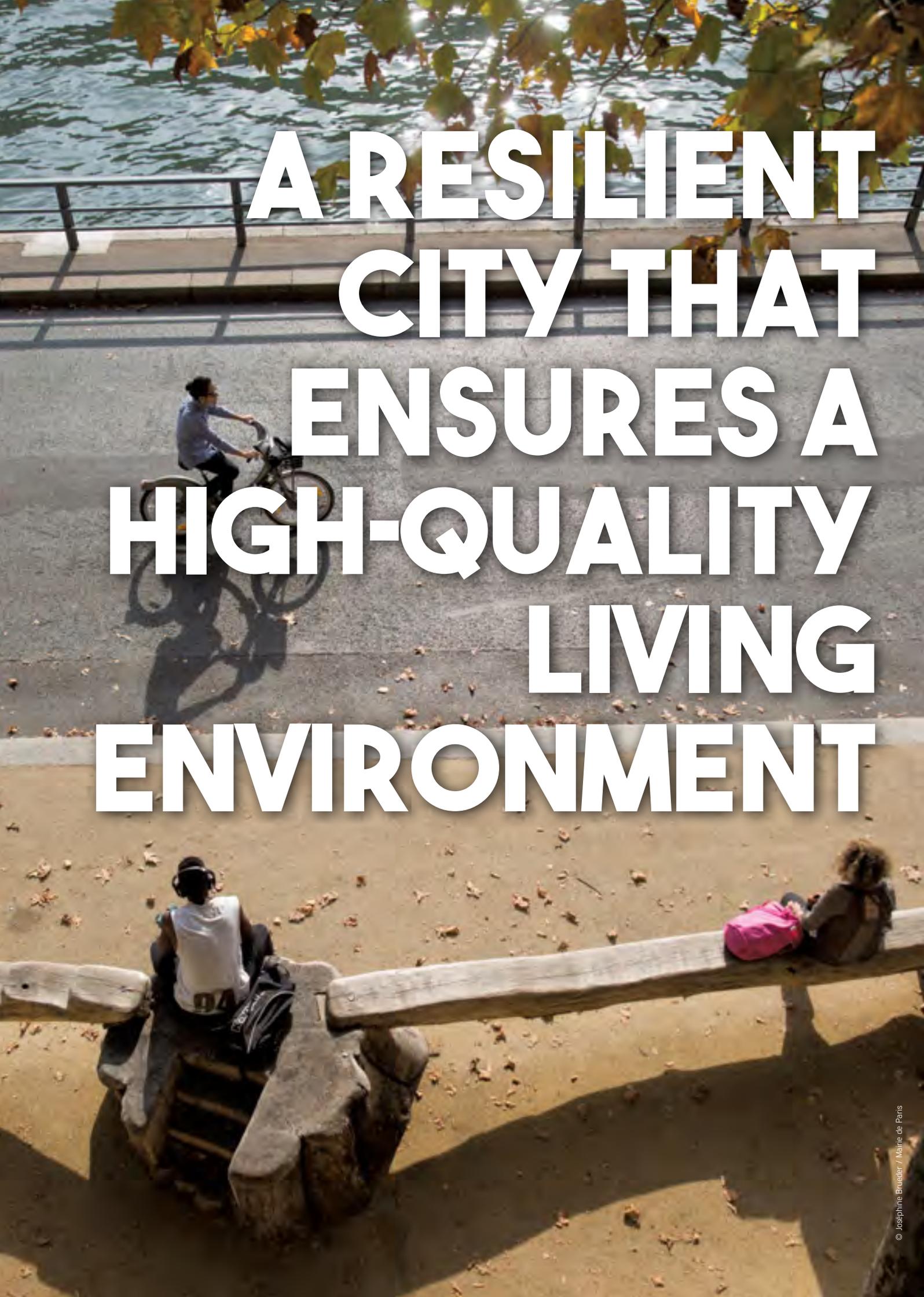
A sustainable food strategy for Paris

In 2018, the City will present its first food strategy to the city Council of Paris. Created following a major consultation with food professionals, the objective of the strategy is to develop a sustainable, inclusive, resilient, safe, and diversified food system to mitigate and adapt to climate change. This strategy is in line with the objectives of the Milan Urban Food Policy Pact, which the City signed in October 2015, along with 136 other international metropolitan areas. This food strategy complements Paris's efforts on sustainable food, particularly the Sustainable Food Plan, through which the City has become the biggest public buyer of organic products in France through procurement for its institutional food services. The food strategy aims to expand this action throughout Paris and beyond, in collaboration with public and private food industry players. ■

+ LOCAL GOVERNMENT +

PARIS, A CITY WITH EXEMPLARY INSTITUTIONAL CATERING FACILITIES

As a continuation of the Sustainable Food Plan (which increased the rate of sustainable food in the city's 1,300 dining facilities to 38% in 2016), and the introduction of one vegetarian day per week in school cafeterias, the City of Paris has set ambitious objectives for its institutional catering services (day-care centres, school cafeterias, shelters, staff cafeterias, etc.): a 50% reduction in the percentage of meat in meals by 2030, and a 90% increase in the use of sustainable ingredients (organic, red label, and sustainable fishing) served by institutional catering services in 2050. After consultation with the educational community, and discussions with suppliers to create balanced and varied menus, two vegetarian meals per week will be offered in school cafeterias. Furthermore, the City of Paris will examine the technical and material conditions that will allow schools, in consultation with their management committees, to experiment with offering vegetarian alternatives at each meal. These will need to comply with existing legislation and take account of consumer preferences to limit waste.

A high-angle photograph of a city park area. In the upper half, a person in a blue shirt is riding a bicycle on a paved path. To the left, a body of water is visible with a metal railing. In the lower half, a person is sitting on a wooden bench, and another person is sitting on the ground nearby. The ground is covered with fallen leaves. The text 'A RESILIENT CITY THAT ENSURES A HIGH-QUALITY LIVING ENVIRONMENT' is overlaid in large white letters across the center of the image.

A RESILIENT CITY THAT ENSURES A HIGH-QUALITY LIVING ENVIRONMENT

Paris is a robust city that is working to address the expected consequences of climate disruption²⁶. Nevertheless, vigilance is required in certain key areas: heat waves, flooding, air pollution, and water resources.

Paris's climate is changing, and will continue to do so throughout the 21st century. Heat waves, heavy rains, droughts, dwindling water resources... all these problems require advance planning today to make Paris more resistant to climate change.

By 2050-2070, we should expect:

- Hotter summers and more frequent heat waves. The average annual temperatures will continue to increase between +2°C and +4°C. The scorching summer of 2003 may well become a "normal" summer in 2050.
- More frequent heavy rains and storms. Climate projections for Paris indicate an increase in the frequency of heavy rains in the coming century, like the storm in early July 2017.

- Flooding should become neither more nor less frequent due to climate disruption. Nevertheless, the consequences of the Seine flooding to levels similar to or greater than 1910 would be disastrous for our connected society (flooded metro tunnels and power grids). Special vigilance is thus required: major anticipatory actions, prevention at the catchment area-level, adaptation of the city's infrastructure, and preparation of the population.
- Droughts and conflict over the use of water resources. Droughts will lead to a significant decrease in groundwater levels and the water system, and a major drop in the available water volume.

Air quality is a key priority for the municipality. The City will continue to improve air quality to protect the health of Parisians and Île-de-France region residents. It is important to remember that heat waves accelerate the deterioration of air quality when there is pollution.

In 2015, the City of Paris adopted its first Adaptation Strategy to address climate change and growing resource scarcity. It took stock of Paris' strengths and weaknesses and made proposals to boost climate resilience through 30 objectives and 35 actions for the 2020-2050 period.

The Paris Environmental Health Plan (2015), the Resilience Strategy (2017) and the new Biodiversity Plan complement prevention efforts and work to improve the living environment of Paris's residents and users.

PARIS'S RESILIENCE STRATEGY

Urban resilience is defined as a city's ability to prepare for, survive, and develop regardless of the type of shocks (terrorist attack, major flood, heat wave, etc.) and chronic stresses (housing, employment, migration, climate, etc.) it may experience in the coming decades.

Paris's strategy is an invitation for stakeholders to come together and re-examine the risks and stresses that affect city life to provide comprehensive solutions built on solidarity for all.

The assessment of Paris's resilience, which involved more than 800 stakeholders, identified six major challenges for the City: reduce social, economic, and territorial inequalities and the risks to social cohesion; the threat of terrorism and security issues; climate disruption; air pollution – a major public health issue; the River Seine and related risks; and governance.

In light of these challenges, the City launched a second phase in the development of the strategy in October 2016 to create initiatives to overcome them.

Many stakeholders participated: municipal departments, external institutions and public or para-public agencies, network operators, businesses, start-ups, researchers, and community organisations. This work allowed us to identify strategic initiatives to create a vision for Paris that involves residents, adapts the infrastructure, and mobilises collective intelligence as well as the surrounding cities and towns in order to turn these challenges into opportunities. These initiatives are broken down into three pillars, nine objectives, and 35 actions that were approved by the Council of Paris in September 2017.



© Julien Faumelle

AIR

IMPROVING AIR QUALITY FOR BETTER HEALTH

A number of parameters can affect the quality of the air we breathe: climate conditions, emissions of atmospheric pollutants (of natural origin or caused by human activity), and the dispersion and transformation of pollutants in the environment.

Air pollution data is not limited to Paris itself but covers the Greater Paris Metropolitan Area and the Île-de-France region as well. Indeed, Parisians and users may be exposed to pollution that comes from outside the city.

In Île-de-France, there are five atmospheric pollutants that regularly exceed thresholds or air quality objectives in European regulations: nitrogen dioxide (NO₂), fine particles (PM10 and PM2.5), ozone (O₃), and benzene (C₆H₆). Of all these pollutants, only ozone is also a greenhouse gas (GHG). Unlike GHGs, such as carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), atmospheric pollutants do not contribute to

global warming (with the exception of ozone). However, they do have a direct impact on health.

In 2016, 1.4 million Île-de-France residents were exposed to air that exceeded the regulations on nitrogen dioxide (NO₂), including nearly half of all Parisians. As for PM10 particles, 200,000 Île-de-France residents were affected by levels exceeding the daily limit value, particularly those near vehicle traffic. According to the report of a 2015 Senate commission inquiry into the cost of air pollution, fine particles (PM2.5 and PM10) and ozone (O₃) are responsible for the premature deaths of nearly 45,000 people in France each year.

Paris's air quality has been improving over the past 10 years. Nevertheless, concentrations of certain atmospheric pollutants are still too high. The City of Paris has set an air quality objective for less than 10% of Parisians to be exposed to pollution levels exceeding the limit values in 2020, and for this percentage to be reduced to drop zero by 2024 through compliance with limit values for all pollutants.

Paris's air quality has been improving over the past 10 years.

By 2030, Paris aims to exceed existing European regulations by complying with World Health Organisation (WHO) guideline values for atmospheric pollution, below which there are no negative effects on human health or vegetation:

- **NITROGEN DIOXIDE (NO₂) :**
200 µg/m³ for more than an hour and 40 µg/m³ as an annual average
- **PM10 PARTICLES:**
50 µg/m³ for more than 3 days a year and 20 µg/m³ as an annual average
- **PM2.5 PARTICLES:**
25 µg/m³ for more than 3 days a year and 10 µg/m³ as an annual average
- **OZONE (O₃):**
100 µg/m³ for more than eight consecutive hours
- **BENZENE (C₆H₆):**
no WHO guideline value; European regulations of 2 µg/m³ as an annual average

In response to the health impact of air pollution, the City of Paris will continue to take action by reducing background air pollution, and implementing measures during pollution peaks and for point source pollution. At the same time, Paris will inform residents and local stakeholders of behaviours to adopt and measures needed to improve both indoor and outdoor air quality. The City of Paris will pursue research to improve the understanding of fine-scale, real-time pollution in Paris.

Through the implementation of the Paris Environmental Health Plan, the City will mobilise PMI (Maternal and Child Protection) and school health services and work with partners (AP-HP [the public hospital system], CPAM [Local Sickness Insurance Fund], ARS [Regional Health Agency]) to improve the screening, prevention, and treatment of respiratory illnesses, particularly among the most vulnerable populations and residents of areas that are most exposed to air pollution. ■

By 2030, Paris aims to exceed existing European regulations.

// A CITY THAT TAKES ACTION TO REDUCE BACKGROUND POLLUTION

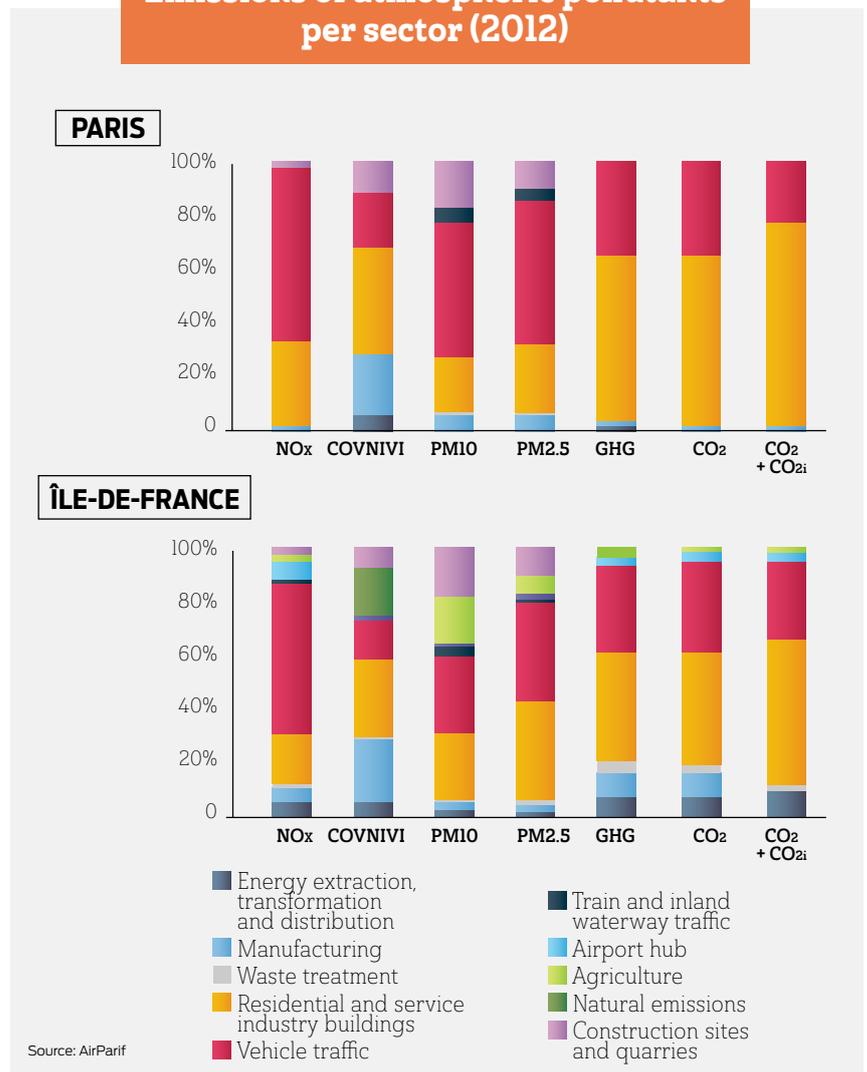
Atmospheric pollution in the Île-de-France region is essentially caused by vehicle traffic and heating. These two sectors are responsible for three-quarters of regional emissions of nitrogen oxides (NOx) and PM2.5 particles, and more than half of PM10 particle emissions. The remaining background pollution comes from the agricultural sector, industry, and air and maritime transport.

Combating traffic-related pollution

According to an Airparif inventory of emissions for reference year 2012, vehicle traffic in Île-de-France was responsible for more than half (56%) of the region's nitrous oxide (NOx) emissions, more than one third (35%) of PM2.5 particle emissions, and more than one-quarter (28%) of PM10 particle emissions. In Paris, vehicle traffic generates half of fine particle emissions, and 95% of all traffic-related particle emissions come from diesel engines.

It is estimated that 60% of background air pollution due to vehicle traffic comes from engines, while the remaining 40% is produced by emissions from braking systems, tyre wear, road abrasion, and the repeated disturbance of particles caused by the passage of vehicles. The City of Paris will continue to roll-out Low Emissions Zone (Zone à Circulation Restreinte – ZCR), which will gradually exclude the most polluting vehicles according to their Crit'Air emissions stickers. The ultimate goal is to completely phase out diesel engines by 2024. The City will continue to work with the Grand Paris Metropolitan Authority to extend the ZCR to the metropolitan level by 2030, in accordance with the Breathable Cities approach.

Emissions of atmospheric pollutants per sector (2012)



Source: AirParif

Pollution-free streets and areas

By 2020, the City of Paris will implement a large restricted traffic zone (1st, 2nd, 3rd, and 4th districts) that will not hinder public transport, emergency vehicles, waste collection and cleaning vehicles, residents, and bicycles. This initial experiment may then be duplicated in other Paris neighbourhoods starting in 2020. Ultra-Low Emissions Routes (AUBE) will also be introduced in several Paris neighbourhoods, in which a traffic lane will be permanently reserved in one direction for clean vehicles that run either on Natural Gas for Vehicles (NGV) or electricity. The objective is to reduce overall traffic on that road while encouraging users to adopt low-carbon vehicles. The goal is to introduce these ultra-low emissions routes by 2024.

The City of Paris will also help individuals purchase non-polluting vehicles through the "Air'volution" rating system that will rate light-duty vehicles according to their real-world emissions of GHGs and atmospheric pollutants.

