

## The digital Fort, Issy-les-Moulineaux

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**Address 1 - street** : 92130 ISSY-LES-MOULINEAUX, France

**Population** : 3 500 hab

**Starting year of the project** : 2001

**Delivery year of the project** : 2010



12 ha



100 000 000 €

**Proposed by :**

ARCHITECTURE-STUDIO

### ID CARD

Built on the site of an ancient fortress of the nineteenth century demilitarized in 2009, the eco-district of Fort d'Issy represents 5% of the territory of the city of Issy-les-Moulineaux. It covers 12 hectares and has:

- 1,623 units (including 330 social housings),
- more than 3,500 people,
- 2300 sqm of shops and public facilities
- and 44,000 m<sup>2</sup> of green space planted with 300 fruit trees.

Dominating the Paris area, it is designed in compliance with a high environmental quality. Its habitat, its community facilities and activities conform to the highest energy performance, the whole district is heated by geothermal energy. The area is also connected to IssyGrid® first district smart grid in France, whose goal is to consume better, less an at the right time.

In most homes, fiber and a home automation equipment are used to make the most of all digital services. The eco-district also benefits from a unique system of

pneumatic waste collection. Finally, it is also the place for experimentation of the smart mobility in Issy-les-Moulineaux: Shared parking, real-time tracking of buses through smartphones or electric cars in self-service.

The digital eco-district of Fort d'Issy received several awards: he notably received the Marianne d'Or 2012 for Sustainable Development and the Grand Prix of local authorities 2015 (digital networks award).

## Programme

- Housing
- Offices
- Businesses and services
- Public facilities and infrastructure
- Public spaces
- Green spaces

## Project progress

- Operational phase

## More info

<http://www.issy.com/fortdissy>

## Data reliability

3rd part certified

## TERRITORY

### Type of territory

#### Issy-les-Moulineaux

Issy les Moulineaux is a city that has known a significant development with increasing attractiveness since the 1980ies. More than 40% of the area of the City (425 ha) was subject to a urban renewal. Over the past 35 years, brownfields and abandoned buildings have given way to new, modern and harmonious neighborhoods. This development, mainly in the form of ZAC (Concerted Development Zone), has always been the result of a strong desire to enter the city in a sustainability scheme, focusing on habitat diversity / offices / shops / services.

With more than 66,000 inhabitants, Issy continues to attract new residents looking for quality of life (green areas represent 53.1 ha) but also a high level of service.

With its dynamism, daring and innovative dimension (especially in terms of new technologies) and its very good access by public transport, the city has also attracted many companies. It hosts the headquarters of prestigious companies such as Microsoft, SAFRAN, Sodexo, Aldebaran Robotics, Coca Cola, etc. It is also the privileged place of settlement for many media and has gradually established itself as a must-go city for the communication sector.

#### **Current issues and challenges for the community**

The regeneration of brownfield sites is now complete. It is now for the city to provide a new dynamic of urban development, in particular linked to the many public transport projects, including the Grand Paris Express, and served by two stations in 2022. These will enhance the region's attractiveness and promote the development of housing and economic activities.

Issy-les-Moulineaux will nevertheless take care of preserving the living environment by developing green spaces which the city is particularly attached to. Indeed, with its 8.3 m<sup>2</sup> of green space per inhabitant, Issy is among the best endowed cities of the department and intends to maintain this position.

The challenge is thus to propose a integrated and environmentally friendly "density", but also rational and selective, adapting to the local context, including the new polarities related to public transport projects.

#### **Overall development strategy of the city and its neighborhoods**

In response to these challenges, the city comes to develop a Project Planning and Sustainable Development for its new PLU (Local Urbanism Plan) to enhance the attractiveness and identity isséenne around two axes:

- smart city, excellence to affirm in the Metropolis
- a unique living environment to preserve.

