

巴黎净烟大楼

Anti – smog

建筑设计 Vincent Callebaut Architectures



巴黎净烟大楼是后工业时代城市结构基础之上的产物，坐落于巴黎19区“小腰带”（双轨铁路内环线）乌尔克运河。作为公共的“设施”，它致力于促进住宅与交通在城市领域可持续发展的创新，旨在运用各种前沿的可再生能源改善巴黎烟雾缭绕的现象。这里所指的烟雾（烟+雾）是蓝色至红色的阴霾，由悬浮灰尘与对流层臭氧经水冷凝而成。烟雾的产生除了水蒸气围绕灰尘冷凝之外，主要来源于化石燃料燃烧释放的含有硫磺的气体（如二氧化硫）。这种由光化学作用而形成的烟雾对健康造成诸多危害（如气喘、梗塞、AVC），并对环境带来不利影响（如酸雨、建筑腐蚀）。巴黎净烟大楼则意在创建可舒缓该地区窒闷环境的新型建筑。

以城市空间为尺度

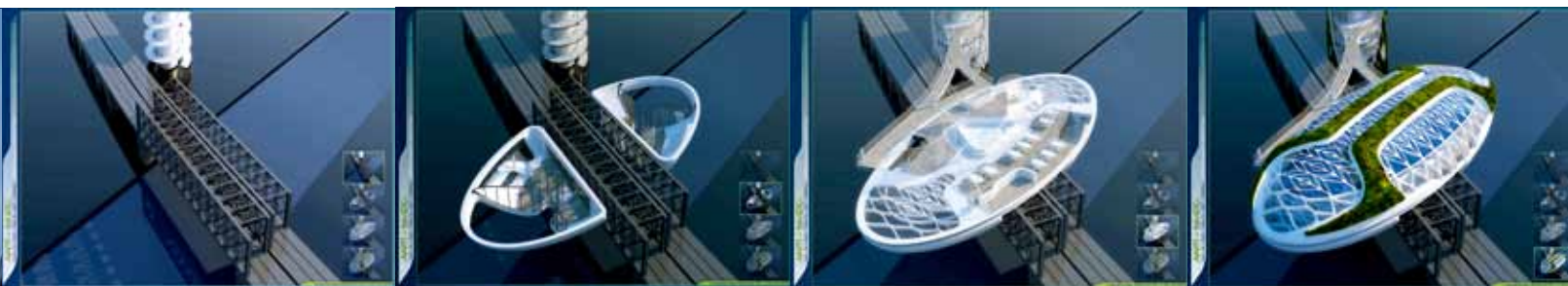
巴黎净烟大楼是一个自给自足的、防止污染的生态建筑模型，能对环境自主应变，主要建立在欧几里得三维尺度之上：

X轴：乌尔克运河

乌尔克运河与圣丹尼斯运河、维莱特湖、圣马丁运河一起组成了巴黎交错的运河系统，全长130km，与整个城市融为一体。这是一片悬浮于水域之上的线性的有象征意义的地区，连接着尼古拉勒杜圆形大厅和维莱特公园。维莱特公园由美国建筑师伯纳

Anti-Smog is a parasite project set up on the post-industrial urban structure of the Petite Ceinture and the canal de l' Ourcq in the 19th Parisian district. It is a public equipment dedicated to promote the last innovations on the theme of sustainable development in urban area in terms of housing or transport. Its role is to apply all the avant-garde renewable energies so as to fight against the Parisian smog. This smog (smoke + fog) is a bluish to reddish haze. It is the result of the water condensing (the fog) on the suspended dust and the presence of ozone in the troposphere. The smoke is produced in major part by the burning of fossil fuel and is composed of sulphurous gas (such as