Combating heating-related pollution

According to Airparif, heating in Île-de-France in 2012 was responsible for more than one-third (39%) of PM2.5 particle emissions, more than one-quarter (26%) of PM10 particle emissions, and almost one-fifth (18%) of regional nitrous oxide (NOx) emissions. Even though wood only represents 5% of fuel consumption for heating

in the Île-de-France region, it is responsible for more than 90% of particle emissions (PM10 and PM2.5) from residential heating.

To prepare for the potential impact of an increase in wood-fuelled heating systems, the City of Paris will support implementation of the Wood Energy Charter project in the Atmospheric Protection Plan and will ensure it is disseminated throughout the entire Paris community (professionals, general public, etc.).

The Paris Climate Agency will raise the general public's awareness of the subject, including the need to stop using fireplaces during pollution peaks.

In order to limit pollution caused by fires and individual heating by wood, the City of Paris will collaborate with the Grand Paris Metropolitan Authority to support the creation of a Metropolitan Air-Wood Fund for individuals by 2020. This fund will support the replacement of existing heating systems with high performance wood-burning appliances and the transformation of open fireplaces into closed fireplaces with filters.

The City of Paris and the Paris Climate Agency will encourage the replacement of oil-fired central heating systems through incentives to meet the target of zero oil-fired heating by 2030. The APC will inform residents in jointly owned properties and property management companies about alternatives to oil heating.

Combating pollution caused by agriculture and industry

In 2012, agriculture; industry; waste treatment; and rail, river, and air traffic were responsible for 23% of NOx emissions, 28% of PM10 emissions (with 18% from agriculture) and 15% of PM2.5 emissions in the region.

Since pollution sources extend beyond geographic boundaries, cooperation between the City of Paris, the Greater Paris Metropolitan Area, and national and rural agencies is critical to ensuring the most effective possible action is taken to improve air quality. For the agricultural sector, yearly crop-dusting in early spring has contributed significantly to known pollution peaks in the past few years. The particles emitted at that time are compounded by those emitted from traffic and urban heating systems. Currently, the City of Paris prohibits the use of plant protection products in green spaces and in cemeteries. The goal is to go even further by pushing the French government and Europe to reduce emissions of atmospheric pollutants as much as possible in Europe, particularly from agriculture, mid-sized manufacturing, and air and maritime transport – all of which have a negative impact on air quality. As part of our resilience strategy, the City of Paris will initiate pilot projects in cooperation with rural governments to change agricultural practices in the areas that are most affected by pollutant emissions stemming from the application of chemical products. ■

// A CITY THAT TAKES ACTION TO ADDRESS POLLUTION SPIKES AND POINT SOURCE POLLUTION

During spikes in pollution levels, it is critical to provide quick and effective solutions to reduce air pollution levels. These spikes are generally related to weather conditions, in two recurring situations. In addition to the springtime pollution described above, there are spikes in ozone pollution in summer and episodes of particle and nitrogen oxide pollution in the winter. Urgent measures are therefore required to reduce vehicle traffic and the attendant pollution.

Furthermore, the City needs to address two main types of additional point source pollution that degrade local air quality: construction sites and public works (given the fine particles that are produced and suspended), and diesel generators.

Towards rapid implementation of alternate-day traffic measures

Paris's main tool to reduce pollution peaks involves limiting vehicle traffic. The City will work with decentralised government services, and particularly the Police Headquarters, to facilitate the rapid implementation of alternating traffic schemes in Paris as early as the second day after a pollution notice, and the first day of a pollution alert for Paris.

Decreasing point source pollution from construction sites and generators

According to Airparif, in 2012, construction sites and quarries in Île-de-France were responsible for 18% of PM10 particle emissions, 11% of PM2.5 particle emissions, and 3% of nitrous oxide (NOx) emissions in the region.

By 2020, the City of Paris will implement a Clean Worksite Charter for all construction sites in the

Paris area, with the support of the Atmospheric Protection Plan. By signing this charter, project managers will commit to reducing the construction site's impact on air quality.

For municipal construction sites, the City will drastically reduce atmospheric pollutants by reducing particulate emissions from diesel engines in construction equipment and by encouraging the use of electricity rather than diesel generators. In order to clarify vague French regulations on pollutant emissions from generators, the City will lobby Parliament to produce regulations for generators by 2030. ■

THE PARIS ENVIRONMENTAL HEALTH PLAN

The concept of environmental health goes beyond a strict focus on environmental health measures to protect human health. It addresses links between health and the environment that have decisive impacts on individual health and general well-being. These can be either positive, like access to amenities (green spaces, landscapes, etc.), essential goods, and natural resources (water, energy, etc.), or negative through exposure to nuisances, pollution, and risks.

The Paris Environmental Health Plan, adopted in 2015, aims to improve our understanding of health issues stemming from living environments, and integrate objectives to improve the health of Parisians into the city's operations and urban planning. It addresses living environment-related risk factors that affect the health of residents, particularly the most vulnerable. The general aim is to reduce environmental health inequalities.

THE PLAN COMPRISES 15 MEASURES, WITH AMBITIOUS OBJECTIVES

- Undertake urban planning that improves health, and conduct health impact assessments for the municipal government's major urban projects.
- Better identify and understand environmental health issues in Paris.
- Prevent and monitor respiratory conditions among children, who are most affected by poor air quality.
- Develop a common environmental health culture.
- Create an environmental health unit to support civic, non-profit, and economic initiatives and rely on the expertise of researchers and the City's departments.
- Develop a service to provide Parisians with advice and audits of their indoor environments.
- Ensure that Paris improves its management of public access buildings, public procurement, and institutional catering. The goal is to eliminate carcinogenic, mutagenic and reprotoxic substances and endocrine disruptors from Parisians' living environment.
- Improve the protection of the health of city personnel, particularly those in exposed professions.

// A CITY THAT PROTECTS ITS RESIDENTS FROM AIR POLLUTION RISKS

To prevent and reduce the risks of pollution-related afflictions, it is critical to increase the number of protected areas and inform professionals and residents of good habits to adopt on a daily basis.

Breathing spaces for Parisians

In order to offer Parisians more breathing spaces, the City will increase the number of more tranquil and green streets in each district by 2020. The "Paris Breathes" scheme, which already closes 23 Paris neighbourhoods to vehicle traffic every Sunday and bank holiday, will be extended. It will establish breathing spaces in all Paris districts on every Sunday and bank holiday by 2024. These areas will be reserved for pedestrians, bicycles, rollerblades, and scooters.

Towards better indoor air quality

Indoor air quality refers to the air inside buildings and enclosed spaces in general. The City of Paris will improve the information and prevention messages on indoor air pollution given to Parisians.

During energy renovation projects, particular attention should also be paid to indoor air quality during and following renovations in housing units. To this end, the Paris Climate Agency will work with its partners to define and provide information about effective ventilation and air circulation systems, as well as the construction materials and techniques to avoid or favour. It will also raise awareness among and train professionals in the field.

Building on an Airparif study of transport operators, the City will work with the RATP, *Île-de-France Mobilités*, the SNCF and rolling stock manufacturers to improve air quality in public transport, particularly in underground railway enclosures. The objective will be to replace braking systems on trains and wagons, which are the primary source of fine particle emissions in railway transport.



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Measuring the health impact of air pollution

The degradation of air quality, particularly by new pollutants that are not yet regulated, has a direct impact on public health: respiratory diseases, eye irritations, and reduced immunity to microbial infections. PM2.5 particles cause cancer and cardiovascular diseases and reduce life expectancy.

By 2020, studies will be launched on the co-benefits, in terms of health, well-being, and social links, of measures to improve air quality and the climate. One example is the new *Rives de Seine* park, as part of the C40's Healthy Liveable Cities initiative.

The creation of the AirLab within Airparif will increase the number of measures and innovations to improve air quality, in collaboration with major private sector companies as well as start-ups.

GUAPO (Global Urban Air Pollution Observatory) is the new global observatory for pollutant emissions and best urban practices to improve air quality. It was created by the Grand Paris Metropolitan Authority and Airparif, in collaboration with the WHO. Its role will be to improve diagnoses, evaluate policies, and suggest new partnership-based initiatives and exchanges with various cities around the world such as Abidjan, Accra, Auckland, London, Madrid, New York, Beijing, Tokyo, and Rotterdam-the Hague. Lastly, the City of Paris will support mechanisms to provide individualised/personalised information in real time. ■

The City will increase the number of more tranquil and green streets in each district by 2020.



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FIRE

STRENGTHEN SOLIDARITY AND RESILIENCE IN RESPONSE TO HEAT WAVES

Heat waves are a major short-term risk in Paris. As a very dense city with many concrete and asphalt surfaces, Paris is particularly subject to the urban heat island (UHI) effect. The city can become a real furnace during heat waves, prompting residents and visitors to seek out cooler areas.

Green and humid spaces provide an ideal refuge. For example, during the 2003 heat wave, the *Bois de Vincennes* was up to 10°C cooler than the centre of Paris.

Between 2014 and 2016, the City of Paris conducted a study on the thermal regulating effect of green and humid spaces in the Paris area. This study combined field measurements in green spaces and nearby urban areas with aerial thermography maps. This research prompted the City of Paris to define the concept of 'cool islands' – specific areas that are open to the public, day and night, and which are cooler than the nearby environment.

Trees and vegetation can also help bring down temperatures. But in the event of a drought or extreme heat wave, fires are likely to break out in Paris. We must therefore prepare for this possibility.

Additionally, during heat waves, we must change our behaviours and lifestyles, and above all look out for our neighbours.

By 2020, the goal is for all Parisians to be within a seven-minute walk of a cool island.

// A CITY THAT PLANS AHEAD AND TAKES ACTION IN RESPONSE TO HEAT WAVES AND FIRE RISKS

After the lessons learned from the 2003 heat wave, the City of Paris is planning to create cooler areas within easy reach of Parisians and users of the area. By 2020, the goal is for all Parisians to be within a seven-minute walk of a cool island.

Cool islands and routes in Paris

The City of Paris will keep working in partnership with the Paris Urbanism Agency (APUR), the City of Paris School of Engineers (EIVP), the Paris Climate Agency (APC), the Météo-France weather service, and *Santé Publique France* (the national public health agency) to identify, create, and inform the general public about the “cool islands and routes” that are available every summer in Paris. The City of Paris will place an interactive map on its website every year so that users can identify the best places to escape the heat. In 2018, this data will be used to develop a mobile application with real-time information about the closest cool areas, and the coolest routes to take. In Paris, around 700 cool islands have already been identified (museums, libraries, swimming spots, green spaces, etc.). By 2030, the City will create or open to the public at least 300 cool islands and routes.

Paris’ Resilience Strategy also includes a plan to create more “schoolyard oases”: schools that have removed their asphalt and added greenery. These oases will contribute to the City’s efforts to create more cool islands. They will eventually exist in all Paris neighbourhoods, since no Parisian lives more than 200 metres from a school. Schoolyards in Paris represent more than half a million square metres that can potentially be transformed and made accessible to neighbourhood residents outside of current opening hours. The experiment will begin with three schoolyards by 2020, with the goal of expanding to the rest of Paris.

By 2030, the City will create or open to the public at least 300 cool islands and routes.

Reduced vehicle traffic during heat waves

Examination of thermography studies in Paris show that heat from vehicle traffic is particularly visible at night on road surfaces. Roads store the heat that accumulates from traffic during the day, and then release it at night into the urban environment. During a heat wave, the heat released by vehicles further aggravates the urban heat island (UHI) effect. In order to keep Paris from further overheating, and reduce potentially significant health risks, the City of Paris plans to ask the Police Headquarters to prevent the most polluting vehicles from being driven in Paris during recognised heat waves (as soon as threshold level 2 is reached). The procedure would be similar to that used for pollution peaks, with strongly enforced bans during critical situations (level 4 of the heat wave plan).

The goal is to implement this measure in 2030. It is important to note that heat waves sometimes coincide with spikes in ozone pollution, during which alternating traffic measures are implemented to rapidly improve air quality.

Preparing for the risk of fire in public spaces

In order to reduce the risk of fire in woods or other green spaces in Paris, by 2030 vegetation will be watered with collected rainwater or water that is unfit for drinking. ■

THE ADAPTATION STRATEGY

The goal of the Adaptation Strategy, adopted in 2015, is to ensure that Paris can adapt to climate impacts and increasing resource scarcity.

Issues to be monitored carefully include:



Heat waves



Heavy rains



Flooding



The preservation of water resources

The strategy comprises 30 objectives and 35 actions in 4 key areas:

- Protect Parisians from extreme climate events
- Maintain water, food, and energy supplies
- Adapt to climate change through more sustainable development
- Support the shift to new lifestyles and strengthen solidarity

// A CITY THAT REINVENTS ITS BUILDINGS AND ROOFS TO ADAPT TO HEAT WAVES

Profound changes to the Paris climate are expected, which will have an impact on the architectural and functional decisions made for certain buildings. For example, housing units with zinc-covered roofs are likely to become unbearable if heat waves intensify even further.

Buildings that are comfortable in the summer

By 2020, the City will support the creation of construction guidelines that are adapted to climate change, particularly relating to summer temperatures. It will address the key ways of making buildings comfortable in the summer: bioclimatic design, adding greenery to buildings, solar protection, light-coloured materials, effective ventilation, and setting the temperature to 26°C before an environmentally friendly cooling system is activated. As for existing buildings, the City will improve insulation, solar protection, and ventilation by adding a “summer comfort” component to all energy renovations conducted by the City of Paris or submitted for authorisation. With the future extension of the

urban cooling network, specific communication campaigns will be carried out to increase the number of buildings that are connected to the network, and in this way reduce the use of individual air conditioning. This approach will also be used for new and renovated municipal facilities in line with the Resilience Strategy.

New roofs for Paris

By 2050, the City will make better use of our rooftops so they can help produce three resources that will become even more precious in the coming decades: renewable energy with solar roofs, food through urban agriculture, and water through rainwater collection and storage. Roofs that cannot produce at least one of these resources (too steep, facing the wrong direction, etc.) should be covered in vegetation or reflective paint to help reduce the UHI effect. In the meantime, by 2020 the City of Paris will initiate a research programme to determine how to adapt Paris’ zinc roofs to global warming while preserving their architectural identity, in collaboration with the official French Architect’s Body (*Architectes des Bâtiments de France - ABF*) and the Paris Climate Agency. Starting in 2020, this approach will also include experiments to transform existing roofs on willing jointly owned properties. ■

// A CITY THAT PROMOTES RESILIENCE THROUGH SOLIDARITY, INCLUSION, AND THE MOBILISATION OF CIVIL SOCIETY

The City aims to strengthen climate resilience in Paris through solidarity and inclusion, because a well-adapted city is one whose residents are mobilised and can count on their neighbours.

The key to this approach is the direct involvement of Parisians in the application of solutions to preserve water, green the city, and save energy. The City of Paris will play an active role in setting up facilitation, educational, and co-financing tools so that residents and private stakeholders can help the city adapt to climate change. As part of Paris’s Resilience Strategy, the idea is to capitalise on lessons learned from the “greening permit” and the “*Végétalisons Paris*”²⁷ (Let’s Green Paris) platform to extend these measures to other social, environmental, and economic challenges, while including Parisians in their definition.

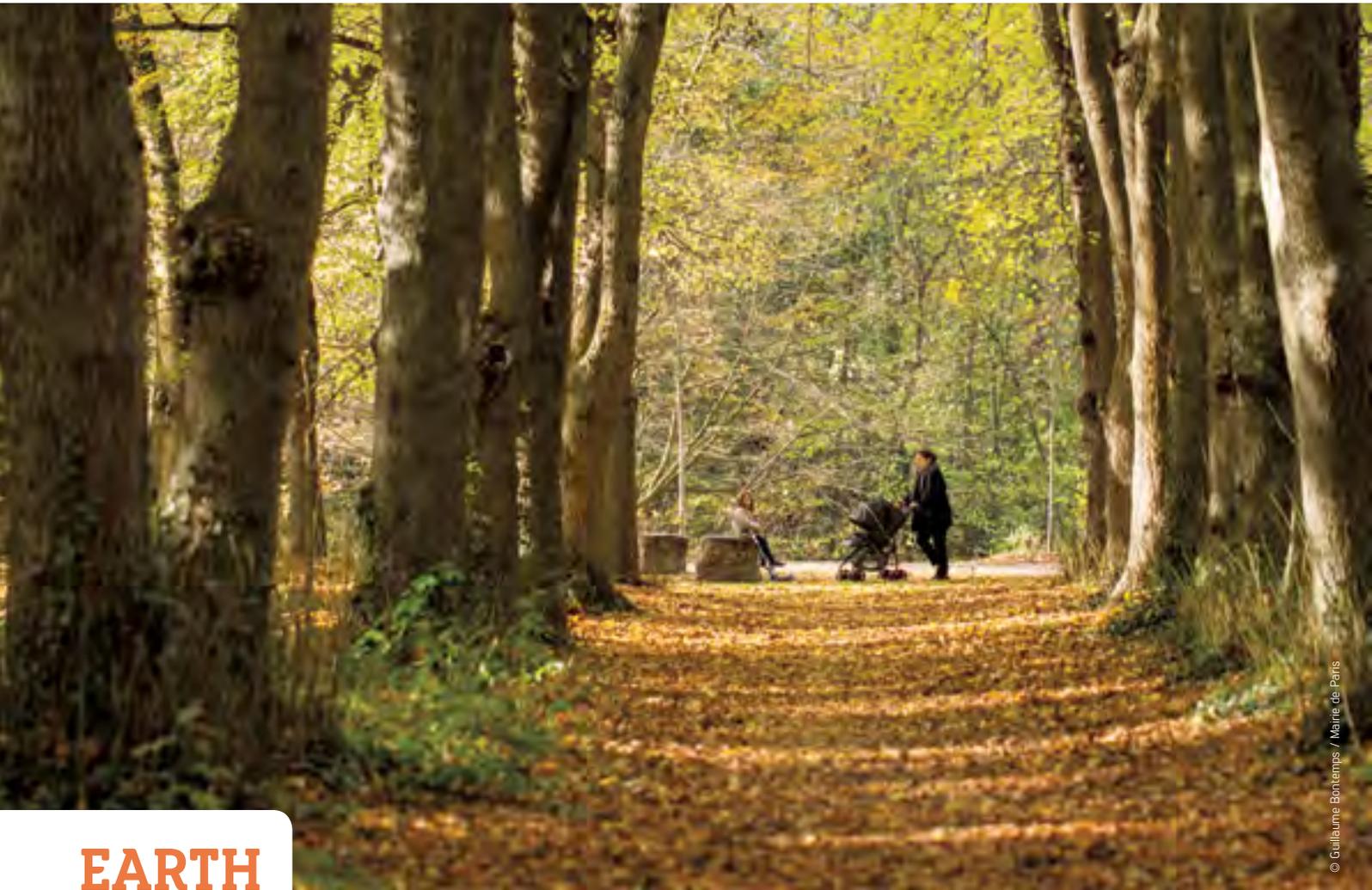
Climate resilience through solidarity

By 2020, the City will help create a “civic solidarity network” that trains residents to become a driving force for resilience at the micro-local level. The purpose of this network will be to improve the ability of public authorities to take action during both major crises and on a daily basis, and to build a culture of solidarity among citizens. This network will collaborate with the solidarity reserve unit of retired City of Paris agents, in partnership with reserve units from the RATP, the public hospital system (AP-HP), the Paris Police Headquarters, emergency management organisations, and so on.