The territorial attractiveness is considered in a logic of reaffirming the dynamic and daring city image on the outskirts of Paris, integrating residential, demographic and economic dimensions.

It aims meet the major metropolitan issues, while preserving the green and blue PLU, the suburban districts, the remarkable built heritage, urban bustle of the city center and neighborhood life.

The improvement project also encourages commercial momentum on major roads and major local centralities.

## Climate zone

[Cfb] Marine Mild Winter, warm summer, no dry season.

## More info

<http://www.issy.com/>

## KEY FIGURES

### Neighbourhood paved surfaces

Neighbourhood paved surfaces : 5 400 m<sup>2</sup>

### Green areas, roofs included

Green areas, roofs included : 44 000 m<sup>2</sup>

### Public facilities floor area

Public facilities floor area : 2 300 m<sup>2</sup>

### Number of residential units

Number of residential units : 1 623

### Number of social housing units

Number of social housing units : 330

### Green spaces /inhabitant

12.57

### Amount of the investment taken in charge by the local authorities

Amount of the investment taken in charge by the local authorities : 60 000 000 € HT

### Total of subsidies

Total of subsidies : 1 264 000 € HT

### Detail of subsidies

Investment 40 M € (excluding acquisitions) + 60 M € (cost acquisition Strong) by SEMADS (developer) immediate funding by the promoters through the sale of building rights Grants: € 1.264 million for public facilities ( nursery, school Louise Michel and Time of Cherries)

## GOVERNANCE

### Project holder

Name : City of Issy-les-Moulineaux

Type : City

General description :

As part of the fight against climate change, the town of Issy-les-Moulineaux acts at its own level through several initiatives:

- 1) Go beyond environmental standards for construction with the Issééo Charter
- 2) Building green and organic schools and nurseries
- 3) Protecting biodiversity in the city
- 4) Make eco-districts of Fort Issy and Bords de Seine examples to follow
- 5) Abolish garbage trucks with the automated vacuum collection
- 6) Consume less and better with IssyGrid
- 7) Using geothermal energy, renewable energy for heating
- 8) To control its energy consumption through the connected habitat
- 9) Streamline urban travel by "Smart Mobility"
- 10) Associate the population to fight together against climate change

## Project management

### Description :

- Contest launched by the city of Issy-les-Moulineaux, on behalf of the Ministry of Defense.
- Bouygues Immobilier named the winner of the contest in 2000 with ARCHITECTURE STUDIO by creating the concept of "FORT DIGITAL" for the realization of a district representing 104,000 m2 floor area about 1600 dwellings.
- Land acquisition 13 October 2010.
- From 2010 to 2013, coordinating work was carried out by Bouygues Immobilier closely with the developer of the Fort, the SEMADS.
- VRD start preliminary work in December 2010.
- 287 notaries sales to December 31, 2010.
- Start building work in January 2011.
- Construction period 26 months.
- Shipments: February 2013 to February 2014.

## Project stakeholders

Bouygues Immobilier

**Function :** Developer

Project coordinator and interlocutor of the city, the SEMADS and state. This mission is paid by the promoters.

**Construction21 company page :**

<http://www.bouygues-immobilier.com/>

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Architecture-Studio

**Function :** Architecture agency

Urban Design Fort Issy

10 rue Lacuée 75012 Paris - [as@architecture-studio.fr](mailto:as@architecture-studio.fr)

**Construction21 company page :**

<http://www.architecture-studio.fr/>

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SEMADS

**Function :** Developer

Urban planner Fort Issy

## QUALITY OF LIFE

### Net density

135.25

### Social diversity

Residents are satisfied with the quality of life in Fort Issy: 95% of residents are proud to live there.

93% of respondents found that there is a real neighborhood life, especially through the village spirit and lack of drive.

The facilities and public areas are very many innovative - a school of straw and wood, a Feng Shui pool, a space for cultural and digital animation, sports equipment, etc. - As well as green spaces with an orchard of 44,000 m<sup>2</sup> and a shared garden for growing a vegetable garden and a Japanese garden.