德·屈米设计，有夸张的红色建筑点缀其间。乌尔克运河发端于维莱特第二大盆地，附近有一座建成于1885年、重约85t的桥。乌尔克运河宽30m，长730m。在18世纪，它的最初功能是为巴黎城区储存饮用水，也是圣马丁运河后备适航水域。直到20世纪70年代，这个地区已带有强烈的工业特质，其功能才被定义为水运。现在，后工业时代的休闲生活方式使得河岸成为展示巴黎文化的主题活动区。

Y轴，内环铁路桥

内环线是一条环巴黎城区的双线列车线路，被Maréchaux大道所包围。这条火车道始运于1862年，现部分线路已截断，大部分废弃不用。目前能使用的仅为23km，运行于北部克里希和南部维克托之间，贯穿巴黎东部。铁路目前虽禁止行人穿行，但不时出现的过街桥却暗示此地蕴含着巨大的发展利用空间，这不仅体现在公共交通，也体现在保留林荫道、自行车道或太阳能汽车道等之上。

Z轴，城市供热工厂

巴黎热能公司这座庞大的废弃工厂内屹立着高耸的烟囱，喷涌着浓重的白烟。然而，这个场景即将消失。根据城市规划，一栋住宅和一个面积1500m²的公共花园将取而代之，以此为重心由内向外依次布置艺术和工艺品店，巴黎热能公司则将转入地下。20世纪以来，这家公司已通过废热发电和废物焚烧提供了城市供热，限制了部分化石能源的进口。

sulphur dioxide) in addition to the dust on which the water steam contained in the fog condensates itself. This photochemical cloud is associated to many detrimental effects for the health (asthma, infarct, AVC) and for the environment (acid rains, attrition of the building). This project aims therefore at inventing a new architecture able to disasphyxiate the area in which it is set up!

URBAN VECTOR XYZ

Anti-Smog is thus an ecological prototype of auto-sufficient, depolluting architecture, reactive to its environment and is set up on an Euclidean urban vector with three axes:

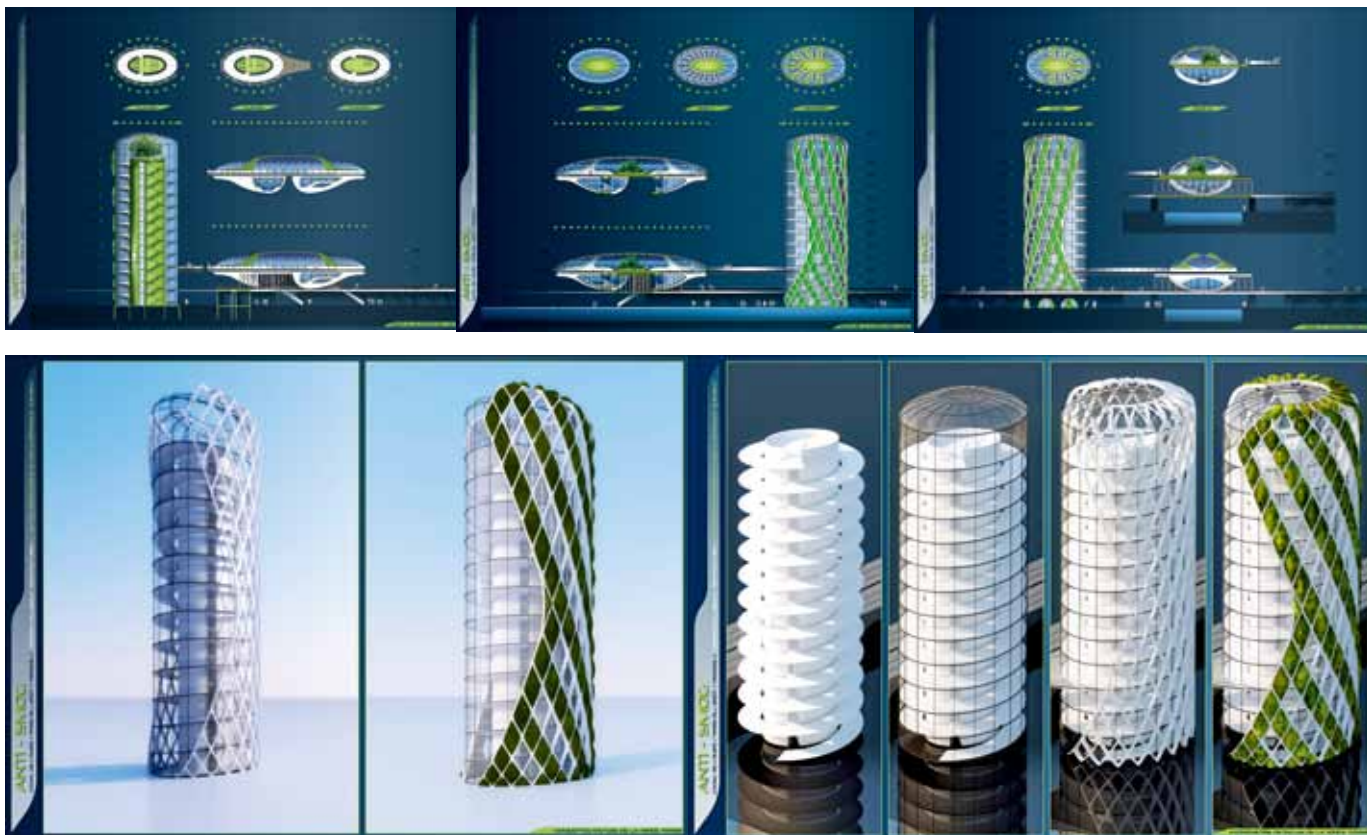
In X, the canal de l'Ourcq :