By 2020, Paris will also work with community organisations to create more social areas at the neighbourhood level in the form of local mutual assistance networks and dedicated areas, socially responsible shops, and community premises. This will make it easier to match offers of and needs for assistance (food products, basic necessities, language courses, advice) on a daily basis. We will also create a platform that is connected to social and community practices, with an interactive map of geolocated initiatives through the contributions of decentralised municipal departments and local community representatives. ■



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EARTH

BIODIVERSITY TO BENEFIT ALL PARISIANS

The greening of Paris is vital to increase biodiversity, while also providing a number of co-benefits for the Paris ecosystem: cooler temperatures, shade, water absorption, slowing of floods and the trapping of dust, as well as beautifying the city and creating spaces for relaxation and even food production.

This is why, as part of the new Biodiversity Plan, the City has set a target for 40% of Paris to consist of permeable green space.

Adapting to the effects of climate disruption will require creating more green space in the city as well as areas with cooler temperatures. Indeed, a July 2017 study of Paris's urban heat islands showed that adding multiple layers of greenery (lawns, bushes, trees, green roofs) helped reduce local temperatures²⁸.

Furthermore, underground Paris represents a potential source of coolness, since it has a stable temperature all year round, and is generally cooler than the surface in the summer.

In order to become resilient and adapted by 2050, the City will continue to add more green spaces and trees around Paris. We will also reinvent Paris's surfaces and underground areas by improving the permeability of the ground and surfacing materials.

The City has set a target for 40% of Paris to consist of permeable green space.

28- Article published on 17/07/2017 in Le Monde: "À Paris, des îlots de fraîcheur" pour rendre la canicule plus supportable". <http://k6.re/1AabY>

// A CITY THAT TAKES ACTION TO ADD MORE GREENERY

For the past few years, the City of Paris has been pursuing an ambitious greening policy.

A number of ongoing measures will be completed by 2020: 30 hectares of green spaces newly open to the public; 20,000 new trees planted in Paris; green streets and an “edible” street; 10 kilometres of the *Petite Ceinture* (a former circular railway line) open to the public; 100 hectares of green roofs and walls, one-third of which will be devoted to urban agriculture.

In connection with the Adaptation Strategy, other measures will be deployed: the identification and creation of new cool islands and routes, night-time openings of certain large green spaces, planting of green areas for better water infiltration, and management of rainwater as recommended in the Paris Rain Plan.

To ensure that Paris’ greening efforts are sustainable, natural environments must not only be adapted to climate change and the urban environment, but must also welcome new and transient species. These strategic networks, or green and blue belts, are part of the Biodiversity Plan.

A patchwork of small urban forests in Paris by 2050.

Increasing green spaces in Paris

By 2030, in a context of increasing land scarcity, the City of Paris will create new gardens and green spaces. These are veritable breathing areas that will combine “zero-emission zones”, calm areas, biodiversity zones, alternative rainwater management zones, and cool islands.

We will also add more greenery to the city through a very dense network of vegetation (plants grown around trees, window boxes, flower beds, greening of streets and flights of steps in Paris streets, etc.). One key step is to continue the greening permit scheme that allows citizens to help green the city.

Trees and urban forests in Paris

By 2030, the aim is to increase the tree canopy by 2%, equivalent to more than 20,000 trees. The City will encourage tree planting by various stakeholders (residents, companies, organisations). One tactic is to inform Parisians of the city’s arboreal heritage and its ecological value using a geolocation tool.

Gradually, patches of trees could form a patchwork of small urban forests in Paris by 2050 – veritable refuges offering cooler temperatures on hot days. We will begin this effort by identifying the new areas for planting and growing trees. ■



THE NEW 2018-2024 BIODIVERSITY PLAN

Since the adoption of Paris’ first Biodiversity Plan in 2011, the international, national, and regional biodiversity context has changed considerably.

The adoption of the French Law for the Restoration of Biodiversity, Nature, and Landscapes; the implementation of the Île-de-France region’s Regional Ecological Coherence Scheme (*Schéma Régional de Cohérence Écologique - SRCE*); and the emergence of new biodiversity management and land-use planning practices have set a new framework.

In 2016, in order to address these new issues and generate new momentum, Paris decided to review the first Plan and identify opportunities to develop a new Paris Biodiversity Plan.

This new Biodiversity Plan, jointly co-developed with Parisians, includes a programme of 30 or so actions in three categories:

- Biodiversity in a committed city: Paris as an exemplary city,
- Biodiversity by and for all: everyone can contribute to biodiversity,
- Biodiversity everywhere: designing the city to be an asset for biodiversity.

// A CITY THAT REINVENTS ITS SURFACES AND UNDERGROUND AREAS TO ADAPT TO CLIMATE CHANGE

Soil sealing causes excessive runoff of water during heavy rains and intensifies the urban heat island effect. For the past few years, the City of Paris has worked on making the ground more permeable. This includes adding more vegetation, maintaining areas of open ground, developing water in the city, and using permeable paving materials for roads.

More permeable surfacing materials

Paris is mainly covered by asphalt and granite. Even though public spaces have become greener in the past three years, we must accelerate the transformation of Paris's paved surfaces to realise the vision of a resilient Paris by 2050. Paris must thereby completely re-evaluate its development of public spaces. The City can take advantage of any new roadworks to add more vegetation, make the roads more permeable, and install light-coloured materials that reduce the UHI effect. During these redevelopments of the road system, the use of permeable materials and the addition of vegetation will help restore the permeability of the ground in accordance with rainfall zoning.

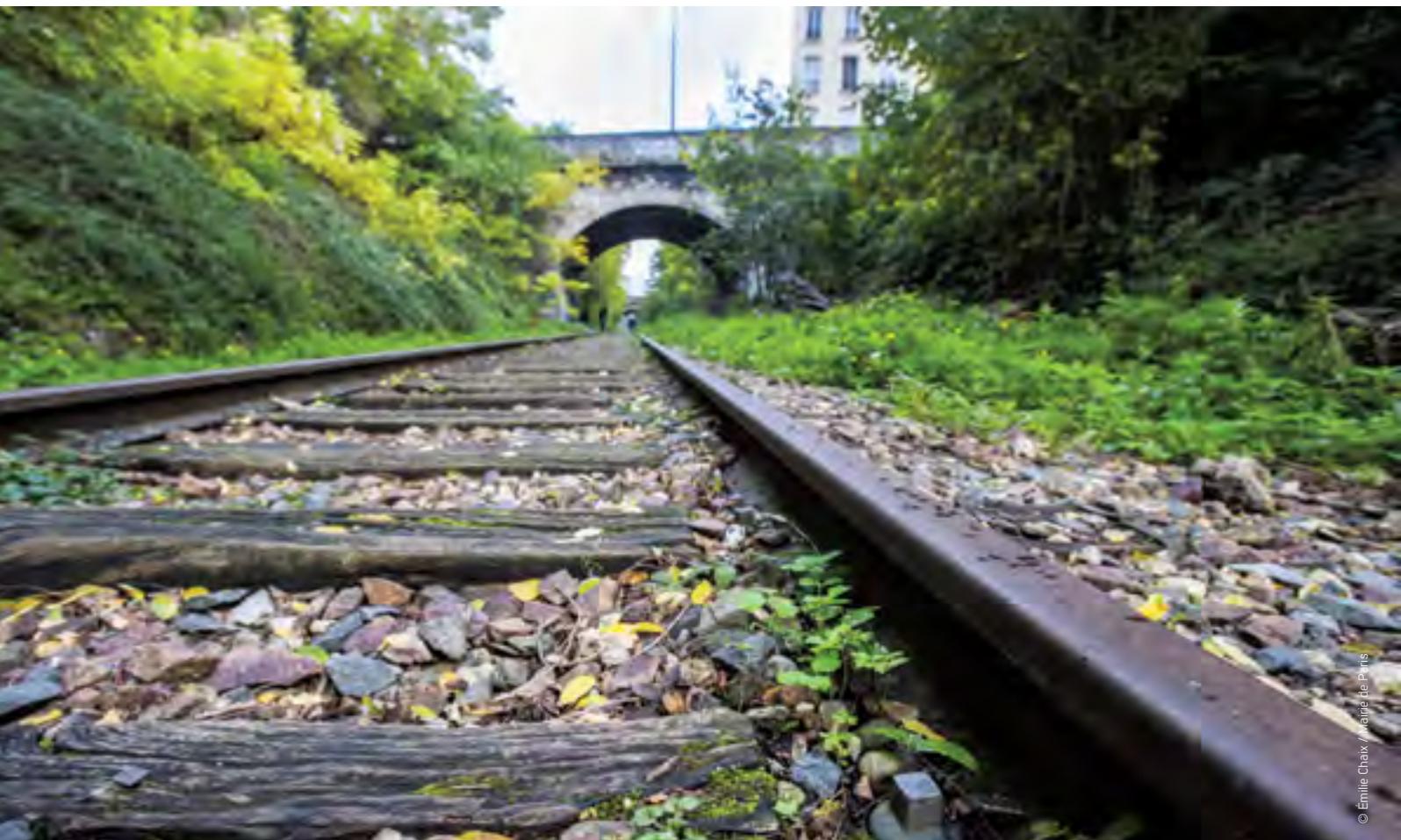
To go even further, the City of Paris will test new surfacing materials to reduce heat effects,

pollution, and noise. The goal is to create a green "lung" in the centre of Paris, a truly communal area with calmed traffic that prioritises other uses: streets to play in, convivial neighbourhoods, urban vegetable gardens and community gardens, and pedestrian pathways to schools and amenities. The "resilient road" concept could be used to attain this goal.

Cooler temperatures in underground Paris

We could make better use of underground Paris, particularly in the summer, since it boasts cool and generally stable temperatures throughout the year. The City of Paris will examine opportunities to exploit underground temperatures for cooling purposes in summer through the installation of ground-coupled heat exchangers by 2030²⁹. ■

Reduce heat effects, pollution, and noise. The goal is to create a green "lung" in the centre of Paris.



© Emilie Chaix / Mairie de Paris

29- Also called earth tubes, earth-cooling tools, earth warming tubes, or earth-air heat exchangers (EAHE or EAHX), a ground-coupled heat exchanger is an underground tube that connects a building to the outside air. Depending on the season, the outside air is either heated or cooled underground and in this way provides natural heating or cooling.



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WATER

A RESOURCE THAT NEEDS PROTECTION FOR DIVERSIFIED USE

Water is essential to life. It is a fundamental resource for human beings and ecosystems. Water is present all over the city in multiple forms: potable water, raw water³⁰, wastewater, grey water, mine water, and even decorative or ornamental water.

The City of Paris is unique in having several water networks: drinking water and non-drinking water as well as wastewater and rainwater in the Paris sewage treatment network. Though drinking water serves basic human needs, filtered non-drinking water from the *Canal de l'Ourcq* and the River Seine is used in public spaces (watering parks and gardens, cleaning roads, supplying lakes and rivers in the woods) and provides an important opportunity for cooling in response to global warming.

Water resources are vulnerable in both quality and quantity, particularly in light of the projected weather changes in Paris and the Seine basin. The city has already experienced periods of drought, but these will only worsen starting in the mid-21st century. This raises questions about the water supply and competing uses at the catchment level (drinking water, water for irrigation, cooling, industrial use, etc.). Consequently, we must prepare for these changes now by continuing and multiplying our efforts to preserve and diversify our water resources.

In addition to the increasing scarcity of water resources, climate change can also contribute to other extreme effects, such as flooding. Therefore, it is highly likely that very heavy rains, which currently occur infrequently, will become more common. This increases the risk of flooding, which we need to prepare for and prevent.

In order to be resilient and adapted to climate change by 2050, Paris must focus more strongly on the city's water in its urban development projects and in public areas to make it accessible to all.

30- Raw water is water that is collected from underground structures (metros, tunnels, parking lots, various buried structures) in order to prevent water ingress so as not to impair their operation in any way.

// A CITY THAT MAKES WATER VISIBLE AND ACCESSIBLE TO ALL

Water in the city is used for drinking, cooling, reducing the heat island effect, and strengthening biodiversity. In response to climate change, Paris intends to increase the role of water in city planning to improve the health and well-being of its residents.

More wetlands and blue belts in Paris

The City of Paris will create new ponds, urban swales, and rain gardens – veritable breathing spaces that combine conservation of biodiversity, alternative rainwater management zones, and areas of cooler temperatures. For rainwater management, a specific storage and treatment project is underway at the Bugeaud Combined Sewer Overflow in the Bois de Boulogne. In accordance with the Paris Biodiversity Plan, a network of wetlands and ponds will be created and restored throughout Paris, with identification and incentive programmes in each district. The objective is to restore 40 wetlands by 2020 and create 50 new ones by 2030 all over Paris.

The installation of phytoremediation basins could also help increase the number of water bodies in the city. These basins use vegetation to treat certain kinds of contaminated water that are then used for watering crops or even swimming. For example, Eau de Paris is conducting an experiment in the Charonne non-drinking water reservoir to analyse the quality of water obtained using the system. By 2019, wetlands will also be created in the Bois de Vincennes that use phytoremediation to make the water in the Lac Daumesnil safe for swimming. The lake should be open to the public by summer 2019.



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The right to water for all

The City of Paris believes everyone has the right to water, since water is a common good, but one that is potentially threatened by climate change. Paris will consequently continue to make drinking water more accessible in public spaces by adding 40 new drinking fountains from 2018, as part of the participatory budget. Additional fountains will be made accessible in winter to guarantee free access to drinking water all year, particularly for the homeless.

Given the increasing number of heat waves and the need for Parisians to cool off, the City of Paris is planning to convert some ornamental basins into temporary paddling pools (Promenade du Viaduc des Arts, 12th district) and potentially install water-efficient cooling systems near fire hydrants and drinking fountains.

New swimming areas in Paris

In order to provide Parisians with additional areas of cooler temperatures, the City of Paris will open new pools and new open-water swimming areas. In 2017, a swimming area opened in the Bassin de la Villette. Other natural swimming areas will be opened, such as in the River Seine in 2024, following the Paris Olympic and Paralympic Games. ■

Paris will open new pools and new open-water swimming areas.



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// A CITY COMMITTED TO SUSTAINABLE WATER MANAGEMENT

Water is an essential common good, which will be used more intensively as the climate changes, coinciding with increasingly scarce resources. In response to this challenge, Eau de Paris has developed a strategy to protect and monitor water resources. This action plan for 2020 relies on the expertise of Eau de Paris staff in the field of public research and is based above all on encouraging more sustainable agricultural practices through close partnerships with professionals and local authorities.

Protecting water resources

114 farmers have committed to reducing nitrogen and pesticide applications on 10,500 hectares of the 240,000 ha of water catchment areas identified by *Eau de Paris*'s in 2015, 3,500 ha of which will be cultivated using organic methods. Based on these findings, the 2020 targets are now to increase the number of hectares farmed using organic methods by 67%, and increase the percentage of sustainably farmed land by 67%, while also acquiring another 200 hectares of rural environmental leases, using agronomic, land-use planning, and economic development tools. *Eau de Paris* is also proposing to conduct a study on changes to the availability of water resources by 2030 in partnership with the City of Paris, local authorities in areas where *Eau de Paris* facilities are located, and the Seine Normandie Water Agency.

Diversifying water resources

In order to reduce long-term pressure on water resources, we need to develop solutions to substitute other types of water – raw water, mine water and rainwater – for certain uses. The Master Plan on non-drinking water uses and the non-drinking water network that was adopted by the Council of Paris in September 2015 views this network as an essential component of the sustainable city. The plan consists primarily of renovating and modernising the network, making changes to certain production sites, developing new uses, improving our understanding of water resources and creating a sustainable tool to cool the city, adapt to climate disruption, and develop projects that combine water and renewable energy. An evaluation of ways to mix the different kinds of water that supply the non-drinking water potable system should be conducted for implementation by 2030. Collecting rainwater to supply the non-drinking water system or for re-use on-site is also being considered as part of Paris's resilience strategy.

Securing the drinking water supply under all circumstances

The City is working with *Eau de Paris* to ensure that users have access to drinking water in the event of exceptional climate events. To this end, *Eau de Paris* is already helping to secure water exchanges and emergency supplies, particularly through emergency intercommunication agreements with other Île-de-France regional operators and emergency drinking water boreholes in the Albian aquifer, particularly at Clichy-Batignolles.