## SOLUTIONS

Aquazena, Feng Shui swimming pool

### Description :

On an area of over 2,000m<sup>2</sup>, it hosts a large pool of 25 m, a children's pool and a paddling pool for smaller spaces dedicated to fitness with a group class room and a cardio room hosting 16 aircraft cardio and weight training and two squash courts.

### Water treatment with ozone

- The pool has a water treatment with ozone, a system of new generation still little used in the pool, compared to the standard disinfectants such as chlorine products.
- The ozone treatment is based on the use of ozone generators, a molecule consisting of three oxygen atoms, naturally present in the atmosphere, which is a powerful oxidizing agent and disinfection more efficient as chlorine. The production of ozone is performed in an ozonation column from ambient air or from oxygen.

### Advantages of ozone treatment

- Ozone is the most powerful oxidizer, used for over 40 years in the treatment of drinking water, the waste water, industry and swimming pools in recent years, where he made a grand entrance.
- The water produced is perfectly disinfected. Ozone destroys bacteria but also viruses, and this in a very short time. Where it would take 20 minutes for disinfection of water with chlorine, it takes less than a minute with ozone.
- The rate of chloramines, which can cause public health problems (irritation of the eyes, ears and throat), is greatly reduced. In addition, certain viruses, amoebae and cysts are not destroyed by the chemicals normally used for treatment of swimming pool water.
- The water obtained is clearer and purer: Ozone is a very good micro-flocculant to trap the finest parts on a sand filter, agglomerating. Since water is clearer, it then has a bluish color.
- With ozone, saving on water consumption are realized because it is no longer mandatory to renew as the pool water to maintain compliance with regulations.

### Electronic system monitoring swimmers

- The pool has an innovative system of electronic monitoring of swimmers. To overcome drownings that occur each year in swimming pools, Poseidon company has developed a system of monitoring and warning consists of a series of underwater cameras and aerial and software that analyzes images to identify the position of swimmers.

<http://www.issy.com/piscine-Aquazena>

- Proximity services



## ECONOMIC DEVELOPMENT

### Local development

- 8 of 9 shop owners are satisfied with their level of activity and 87% of residents say they often come to Fort d'Issy because of the attractiveness of shops, equipments, walks and atmosphere.

### Functional diversity

The functional diversity of the district favors soft transports and carpooling. It offers a potential reduction in travel of about 10-15%, equivalent to a reduction of 5 to 7% of GHG emissions in the neighborhood.

- 2 schools
- 1 nursery
- 1 bowling / gym
- 1 Feng shui swimming pool
- 1 cultural space
- 1 concierge
- 9 commercial premises

### ***The concierge and shops***

The concierge centralizes many services to improve the comfort of the inhabitants: mail, dry cleaning, shoe repair, ironing, delivery of fresh products, tutoring, babysitting, car care, administrative procedures ... The implementation of this concierge helps also to reduce the environmental impact of the neighborhood, through the pooling of nearby movement of residents. Fort d'Issy also has many shops: supermarket, bookstore, bank, bakery, brewery and restaurant, pharmacy, etc.

According to the poll conducted by Opinion Way for the city of Issy-les-Moulineaux and Bouygues Immobilier:

- 98% of residents use local shops and are satisfied;
- The green areas represent 97% of them, an important component of quality of life.
- Used by 68% of residents, public facilities are valued at almost unanimously for their proximity and quality.

## TRANSPORT

### Mobility strategy

#### ***A testing ground for smart mobility***

The city of Issy-les-Moulineaux tests urban mobility solutions to enhance the fluidity of urban travel, to facilitate daily life and to help reduce CO2 emissions. Thus the city is involved, together with other key players, including Bouygues Immobilier, in a consortium gathered around the So Mobility project. It aims to develop innovative uses of mobility on the field:

- development of multimodal deals in real time,
- carpooling, changes in work schedules,
- optimization of parking,
- traffic and actions on anticipation of new modes of travel.

