Skolkovo Innovation Center - District 11

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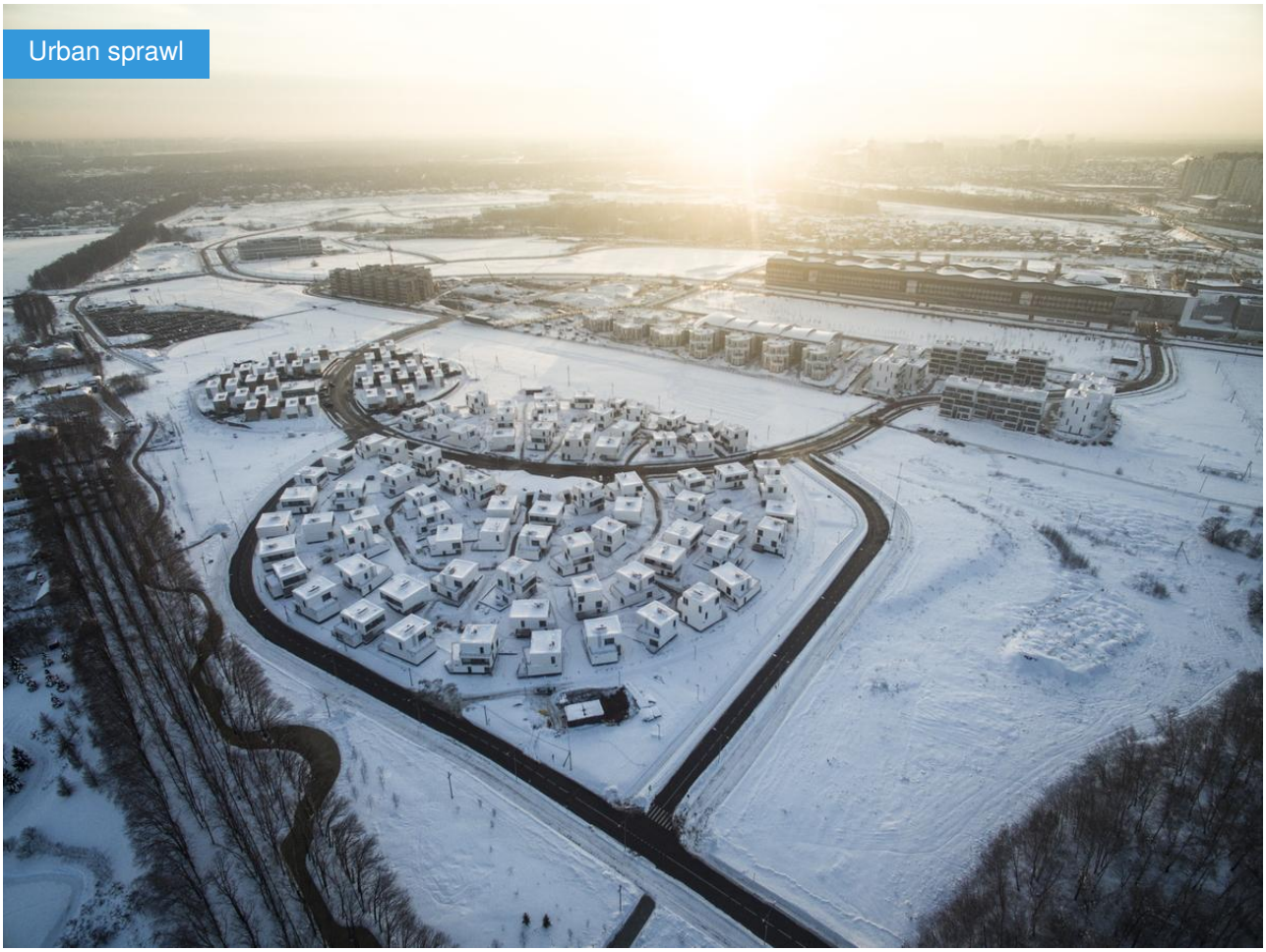
Urban sprawl