To go even further, *Eau de Paris* will evaluate the possibility of opening a 7th Albian aquifer borehole in Paris, combined with a matching geothermal borehole, in the Bercy-Charenton Designated Development Zone (ZAC) to heat and cool the buildings there. Furthermore, starting in 2018, the City of Paris will conduct a joint study with public water supply management authorities in the metropolitan area on guaranteeing

the security of the water supply in the Île-de-France interconnected region. The study will also examine how to preserve water resources in preparation for climate change and other changes affecting the area.

Preparing for crisis management

Crisis management exercises like Operation Sequana in 2016, which simulated the flooding of the River Seine, help improve preparations for crises and ensure that all stakeholders are involved in decision-making. As part of a continuous improvement approach, these exercises will be conducted at least every two years starting in 2020, with the involvement of all stakeholders concerned, including civil society. The goal is to raise awareness and help people adopt the appropriate responses to risks. To address ongoing climate changes, these exercises will be extended to other extreme events, such as severe drought.

As for floods caused by heavy rainfall, the Paris Rain Plan aims to reduce the risks of overflows due to saturation of the network during thunderstorms in certain vulnerable parts of the capital. In addition to the previously mentioned measures on increasing ground permeability and greening the city, the City of Paris is planning to build storm water management structures, such as impermeable floodwater retention areas, reservoirs with variable water levels, resilient parks that serve as flood plains, and rainwater storage tanks.

One illustration of this measure is the alternative rainwater management scheme in preparation for the future Paris Olympic and Paralympic Games. In order to maintain the required water quality level in the Seine, work will be conducted on 100 ha of land in Paris' 5th, 12th, and 13th districts to disconnect rainwater from the sewage system by 2024. This will prevent sewage from being released into the Seine when it rains, while increasing the permeability and plant cover of the ground in those areas. ■

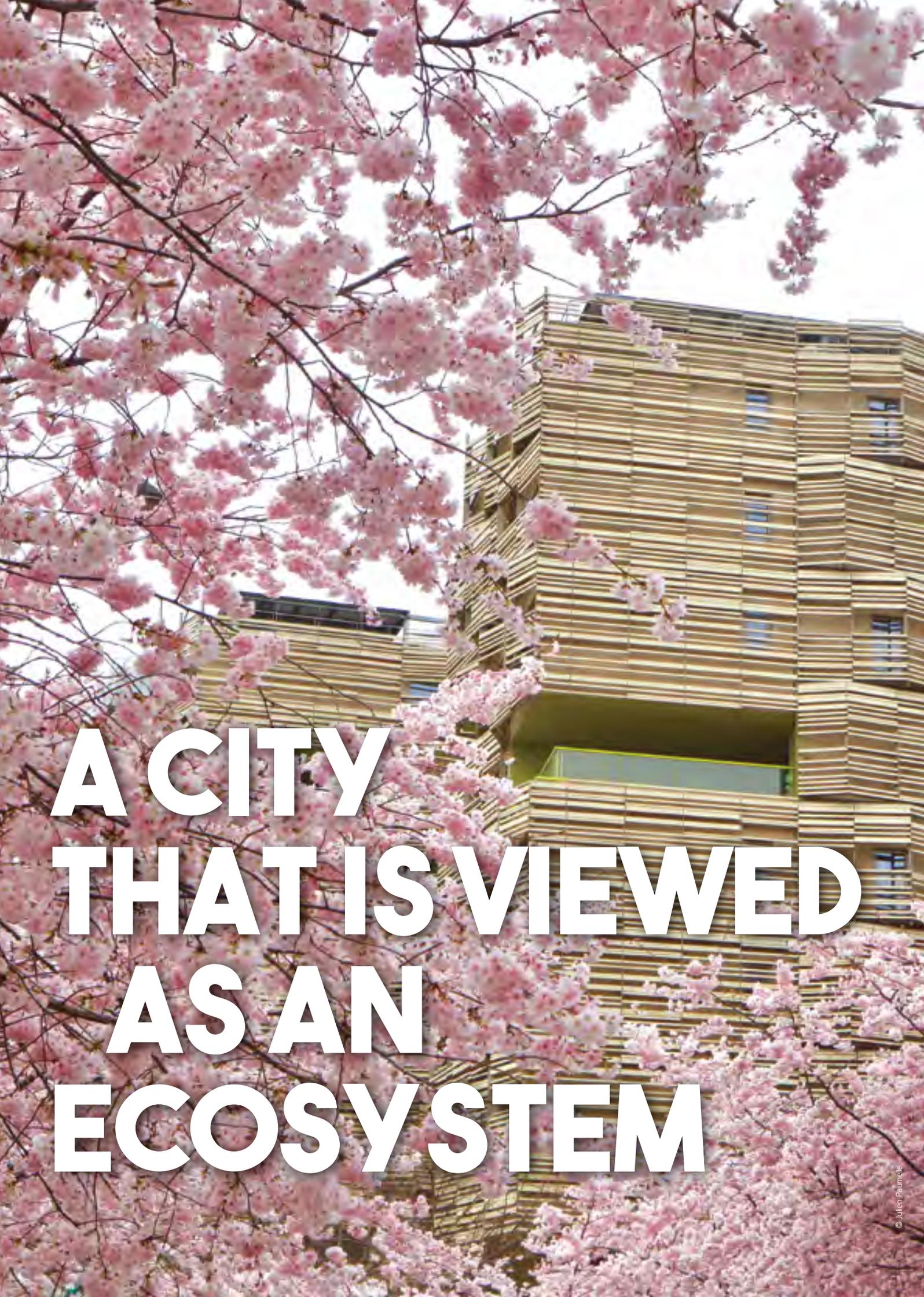


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The City is working with Eau de Paris to ensure that users have access to drinking water in the event of exceptional climate events.



**A CITY
THAT IS VIEWED
AS AN
ECOSYSTEM**

Because the climate is everyone’s concern, the City of Paris will continue to work with local social and economic players as well as partners on making the transition towards a low-carbon society.

Since three-quarters of emissions in Paris do not originate from the City administration itself, the City plans to mobilise all stakeholders (particularly citizens, companies, and institutional partners) to develop concrete action projects, adapt the regulatory context, and offset Paris’s residual emissions.

Through the new Climate Plan, the City of Paris aims to strengthen its connections with neighbouring cities and towns to build win-win partnerships while also forging international links in a context of cooperation and solidarity.

A SUCCESSFUL ENERGY TRANSITION IS A FAIR TRANSITION

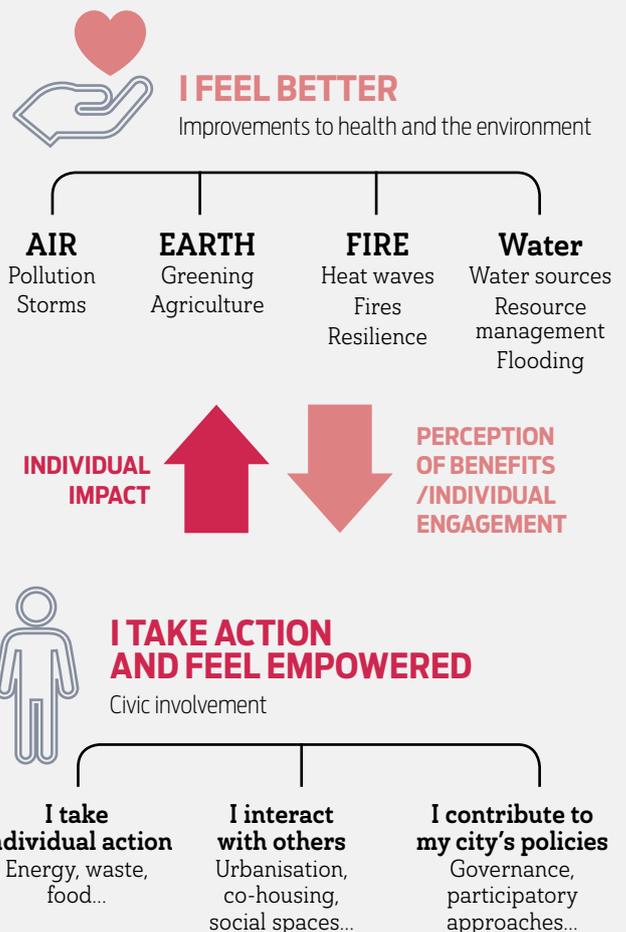
Though the City of Paris has committed to an ambitious climate mitigation policy, the City also wants to make sure our ecological transition is fair and inclusive. The push towards carbon neutrality, driven by the Paris Agreement at the international level and transformed into public policy at the local level, is bringing about profound changes, particularly in the energy, construction, and transport industries. These transformations will have many positive effects (sustainable resource management, green growth, innovation, jobs, living environment, etc.). However, we must be careful to ensure that the ecological transition does not only benefit the most privileged people.

Since the City of Paris views the Climate Plan as a means to tackle social insecurity, it also wants to make sure that socio-economic issues are prioritised as part of its climate efforts. To do so, it has conducted a study on the socio-economic impacts of the energy and climate transition in order to specifically identify the impacts of the Climate Plan, whether positive or negative³¹. A range of individual, economic, social, and political impacts were analysed for the main actions in the Climate Plan. Their effects on employment, well-being, equity, and balance across the city were also examined.

This study showed that many of the Paris Climate Plan measures will help to improve the well-being of citizens by improving the quality of their immediate environment, which will have an impact on physical and psychological health. These improvements should promote support for the Climate Plan and the willingness of citizens to contribute. In turn, increasing individual support for and involvement in an ambitious climate transition is critical to improving the environment and living conditions.

Through its actions, the Climate Plan also strengthens social links between citizens and helps reduce insecurity related to energy, food, housing, and transport. The goal of these measures is to reduce social divides and encourage Parisians to adopt more sustainable lifestyles. Updated skills will be needed to support the energy transition, which requires major changes in uses, building renovations, and the installation of facilities to produce and store renewable energy. ■

The Climate Action Plan as a lever to fight against social poverty



31- "Les impacts socio-économiques de la transition énergétique et climatique", Ernst & Young, 2017

// A CITY THAT RELIES ON THE ECOLOGICAL TRANSITION TO BOOST THE LOCAL ECONOMY

Since the different components of the Climate Plan cover all economic activities in the area, they will generate a variety of economic benefits.

Job creation, skills development, emergence of new professions

The energy transition will foster job creation as well as changes to and the emergence of new professions and skills. The sectors most affected by the ecological transition include the construction and public works sector, transport, waste, energy, green spaces, and agriculture. At the national level, it is estimated that the energy transition will generate 330,000 new jobs by 2030 and 825,000 jobs by 2050³².

For Paris, actions to promote renewable and recovered heat and electricity production will stimulate the market by creating significant demand for qualified labour and supporting the emergence of new professions. These include renewable energy operators, demand response operators, data analysts, eco-managers, energy facilitators, and local coordinators. The same is true for the construction industry, which is an important source of jobs. For example, 10,000 jobs were created as part of energy renovation work in Paris' social housing units.

In the waste management and food sectors, it is estimated that more virtuous practices require a larger workforce that cannot be relocated, in comparison to traditional methods. In this way, for 1,000 tonnes of waste recycled through composting or biogas production, 3.5 times more jobs are created in comparison to incineration³³.

A number of professions are involved in the major urban development projects that are compatible with carbon neutrality, such as road infrastructure development (greening of public spaces and roads to foster active forms of mobility): landscaping, design, production of street furniture, and project management during conversion and maintenance work. Furthermore, the push for carbon neutrality will create new professions related to ecological management, and new training courses to develop certain practices.

Attractiveness and economic gains

Paris's ecological transition will have a range of positive economic impacts, including economic gains for individuals and the private sector.

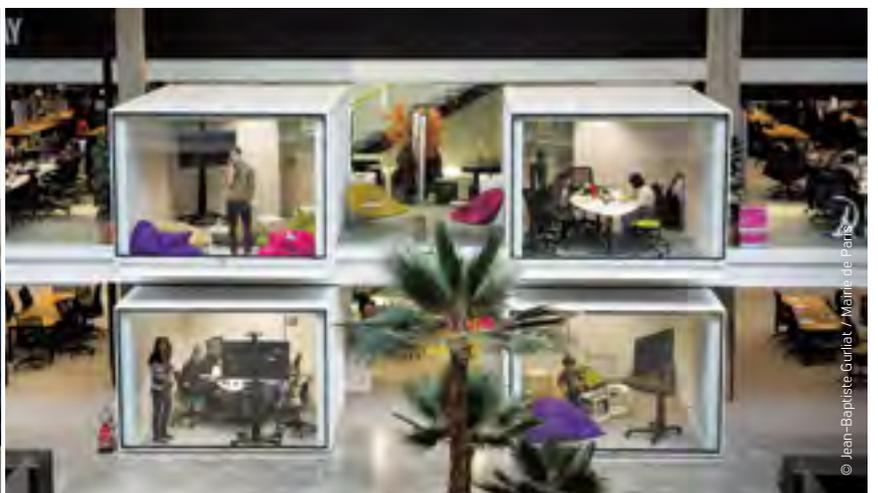
The transformation of structures and uses in the transport sector will make a positive contribution to the local economy. First of all, measures to add pedestrian areas to certain neighbourhoods and streets in Paris will have a local economic impact by promoting shopping in those areas.

Pedestrianisation could have significant positive effects on business, as illustrated by Madero Street in Mexico, where business increased by 30% following pedestrianisation³⁴. Furthermore, an increase in teleworking could lead to productivity gains (estimated at an average of +22%) by reducing absenteeism, improving concentration, and saving time by avoiding or shortening commuter journeys.

The push for carbon neutrality will create new professions

Through its strategy to attain carbon neutrality by 2050 – a clear and stable signal of its energy transition policy – the City of Paris will boost its economic attractiveness. This will appeal greatly to investors and manufacturers, and will help them develop their industrial strategies (end of reliance on diesel fuel, establishment of systems to recycle construction materials, etc.). Furthermore, the development of green finance tools to help leverage foreign investment, and Paris's goal to become the international green finance hub will further boost the shift to a local low-carbon economy.

On a larger scale, Paris' investments in the energy transition, combined with the expansion of renewable energy and energy efficiency, will reduce gas and oil imports (€39.7 billion in 2015, or 87% of France's trade deficit). This will bolster France's energy independence and security. ■



32- "Évaluation macroéconomique des visions énergétiques 2030-2050", ADEME, 2013
33- ADEME 2013 data
34- Source: Healthy Liveable Cities study on Mexico City, C40

// A CITY THAT TAKES ACTION TO BOOST THE HEALTH, WELL-BEING, AND RESPONSIBLE CONSUMPTION OF RESIDENTS

Beyond the structural changes to the economy and society, the transition towards a low-carbon society can only occur if citizens are at the centre of these changes. There are two main types of impacts on individuals: modifications to their environment that will improve their health and well-being, and changes in the habits and behaviours needed to carry out this transition.

Cleaner air for better health

Air pollution from PM2.5 particles, which is primarily caused by the use of internal combustion vehicles, has a significant impact in the Île-de-France region (7,000 more deaths per year in Île-de-France in relation to areas of similar size with the lowest concentrations). Air pollution has negative impacts on the respiratory and cardiovascular systems, as well as on reproduction, child development, and the endocrine system.

The use of more active mobility and cleaner transport modes to phase out diesel- and petrol-powered transport by 2030 will contribute to significantly reducing air pollution and its associated mortality. Complementary financial measures, such as the creation of the Air-Wood fund will have a direct impact on the metropolitan area by reducing atmospheric pollution while helping households change their lifestyles.

By promoting organic agriculture as part of its food strategy, the City will contribute, even indirectly, to improving the health of Parisians and those living near agricultural areas by reducing air pollution from the application of pesticides.

A living environment conducive to physical and psychological well-being

The energy transition will also lead to major changes to the living environment, an area in which residents have consistently requested improvements.

The increasing use of active and clean mobility modes will have positive impacts on Parisians' health. The aim is for 15% of all journeys to be made by bicycle by 2020, which will offer a number of universally recognised health benefits and reduce the stress related to motorised transport. A modal shift toward cycling will also reduce the number of traffic accidents, particularly for cyclists. Additionally, the use of clean vehicles, which are quieter than thermal combustion engines, will limit the negative impact of noise on health, including sleep disturbances and disorders. Teleworking will also have a positive impact on employee health by eliminating the need to commute while offering more sleep and higher job satisfaction³⁵.

Reintroducing nature into the city will calm the living environment and contribute to the psychological and physical well-being of residents. Increasing the number of green spaces and water sources will also limit the Urban Heat Island effect by creating cool islands. As such, the Climate Plan will address this major public health issue, particularly for vulnerable populations (children, seniors, isolated individuals) during heat waves.

Healthier and responsible lifestyles and consumption habits

The decarbonisation of the economy will also require shifts in consumption and dietary habits to focus on sustainability and responsibility (local and organic food, contribution to the circular economy, etc.).

The City of Paris's objectives for consumption of organic products (with 75% of Parisian households regularly buying organic products, and 100% doing so by 2020) will offer important health benefits. According to the French National Institute for Agronomic Research (*Institut National de la Recherche Agronomique – INRA*),

organic food contains fewer dangerous chemical products such as cadmium, pesticide residues, nitrates, and nitrites. The City will also inform Parisians of the health and environmental benefits of moving towards a more plant-based diet with lower meat consumption. The French Agency for Food, Environmental, and Occupational Health & Safety (*Agence Nationale Sécurité Sanitaire Alimentaire Environnement Travail – ANSES*) recommends that each inhabitant consume no more than 500 g of meat (other than poultry) per week, compared to the average consumption of 1.17 kg per person in France.