#### **BePark to park in the parking lot of the Louise Michel school:**

This application allows the sharing and including optimizing the school's parking spaces, which are used only in the day. With this intelligent system, residents and visitors can anticipate their parking spaces on the outside opening hours of the school.

#### **Zenbus to track movement in real-time bus:**

Deployed for the first time in France in January 2014, in collaboration with the RATP, Issy-les-Moulineaux and Western Greater Paris, ZenBus can precisely see on his smartphone where his bus from a free downloadable application Appstore and Google Play.

## Autolib 'electric car self-service:

The city of Issy-les-Moulineaux are 19 stations Autolib ', one in Fort Issy.

In 2022, the station of the Grand Paris Express "Fort Issy - Vanves - Clamart"

The automatic metro will allow a very good connection with the line N Transilien and RATP buses 189, 323, 394 and 579.

According to the poll conducted by Opinion Way for the city of Issy-les-Moulineaux and Bouygues Immobilier:

- 57% of residents say they have changed their traveling habits thanks to the proximity of shops, services and public facilities on site.
- 70% use the bus and Autolib 11% while 51% of people feel that there is not enough parking spaces within the Fort.
- 49% of residents are satisfied with parking facilities on site. The BePark solution to improve the parking will be put in place

## SMART CITY

### Smart City strategy

#### *IssyGrid® connected to a neighborhood, district first intelligent network*

This intelligent network was connected to the Fort of Issy since its commissioning in 2013. Today, 800 homes are being equipped of all new smart meters deployed by ERDF, which will track their online consumption participate in the quality of the electrical distribution network neighborhood. Moreover, the housing connected via home automation, soon transmit to IssyGrid® and Urban Power software platform EMBIX their energy consumption data (electricity, hot water, cold water and heat). Secure transmission of this data will be in groups of ten apartments in each building, in order to respect anonymity. With IssyGrid®, it will be possible to follow hour by hour, the average consumption of buildings, not discerning individual consumption per household.

To make optimum use of the deployed advanced infrastructure, analytical work and learning continues to ensure ownership of particular technologies and concepts by residents. So EMBIX soon propose a visualization application and 3D data in real time to measure the performance of the district.

#### *Accommodation with a home automation and connected to the optical fiber*

The people equipped with home automation system can be informed in real time of their energy consumption through a touch screen located in the entrance of their apartment. This equipment allows them to set the right level of use at the right time in the right part, to avoid unnecessary energy consumption, better control their energy costs and reduce the environmental footprint of their homes.

According to the poll conducted by Opinion Way for the city of Issy-les-Moulineaux and Bouygues Immobilier:

- 77% of residents say fitted with home automation use and among them 67% consider that it makes their life easier.
- 70% of residents say they have saved money on their bills using the device in place.
- 78% of respondents are satisfied with the thermal comfort of their homes.

## SOLUTIONS

IssyGrid® first district smart grid in France

#### Description :

Designed in 2012 as part of a public-private partnership of major companies (Bouygues Immobilier, Alstom, Bouygues and Energy Services, Bouygues Telecom, EDF, ERDF, Microsoft, Schneider Electric, Steria and Total), SME and startups (Navidis, Sevil, IJENKO and EMBIX) and the city of Issy-les-Moulineaux and the urban community Western Greater Paris, IssyGrid® manages the production of renewable energy consumption but also to storage ensure optimal and intelligent energy





management. With the latest generation of meters that collect data on energy consumption and transmit them to an analysis center, the IssyGrid® information system analyzes all production resources, but also consumption energy of the neighborhood. Intelligent street lighting has also been installed and electrical distribution station ensures the balance between consumption, production and storage of energy. The energy storage solution is also environmentally friendly, because made with batteries of recycled cars.

