Future memories from the deep. An open artificial system for Kiruna

Virginia Sellari, Susanna Vissani,
Department of Architecture, Built environment and Construction engineering, Politecnico di Milano, Italy
susanna.vissani@gmail.com
virginia.sellari@gmail.com

Abstract. Thinking about an increasingly nomadic society that needs to adapt to the economic circumstances and to climate change, the dissertation aims to find a balance between anthropological and environmental needs in the extreme context of Kiruna. This city is an opportunity to imagine a possible spatial translation of a 'liquid' society. Its strong relevance in the contemporary scene is its floating in a perpetual condition of change and movement, until the necessity for its relocation due to the iron mine expansion.
The thesis moves from a deep analysis of Kiruna territory and passes through the research of the main constants that influence the foundation of cities. The project addresses the theme of the limit by creating an unusual relationship between inside and outside, natural and artificial.

Keywords: Urban Relocation; Strategy; Platform; Underground; City in motion.

Introduction

Nowadays, cities increasingly reveal their temporary and provisional nature, guided by rapidly changing forces. The world is not characterised by boundaries and borders anymore, but by networks and flows: flows of people, capitals, goods and information. In this state of affairs, the attempt to fix a stable order through architecture is not feasible anymore due to the unpredictability of the numerous variables, such as climate change, wars, and economic crises, which progressively turn people into global nomads (Aureli, 2013).
This 'forced' attitude to migration deeply affects the sense of inhabiting. It produces new meanings for identity, memory, and spatial belonging that need to be re-established and re-processed through the design process. We can say that cities are defective organisms that can work for a short span of time due to their intrinsic fixed character.
At present, this instability lacks an answer in the physical construction of urban settlements, leaving pieces of architecture built for a specific purpose (economic, energetic or industrial) the most exposed to abandonment and underuse.
The scope of our dissertation is to face this weakness in urban design through a strategic plan capable of recreating a continuous balance in the whole structure, while explaining the possibilities of keeping a city alive.
The city has been chosen as a case study in order to address possible answers to figure out the future spatial layout of this city encountering the identity of the place. The aim is to open new lines of research where «Kiruna will perhaps be a model for other cities in the world. One can for example imagine that climate change and a rising sea level will force cities to move to safer places. In that case our experiences in Kiruna can be of great help to people who work with city planning» (Kiruna, 2007).
Our research has been conducted using multiple methods and a variety of data related to the urban structure. Readings and articles create the theoretical background to build the knowledge of the place. The onsite visit was useful to understand the harsh environmental conditions, always taking into account the different territorial scales, from the very large Arctic landscape to specific site area. Interviews with inhabitants, local indigenous groups, miners and scientific guest workers, municipal officials and economic actors provided information about a territory shaped by continuous struggles.

Kiruna. A city in motion

Located on the northernmost border of Sweden, Kiruna lies 140 km away from the circumpolar line. With its extreme geographical limits, intensely cold climate, and natural landscape, this city emulates visions of towns situated at the edge of the world. Kiruna is part of such an unmitigated nature where clear signs of industrial landscape show pervasive changes brought about by Man.
Born at the beginning of the 20th century as a small mining village, Kiruna is today a city of 20,000 inhabitants where the iron mine represents the most important economy. Its dimension has now reached the same extension of the city itself with a depth of 1,175 m in the Earth.
The iron mine is the predominant feature from every viewpoint: its sight is external for those arriving in Kiruna and internal for those who live there. What its inhabitants are witnessing is a kind of slow-motion earthquake: the soil deformation produced by iron extraction is gradually subsuming a large area of the town endangering the stability of buildings. For this reason in 2004 the municipality, under the influence of the mining company LKAB (Loussavara-Kiirunavaara Arktiebolag), decided to relocate almost the entire town[1].
Kiruna is part of a "mining cities archipelago" including open mines and other drilling sites situated throughout Lapland. We can say that the *genius loci* of this city and this territory is *oeconomicus* and largely derives from a capitalist attitude, namely the exploitation of soil resources and their trade on the global market. LKAB deeply influences the town and its population, in terms of numbers. When the demand for iron is high, the city's population too grows; and when the economy slows down, the population too decreases. This shows how the two entities are interrelated, and how the economy has a real effect on urban structure. The symbiosis between the mine and the inhabitants is obvious even according to the local saying, "Kiruna catches a cold if LKAB sneezes" (Nilsson, 2010).
In Western history, the engine of a city has seldom stopped working, reminding us that cities can die, leaving post-human and deurbanised territories.
In "Apocalypse Town" (2012), Alessandro Coppola describes the history of the city shaped by capitalism as part of a consolidated script. A violent external shock strikes the city, producing a very sudden conclusion of its existence. The subsequent dispersion of a large part of the population concludes the plot definitively. The end of cities such as Detroit, Cleveland and Flint was not sudden but, on the contrary, a long agony capable of producing a huge amount of ruins, both social and material (Coppola, 2012).
The question is if and how this plot can be turned into something different, making it possible for citizens to live in Kiruna even when the mining era draws to a close.