Address 1 - street : skolkovo DISTRICT 11, Russia

Population : 374 hab
Starting year of the project : 2015
Delivery year of the project : 2017
Key words : innovation, biomimicry, russia, smart city

Certifications :

46700 ha

25 959 000 €

ID CARD

The Skolkovo Innovation Center, also known as the Russian Silicon Valley,is a key Russian development project: a 460 hectare technology business area planned at Skolkovo, near Moscow, Russia. The strategic goal of the Skolkovo Innovation Centre is to concentrate international intellectual capital, thereby stimulating the development of break-through projects and technologies. The AAAB et associés agency is experimenting with a new approach of ecological town planning for this complex which will be housing researchers and their families in single family homes, providing them with a living environment that encourages

social interaction.

Much like penguins on an ice shelf forming a circle to share their heat, a hundred villas are grouped ten by ten in a vast clearing, surrounded by a waterway able to drain away the melting snow. The 'tortoiseshell' arrangement inspired the site plan, it allows a 5°C reduction in the temperature. By huddling in very tightly packed groups (8 to 10 per square metre) and only exposing their upper backs to the cold wind, penguins limit their heat loss. The intention is to create micro-communities organised around a central space that provides the atmosphere of a village square. All the low energy houses are different from one another, providing each occupant with his or her specific identity within this urban complex. Their modular framework design – initially intended to be in wood but finally constructed in concrete by a Russian contractor while retaining their planted roofs – permits the lowcost, rapid and diversified construction of the complex. Integrated into the topography, the public and shared services are located in the heart of the project providing a landmark for cars entering the site and a real social link for all the inhabitants. While respecting the continuity of the biotope, the project recommends soft modes of transport, the use of renewable energies, and the intelligent collection of water with conservation of natural flow rates.

Programme

- Housing
- Public facilities and infrastructure
- Public spaces
- Green spaces

Project progress

- Management phase
- Delivery phase
- Operational phase

Procedure type

- Urban développement permit

Key points

- Quality of life
- Economic development
- Mobility
- Smart city
- Resources
- Biodiversity
- Energy /Climate

Approaches used

- Others

Certifications

- Autre

More info

https://www.bechuetassocies.com/en/projet/skolkovo-innovation-center-district-11

Data reliability

Self-declared

TERRITORY

Type of territory

Creation of a new vast technology innovation centre in the suburbs to the south of Moscow. The intention of this centre is to be able to compete against California's Silicon Valley. Imagined by Vladimir Putin to resemble the famous Star City in the ex-Soviet Union and transposed to a universe incorporating all

leading edge technologies, this complex will house research and university laboratories, established and start-up companies, networking and seminar hubs, as well as friendly residential zones. On conclusion of a Russian competition, each district has been given to a different internationally known architect (Sanaa, OMA, Boeri, etc.).

Discription of the area

Climate zone

[Dfc] Wet subarctic, cool summer, severe winter

Land price

Land price : 556 €/m²

KEY FIGURES

Built surface on natural or agricultural spaces

Built surface on natural or agricultural spaces : 10 149,00 ha

Number of residential units

Number of residential units : 100

Total investment costs (before tax)

Total investment costs (before tax) : 26 000 000 € HT

Total of subsidies

Total of subsidies : 26 000 000 € HT

Detail of subsidies

The innovation center was financed primarily from the Russian federal budget. The center's 2010 budget was 3.9 Billion RUB. An additional 22 Billion RUB is planned for 2012 and 17.3 Billion RUB in 2013.

GOVERNANCE

Project holder

Name : OOO DAS SKOLKOVO

Type :

General description :
The Skolkovo fondation provide favorable conditions for research in most technological fields (energy, space, nuclear, biomedicine, computer science).

Project management

Description : In early 2010, the Russian President Dmitri Medvedev announced the creation of a vast technology innovation centre in the suburbs to the south of Moscow. The intention is that this centre should be able to rival California's Silicon Valley. Imagined by Vladimir Putin to resemble the famous Star City in the ex-Soviet Union and transposed to a universe incorporating all leading edge technologies, this complex will house research and university laboratories, established and start-up companies, networking and seminar hubs, as well as friendly residential zones. On conclusion of a Russian competition, each district has been given to a different internationally known architect (Sanaa, OMA, Boeri, etc.)