The City of Paris will also advocate the establishment of carbon footprint labels for consumer products that are sold on the market, based on the existing model of energy labels. These carbon footprint labels will allow consumers to make responsible choices by providing them with appropriate information before they make their purchasing decisions. This could provide companies with an incentive to reduce the carbon cost of their production and in this way bring a certain number of jobs back to France.

As for energy, the idea is to raise awareness about daily behaviours so that people reconsider behaviours that have become automatic. The creation of a public Energy Data Service will provide information about energy consumption, for the City as well as jointly owned properties (condominiums). Access to this data will help residents better understand their needs, identify possible savings, and take action to improve their management of energy consumption. This civic commitment to a more responsible use of energy could be strengthened by membership of energy cooperatives supported by the City: the success of collective projects will be visible to all (solar panels on roofs or railways lines, for example), and will also take on more importance in the life of Parisians. In this vein, increased participatory financing for projects with a climate-energy component will also encourage the use of individual savings to fund community projects in Paris or outside the city. These projects will foster strong civic engagement and cohesion. They will also help all Parisians take ownership of issues relating to the ecological transition. ■

The transition towards a low-carbon society can only occur if citizens are at the centre of these changes

35- *Le télétravail dans les grandes entreprises françaises Comment la distance transforme nos modes de travail*. French Ministry in charge of industry, energy and the digital economy, 2012.

// A CITY THAT CHAMPIONS EQUITY AND DIVERSITY

The energy transition presents an opportunity to strengthen connections between citizens and bring them closer to the city's stakeholders. To make sure that all residents benefit from the energy transition, the City will use the Climate Plan as a tool to combat social insecurity.

Towards a more close-knit and inclusive social fabric

Urban planning associated with the energy transition will re-appropriate certain spaces to make it easier for citizens to meet and share information. There is very strong potential to create social connections in shared spaces and areas where people come together, such as third-party teleworking premises and green spaces. Through greening, the installation of street furniture, and the promotion of local businesses, these areas will become veritable "avenues for social links", facilitating interactions between the city's residents and users.

The City's efforts to support ecological housing renovation and promote intergenerational cohabitation can foster more inclusive citizenship, so that neighbours reach out to the most vulnerable members of society during heat waves, for example.

Improving public transport (single travel pass, rapid transit lines, etc.) will improve access to services such as healthcare and education, particularly for the most vulnerable residents who most often use public transport. Shared mobility could help strengthen social links by increasing interactions between Parisians, particularly the most isolated, such as senior citizens. The creation of a single travel pass would facilitate intermodality across Île-de-France and ensure greater equity in access to transport for those in areas surrounding Paris.

A tool to combat social insecurity

Measures to support food markets and socially responsible catering, the collection of unsold food items and the study to launch a food donation platform from private individuals to the most vulnerable people, will help reduce the number of people in the Paris region suffering from food poverty (6.5%). On the other hand, increasing the proportion of organic products, which currently cost more than conventional products,

could undermine this objective and deepen the social divide in terms of access to high-quality food. The City is consequently already increasing its efforts to include the largest possible number of stakeholders in the food value chain. We are also exploring several options to make organic food more accessible to all. Similarly, encouraging people to reduce meat consumption, which represents 20% of food costs on average, could help reduce overall household expenditure. It is important to help residents change their way of thinking.

Lastly, within the Paris conurbation, 5.3% of residents say they have trouble keeping their homes at the right temperature, while 5.4% are late in paying their electricity bills during the year. Several Climate Plan measures aim to reduce this number. The renovation of one million housing units, and particularly social housing, will have a direct impact on these two contributors to fuel poverty: electricity bills and the feeling of being cold. The City will continue to ensure that renovations are accessible to all households, including those on the lowest incomes. ■

The renovation of one million housing units, and particularly social housing, will have a direct impact on these two contributors to fuel poverty: electricity bills and the feeling of being cold.



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MULTIPLE INDIVIDUAL TRAJECTORIES IN A CARBON-NEUTRAL PARIS

The magnitude of the energy and climate transition for 2050, which includes the widespread implementation of very ambitious targets such as the energy renovation of all existing buildings, a substantial reduction in number of individual car journeys, and sustainable food for all, may raise concerns about the City's desire to promote a standard lifestyle based on a certain "model", which may seem unattainable to some.

While this transition does indeed include all residents and visitors, several long-range planning exercises have shown that a wide variety of individual and collective trajectories are possible. For example, the "A New Era for Paris" study features a "carbon neutrality series" focusing on nine fictitious families³⁶. They have different values, aspirations, and life events, but all share and participate in Paris's energy transition.

This type of exercise, as well as its cultural and symbolic actions, will help create a common culture that is open to the diversity of lifestyles and personal trajectories, which all have their place in a carbon-neutral Paris.

// A CITY THAT SUPPORTS DEVELOPMENT IN OTHER AREAS IN BOTH FRANCE AND ABROAD

Carbon offsetting, a major issue for equity between regions

Part of Paris' carbon offsetting efforts will be to send financial flows outside the region to support energy transition or low-carbon development projects. The City intends to use funding for carbon offsetting to reduce greenhouse gas emissions in France and abroad, while adding value to benefit local populations. For example, the reforestation of an area could create new amenities for citizens. In this vein, the City of Paris will ensure that none of the projects it funds will upset the equilibrium in that area (for example, reforestation of agricultural land that would reduce revenues for residents). The City will also conduct consultations with affected areas and analyse the project's economic impact in order to prioritise certain types of projects.

Solidarity at the heart of Paris's climate diplomacy

Paris has committed to supporting low-carbon developments in neighbouring areas as well as abroad, as exemplified by our €1 million contribution to the UN Green Climate Fund. The Climate Plan's climate solidarity tools will be specifically earmarked in order to make them more effective and relevant both in environmental and diplomatic terms. This earmarking of Climate Fund investments in green financing is critical to effectively fund energy transition projects outside of Paris, and to help developing countries better prepare for climate change. ■

Paris has committed to supporting low-carbon developments in neighbouring areas as well as abroad.



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MOBILISATION PARIS MOBILISES ITS CITIZENS AND STAKEHOLDERS

Though the City's local government is directly responsible for 2% of greenhouse gas emissions in the area, from its facilities or activities, the remaining emissions come from the people who live, work, or pass through Paris. It is therefore essential to mobilise everyone. Initially this will take the form of clear and transparent communication campaign that is accessible to all, and disseminated by all stakeholders in the area.

The transition will necessarily require a profound cultural change in order to transform lifestyles and guide behaviour towards energy efficiency and the ecological transition. The City will actively contribute to making these long-term societal changes by preparing young people and future generations for these shifts and working with Parisians as closely as possible. In order to accelerate this transition, it is essential to put tools at everyone's disposal, individually and collectively, to promote low-carbon choices and actions on a daily basis.

The extensive consultation for this Climate Plan was proof of our real desire to conduct this transition together, by increasing the number of spaces for discussions and support for social-environmental movements.

All the stakeholders in the area, both citizens and companies, can contribute to the success of the Climate Plan: some will take action in public spaces, others through their economic activities, and still others by participating in shared governance on various Climate Plan monitoring committees. In order to mobilise

these stakeholders, the City of Paris is already building on strong partnerships, such as with the Paris Climate Agency, and tools such as the Paris Climate Action Charter and Sustainable Paris Stakeholders (*Acteurs du Paris Durable*). Through this new Climate Plan, the City aims to strengthen this partnership-based approach to accelerate Paris' energy transition.

// A CITY THAT INFORMS CITIZENS OF CLIMATE ISSUES

As part of the consultation for this new Climate Plan, 20 Parisians and Île-de-France residents were brought together for a citizen's conference. During a full weekend of information and two evening debates, attendees learned about individual and collective efforts to transform lifestyles and participate in climate change mitigation. These citizens remarked upon the lack of visibility and information about actions being taken across Paris, despite their large number. As part of the new Climate Plan, the City of Paris has thus decided to change how we communicate about climate issues and existing initiatives in order to help Parisians take ownership of them.

Targeted communication across Paris

The City will engage in comprehensive discussions to create targeted communications that speak to everyone. Each year, starting in 2018, the City will launch a large communications campaign in the Paris area aimed at all levels of understanding and all audiences. We will involve local partners in providing information about climate issues and encouraging individual and collective action on a daily basis.

Furthermore, signage associated with Climate Plan actions will be produced. Among other things, this will improve the visibility of projects that emerged from the participatory budget. The objective is for 20% of participatory budget projects to have a climate action component by 2020.

All the stakeholders in the area, both citizens and companies, can contribute to the success of the Climate Plan

To improve visibility, public guides to best practices will be produced by 2020, using existing tools from the Sustainable Paris Stakeholders, or those forthcoming from the Paris Climate Agency, to promote actions that contribute to the ecological transition. Convivial events focused on the ecological transition such as "Paris de l'Avenir" (Paris of the Future), or partner initiatives (the Climate March, Disco Soup, events in the Greater Paris Metropolitan Area, etc.) will provide opportunities to come together and take climate action.

Local information sources

To ensure the broadest possible dissemination of information, it will need to be decentralised and shared through various channels and with the help of different partners.

The Paris Climate Agency, already identified as the "one-stop shop" for information on energy renovation, will adapt its messages and diversify its tools by developing a "Climate Kit": a compilation of references, solutions, and local events to help people understand climate change. These tools will reach a much larger audience through clear explanations of climate data and public policies.

At the grassroots level, we will recruit volunteers who know how to explain and communicate about climate issues. The goal will be to create a team of 150 Climate Ambassadors in Paris to mobilise citizens to get involved in the City's carbon-neutral programme and increase its resilience. The Olympic and Paralympic games in 2024 will provide an excellent initial recruitment opportunity. These ambassadors could be recruited first and foremost from the holders of "citizen cards", Paris Sustainable Stakeholders,

the Paris Youth Council, the Council of Future Generations, etc. They could then later be mobilised for major climate or cultural projects. ■

+ LOCAL GOVERNMENT +

A NETWORK OF COORDINATORS AND IN-HOUSE TRAINING COURSES

The City of Paris' "Sustainable Development Network", which has 1,200 members, will provide additional intermediaries organised around a sustainable development coordinator in each municipal department to share best practices among personnel. Furthermore, a training course on the Climate Plan will be included in the introductory training for all new City employees. And in partnership with relevant organisations, a training programme on sectoral issues in the Climate Plan will be added to the catalogue and offered to operational departments.

// A CITY THAT HELPS CITIZENS MOVE TOWARDS LOW-CARBON LIFESTYLES

The City of Paris will not only provide Parisians with information. It will help them in all areas of their life, from school to home to transport, to help change their lifestyles and move towards a transformation and reduction of their consumption by 2050. These changes in behaviours can be initiated through positive incentives and by providing educational tools at each stage of life.

Raising awareness among the next generation

Paris has a very large network of schools and education providers. As part of the City's

competencies in the field of education and the various after-school activities it manages, it will develop and support Education for the Environment and Sustainability (EfES) and will increase its efforts to inform children about sustainable development from the youngest age and throughout their schooling. In particular, it will increase the number of educational partnerships with teachers so they can address topics such as food, transport, waste management, and others during school hours. For example, the City plans to involve these education providers spaces in the renewable energy deployment plan and energy saving programmes, and to encourage visits to industrial sites such as waste sorting facilities. We will provide participating schools with educational tools to monitor the renewable energy production and energy consumption of their buildings.

Furthermore, all projects and experiments conducted in Paris schools, both during and outside of school hours, will be assessed in order to identify good practices that have had a positive impact in order to replicate them. In 2018, the City will launch a promotional campaign to encourage schools to participate in the E3D labelling process. These labels are attributed to any school that is involved in a sustainable developed project.

Lastly, Paris will encourage the Regional Education Authority to adapt its teacher training programme for Paris teachers to include training modules that cover environmental and climate change education.

Positive incentives to alter behaviour

For the past few years, the City of Paris has supported or created educational tools to engage Parisians in climate change and guide their daily choices: *Paris Commerce Énergie* (a way for businesses to reduce their energy costs); *Clim'Way Paris*® (a serious game in which players take part in Paris's fight against climate change); the food carbon simulator to raise awareness about the greenhouse gas emissions of food; the solar register (interactive web app); *CoachCopro*®, developed by the APC; *Climat En'jeux* (a serious game to develop eco-friendly behaviours), etc.

Encouraging collective emulation with fun and informative tools is a great vehicle for change. The annual Positive Energy Families challenge, which brings together individuals who want to reduce their energy consumption during the heating period (November-March), is a good example that should be continued. In 2016, the households involved in this collective training programme achieved energy savings of 12%. Other types of challenges exist, such as CUBE2020, an energy efficiency competition for tertiary/service sector buildings organised by the French Institute for Building Efficiency (IFPEB). CUBE2020 aims to reduce the energy consumption of buildings through the notion of managing use (changing and adapting user behaviour). The City is planning on extending these challenges to businesses, companies, and even schools and universities to ensure the greatest number of people participate. By 2020, we will also launch challenges such as reducing food waste in restaurants.

Since the ultimate objective is to sustain good behaviours and low-carbon lifestyles, participation in such challenges should have a real and shared level of motivation. In order to also reach people who are less interested in environmental issues, financial or material incentives may be offered through virtuous partnerships between the City and economic and community actors.

+ LOCAL GOVERNMENT +

NUDGING APPROACHES

Since 2017, the City has been experimenting with "nudging" techniques to boost the involvement of City personnel and building users. By expanding the use of these "nudging" approaches, we can encourage personnel to change their behaviours in a fun and gentle way, rather than through imposition. In this vein, several City buildings registered for the national CUBE2020 competition in 2017. Following this initial participation, the City will consider registering more buildings in the future.

Places for Parisians to act together

There are a number of places in Paris that are focused on environmental issues and raising awareness on general interest topics, such as the *Maison des Canaux*, *les Maisons de la Vie Associative et Citoyenne*, the *Pavillon de l'Eau*, *Maison Paris Nature*, and *Maison des Acteurs du Paris Durable*. The last centre is an events venue in the heart of Paris that is committed to spreading solutions for the ecological transition that are spearheaded by community organisations, companies, and citizens. It organises workshops and talks led by experts for stakeholders and

Parisians, regardless of their level of knowledge. Based on this principle, the City of Paris will expand this approach by supporting the use of available spaces to ensure that each district has venues where people can come together to unwind, talk with others, or receive training on environmental and social issues. These venues for conversation and sharing will expand even further, based on the model of Repair Cafés, re-use shops, mutual assistance and service exchange platforms, or any kind of approach involving citizens. These spaces will allow people to find each other and work together to advance Paris' ecological transition.

To support the efforts of people working together, starting in 2018 the City of Paris will develop the "*Réseautage Papotage*" (Networking discussions) and will promote the emergence of "*Planète Quartier*" (Neighbourhood for the Planet), in collaboration with district municipalities and the network of Sustainable Paris Stakeholders. Through these avenues for discussion, actions led by Parisians and stakeholders will become better known, identified, shared, and reproduced.

Furthermore, citizens' cooperatives for energy production will be encouraged, along with mechanisms to financially involve people who live close to renewable energy sites. All of these collective efforts will help Paris' goal to become a carbon-neutral and 100% renewable energy city by 2050.

These spaces will allow people to find each other and work together to advance Paris' ecological transition.



A charter for eco-friendly events

Paris hosts a number of cultural, sporting, social, and economic events every year. In 2016, the City created an Eco-friendly Events Charter to limit their environmental impact by encouraging designers and organisers to adopt sustainable practices. This Charter applies to each step of the event, from design and installation through to disassembly, as well as communication. The City will examine the possibility of making this charter more binding, while developing tools to help event organisers. ■

The “Paris Climate Action” initiative will help Paris become carbon neutral by seeking a balance between economic and tourist attractiveness and reduced environmental impact.

// A CITY THAT INVOLVES PROFESSIONALS IN ITS CLIMATE ACTIONS

Since 2012, the City of Paris has mobilised economic and institutional representatives through the Paris Climate Action Charter to ground our ambitions in the city’s economic reality and promote actions taken in the private and institutional sectors.

To date, around 40 companies and institutions in Paris have recognised both the risk of climate change to their economic model, and the opportunities offered by the ecological transition³⁷. The signatories of this Charter are committed to setting their own specific binding objectives to limit their carbon footprints, developing more virtuous products and services, and encouraging more sustainable working methods and practices.

Now, bolstered by a community of active participants, the City of Paris intends to create a broad initiative to involve private and institutional stakeholders as a way to encourage both individual and collective action. As the basis of the win-win partnership between Paris and the area’s economic players, the “Paris Climate Action” initiative will help Paris become carbon neutral by seeking a balance between economic and tourist attractiveness and reduced environmental impact.

A Charter for major economic players taking climate action

To encourage individual action among professionals, the City of Paris will continue to develop the “Paris Climate Action Charter”, extending its commitments to 2030 with the aim of reaching carbon neutrality in 2050. The signatories will update their individual objectives periodically between 2020 and 2030. As Ambassadors of the new Paris Climate Plan, the Charter signatories will continue to take action on a daily basis. As key partners of the City, they will lead initiatives for a more sustainable Paris and facilitate negotiations between economic and institutional players around local determinants of climate change.

The City of Paris will help signatories incorporate low-carbon practices into their activities and make decisions regarding the company’s operations, investments, and development.



Thematic communities of private and institutional players

Beyond the voluntary and individual commitments of the signatories to the Paris Climate Action Charter, the City of Paris would like to bring together a broad range of economic and institutional players to facilitate collective action. Starting in 2018, the City will work with the Paris Climate Agency to co-facilitate thematic communities that bring together key players in Paris' major economic sectors. These communities are designed to engage participants and encourage them to examine their own practices, link them to the City of Paris' strategic choices in the new Climate Plan, and guarantee their involvement in the process by creating multi-stakeholder actions in each sector.