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01 |

01 | Kiruna, panoramic view, image by Virginia Sellari and Susanna Vissani

Kiruna is now witnessing a phase in which the rhythm of the city and the rhythm of the mine are disconnected. They work at different times, and the symbiosis that characterised the first century of its history is currently lost. In a city built in such a harsh environment by a ruthless builder (capitalism), and where the prevalent engine is the mine, what would happen if the engine stopped working? Would the entire city come to a halt?

The project attempts to answer these questions by imagining a different urban structure in which flows, movement and adaptability are the interpretational keys, and in which the traditional 'figures of speech' – the street, the square, the façade – will turn into something different.

The operation of 'moving' Kiruna is not only a pure process of replacement. It also represents the opportunity to think about a new city model: re-shaping its identity, yet maintaining the ability to be the physical support for community life.

The goal of this research is to face the above instability with a strategic plan capable of recreating a balance in the whole structure, even if it is continuously disturbed by external forces. By now, building urban resilient strategies is an unavoidable necessity for our contemporary and future agenda.

«Our time is experiencing a new season in which architecture is no longer the construction of city but, like a new branch of physics, the outcome of the dynamics of force fields in perpetual motion, that precious professional alibi of the architect – the mystical 'spark' of inspiration – is obviously outdated. […] His task is truly impossible: to express increasing turbulence in a stable medium» (Koolhaas, 2016).

Starting from this assumption, the new urban paradigm for Kiruna is a city designed as an "open artificial system". "Open" because it can be freely adapted and is accessible without restrictions. "Artificial" is related to its character of being completely man-made, ruled by a rational logic. The "System" is linked to its individual parts' ability to work together as parts of a mechanism.

The project between nomadic and sedentary attitude

Kiruna is also a place dense with territorial struggles between different forces: underground iron extraction and surface instability, anthropic and natural environments, silence and mine deflagrations, sedentary and nomadic habits. The expansion of the mining industry and the construction of the city itself destabilised free movement of the nomadic Sámi tribes across Lapland.

The Sámi are indigenous groups who have inhabited the northern Arctic and sub-Arctic region for at least 5,000 years. These people, along with other ethnic groups, lived by reindeer herding for several centuries, and they traditionally used to travel across the region following the movement of the herds through the valleys and waterways characterising this landscape by being geographically distributed in parallel strips. They live in a territory that is not related to a specific nation, moving across Norway, Sweden, and Finland, so they do not perceive the stability of State borders (Borchert, 2001). The habitation of Arctic landscapes seems to blur the notion of city life and boundaries into something that we might call "extended Arctic urbanity" (Hamdouch, 2017).

The inhabitants define their urban lives in a more extensive territory than the physical limitation of the actual city. This concept is also valid in Kiruna. The city itself rests in a vast landscape, with the nearest city situated 120 kilometres away, which means that the inhabitants are continuously interacting with their surroundings - through their cabins, leisure activities, harvesting the land's resources – and thus softening these borders (Johansson, 2010).

Their everyday practices shape this environment, and the life of each inhabitant is mutually influenced by the landscape and its coexistence with the city. Hence, the conflict is not just between local culture and international capitalism but, instead, also involves two types of economies and their very different approaches to land use on which both depend (Forrest, 1996).

Around Kiruna, a particularly important reindeer's route is being

02 | New urban system composition, image by Virginia Sellari and Susanna Vissani

| 02

deviated by the construction of the new railway and, in general, Sámi needs and their idea of space are not taken into account in the general planning of the territory (Borchert, 2001).

This blurred nomadic concept of the territory contrasts with the traditional Western way of approaching space. Setting borders in order to identify man's own space from the uncontrolled outside is something close to Human nature. As explained perfectly by Hannah Arendt in "Vita Activa", the structure of the *polis,* allowed by the physical construction of the walls and structured by its rules, is a sort of "organized remembrance" (Arendt, 1989). In this vision, the walls represented not only a protection from the outside but also from the non-place, from the non-being. So we can say that inhabiting a city also meant an act of identification. In our Western culture, the space is defined by walls, boundaries, and properties, and the city is designed with a specific centre.