Project stakeholders

Agence d'Architecture A. Bechu & Associés

Function : Other

Architect

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Construction21 company page :

QUALITY OF LIFE

Quality of life / density

- The master plan and the clusters: optimal location of each house in accordance to bioclimatic principles assuring comfort during winter, summer and mid-season thanks to sun heat absorption and allowing natural ventilation, reducing wind speed impacts and thanks to green roofs the avoidance the "heat island" effects
- Reduction of motor vehicles dependency through the centralization of the parking at the cluster entrances and restriction of the access to the courtyards. The courtyard, without the presence of any vehicles, will allow more enjoyable and safer space for everyone. The "Shared Space" concept applied to the secondary road system and the courtyards follows a mobility prioritization: pedestrians, cyclists, motor vehicles. Instead of separating these fluxes, the proposal is to share the space, which is complemented by a progressive gradation between public and private areas.
- Constructive system based on cross-laminated timber elements, serving as structural walls, ceilings, and roofs. The advantages: - Renewable construction material, with low embedded energy levels - Healthy, comfortable room climate - Short construction period, dry construction method and quick occupancy - Weather-protected delivery of the pre-manufactured elements straight to the construction site
- "Blue & green weft": integrated and interdependent landscape, infrastructure, urban fabric and architecture design to achieve an attractive and functional neighborhood, providing wind protection, shade and improving users comfort, habitat for native species and ecosystems, carbon absorption, soil enrichment.

SOLUTIONS

- Urban densification
- Air quality

ECONOMIC DEVELOPMENT

TRANSPORT

Mobility strategy

If we convene that "making the city" is necessarily related to be anchored to a place, and that sustainable development implies the quantitative and qualitative rationalization of transportation and building, we can conclude that the answer is the compact town, the one which enables to live, enjoy and work in the same place: the City of Short Distances.

Mobility is a key factor to social cohesion and economic attractiveness: access to employment, education, shopping, leisure, and integration in social life are conditioned by the ability to move, in every sense of the term.

This multi-dimensional question is well apprehended by the Green Code. It is related to the interconnection of all paths, giving clarity and flexibility to the tissue, and to mesh the neighborhood to the territory through the pedestrian and cycle roads.

Our proposal incorporates these requirements and goes further by offering a street serving every cluster, accessible for services and security but with limited access for drop-off in every day conditions. Thus, the cluster courtyard becomes a "shared space" in which the car has the right to enter, yet the preferred use is to be a place of social coexistence. The purpose is not to ban motor vehicles, but to show the benefits of non-motorized links, until the use of the car is no longer an automatic reflex rather than the result of a real need.

It is for this reason that at the entrance of each cluster a "mobility node" concentrates all the following functions:

- 3 car-sharing parking lots
- 2 parking spots for other cars
- a bike shelter with electric bike chargers
- an automatic delivery installation
- technical room (counters, rain water supply, common workshop, etc)
- garbage disposal (central system terminal; containers for glass, electronics, bulky waste)

SOLUTIONS

- Soft transportation
- Parking management

RESOURCES

Water management

Run-off attenuation measures

Thanks to the implementation of a SUD (sustainable drainage system) no underground network will be needed, this includes a sequence of management practices and control structures designed to drain surface water.

The objective of the project is to limit the impact on the water cycle, multifunctionality is sought, i.e. the combination of urban and hydraulic uses is integrated in such a way, that they create a blue weft combined to the landscape weft.

The additional predicted volume of rainwater discharge caused by the neighborhood, for a 1/100 year event will be studied in order to be entirely reduced using infiltration and rainwater harvesting.