Each thematic community is designed as a space for participants in a given sector to discuss and develop partnership projects that will contribute to the Climate Plan roadmaps for economic operators.

When they join a thematic community, Parisian companies and institutions will receive help in preparing for an increasingly ambitious regulatory environment. They will also be able to identify agencies that can provide resources to ensure better cohesion among participants and coordination of initiatives.

There are currently six thematic communities (real estate, tourism and culture, commerce, sports and leisure, health, higher education and research). More will be added or developed according to the needs of participants and the maturity of certain subjects.

Supporting sustainable real estate

Office buildings represent nearly one-third of property assets in Paris, most of which will still be present in 2050. To achieve carbon neutrality, these buildings will need to change over the next few decades to become more adaptable. The Paris Climate Agency and the Sustainable Real Estate Observatory (*Observatoire de l'immobilier Durable - OID*) coordinate the real estate community, bringing together builders, promoters, and property managers to accelerate the energy renovation of the building stock and the development of renewable energy. It will also contribute to the future Public Data Service.

Promoting sustainable tourism

Paris's rich heritage contributes to the capital's fame and has made it the world's top tourist destination. The City intends to preserve this historical heritage, while adapting to the major climate changes ahead. In partnership with the Paris Convention and Visitors Bureau, the City will help professionals in this sector develop and promote responsible cultural and tourism offers that are compatible with the Tourism Development Scheme and the Charter for Sustainable Accommodation in Paris.

Involving shopkeepers and small businesses in energy efficiency

Commerce plays a key role in Paris' economic fabric and the development of a low-carbon economy by offering more sustainable products. Shopkeepers can serve as intermediaries to promote more sustainable behaviours among their customers. With the support of the Paris Climate Agency, the City will help shopkeepers reduce their water and energy consumption using the *Paris Commerce Énergie* website.

Uniting sports stakeholders to take action on climate and air quality

The "Sports and Leisure" community aims to ensure that high-quality sporting events and athletic activities are accessible to all. In preparation for the 2024 Paris Olympic Games, this community will encourage all stakeholders in sport to adopt sustainable development as one of the values promoted by sporting organisations. Specific efforts will also be made to bring a circular economy approach to sporting events and athletic activities.

Developing low-carbon healthcare

The City of Paris has made the fight against unequal access to healthcare a major priority, thanks to the presence of major hospitals and a wide range of specialised health services. This community, supported by the Committee for Sustainable Health (C2DS), will help healthcare professionals ensure that all patients have access to affordable and high-quality healthcare, while reducing the environmental impact of healthcare facilities and activities.

Encouraging higher education and research to work towards the energy transition

Paris is a university city that is internationally renowned for its prestigious universities and specialised schools. Beyond the prestige, Paris is committed to providing a supportive learning environment that fosters creativity and research. The City of Paris will draw on this community to provide the resources required to produce the educational programmes and facilities that will help future generations tackle the challenge of climate change.

Developing low-carbon digital technology

Digital technology is ubiquitous in our professional and personal lives. Although it has helped reduce paper consumption, it consumes a great deal of energy. In 2016, the electricity consumption of the 130 main French data centres already represented 9% of national consumption. The sector is aware of this problem, and is working to reduce consumption as well as cooling needs and waste heat emissions. By 2020, the City of Paris will encourage this community to improve energy efficiency and use more renewable energy, while working with all professionals and users to manage needs and disseminate best practices (archiving, standby mode, turning off screens, etc.).

The Green Embassy Network in Paris

In 2017, the Ministry of Foreign Affairs, in collaboration with ADEME and the City of Paris, launched the Green Embassy Network in Paris. Around 60 foreign embassies participated in the launch. In keeping with the Paris Agreement, this network's objective is to promote cooperation, the sharing of good practices, and the implementation of concrete projects in foreign embassies in Paris that are striving to reduce their ecological footprint. Through the Paris Climate Action programme, the City of Paris will assist this network as a means to support the development of energy efficiency and renewable energy in Paris, and above all as a catalyst for international climate cooperation. ■



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GOVERNANCE OF THE LOW-CARBON TRANSITION

For this new Paris Climate Action Plan, the City wants to change the governance model to facilitate the more regular involvement of stakeholders in monitoring Paris' actions and discussions on carbon neutrality.

In the past, the City consulted residents prior to drafting the official guidance document, but not during the implementation phase, which was limited to professional stakeholders. An innovative form of governance will be redesigned by and for Parisians, in association with

Paris' national and international partners, since the fight against climate change is a global challenge that requires a collective response that extends beyond Paris' borders.

An innovative form of governance will be redesigned by and for Parisians, in association with Paris' national and international partners.

// A CITY THAT INVOLVES ITS LOCAL STAKEHOLDERS IN GOVERNANCE

Extended Climate Plan Monitoring Committees

Currently, steering committees and strategic committees regularly bring together municipal departments, elected officials, and the Paris Climate Agency at key stages of the implementation of Climate Plan actions. While this structure will be maintained, in 2018 the monitoring committees will be extended to include representatives of other stakeholders such as the Greater Paris Metropolitan Area, NGOs, private and scientific organisations, entrepreneurs, and the City of Paris's institutional partners. These committees will monitor the progress of the entire Paris Climate Energy Plan on an annual basis. Participants will be informed of actions that are taken, and will be able to provide recommendations and advice as part of a continuous improvement approach. The general objective of these expanded committees will be to strengthen the momentum of and spread the world about the Climate Plan's achievements, and to ensure that Paris's ambition remains high.

+ LOCAL GOVERNMENT +

PROVIDING THEMATIC ROADMAPS

The Climate Plan sets Paris's policy for attaining carbon neutrality, and aims to build a low-carbon society at all levels (travel, housing, food, waste, energy, adaptation, etc.). In operational terms, these priorities will take the form of thematic roadmaps for all City of Paris departments in order to disseminate the objective of carbon neutrality to all municipal activities.



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Civic participation in governance

For the past few years, the City of Paris has been actively rethinking its governance to increase civic involvement in municipal choices. Digital technologies have helped strengthen civic participation through collaborative platforms. Building on this experience, the City of Paris plans to use the Participatory Budget system to involve citizens in the Climate Plan's governance and allow Parisians to help make strategic choices to attain carbon neutrality. The objective is for 20% of participatory budget projects to have a climate action component by 2020.

Furthermore, the process of developing the Climate Plan has fostered discussions with Parisians about carbon neutrality, sparking their imagination and creativity to jointly develop the vision of a desirable future. The interesting and varied proposals that were shared during the consultation phase on the idea submission platform, "Madame la Maire, j'ai une idée" (Madam Mayor, I have an idea), have enriched the debate and given a clear idea of Parisians' expectations for this new Plan. The City of Paris will continue this exercise by conducting campaigns to solicit ideas on specific topics as a means to support digital citizen governance tools that guarantee the essential involvement of Parisians in achieving Climate Plan objectives.

To jointly develop the vision of a desirable future

At the same time, we will create a Digital Citizen's Council by 2020. This Council will be broader than the monitoring committees mentioned above, and will offer members the ability to monitor the Plan's actions, make suggestions, and pass on information to other government bodies. This original form of governance, which will be facilitated by the City, could bring together around 50 people from civil society, the Paris Youth Council, the Council of Future Generations, neighbourhood councils, and Paris-based environmental organisations, along with

municipal employees and public and private stakeholders. It will act as a space to share information and create links between all those working to mobilise and inform the general public and stakeholders. It will be associated with and take part in the City's climate-related consultation and cooperation measures.

Involving researchers and scientists

Given the many universities and research organisations in the city, Paris will work with the scientific community to develop long-term actions and anticipate their execution. These scientists are already thinking about the Paris of the future, and will make useful contributions to the municipality's decision-making process. In order to organise and facilitate discussions between researchers and the City, we may create a scientific committee by 2020 to suggest research topics that are in line with the Climate Plan's objectives. The committee would also report on climate-related scientific studies for application by 2030 and 2050 in the Paris area. This scientific committee will have a longer-term vision of actions to be taken, as well as their relevance and methods. Its contribution would therefore differ from that of the "experts" on the extended monitoring committees. ■

+ LOCAL GOVERNMENT +

TOWARDS IN-HOUSE ENGINEERING FOCUSED ON THE CLIMATE PLAN

Starting in 2020, a substantial component of internal training budgets will be devoted to inter-professional exchanges, the acquisition of new skills, and the emergence of new professions for the City of Paris' engineers, architects, and technicians.

To strengthen the momentum of and spread the world about the Climate Plan's achievements, and to ensure that Paris's ambition remains high.

// A CITY THAT SHOWCASES AND SHARES ITS PROGRESS

Annual monitoring report

Ever since the first Climate Plan in 2007, the City has published its "Annual Climate and Energy Report", which monitors the City's climate change mitigation and adaptation efforts. The City will continue to produce this evaluation document, which contains a number of financial and operational indicators, in order to share and spread the word about the advancement of major projects. It will serve as the reference document for the various governance bodies involved in the Climate Plan.

Continuous display of Climate Plan data

The City of Paris' Open Data department will work with the Paris Climate Agency to create a dashboard for the low-carbon transition as an innovative way to actively involve the newly created Digital Civic Council. It will provide a dynamic display of Climate Plan data and updates to indicators and reference values for the City's main public policies regarding Climate Plan

objectives (transport, housing, food, biodiversity, waste, etc.). It will provide all Parisians with access to general and geographically specific Climate Plan data. A transition tracker will provide a simple and instructive way to present progress being made. By 2024, data displays will allow anyone to see what the Climate Plan has accomplished, learn more about each item, be inspired by good practices, and hear stories from Climate Ambassadors.

Cooperation at the metropolitan level

The Greater Paris Metropolitan Area and the City of Paris face the same challenges: conducting energy renovations on private buildings, improving air quality, providing more public transport in the inner and outer suburbs, clean deliveries, etc.

Many of the new Paris Climate Plan actions were designed at the Metropolitan level: the Air-Wood Fund to improve wood heating, metropolitan Low Emission Zones, the Vélib' bicycle sharing service throughout the metropolitan area, etc.

The Grand Paris Metropolitan Authority will also tackle climate resilience and the ecological transition through its Metropolitan Climate

Air Energy Plan. This strategic document will dovetail with municipal climate plans to ensure effective implementation. As part of discussions with the Metropolitan Area and its towns and cities, the City of Paris will ensure that our own Climate Plan is compliant and consistent with the Metropolitan Plan and those of surrounding areas. The City will share lessons learned, participate in cooperation projects, and develop partnership-based financing tools to create the best possible conditions for achieving carbon neutrality across the entire metropolitan area. ■

To create the best possible conditions for achieving carbon neutrality across the entire metropolitan area.

// A CITY THAT WORKS WITH THE PARIS CLIMATE AGENCY TO ACCELERATE THE ENERGY TRANSITION

Since it was created in 2011, the Paris Climate Agency (APC) has been an important partner to the City of Paris in providing assistance and training on climate change issues. The Agency aims to strengthen and expand its missions, expertise, commitment to partnership, and its valuable work in the field with the support and involvement of the City of Paris.

An agile stakeholder, a trusted third party, and a provider of support for change

The APC is the leading climate and energy platform. Through its services, coordination, and website, it gives Parisians and economic operators the information and tools they need to take concrete action. In 2018, the APC will strengthen its role as a neutral, free, and independent advisor to residents, and bolster its comprehensive energy renovation services in jointly owned properties throughout the metropolitan area. By 2020, it will oversee the creation of a public Energy Data Service. At the same time, the Agency will develop new expertise in sustainable mobility,

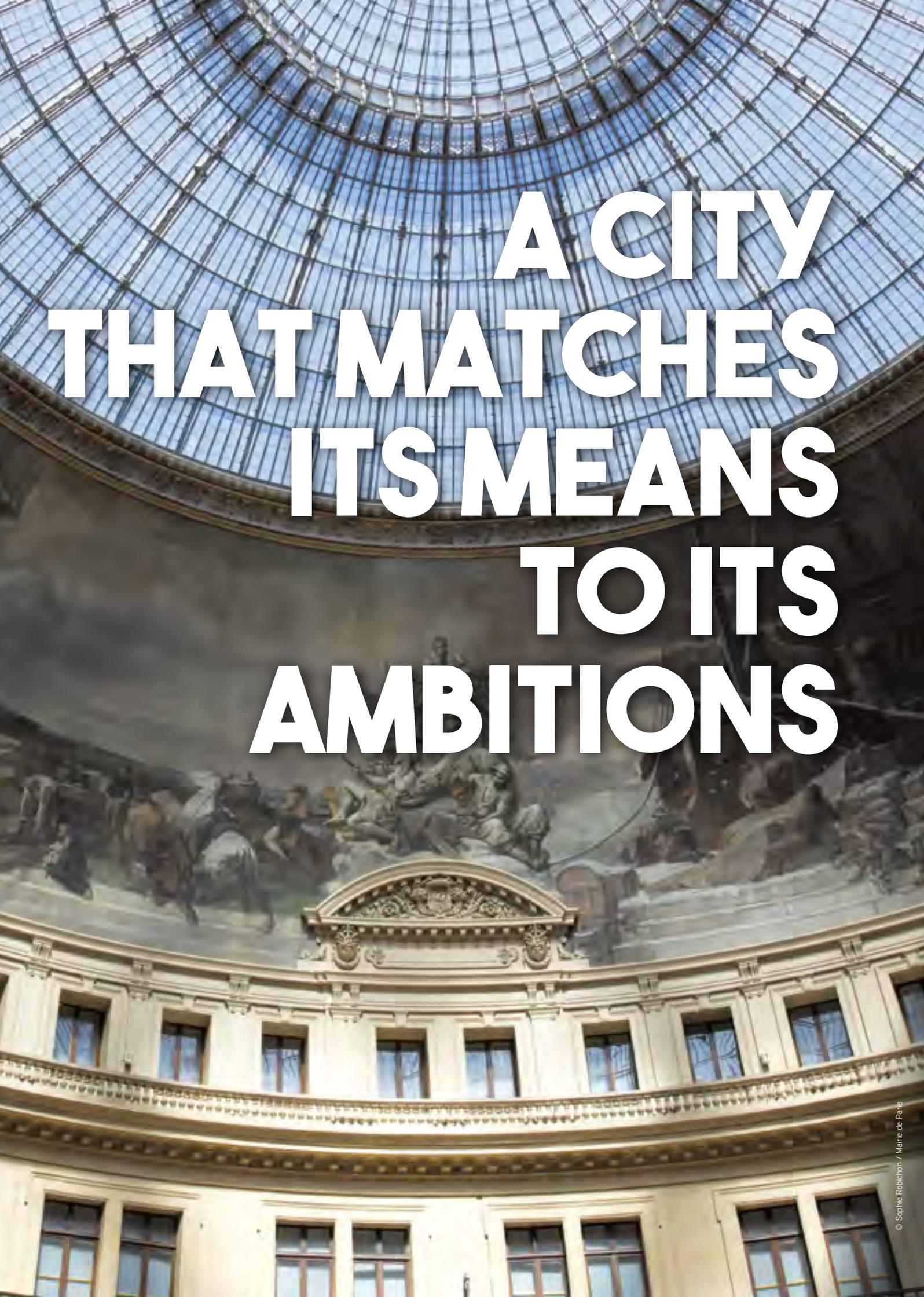
the circular economy, and resilience. It will continue to lead innovative partnership-based projects bringing together public and private stakeholders by organising workshops on the transition. In 2018, the APC will work with the City of Paris to coordinate operational groups that bring together economic operators with similar concerns so they can work together to overcome the technical obstacles to the energy transition in Paris. A second priority will be to support the emergence of new jobs related to the ecological transition, such as eco-managers and energy facilitators.

An increased presence, both physically and virtually

The *Pavillon du Lac* – the Paris Climate Agency's (APC) headquarters – could become a demonstrator for innovative low-carbon solutions in the coming years thanks to the sponsorship of innovative companies. The APC will be present in all the main areas that address topics related to the Climate Plan: innovation, the circular economy, air quality, etc. The Agency will seize opportunities for virtual interactions, and will help facilitate various digital communities on social media. To do so, the APC will more closely target its messages and audiences by partnering

with teams of researchers who specialise in behavioural sciences relating to the transition. It will also use new online training tools such as MOOCs (Massive Open Online Courses) and webinars to disseminate information. ■



A large, ornate glass dome with a central sculpture and a lower level with windows. The dome is made of a grid of metal and glass, with a central sculpture of a figure on horseback. Below the dome is a circular gallery with a decorative frieze and a row of windows. The lower level also has a row of windows.

**A CITY
THAT MATCHES
ITS MEANS
TO ITS
AMBITIONS**



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FINANCE

A CITY THAT IS PREPARING FINANCE FOR THE ENERGY TRANSITION

As local authorities face increasing budget constraints, moving towards carbon neutrality can seem like an overwhelming challenge. However, the key is shifting existing capital towards the investments needed for the municipality's energy and ecological transition.

This provides cities with an economic opportunity that the financial sector has understood ever since COP21, based on the development of new financial products, the diversification of financing solutions, the emergence of new public-private partnerships, and the use of socially responsible investment³⁸. Carbon neutrality requires the extension of green financing to support economic growth at the local, national, and even international level.

Paris' strategy to finance the Climate Plan is based on the development of new financial tools, the search for partners to co-finance innovative projects, and the shifting of investments to support the energy transition.

It requires a simultaneous and convergent mobilisation of local financial players to decarbonise the portfolios of the capital's main investors. And Parisians must also shift their savings towards more responsible financial products to directly support the Climate Plan's specific projects. The Climate Plan's financing strategy will in this way contribute to the growth of a local, low-carbon economy.