With the canal Saint-Denis, the bassin de la Villette and the canal Saint-Martin, the canal de l'Ourcq constitutes the network of the Parisian canals, long of 130 km and that belongs to the city of Paris. It is a linear and emblematic site suspended on the water between the Rotonde de Nicolas Ledoux located place Stalingrad and the Parc de la Villette punctuated by the red folies of the American architect Bernard Tschumi. This canal de l'Ourcq begins at the second Bassin de la Villette by a standing bridge, of 85 tons built in 1885. It measures 30 meters of width and 730 meters of length. In the 18th Century, its first function was to constitute a reserve of drinking water for the city of Paris but also a reserve of navigable water for the canal Saint Martin. Until the 70's, the district has been strongly marked by the industries and the activities linked to the use of the waterway. Today, our post-industrial period of leisure stigmatises the banks with thematic activities related to the culture of water such as Paris Plage.

In Y, the rail bridge of the Petite Ceinture :

The line of the Petite Ceinture is an old double way train line that went round Paris inside the boulevards des Maréchaux. Operational in 1862, it is now mostly unused and amputated of a part of its length. It consists currently in 23 kilometres of railways between the porte de Clichy in the North and the boulevard Victor in the South, going through the East of Paris. The pedestrian access is now strictly forbidden but the railway punctuated by bridges presents a huge potential not only in term of public transport but also in term of reconversion in planted promenade or Vélib and solar car ways on rail for example.





XYZ轴

在交错的水道和火车道上，净烟大楼犹如矗立在这三轴交汇的心脏之上。这座大厦由两个具备积极能效的博物馆组成，所谓“积极能效”是指这两个博物馆生产的能量大于其所消耗的能量。一方面，“太阳能水滴”是由聚酯材料和光伏电池（为结构提供能源）组成的上盖结构。双道金属桥支撑着它横跨于乌尔克运河之上。另一方面，风塔呈螺旋形外观，内有风机，垂直立于未来的临水市政花园边。