More than 70% of the buildable land will be permeable or designed to capture water runoff for infiltration on-site, using:

- Extensive vegetative landscape
- Wide use of permeable paving with porous sublayers with proper drainage
- sealed surfaces are reduced to a minimum
- Rainwater harvesting and reuse for WC flushing will help reduce the water runoff volumes. A freeze-safe system will be implemented for the green roofs' rainwater collection.
- A vegetated swale grid (the "blue weft") is designed to direct runoff toward reed beds for eventual depollution before infiltration on site.
- The outer "ring" will work as a holding pond at the end of the system during heavy rain periods, assuring zero runoff output to the area.

Drinking water supply

The offset of potable water demand will be obtained through:

- the use of water-efficient fixtures and fittings (dual-flush toilets, low-flow faucets for lavatories and showers, leak detector on the distribution network, counting meter, etc)
- Reuse of rain water for the WCs.

Snow management.

The « ring », serving as a storm pond during the rainy season, will become the snow storage area in winter. The paths leading from the courtyards to the ring will progressively hold the snow storage on their sides, till the amount of snow will need to be pushed towards the "ring".

Waste management

The master plan, with the interior serpentine street, easily allows the installation of a pneumatic collection system, where each cluster would have a collection terminal in the "mobility node". These could also include glass containers, electronic waste containers, etc., thus reducing any nuisance within the public space.

SOLUTIONS

- Water management
- Soil management
- Waste management
- Citizen-awareness

BIODIVERSITY

Biodiversity and natural areas

Our strategy: ecological continuity at the local scale and diversity of species

The proposed landscape design minimizes the need for irrigation and chemicals, and is based on climate-tolerant plants that can survive on natural rainfall quantities. It is attractive and functional, providing shade and improved occupant comfort, habitat for native species and ecosystems, carbon absorption, soil enrichment.

We also take in consideration that natural or semi-natural environments in a town can accommodate specific biotopes which have to be linked together to ensure their ecological functioning, that is a sufficient mixing of plants' and animal populations' genes. The concerned groups of species present a certain dispersion, beyond the physical barriers of the urban environment (streets, roads, high density lots ...).

Commonplace and mono-specificity are two risks in urban areas. These environments mostly host very ordinary flora and fauna, often invasive, or simply homogeneous. It is very important then to ensure diversity, especially in terms of flora, to attract a large number of animal's species.

Creating bushy shrubs and hedges Planting will be done with a width of at least 3m for dense hedges, composed of native shrubs, in order to ensure:

- A nesting and feeding support ground for birds and insects
- An ecological corridor actively participating in the movement of species
- Diversification of vegetation strata

Green roofs

The green roof contributes mainly to the permeabilization in urban areas (rainwater retention) and to avoid saturating the water runoff network during storms. But it is also an important resource for accommodation and reproduction of species.

Types of green roof:

- Intensive: designed for big size plants
- Semi-intensive: designed for ground cover plants
- Extensive: designed for plants of medium height, as permanent ground cover.

Nest boxes Integration of different birdhouses amidst green spaces

Limiting the risks associated to the development The lighting of lamps and other light sources at night is responsible for the direct or indirect death of many species (insects, birds, ...), and a change in the behavior of many others animals.

Protection measures:

- Limitation of lighting after 23 PM.
- Use low temperature sodium bulbs for outdoor lighting.
- Orientation of the beams below the horizontal

SOLUTIONS

- Management of natural areas
- Other

ENERGY/CLIMATE

Energy sobriety

Bio climatic architecture and passive construction

The master plan takes into account the sun path in order to maximize solar gain in each house as well as in each cluster, making it possible to enjoy sunny courtyards.

The way in which houses are oriented, having always a cold and a warm façade, allows for natural ventilation during summer and mid-season hot days, ensuring occupant comfort without the need of air conditioning.

The green roofs contribute to the outside comfort and to the reduction of the heat island effect through evapotranspiration, the numerous plants help refresh the air and keep down dust dispersion.

The compactness of the houses allows for an optimal performance of the envelope, suitable sunscreens complete this approach.