This digression about the limit is meant to understand if the concept can have a contemporary meaning, a new relationship with the territory, not immutable anymore but undergoing continuous modification and adaptation. Our research tries to investigate the possibility of inhabiting the threshold by reaching beyond its traditional meaning or, as in the nomadic culture, our space should have a direction and not a centre.

In the modern era, linearity has substituted the punctual aspect. We see flows as the primary element defining our cities' structure. This assumption is particularly evident in the Plan Obus by Le Corbusier for Alger (1933) where the city is an infrastructure in itself, and the urban space is completely translated into a high speed movement facility: an elevated highway containing residences beneath it. In modernity, the infrastructure is not an essential means of transportation anymore but a place to inhabit. The city, finally, acquires its appearance.

The flow is what draws contemporary society closer to a nomadic attitude, where movement on a local and global scale is the motive. In our narration, we took the infrastructures as a fundamental element for the foundation of the contemporary city.

Nomads move through the landscape using the longitudinal valley lines designed by the water system that are now contrasted by industrial infrastructures (railways and highways) connecting the region for mining purposes and cutting those strips in a transversal direction.

These two systems highlighted at the regional scale are maintained in Kiruna: the continuous natural one of the Torne river and the industrial infrastructure of the highway E10 are getting closer to each other, running concurrently from Kiruna to Vittangi and connecting four different mines along their longitudinal journey. We decided to place the new city at a hinge between the river and the highway E10 in the area where their distance is at a minimum in order to exploit their potential on both sides.

Inhabiting the threshold: a new paradigm for dwelling

Today, the past model of concentric, centralised and dense city typical of the European scene have revealed their fragilities. Moreover, we are facing a territory that has never had real centres but scattered communities organised on the force lines of the landscape. This dispersion can be potentially used as the basis to define a new formula to inhabit the land, working through distributed polarities in strategic nodes capable of dismantling the dichotomy between centre and periphery.

In our idea, the new Kiruna would be a composition of different 'moments', each one with its own identity, capable of fulfilling the needs and desires of a mixed culture and of people with different degrees of nomadism. Those different elements work and communicate together in the same 'tray', generating a complex system but avoiding marginalisation of the parts.

Taking into account these territorial vocations, we organise the entire system following the principle of a "dispersed concentration", where every structure is linked to economies that are already active in the region, and have a main relevant profile:

- scientific;
- leisure;
- productive;
- civic;
- touristic.

These horizontal 'skyscrapers' of mixed functions are capable of blurring the private sphere with the public one.

Projects such as the Non Stop City of Archizoom (1970-71) and the Fun Palace of Cedric Price (1961) provided the background to define the design principles following the idea of a city as a continuous structure, free from architectural types, organised following changing forms of social aggregation: a social interactive machine to accommodate different trends, events, and necessities.

The decision to place the city structure underground was crucial for the design outcome. It was a gesture that solved multiple issues; first of all, the problem of facing the harsh climatic condition, secondly,

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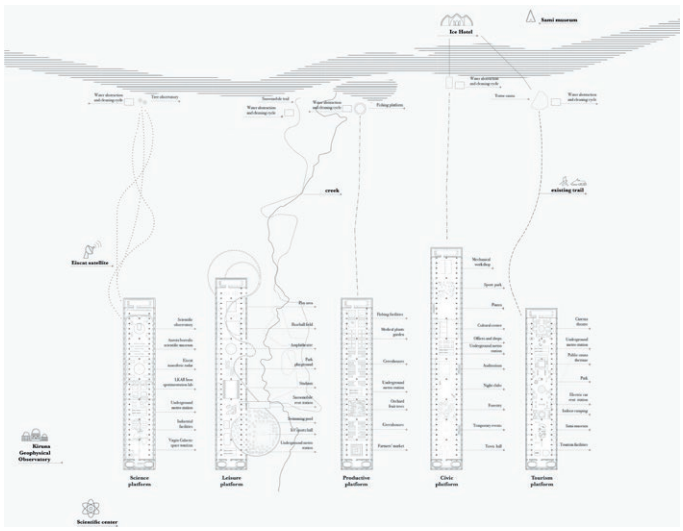

03 | Plan of the underground city platforms, image by Virginia Sellari and Susanna Vissani

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04 | View from the ropeway of the underground city, image by Virginia Sellari and Susanna Vissani