太阳能水滴

铁路线发端于Buttes Chaumont公园，穿过巴黎贝斯亚提（通往维莱特屠宰场的一座老式火车中转站）到达运河交汇点。人们的目光随着乌尔克运河的铁路桥移行，一座250m²蓝色光伏屋顶赫然在目。犹如船身，“太阳能水滴”的建造材料主要为聚乙烯纤维，骨架为钢结构，上覆二氧化钛涂层，既能反射紫外线，又能减少空气污染。在地区发展政策规划纲要中，“太阳能水滴”是一座自清洁建筑，能通过光催化氧化法吸纳不健康的烟尘，尤其是巴黎内环大量的交通车辆所排放的尾气，并使之循环再生。这座超级半球建筑表面呈网格状，这种网状结构犹如肺泡或耳朵，其中布满了玻璃和碳像素芯片，能充分发挥净烟作用，使能量自给自足。此外，两条植物拱廊覆盖整个椭圆长轴，收集雨水，并为展览中心和自助餐厅提供物流通道。在太阳能屋顶的下方是一个大型展览会议室，环绕着中心花园和植物净化功能的水族馆。毫无疑问，这就是新型生态城市和可再生能源实践的典

In Z, the factory of urban heating:

This monolithic and obsolete factory of the Compagnie Parisienne de Chauffage Urbain (CPCU) planted with its white smokestack pierces the horizon of the Buttes Chaumont. It is dedicated to disappear. According to the urbanism plan, it will be replaced by a building of housing and a public garden of 1500 m² enabling to relay out the bearing vaulting of the petite ceinture in art and craft shops. CPCU is integrated in the underground of the capital city. This company has helped all along the 20th Century to limit a part of the imports of fossil energy by producing urban heating (steam) and electricity from the cogeneration and burning of waste.

In XYZ :

At the crossing of the fluvial and train ways, the project Anti-Smog sets up in the heart of this vector with 3 directions. It is composed of two distinct museum entities with positive energetic results, which means producing more energy that they consume. On the one hand, the Solar Drop is a superstructure in polyester and in photovoltaic cells that treads the «Cage», the double bridge with metallic braces crossing the canal de l'Ourcq. On the other hand, the Winds Tower is a helical structure incrustated of wind machines fixed vertically in the future municipal garden on the edge of the water.

SOLAR DROP

On the railway, coming from the park of the Buttes Chaumont, after the crossing of the«Paris-Bestiaux» (the old transit train station of the bovine towards the butchery of la Villette), comes the crossing of the canals. Capturing under its curve the rail bridge of the canal de l' Ourcq, a great white drop with a 250 m² photovoltaic blue roof catches the sun rays to transform them in electrical energies. As a ship's body, it is built in polyester fibre reinforced with steel bends outlining its main profiles. The whole building is recovered by a layer of titanium dioxide (TiO₂) as anatase, which by reacting to ultraviolet rays, enables to reduce the air pollution. In the framework of the lay out policies and the development of a governance responsible of our territories, the Solar Drop, in addition to be an auto-cleaning building, will enable to absorb and recycle by photo-catalytic effect the cloud of unhealthful effects (Smog) especially coming from the intense traffic of the very close Parisian belt. The superior hemisphere presents a structure deploying itself in net where the alveoli or ears are filled up with glasses and chips of carbon pixels enabling the Anti-Smog to



范。“太阳能水滴”采用了玻璃地面，倒影波光粼粼的水面，显得晶莹剔透，犹如浮在乌尔克河上的巨大发光水滴。另外，“太阳能水滴”两侧的悬臂结构倚靠桥梁，犹如舒展的两臂横跨于运河之上。进入“太阳能水滴”有两层不同的通道：可以通过目前连接运河两岸的人行桥双向进入；第二个通道是在10m高处与风塔连接的人行桥。