Passive construction – applied principles

- Reinforced insulation (U between 0,1 and 0,15 W/(m²K) : approximately 30 cm on the vertical walls, 50cm under the roofs
- Suppression of thermal bridges thanks to exterior insulation
- Good air tightness (n50 inferior to 0,6 h-1) : vertically and horizontally continuous air tightness membrane
- Triple glazed window (U windows inferior to 0,8 W/(m²K)
- Double flow ventilation with heat recovery, together with a heating coil coupled to the district heating, or a geothermal exchanger.
- Hot water through a local district heating network or through a geothermal exchanger
- The total primary energy consumption must be under 120 kWh/m²/year (including heating > 15 kWh/m²/y)

Energy mix

Renewable Energy

The SIC foresees is the installation of an urban heating network. Nevertheless this installation which represents a heavy investment, could not be up to date with

the time of the realization of our area. Therefore we have considered an independent solution which will allow emphasizing the functioning of the area, including immediately the spa.

We considered an alternative solution which would allow an immediate functioning of the area, including the spa, independently of the global heating network.

This solution is based in a local heating network consist in a combined heat and power (CHP) station with biomass boilers coupled to a Stirling engine, in order to produce heat and electricity.

The share represented by the spa, which relatively large heat demands, and the surrounding houses, which lower needs due to their "passivhaus" performance, allow optimizing such a facility, since the hot water needs will be fairly regular and will establish the basis of the network operation, thus ensuring a fast return on investment through the sale of electricity.

This solution addresses the challenge of bringing buildings' energy needs close to the available renewable energy potential on the nearby territory. Producing the energy as close as possible to the consumer helps building a resistant economic tissue.

The advantages:

- Flexibility, allowing optimal operation as soon as the neighborhood is built, without having to wait for the global district heating system.
- The spa's needs for hot water will allow optimizing the operation of the boilers in the summer.
- Compact, light maintenance.
- The system is self-financed by the sale of the electricity.

The performance of the CHP:

1. Integrated gasification combined cycle

2. Combustion chamber

3. Stirling engine

4. Hot water storage tank

Nevertheless, we have studied a third option: the use of a heat pump coupled to a geothermal exchanger, in order to produce the necessary heat for hot water and for supplementary heating. In this case the heating network could be avoided, making the houses completely independent, which would facilitate the neighborhood's building's phasing.

SOLUTIONS

- Climate adaptation
- Renewable energies
- Urban Lighting
- Low-carbon materials/ infrastructure
- Other

BUILDINGS

Buildings

The Skolkovo project consists of a set of 90 individual dwellings. Originally, the walls and floors of the houses were supposed to be built entirely of wood (rather than concrete), and they were also designed to be energy self-sufficient. The general energy source was in the central building, which also houses a spa and common room.

For the wood frame, we consulted the Austrian company KLH. Their calculations classified the design as meeting the LEED Gold standard.

The houses are designed based on 3 different room 'families':

- the living rooms on the ground floor
- the bedrooms
- the loggia rooms

We preview a maximum of 2 different components for each room family, and a maximum of 6 rooms per house. Using different assembly combinations, we created 9 types of house (all different in accordance with the sun's orientation). We ended up with 9 mini-districts, with the aim also being to create a different perception of each individual mini-district among the executives living in them.

Each district is made up of 9 houses arranged around a shared courtyard in which cars are prohibited. Each house has its own private entrance, terrace, and south, southeast or southwest-facing garden. The houses are raised 80 cm above the level of the courtyard, allowing them to handle up to 80 cm of snow in winter. Each private entrance therefore has its own ramp, a built-in feature of the landscape design (also handled by us).

To summarise:

- 90 houses
- 9 types
- 2-storey and 3-storey

- 3 rooms, 4 rooms or 5 rooms (disabled access is also available for each type, with the option of a ground-floor bedroom)
- 125 to 155 m² per house
- Wooden terrace on the ground floor/1st floor depending on house type
- Private garden of 150 to 200 m² for each house
- General heating provided by district heating and in-house radiators
- Triple-glazed aluminium/wood doors and windows
- Compulsory security door for all houses

When it came to installing the houses, their modular nature allowed us to predict the manpower and time requirements: 5 people, a crane and 2 days per house was the company's calculation for shell assembly.

Contest

Building candidate in the category

Sustainable City Grand Prize

Users' Choice

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