The Smart Grid of Issy-les-Moulineaux uses advanced computer technology to manage and optimize production and energy needs of a wide area and to best integrate renewable energy: Cloud Architecture for massive treatment and extensible data, real-time consumption data, use of energy storage in the public distribution systems, etc.

This device combines digital ecology and has three objectives:

- Eat better while including new energy consumption uses such as electric vehicle charging;
- Better integrate local production of renewable energy in public distribution network;
- Reduce emissions of greenhouse gases, by avoiding consumption peaks.

IssyGrid® today proves the effectiveness of the implementation of a smart grid based on existing assets.

CO2 Impact : 180,00 tCO2

- Infrastructure
- Digital services

<http://issygrid.com/>

Company :

Company :

Company :

## RESOURCES

### % Paved surfaces

5

### Waste management

#### *Pneumatic collection of household waste at the forefront of innovation*

This is a first in France, the eco-Fort area is equipped with a mobile vacuum system by truck, part of the objectives of the Grenelle Environment Forum and has many benefits for the people, as for the community. Deployed by Veolia Environmental Services and Envac companies, this system optimizes hygiene and safety, while reducing noise and odors in undervaluing costs and decreasing CO2 emissions in the Fort which are generated about 55 tons of waste per month, or 660 tons of waste per year.

This collection system makes it possible to reduce the distance traveled by the collection trucks, thereby reducing noise and greenhouse gas emissions. The voluntary contribution principle has been retained for the collection of glass, which can be achieved by suction for reasons of pipes abrasiveness. For bulky, dedicated areas are accessible walk-by dump trucks.

- Collection terminals 115
- 2 suction point outside

Seton survey by the Opinion Way for the city of Issy-les-Moulineaux and Bouygues Immobilier:

- The 95% expressed satisfaction habitantsse the tire collection system for household waste. They are met by reduction of nuisances (noise, pollution) related to the collection of waste.
- 91% believe that this sort of system is effective. They particularly appreciate the proximity of the terminals collection and reduction of noise and smells.



## SOLUTIONS

Pneumatic waste collection system with suction

### Description :

Specifically, residents deposit their waste in collection terminals that store temporarily in underground tanks with a capacity of 3 to 8 m<sup>3</sup>. The "aspiring" trucks followed connect on external suction points.



The waste is then sucked from suction two points located outside the Fort. A truck passes every day on these two points and aspires waste based on the 48 containers fill rate, signposted from automatic sensors.

This system allows:

- Remove containers in buildings and public spaces;
- Remove trash bins on the roads;
- Remove the flow of conventional garbage trucks inside the Fort
- Delete the pre-collection expenses (maintenance of buildings and bins, output loads back and bins before and after each collection classical ...);
- Eliminate the risk of fire;
- Ensure selective waste sorting at source, recycling more reliable;
- Provide automatic control over the whole network and live maintenance.
  
- Waste management

### Company :

- Other

## BIODIVERSITY

### Biodiversity and natural areas

#### *Green spaces respecting biodiversity*

An important place was given to green spaces that respect both the history of the place and participate in an environmental approach. The landscape concept of Fort Issy signed the landscape Meristem agency. They include:

- An orchard of 300 trees with a dozen varieties of apple, cherry, plum and pear trees whose fruit will be picked by the locals.
- A Japanese garden: designed by gardeners Ichikawa, the twin city of Issy-les-Moulineaux, this garden will be completed by the end of 2015, will be a green area, a place of tranquility and meditation.
- The gardens shared to cultivate his garden: a space of 1200 m<sup>2</sup> is available to the association *Les Jardins du Fort* to accommodate 86 individual plots of land intended for Isséens and an area of compost and an apiary.
- Watering of gardens Fort is provided exclusively by rain. There is no automatic irrigation. Only trees and shrubs are watered at planting. No fertilizer, herbicide or plant protection product is used. Mulching massive trees and keeps the freshness and therefore limit watering operations and slow the proliferation of weeds. In the unplanted area near the water mirror, is a flowery meadow that preserves biodiversity. This is mowed once a year, around the month of October, to allow natural seedlings of annuals and regeneration of the prairie.