风塔

风塔位于城市热能工厂所在地，内环线底部，呈螺旋形外观，高度超过45m。从透视图上看，楼板犹如丝带沿着控制塔栏杆缠绕着中央承重区。中央承重区覆着触屏及电子屏，不停显示着信息，控制着整个楼梯间和电梯。风塔之所以呈椭圆形，主要取决于塔的主轴需要顺应运河西南主导风向。玻璃层为自承重体系，其上为网状结构并与幕墙系统分离。第二层结构材质为聚乙烯纤维，被分割成蜿蜒的长条状，上覆植物垫层，沿轴布置50个蛋形风机。整个设计犹如垂直的花园，覆盖着绿植，焕发着勃勃生机。风塔顶部为空中花园，如同为这座大楼之旅划上一个句号。信步芳香四溢的花园，巴黎东部的全景尽收眼底。另外，这座风塔也能摇身变成螺旋形的停车场，可停放自行车及太阳能小车，实现最小占地，在巴黎老城中心缺乏铁路的情况下，形成直接连通双轨铁路的新路线。

净烟大楼是生态建筑试验的典范，“太阳能水滴”及风塔的建设使用了最先进的技术，实现自给自足的建设，其积极的能效不仅能充分发挥于大楼，而且能为维莱特第二湖两岸的夜间照明带来能量。更重要的是，这个项目能减少大气污染，吸附二氧化碳，提高空气质量。这是一个实践的项目，对城市有实实在在的影响。它与周围环境渗透交融，融合了气候、化学、运动或社会的元素，有力地减少了人们在城市环境中的生态足迹。（译/周清，校/李昭君）

be completely auto-sufficient in energy. Moreover, two planted arches cover the ellipsis on all its length and get the rainwater to provide for the logistical needs of the exhibition centre and its cafeteria. Below this thermo regulating solar roof, there is a huge exhibition and meeting function room organised around a central garden, a phyto-purified aquatic lagoon. It is a didactic place dedicated to the new ecological urbanities and renewable energies. It is full of lighting and seems in levitation on top of the Ourcq thanks to the glass floors that let the dancing reflections of the water glimmer on it. Actually, the cantilever structure that lean on the beams of the bridge stretches its two bows in the axis of the canal. The access to Solar Drop is organised on two different levels. First, a double entrance exists through the existing pedestrian footbridge along the “Cage” and linking both banks of the canal. Then, the second entrance by the vertical core or the banister of the Winds Tower gives access to the footbridge at 10 meters high making the hyphen to the Solar Drop.

WINDS TOWER

Located at the bottom of the vaulting of the Petite Ceinture, on the site of the factory of urban heating, the Winds Tower spreads its helical gallery on more than 45 meters of height. The scenographical ribbon unfolds along the banister in console around curved walls of the central bearing core. This core is carpeted of tactile and digital screens beaming the news continuously and containing the stairwell and the elevator. Also of elliptic plan, the main axis of the tower moves according to the one of the canal to take place in the direction of the dominating winds (South-West). Actually, its crystalline glass layer unfolds by an auto bearing layer in fishnet stockings and dissociated of the curtain wall. This second structure in polyester fibre is covered by planted cushions pierced of sinuous slits along almost fifty axial wind machines of Darrieus. The whole set looks like a harmonious vertical park with a vegetable dress in perpetual movement. On the top, the museum way ends with a suspended garden in the sky. With aromatic savours, this perfumed haven of piece offers an exceptional panoramic view on the Parisian East. This Winds Tower can also change into a silo containing a spiral of vélib or solar cars on a minimum of ground surface area on the pattern of the Smart towers. It would be thus directly connected to the double railway for new promenades without the railroad bowels of the city of Paris.

Anti-Smog is thus a didactic prototype of ecological experimentations. Solar Drop and Winds Tower implement the most advanced technologies in the auto-sufficient construction to better reveal the applications of the contemporary society. Its energetic results are positive and enable to assure not only the functioning of the centre but also the nocturnal lighting of the banks of the second Bassin de la Villette. Moreover, this project aims at reducing the atmospheric pollution of the area by capturing the CO₂ and thus improves the quality of the air. It is a play project, an urban and truly live graft. In osmosis with its surroundings, it is an architecture that interacts completely with its context that is climatic, chemical, kinetic or social to better reduce our ecological print in urban area! 