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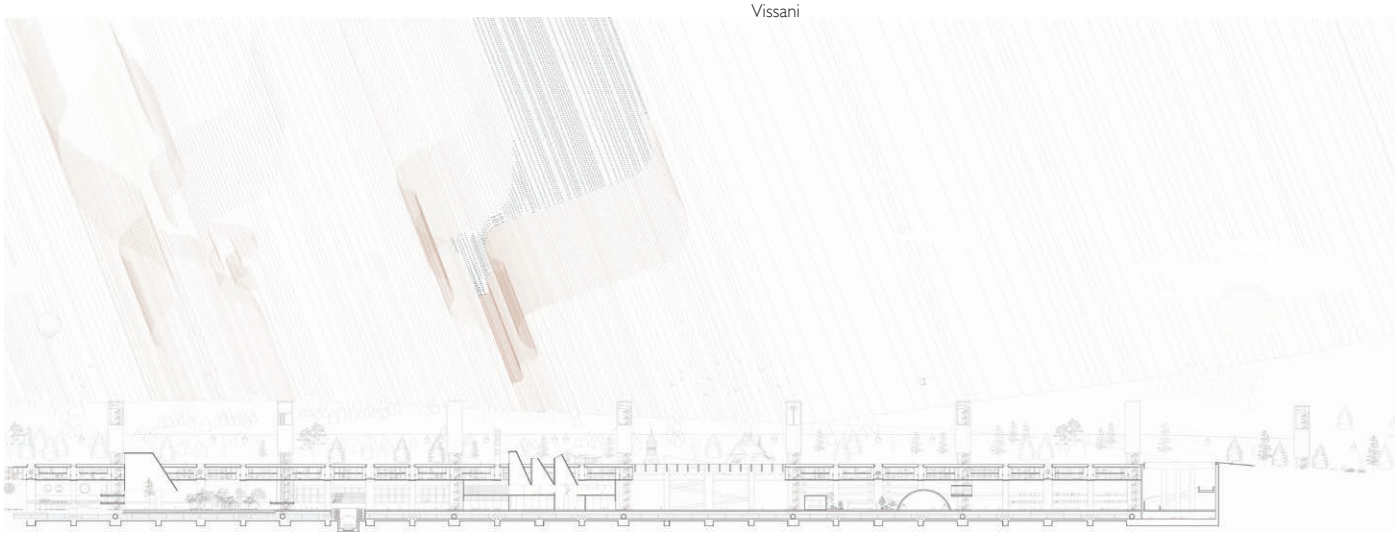


05 | Sample section of the underground city platform, image by Virginia Sellari and Susanna Vissani

to protect the millenary reindeers' migration paths and, above all, to handle the issue of soil consumption hiding architectural skeletons under the soil surface, if and when the city will be abandoned. Building a genealogy of underground facilities already present both in different environments was essential for the work. In the Arctic region, the Svalbard Global Seed Vault is a contemporary valid example of how a scientific facility can be built underground to preserve valuable collections and archives from possible man-made catastrophes. We can also find examples of underground systems of public spaces in Montreal and Toronto where a multi-level network of tunnels connects various activities and functions (shopping malls, underground stations, offices, hotels, schools, concert halls, and restaurants).

Also in the past, underground architectures were either built to assure climatic response and defensibility, or they were linked to symbolic and religious aspects. They act against the harsh climate of the desert in Matmata (North Africa) or the cold winter in the Henan province (China), and respond to the defensive issue in Derinkuyu (Turkey) where the hypogeum city structure was thought to be completely autonomous with all services.

In our vision, the urban life is happening underground, whereas the surface is left permeable and undisturbed to the Arctic extreme wildlife. The two worlds, opposed in terms of image and rhythms of life, work together in building a new model for future urbanity. In the suggested plan, we decided to create a structure where balance is obtained by overlapping different ways of living to allow different economies to operate well independently.

Those massive underground organisms highlight their presence with the element of threshold. Covered by shrubs and tundra, the only evident structures from the upper natural surface would be skylights, gates, towers and landmarks, both new and monuments taken as memories from the previous city.

Towers will not only allow vertical circulation between the inside and the outside, but also the horizontal one extending towards the Torne river using the ropeway[2].

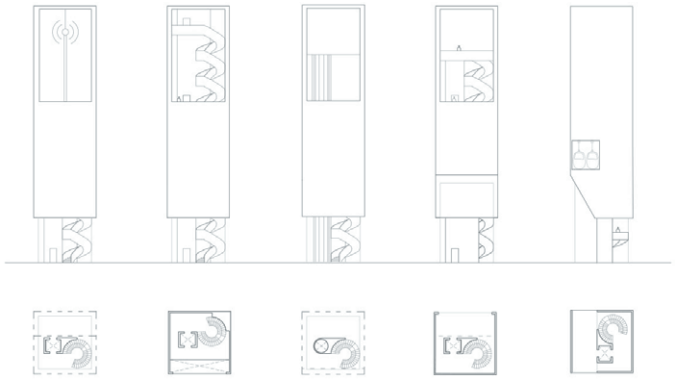
Inhabiting the underground is translated into a matter of layers, overlapping activities, and users. In all the layer plates, a free use of space is permitted through the idea of open permeability.