According to the poll conducted by Opinion Way for the city of Issy-les-Moulineaux and Bouygues Immobilier:

- 97% of residents are finding that green spaces are important to their quality of life at Fort Issy.

## Climate adaptation, resources conservation, GHG emissions

The electricity consumption related to lighting and decision of 1600 housing totals approximately 2500 MWh per year, representing nearly 20% of the energy consumption of Fort Issy. Ultimately, the Smart Grid of Issy-les-Moulineaux should prevent consumption from March to April GWh of electricity and the emission of over 180 tonnes of CO2 eq per year.

## Energy sobriety

### *A high environmental quality neighborhood, with advanced equipment*

An innovative, economical and environmentally friendly geothermal energy, which meets 78% of requirements. Energy intake of this innovative heating network, covering almost all the needs of the neighborhood, saves the emission of almost 2,000 tons of CO2 per year.

## Energy mix

The needs of heating and hot water eco-area totaling 11 000 12 500 MWh per year, according to the climatic variations plus 170 MWh of cold for the pool air conditioning needs. 78% of heat or cooling needs in the area are provided by geothermal energy. Complement (12%) is provided by the electricity that powers the heat pumps.

## Total electricity needs of the project area /year

Total electricity needs of the project area /year : 12 670,00 kWh

## Total electricity production of the project area /year

Total electricity production of the project area /year : 11 000,00 kWh

## SOLUTIONS

Geothermal

### Description :

The heating system can power the 1623 housing and public facilities of the Fort, in a process quite innovative. This unique heating network in France, designed and operated by Dalkia, is a water loop network tempered at 27 ° C, from a water from 28 ° C collected in two geothermal wells dug under the district, 650 meters deep to reach the sheet of the Albian.

The principle of "geothermal doublet" lets not lose a single m3 of water. The entirety of the water pumped from the aquifer is fed back without affecting its quality or changing its composition. Thus, the water table is not impacted by this system. The geothermal heating system that supplies the eco-district consists of the geothermal power station and a heat loop that feeds a series of substations equipped with heat pumps located at the foot of each building.

If the choice was on a conventional gas installation, consumption on the entire eco-district would have reached up to 13,000 MWh of gas per year. And if the installation was operating the fuel, heating oil 45 semitrailer trucks would be needed to feed the boilers.

In addition to its environmental advantages, this device also allows subscribers to benefit from attractive pricing through reduced VAT to 5.5% and subsidies from ADEME and the Île-de-France region.

CO2 Impact : 2 000,00 tCO2

- Renewable energies

Company :

Company :

## BUILDINGS

### Buildings

The buildings are designed in compliance with the highest environmental quality and the area boasts a pneumatic waste collection system with suction

(1200 meters of pipe under the road). 78% of the needs of district heating and domestic hot water are covered with two geothermal wells dug 650 meters deep.

### ***A committed architecture, respecting the history of the place***

Inspired by the pentagonal structure of the former military fort, the project of Architecture-Studio, winner of the competition agency in 2001 for development of new eco-district, reveals its historical footprint with residential buildings built on the plot its five Bastions. The ground plan is well organized into five sets: the Belvedere, the Villas and Bastions and the court, and the orchard. Today, around the Fort, the restored fortification walls invite to walk on the curtains. Low-rise constructions ensure the transition with neighboring suburban fabric.

### ***The villas, buildings***

Thirteen villas buildings are part of the landscape park in the heart of Fort Issy, in a large orchard within which are arranged rides, square, public facilities and a set of reception venues made available to residents of Issy-les-Moulineaux. Built of concrete with external insulation, these residences with soft shapes have been designed according to a bioclimatic approach to reduce energy losses.