The financing strategy is founded on the creation of tools to mobilise financing, the diversification of sources, and the engagement of Parisians through the use of participatory financing tools.

The Climate Plan's financing strategy will in this way contribute to the growth of a local, low-carbon economy.

// A CITY THAT CREATES INNOVATIVE TOOLS TO FINANCE PARIS'S ENERGY AND ECOLOGICAL TRANSITION

A wide range of innovative financing tools is needed to attain the goal of becoming a carbon-neutral city by 2050. These tools must distinguish between the type of user (citizen, company, etc.) as well as the size of the project (small project or major long-term project).

The latter will involve a number of different participants and require larger amounts (tens or even hundreds of millions of euros). In order to meet this need, several financial tools will be examined as part of the Paris Climate Plan. The Climate Plan's different themes already address the financing question and offer specific operational tools. The following proposals will complement and strengthen the Climate Plan's financing strategy.

A Municipal Investment Programme that incorporates the carbon-neutral trajectory

The Climate Plan's acceleration measures for 2020 have been included in the current municipal programme and will boost Paris' transition towards carbon neutrality. In future government mandates, the Municipal Investment Programme (PIM) will include the carbon-neutral trajectory to anticipate the investments that will be needed to attain the Climate Plan's objectives.

While maintaining a high rate of self-financing, the City will seek out innovative financing and look for partners to co-finance projects that meet its environmental requirements. This funding will come from a variety of sources, calling on institutional aid (Europe, State, Region) as well as private investment capital. In particular, the City's Resilience Strategy will involve the insurance industry, which has an economic interest in investing in this topic.

The City of Paris will ensure that the specifications for selecting partners and co-funders for various loans, funds, and green sponsorship will reject candidates that have been convicted of tax fraud. These

specifications will also exclude funds from industries that produce the most greenhouse gas emissions and are based on the extraction of fossil fuels. Additionally, the objectives of the transition fund and the co-funding partnerships must be defined and incorporate the creation of local and sustainable jobs, financing for research, and training on environmental issues.

The costs of non-adaptation to climate change in Paris

Paris' Resilience Strategy recommends examining costs and benefits related to climate change and mitigation activities. Prior to 2020, the City of Paris will adopt a systematic approach to evaluating new development projects by analysing the cost of non-adaptation and the investment costs required for mitigation, as well as the co-funding mechanisms that are required.

The City of Paris' use of green loans

Through the Municipal Investment Programme, the City has allocated nearly €10 billion for the 2014-2020 period to make Paris a sustainable, inclusive, responsible, and innovative city. To put this commitment into practice, the City of Paris uses green financing mechanisms. In 2015, the City issued its first green bond of €300 million, which complied with the four core components of the "Green Bond Principles". The City has launched a "Sustainability Bond" on the 9th November 2017 of €320 million, and plans to launch a "Resilience Bond" starting in 2020. Given the success of this initial experiment, the City of Paris now plans to maximise the use of green loans to encourage financial market players to offer innovative banking tools and to foster investment that supports the energy and ecological transition.

The massive renovation of public buildings

In order to speed up the renovation of Paris' building stock, the City will continue to use the Energy Efficiency Certificates (CEE) programme to provide additional financial leverage for our energy management projects. This scheme, provided for under the Grenelle Law, makes it possible to identify additional sources of funding depending on the energy savings work completed. The City has already made use of this scheme to renovate public facilities and public lighting.

Territorial investment funds for the ecological transition

In the summer of 2017, in order to meet its carbon neutrality objective and accelerate the ecological transition, the City of Paris launched a municipal investment fund for the ecological transition, under the competences obtained through the law on Paris' status. Paris' Green Venture Capital Fund was launched with the February 2018's Paris Council. As a unique legal and financial tool, this Investment Fund for the Ecological Transition will mobilise private financing to support innovative solutions, notably in the Paris area, in the fields of climate protection, air quality, energy and improved energy efficiency, waste recovery, and the development of renewable energy and sustainable transport modes.

Developing green sponsorship

To accelerate financing for public investments in the ecological transition, Paris plans to create a mechanism to accommodate green sponsorship by 2020. This tool will be used to mobilise sponsors wishing to contribute to the investments required to attain our Climate Plan objectives more quickly.

Towards a broad-based eco-loan scheme

The Paris area is divided fairly evenly between residential and tertiary/service buildings. A successful energy transition in Paris necessarily requires renovating all these buildings, regardless of their function. By 2020, the City of Paris will therefore evaluate whether to ask the banking sector to create a broad-based loan to support the environmental transition that would be accessible to all stakeholders: citizens, companies, and shopkeepers. By 2030, the City of Paris plans to label sustainable development loans and work with the Paris Climate Agency to help project initiators prepare their loan application and guarantee the work is completed. ■

Nearly €10 billion for the 2014-2020 period to make Paris a sustainable, inclusive, responsible, and innovative city.

// A CITY THAT DEVELOPS PARTICIPATORY FINANCING MODES FOR CLIMATE ACTION

Civic involvement is critical to achieving carbon neutrality, and Parisians are its main guarantors. In order to foster civic initiatives relating to the energy and ecological transition, the City of Paris intends to support the development of participatory financing.

Participatory financing to make Parisians partners in the Climate Plan

Starting in 2020, the City of Paris intends to make Parisians true partners in the Climate Plan. We will promote participatory financing solutions to encourage and increase private actions from citizens, entrepreneurs, and non-profit organisations that contribute to the Climate Plan objectives via:

- Crowdfunding (citizens' donations);
- Crowdlending (participatory financing in the form of a loan) as a third-party financing tool for the Climate Plan's low-carbon projects;
- A crowdequity solution (capital investment in the project).

In order to develop this type of financing, the City of Paris will use dedicated platforms and innovative communications for the initiatives.

The Participatory Budget to finance the Climate Plan

Through the Participatory Budget, Parisians can suggest investment projects for their own district and/or for all of Paris. Currently, 5% of the City's investment budget, or close to half a billion euros until 2020, is set aside for these projects. In 2017, the Participatory Budget was more than €100 million. In order to support citizen-driven climate initiatives, the City has set a target for 20% of Participatory Budget projects to have a climate action component by 2020.

Supporting civic cooperatives for the ecological transition

Citizens are taking collective action to develop structures and even build a more sustainable social model by capitalising on individual strengths. We will prioritise assistance to community organisations that support civic investments (i.e.: *Terres de Liens*, *Énergie Partagée*, etc.) through the Sustainable Food Plan, for example, and by supporting civic initiatives on local energy production and self-consumption. ■

Starting in 2020, the City of Paris intends to make Parisians true partners in the Climate Plan.



// A CITY THAT PROMOTES GREEN FINANCE

Paris, the green finance hub

By supporting the development of more responsible financial products and launching a low-carbon financing strategy, the City aims to turn Paris into the international green finance marketplace. Paris is already an important financial centre for socially responsible investing, and is thus ideally positioned to become the capital of green finance. We now need to accelerate this shift and help green finance players become mobilised and coordinated. The City is therefore supporting the "Finance for Tomorrow" initiative, which brings together 36 members of the Paris financial market (*Banque de France, EDF, SNCF Réseau, BNP Paribas, Amundi, etc.*). Starting in 2018, we will help capitalise on the city's finance expertise, strengthen public-private synergies, and boost Paris's international reputation as a green financial centre. The City of Paris will continue to act as a catalyst for financial markets by stimulating sustainable and socially responsible investment.

Shadow pricing of carbon in Paris

By internalising the economic cost of its greenhouse gas emissions, the City of Paris is demonstrating its commitment to decarbonising its investments and is also boosting the resilience of its response to climate change by better anticipating and managing natural, legal, and financial risks. This approach also sends residents, partners, and investors a strong message about the city's commitment to carbon neutrality. By joining forces with the Carbon Pricing Leadership Coalition³⁹, which supports and encourages the establishment of carbon pricing throughout the world, the City of Paris will acquire useful evaluation tools to guide its strategic public investments and make them compatible with our carbon neutral trajectory. Initial experiments with several major investment projects (tramway extension, rapid transit lines, etc.) will allow us to evaluate the benefits of this scheme by 2020. ■

39- <https://www.carbonpricingleadership.org/>



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CARBON OFFSETTING

PARIS FOSTERS METROPOLITAN COOPERATION FOR CLIMATE ACTION

Carbon neutrality is the internationally accepted principle at the core of the Paris Agreement, requiring a massive reduction in greenhouse gas emissions and introducing offsets for residual pollution to reach net zero emissions by 2050.

The carbon-neutral trajectory set out in Paris' Climate Plan is aligned with this global target. It calls for a drastic reduction in greenhouse gas (GHG) emissions to attain zero local emissions in Paris, as well as an 80% reduction in Paris's carbon footprint by 2050 in relation to 2004. This commitment to carbon neutrality for the entire Paris area will require, as a last resort, introducing offsets for residual and irreducible emissions. A dedicated offsetting programme will ensure that by 2050, we are able to neutralise the nearly 5 million tonnes of remaining CO₂ emissions each year.

Carbon offsetting will allow us to cancel out greenhouse gas emissions that could not be reduced at source by financing projects that avoid or sequester CO₂ emissions. A certified carbon offsetting programme will allow companies, citizens, and institutions that voluntarily offset their emissions to receive carbon credits. This mechanism is a requirement to achieve carbon neutrality, but requires transparent management, and a strong environmental ethic. ■

Paris will therefore take a responsible and innovative approach to carbon offsetting.

// A CITY THAT CREATES AND USES CARBON OFFSETTING TOOLS

At a time when carbon offsetting mechanisms are constantly changing, and despite the fact that an increasing number of stakeholders (companies, event organisers, citizens) are looking to offset their emissions, local authorities are lacking definitions and legal means regarding carbon offsets.

The City of Paris will therefore take a responsible and innovative approach to carbon offsetting by developing tools to support the local energy transition and low-carbon development of our partner towns and cities. To meet increasing demand, and provide monitoring at the city level, the municipality will explore ways to offset carbon locally.

A platform for carbon offsetting projects in Paris

The biggest challenge for local carbon offsetting is to ensure funding for energy transition projects throughout Paris, as well as in partnership and solidarity at the Metropolitan, national, and international level. The City will therefore explore how to set up a local carbon-offsetting scheme by 2020. This scheme would comprise a dedicated platform to connect project leaders with funders, as well as an operator that would run the platform, verify the integrity of the transactions and guarantee that the project reduces emissions without counting carbon credits twice. The local preference that is included in Paris' carbon offsetting scheme will make it possible to internally offset emissions (called in-setting) to attain zero emissions by 2050. This practice, which needs to be created at the municipal level, presents the advantages of reinvesting carbon offsetting funds locally, better monitoring funded projects, and boosting the visibility of financial contributions from citizens and stakeholders.

While voluntary carbon offsetting mechanisms are mainly geared towards companies, the City of Paris will launch a feasibility study on creating a local carbon-offsetting platform for Paris. The goal is to design a tool to mobilise all of the city's stakeholders to encourage and allow them to reduce their carbon footprint. The main purpose of the study will be to collect suggestions for a wide variety of projects from citizens, city stakeholders, the Metropolitan Area, and the City of Paris, using the same format as the participatory budget. The Greater Paris Metropolitan Area wishes to be involved in this initiative.

This participatory financing tool is designed to accelerate energy and ecological transition projects in Paris and in partnership with rural areas in France, from carbon reduction (energy renovation, renewables) to sequestration (creating green spaces, agriculture, afforestation).

Over time, and consistent with future carbon offsetting mechanisms that will be defined in the Paris Agreement protocol, the platform will make it possible to identify and finance low-carbon development projects in other countries, according to climate solidarity principles.



5 GUIDELINES

The City of Paris has therefore developed five guidelines for our carbon offsetting policy.

1

Focus on drastically reducing greenhouse gas emissions, using carbon offsets solely to neutralise residual admissions;

2

Comply with the five guiding principles of voluntary carbon offsetting to ensure the integrity of all projects that we finance: they must be additional, permanent, measurable, independently verified, and unique;

3

Promote offsets at the local level to accelerate the energy transition;

4

Use some of Paris' carbon offsetting funding to finance climate solidarity in Southern countries;

5

Adopt a policy to define a fair price.

The City of Paris will attempt to use carbon offsetting as a financing tool for carbon reduction and sequestration projects in Paris and in partner cities and towns, in the Greater Paris Metropolitan Area, in France, and internationally through climate solidarity. In order to neutralise residual and irreducible emissions on which the Paris local government has no direct impact, the City will work with partners on developing offsetting mechanisms that are open to citizens and stakeholders in the Paris area.

Parisians taking action for carbon neutrality

The success of carbon offsetting efforts relies on Parisians and local stakeholders to reduce their carbon footprint. To set things in motion, several operations will be launched at once.

We could conduct a communications campaign to support the launch of the platform: a range of educational content will be put on the website to explain carbon offsetting mechanisms, recognised standards, the carbon economy, and provide concrete examples of projects that have been carried out. In addition to raising awareness, the City of Paris will promote the use of tax incentives. We will push the State to offer tax cuts deductions for individuals who undertake carbon-offsetting actions, based on the same principle of reductions for charity donations. *Eau de Paris*, a key player in the field of sustainable development, has offered to evaluate the carbon sequestration potential of its spaces and assess the benefits of agroforestry and organic agriculture in its catchment areas by 2020.

As a dynamic and global city, Paris hosts a number of national and international events. In the spirit of the Eco-Friendly Events Charter, and to raise the visibility of our offsetting approach, the City will encourage event organisers to offset their event emissions by contributing directly to the local platform and encouraging visitors to offset their participation in the event. These recommendations could initially apply to events in public spaces, as part of the Paris Eco-Friendly Events Charter. As for the 2024 Paris Olympic and Paralympic Games, they will be Paris' first international event to take this approach.

+ LOCAL GOVERNMENT +

OFFSETTING BUSINESS AIR TRAVEL EMISSIONS

To set the example, the City of Paris will offset all of its residual emissions by 2050. In the shorter-term, in 2018, the air travel of elected officials and municipal personnel will be offset for the purposes of eventually contributing to a carbon-offsetting platform. In accordance with the Paris Local Government Mobility Plan, train travel should be favoured journeys under 3.5 hours or less than 1,000 km.

A new C40 network for carbon offsetting

Through our new Climate Plan, Paris has committed to creating a new C40 working group in 2018 that will focus on changes to carbon offsetting mechanisms, based on Article 6 of the Paris Agreement. The idea is to create ITMOs (Internationally Transferred Mitigation Outcomes, meaning carbon offset credits) that cities can share with each other.

This carbon-offsetting group will allow the City of Paris to take an international approach to offsetting by strengthening our cooperation agreements to boost low-carbon development and climate solidarity. Cities that participate in this initiative will provide the C40 with a shared definition of carbon neutrality and will work together to establish a simple verification and monitoring method for cities. This will help overcome barriers to national certification programmes and the current lack of methodology. ■

// A CITY THAT SHOWS SOLIDARITY TOWARDS TOWNS AND CITIES THROUGHOUT FRANCE AND AROUND THE WORLD TO SUPPORT LOW-CARBON DEVELOPMENT

Paris' climate solidarity approach has traditionally taken various forms: decentralised cooperation, or contribution to the United Nations Green Fund⁴⁰.

In this Climate Plan, we have also decided to take citywide action for the ecological transition by reducing our GHG emissions, while supporting low-carbon development in neighbouring areas or southern countries. To do so, the City wants to make better use of networks of big cities and metropolitan areas around the world to drive the fight against climate disruption and improve air quality.

Climate partnerships and cooperation

At the international level, the City of Paris will extend its support to cities in developing countries to help them better respond to the effects of climate change. To do so, we will strengthen climate-related cooperation agreements that Paris initiates with local governments in other countries.

Much like the "1% water and sanitation" programme, and more recently the "1% waste" programme, the City of Paris will create a "1% energy" programme to boost decentralised cooperation on energy and climate issues. This cooperation mechanism is authorised by the Framework Law on International Development and Solidarity Policy. It will allow the City of Paris to finance projects in developing countries that provide access to energy and produce renewable energy. A commitments committee will approve the projects that we support.

In addition to its direct investments, the City of Paris will continue to contribute to the United Nations Green Fund. ■

Paris will extend its support to cities in developing countries to help them better respond to the effects of climate change.



Because cities are catalysts, innovators, and are implementing concrete climate actions, the voices of local governments must be heard at all levels of decision-making, from Regions to States to international bodies. The role of cities was officially recognised at the COP21 in 2015, during the 1,000 Mayors Summit at Paris City Hall, and in the Paris Climate Agreement.

ADVOCACY

A CITY THAT SPEAKS ON BEHALF OF CITIES

Paris assumed leadership of the C40 in December 2016, thus representing cities in international discussions on the climate future, and confirming the driving role that cities play in the success of the Paris Agreement. The City of Paris will use

its strategic positioning to advocate conditions that will support carbon neutrality in Paris and more generally for all local governments. We will fight to change legal provisions, encourage stakeholders and industries with high greenhouse gas emissions to take concrete action, and

support city diplomacy to foster positive and ambitious climate action.

In addition to this general advocacy role, specific actions are included in each section of the current Climate Plan, insofar as they are needed to implement some of its measures.

// A CITY THAT MATCHES ITS MEANS TO ITS AMBITIONS



// A CITY THAT REACHES OUT TO INDUSTRIES THAT AFFECT ITS GREENHOUSE GAS EMISSIONS INVENTORY

Through the Climate Plan, the City of Paris has set an ambitious objective to reduce its carbon footprint by 80%. In this way, it is going beyond the legal requirements by integrating indirect emissions that come mainly from aviation, the production of goods, and the food consumed in Paris. To attain this target, the City of Paris plans to encourage the aviation and food industries in particular to make their practices more sustainable.