Scattered fixed partitions operate as tools to access basic services, like electricity, water, heating, and sewer systems.

06 | Typological samples of towers, image by Virginia Sellari and Susanna Vissani

07 | Bird eye view, image by Virginia Sellari and Susanna Vissani

08 | Domestic level plan, image by Virginia Sellari and Susanna Vissani



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Results and implications

This research studies the contemporary concept of inhabiting a territory. Starting from a conceptual point of view, without going into technical-constructive aspects of the city's structure, the project comes to a specific experimental solution by moving towards flexible and adaptive urban design. The limits of this research together with its strengths are related to its utopian and site-specific nature, whereas its strength is to address the theme of the resilient city from an unusual point of view by developing a new consciousness about it.

The "European Commission" states: "A resilient city assesses, plans and acts to prepare for and respond to all hazards – sudden and slow onset, expected and unexpected". The design strives to improve the resilient quality of the city of Kiruna by creating a flexible structure that responds to changes, creating a precedent for other similar situations and a response to the future post-industrialisation and post-capitalism transitions.

The design outcome has its roots in a broader background of underground architectural heritage and in the potentiality of the Arctic to be a new frontier. In the future, climate change will transform millions of people into "climate migrants" escaping water scarcity and sea level rise. In this perspective the Arctic could become a new place to inhabit. The process of relocating Kiruna is an experiment on an unprecedented scale, and it perfectly expresses how economic interests can shape the balance between the city's environment and the memory of a community. The implications of this gentrification tendency have to deal with the mass of the intangible remains of an entire community (Internazionale, 2016).

In such an extreme, problematic, temporary, and changing environment, we approached the project starting from the assumption that we are operating in an emergency situation, faced as such. But at the same time, the idea is to bring this specific situation towards a more general context. The project aims to find a physical answer to the precarious and uprooted condition of our time by establishing a logic and a process more than a fixed shape, avoiding the repetition of the same crystallised typologies of the past.

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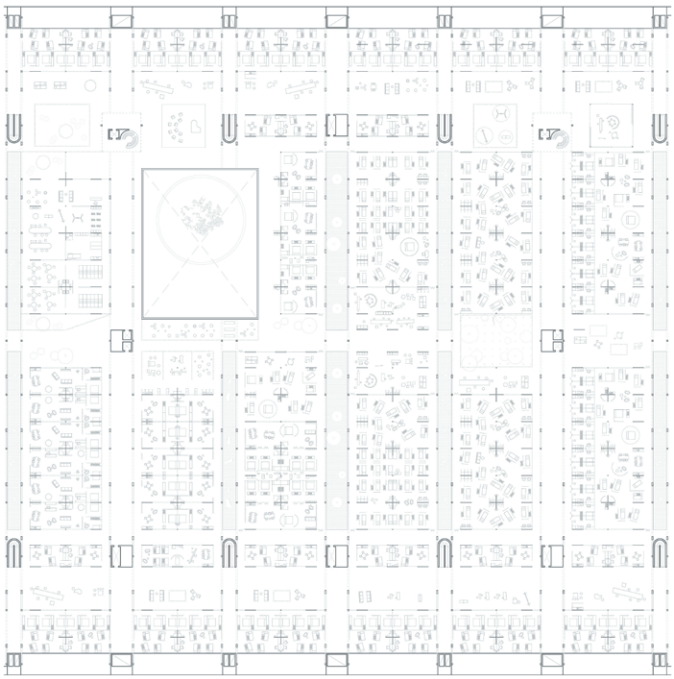

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NOTES

[1] The new city of Kiruna is currently under construction following the design of the international competition winning proposal of White arkitekter studio. The plan consists in gradually shifting the city two miles eastwards. Their structure for the new city is very close to the modern European concept composed of regular blocks and boulevards where nature's fingers penetrate the city.

Moreover, according to the LKAB and municipality predictions, the mine will be operative until 2030, more or less the same year in which the end of the urban transformation is expected, leaving the open question of future leading economies for this town.

[2] The Torne River is a significant presence both for inhabitants and tourists. During winter it becomes an infrastructure for snowmobiles and dog sleds.

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