### ***Les Bastions***

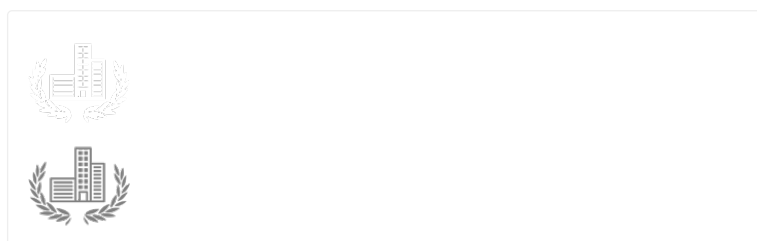
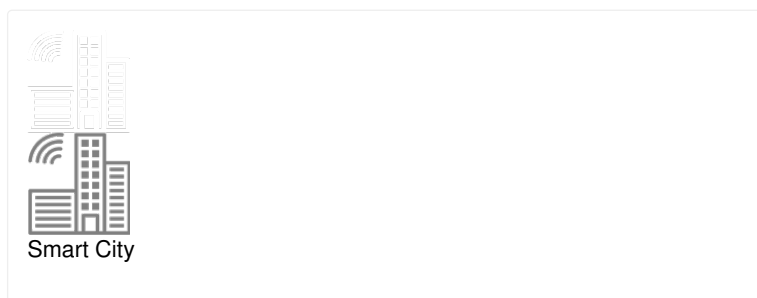
The five buildings Bastions restore the old layout of the Fort, four of them home to housing as well as shops and hosts the Fifth Branch of the National Gendarmerie. This family of buildings adopts a common treatment colorimetry - white body and brown in the attic - and a green roof. The dominant feature of their architecture is the simplicity of expression and abstraction facade treatment. Courses are treated as public open spaces.

### ***Numerous public facilities, innovative and environmentally***

- The school of wood and straw Louise Michel
- The Boules
- The space for cultural and digital animation "The Time of Cherries"
- The pool Feng Shui Aquazena
- Sport equipment "bunkers"

## Contest

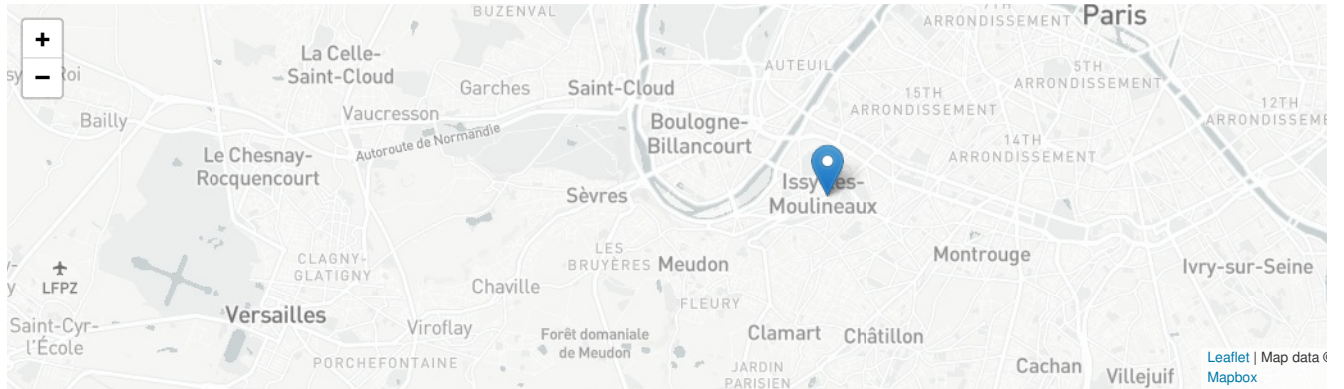
### **Building candidate in the category**



Grand Prix Ville Durable



Coup de Cœur des Internautes



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