Towards a reduction in aviation emissions

The aviation industry alone represents 2% of worldwide CO₂ emissions – if it were a country it would have the 10th highest emissions in the world. Because of strong growth (a 70% increase in 2020 as compared to 2005), this industry is one of the biggest contributors to climate disruption. In Paris, it was responsible for 23% of greenhouse gas emissions in 2014, which is close to one-quarter of all emissions in the city. Without government intervention, emissions from air travel are likely to increase and even triple by 2050. This will further magnify the impact of climate disruption and undermine contributions to the energy transition in other industries.

On the international stage, the City of Paris will advocate for the inclusion of emissions from aviation fuels in the Paris Agreement. This is the only way to document these emissions, and will require operators to take responsibility for their impact. At the same time, by 2020, the City of Paris, in collaboration with the C40, will call on the International Civil Aviation Organisation (ICAO) to require airlines to make binding fuel efficiency commitments. They must become more ambitious than just committing to carbon-neutral growth, such as introducing a universal carbon tax on airports.

Given the importance of air traffic at the global level, Paris will call on manufacturers and

suppliers of aeronautical equipment to improve the technical performance and fuel efficiency of engines and fuels by 2030.

Towards more sustainable food

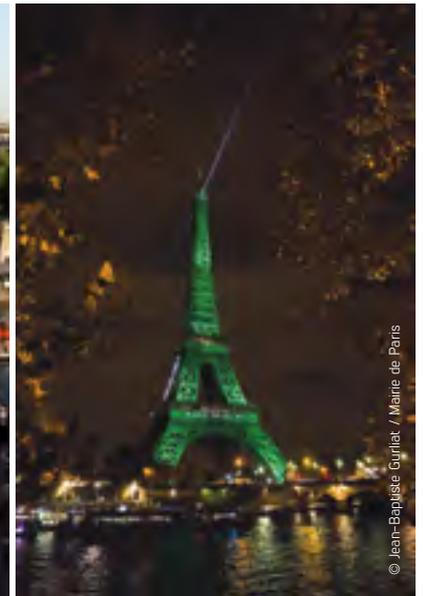
Though agriculture does not have a direct impact on Paris's greenhouse gas emissions, it does contribute to a large proportion of it through what Parisians eat. Agriculture alone is responsible for 24% of global greenhouse gas emissions, and this share is only increasing. The City will thus work with various authorities (Regional, State, European Union) to improve support for support local agricultural and food channels, to ensure everyone has access to high-quality, affordable food and support organic agriculture and measures to encourage more environmentally friendly agriculture.

At the European level, the City will campaign for a redefinition of the Common Agricultural Policy to take better account of environmental issues. This will require updating tariff systems to better protect local production; remunerating the environmental and socio-economic services that farms provide based on the idea of agriculture as a "public good"; and more generally, reorienting subsidies so they are dependent on the sustainability of agricultural practices (basic assistance to all farmers to support small farms, caps on the assistance provided to each farm, stricter eco-conditionality). The City will request that Europe launch, develop, and support mechanisms to promote balanced rural development that will help maintain diversified and sustainable agriculture and provide manageable transformation tools. We will reach out to the European Union to emphasise the importance of stimulating internal demand through the use of local and organic products in institutional catering, and the need to change the European framework for public procurement

to facilitate the use of local products in public catering.

At the national level, the City of Paris will advocate a return to local food systems and promote local organic and seasonal agriculture by participating in the *États Généraux* (a national summit) on food organised by the State. It will also push for the creation of Operations of National Interest (*Opérations d'Intérêt National*) for agricultural projects, just like the ones that exist for urban projects. The goal is to support innovation in intensive food production on small plots (precision tools, new crop rotations and associations, biomimicry, the use of renewable energy). We will also call for simplifying administrative procedures related to Agro-Environmental and Climate Measures, which are too burdensome for small farms. At the regional level, the City of Paris will support all measures to preserve existing agricultural land and help structure regional sustainable production by setting up processing facilities and encouraging the use of local organic products in public institutional catering services. ■

To improve support for support local agricultural and food channels, to ensure everyone has access to high-quality, affordable food.



// A CITY THAT LOBBIES THE NATIONAL GOVERNMENT ON BEHALF OF CITIES COMMITTED TO CLIMATE ACTION

The transition towards carbon neutrality of cities like Paris cannot be accomplished without State government support or changes to the legislative and regulatory framework. This is why Paris will encourage the State to adopt national measures to support actions taken by local authorities, and inform European bodies about its aims.

Towards low-carbon energy

Through our Climate Plan, the City of Paris is sending an optimistic message about the possibility of a low-carbon society. We are gradually introducing a right to clean energy for all Parisians, in order to combat fuel poverty and support the production of renewable energy.

To deliver the full potential of energy-related actions taken by local governments, the City of Paris will work with other French cities to ask the State to devolve energy decisions to local authorities. This will allow them to make real changes to improve the security and origin of their energy supply, and encourage the introduction of renewable energy in the market.

On the topic of renewables, the City of Paris will advocate the adoption of a legislative framework that is adapted to Paris's needs for collective

energy self-consumption. This could allow one-third of solar electricity production to be self-consumed in Paris by 2030, which will bolster the security of the local renewable energy supply. The City of Paris will also support an initiative launched by the National Federation of Licensing Authorities (*Fédération Nationale des Collectivités Concédantes et Régies – FNCCR*), ADEME, and the Ministry for the Ecological and Inclusive Transition to formalise a definition of renewable cooling systems, in conjunction with the new European directive on renewable energy. This will speed up the conversion of individual air conditioning systems towards more efficient district cooling networks, and support the use of waterways (rivers and lakes) for cooling production.

In support of zero-carbon urban planning

Since 90% of Paris' current buildings will still be standing in 2050, attaining carbon neutrality requires adapting the structure and uses of this building stock, which is subject to many restrictions, particularly related to architectural preservation.

The City of Paris will therefore call on the State to give local authorities broader regulatory powers to make local adaptations for energy efficiency requirements or the installation of renewable

energy production facilities. It will also advocate stronger monitoring measures and possibly sanctions regarding compliance with Local Land-Use Plans.

The City will also call for the establishment of new national renovation labels that include a carbon criterion, much like the E+C- standard for new constructions, as well as new incentives for the installation of solar panels during development projects, and incentives to convert oil-fired boilers.

In addition to these regulatory measures, the City will continue its dialogue with the official French Architect's Body (ABF) and site inspectors to incorporate renewable energy production units into heritage buildings and sites. ■

Ask the State to devolve energy decisions to local authorities.

// A CITY THAT MATCHES ITS MEANS TO ITS AMBITIONS

// A CITY THAT STRENGTHENS URBAN DIPLOMACY ON THE EUROPEAN AND INTERNATIONAL STAGE, PARTICULARLY CONCERNING THE PARIS CLIMATE AGREEMENT

As a municipality that is heavily involved in international cooperation, Paris intends to actively participate in city diplomacy and strengthen the role of non-state actors in implementing the Paris Agreement. Above all, it will support the creation of long-term city policies for 2050.

As the leader of the C40, the City of Paris will help local governments develop long-term plans for 2050 that are in line with commitments under the Paris Agreement, modelled on the current Climate Plan. It will also support the "2050 Pathways Platform", an alliance of countries, cities, and companies committed to achieving carbon neutrality by 2050, and it will continue to participate in various networks, such as Energy Cities and the C40, to improve recognition of the role cities play in climate action.

In terms of financing, Paris shares the commitments of the global campaign to ensure that cities have direct access to Climate Financing, led by the Global Fund for Cities Development (*Fonds Mondial pour le Développement des Villes - FMDV*), an international alliance of local and regional governments launched after

the COP22. By joining this movement, Paris will advocate improved actions and financial capacity at the local level to implement local and regional climate strategies. This will give local stakeholders more power in financial negotiations and enhance their innovation capacity.

On the regulatory level, Paris will call for a stricter European regulatory framework to provide local support for proactive initiatives. Though cities are mobilised and are implementing concrete actions to fight against climate disruption, they are often limited by national regulations. The City will support the Global Compact's initiative to strengthen environmental law and principles at the international level.

As part of the Paris Agreement, governments are called upon to step up their national contributions for climate mitigation (NDCs for "Nationally Determined Contributions") every five years. Given the need to accelerate the energy transition, an initial discussion will take place in 2018 during the COP24 to strengthen these contributions starting in 2020. The City of Paris will take advantage of this opportunity to ask

the French government to increase the French contribution in the framework of UN climate negotiations. We will also promote this message at the international level, in collaboration with networks of cities working to address climate change, to encourage the entire international community to increase their contributions to the Paris Agreement. Cities could also make "City-Determined Contributions" that will increase their country's national contributions.

Lastly, as a continuation of the progressive and equitable social project that is the Climate Plan, the City of Paris supports the C40's Women4Climate initiative to empower of a new generation of female climate leaders. ■



GLOSSARY

100 Resilient Cities

An international network of 100 Resilient Cities created by the Rockefeller Foundation

A

ABF

Architectes des Bâtiments de France (official French Architect's Body)

ADEME

Agence de l'Environnement et de la Maîtrise de l'Énergie (French Environment and Energy Management Agency)

Airparif

Association de surveillance de la qualité de l'air en Île-de-France (Air Quality Monitoring Network in the Île-de-France region)

AMAP

Association de Maintien de l'Agriculture Paysanne (Community Supported Agriculture)

ANAH

Agence Nationale de l'Habitat (National Housing Agency)

ANSES

Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail (French Agency for Food, Environmental, and Occupational Health & Safety)

AP-HP

Assistance Publique - Hôpitaux de Paris (public hospital system in Paris and the surrounding area)

APC

Agence Parisienne du Climat (Paris Climate Agency)

APUR

Atelier Parisien d'Urbanisme (Paris Urbanism Agency)

Atmospheric Pollutants

All the gases and particles in the air that can have a negative impact on health, particularly nitrogen oxides (NOx), including nitrogen dioxide (NO₂); fine particles (PM10 and PM2.5); ozone (O₃); benzene (C₆H₆); and volatile organic compounds (VOCs)

AUBE

Axe Ultra Basse Émission (Ultra-Low Emissions Route)

B

Bilan Carbone®

(Carbon Assessment) a method to evaluate greenhouse gas emissions created by ADEME and managed by Association Bilan Carbone (the Carbon Assessment Association)

BIM

Building Information Modelling, creation of a digital model of a building that includes all the technical information needed for its construction, maintenance, and dismantling

BTP

Bâtiment et Travaux Publics (construction and public works)

C

C2DS

Comité Développement Durable pour la Santé (Committee for Sustainable Health)

C40

The Cities Climate Leadership Group, an international network of 91 of the world's biggest cities that are committed to tackling climate change. Paris Mayor Anne Hidalgo became its Chairwoman in December 2016.

Carbon footprint

An area's total greenhouse gas emissions (direct and indirect) calculated using the Bilan Carbone® (Carbon Assessment) methodology

CAUE

Conseil d'Architecture, d'Urbanisme et de l'Environnement (Council for Architecture, Urban Planning, and the Environment)

CEE

Certificats d'Économie d'Énergie (Energy Efficiency Certificates)

COP

Conference of the Parties, the governing body of an international UN convention

COP21

The 21st UN climate change conference held in Paris in 2015

COP22

The 22nd UN climate change conference held in Marrakesh in 2016

COP23

The 23rd UN climate change conference held in Bonn and chaired by the Fiji Islands in 2017

COP24

The 24th UN climate change conference to be held in 2018 in Katowice

CoRDEES

CoResponsability in District Energy Efficiency and Sustainability, a European energy project in the Clichy-Batignolles eco-district, Paris 17th district

CPCU

Compagnie Parisienne de Chauffage Urbain (Paris District Heating Company)

D

DAE

Déchets d'Activités Économiques (industrial waste – IW)

DMA

Déchets Ménagers et Assimilés (Household and Similar Waste – HSW)

DRIEE

Direction Régionale et Interdépartementale de l'Environnement et de l'Énergie (Regional and Inter-Departmental Energy and Environment Directorate)

DRIHL

Direction Régionale et Interdépartementale de l'Hébergement et du Logement (Regional and Inter-Departmental Housing and Accommodation Directorate)

E

E+C-

Positive-Energy & Carbon Reduction Building Reference Standard

ECS

Eau Chaude Sanitaire (Domestic Hot Water)

EDF

Électricité de France (French electric utility company)

EIVP

École des Ingénieurs de la Ville de Paris (the City of Paris School of Engineers)

ELU

Espace Logistique Urbain (Urban Logistics Site)

Energy Cities

A European association of local authorities in energy transition

EnR, ENR and ENR²

Renewable and recovered energy

F

FMDV

Fonds Mondial pour le Développement des Villes (Global Fund for Cities Development)

FNCCR

Fédération Nationale des Collectivités Concédantes et Régies (National Federation of Licensing Authorities)

FSATME

Fonds Social d'Aide aux Travaux de Maîtrise de l'Énergie (Social Support Fund for Energy Management Improvements)

FSL

Fonds de Solidarité pour le Logement (Solidarity Fund for Housing)

G**GHGs**

Greenhouse Gases, all of the gases in the atmosphere that contribute to global warming, namely carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), ozone (O₃), and fluorinated gases (PFCs, HFCs, SF₆, CFCs)

GUAPO

Global Urban Air Pollution Observatory

GWh

1 Gigawatt hour
= 1,000 MWh (megawatt hours)
= 1,000,000 kWh (kilowatt hours)
= 1,000,000,000 Wh (watt hours)

H**Ha**

Hectare, an area equivalent to 10,000m²

HAROPA

The Ports of Paris Seine Normandie, a port system on the Seine River that includes the ports of Le Havre, Rouen, and Paris

I**IDF**

Île-de-France (the capital city region)

ICAO

International Civil Aviation Organisation

IFPEB

Institut Français pour la Performance Énergétique du Bâtiment (French Institute for Building Efficiency)

INRA

Institut National de la Recherche Agronomique (French National Institute for Agronomic Research)

ITMOs

Internationally Transferred Mitigation Outcomes

J**JOP 2024**

2024 Paris Olympic and Paralympic Games

K**KWh**

Kilowatt hour, energy consumed by an appliance with a power equal to 1 kilowatt (1 kW = 1,000 watts) in one hour (1 kilowatt x 1 hour)

kWhpe

Kilowatt hour of primary energy, 1 kWh that takes into account the energy needed to produce and transport the energy consumed

L**LHNS**

Ligne à Haut Niveau de Service (Rapid Transit Line – RTL)

Loi TECV

Loi de Transition Énergétique pour une Croissance Verte (Law on Energy Transition for Green Growth)

M**MOOC**

Massive Open Online Course

MtCO₂

Million tonnes of carbon dioxide (or million tonnes of CO₂)

MWh

1 Megawatt hour = 1,00 kWh
= 1,000,000 Wh
(1 thousand kilowatt hours or 1 million watt hours)

N**NDC**

Nationally Determined Contribution, the national climate change mitigation contribution that governments commit to under the Paris Agreement

NGO

Non-Governmental Organisation

NGV

Natural Gas for Vehicles

O**OAP**

Orientation d'Aménagement et de programmation (Development and Programming Guidelines)

OLS

Organisme de Logement Social (a social housing body)

ORDIF

Observatoire Régional des Déchets d'Île-de-France (Île-de-France Region Waste Management Observatory)

Organic

Product of organic farming

P**Paris&Co**

Agence de développement économique et d'innovation de Paris (Paris' economic development and innovation agency)

PIM

Programme d'Investissement de la Mandature (Municipal Investment Programme)

PLU

Plan Local d'Urbanisme (Local Land Use Plan)

PLPDMA

Programme Local de Prévention des Déchets Ménagers et Assimilés (Local Household and Similar Waste Prevention Programme)

PPD

Plan de Prévention des Déchets (Waste Prevention Plan)

PTRE

Plateforme Territoriale de Rénovation Énergétique (Territorial Energy Renovation Platform)

R**RATP**

Régie Autonome des Transports Parisiens (Paris public transport system)

RER

Réseau Express Régional (Regional Express Train Network)

REVe

Réseau Express Vélo (Express Bike Network)

S**SEM**

Société d'Économie Mixte (mixed-ownership company)

SEM Énergie Posit'if

A regional mixed-ownership company that supports renewable energy projects and energy efficiency in collective housing buildings

Shadow price of carbon

The monetary value assigned to CO₂ emissions to evaluate the profitability of public investments

SNCF

Société Nationale des Chemins de Fer français (French national railway company)

SRCE

Schéma Régional de Cohérence Écologique (Regional Ecological Coherence Scheme)

Syctom

Agence métropolitaine des déchets ménagers (Metropolitan Household Waste Agency)

T**tCO₂**

Tonne of carbon dioxide (or tonne CO₂)

tCO₂e

Tonne of carbon dioxide equivalent (or tonne of CO₂ equivalent), a unit that measures the different greenhouse gases emitted into the atmosphere (CO₂ as well as CH₄, N₂O, PFCs, HFCs, SF₆, NF₃, etc.) using carbon dioxide as a standard to measure the other gases

TGV

Train à Grande Vitesse (high-speed rail service)

TWh

1 terawatt hour
= 1,000 GWh = 1,000,000 MWh
= 1,000,000,000 kWh
(1 billion kilowatt hours)

U**UHI**

Urban Heat Island

V**VNF**

Voies Navigables de France (French inland waterways authority)

W**WHO**

World Health Organisation

Z**ZAC**

Zone d'Aménagement Concerté (Designated Development Zone)

ZCR

Zone à Circulation Restreinte (Low Emissions Zone)

ZRC

Zone de Rénovation Concertée (Concerted Renovation Zone)

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**ici,
demain!**
ensemble pour le climat

CITY OF PARIS

GREEN PARKS AND ENVIRONMENT

URBAN ECOLOGY AGENCY
