

Comparative Study of Urban Form of Colonial Cities as a Method: Case Study of Quebec and Krasnoyarsk.

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Abstract

Methods of urban morphology offer an opportunity to develop holistic approaches to sustaining heritage cities, which address local cultures and identities, through analysis of the evolution of place and its interpretation in spatial and architectural practices. Particularly, the dialectical relationships of elements of urban form on different scales or instances of the same element can be investigated. For example, the structure of plots is a result of the sequence of transformations, description of the history of the part of territory: multi-level diagrams with a representation of the chronological sequence of structural development could be a key to the logic of a dynamic process, even when the urban fabric presents an orthogonal grid. In fact, in these cases, we can recognize the process of transformation of the urban fabric throughout the hierarchically produced order between the roads that have come to be determined over time (readable in the arrangement of the entrances of the buildings, in the distribution of commercial activities, the height of building and largeness of the street). However, there is a difficulty in finding the key specificities of a particular piece of urban fabric, especially for specialists who investigate their indigenous environments (which they take for granted), at the stage of familiarization with the method. The paper illustrates the evidential efficiency of the comparative method, presenting the intermediate results of the ongoing comparative morphological case study of the development of an urban form of colonial cities Krasnoyarsk (Siberia, Russia) and Quebec (Canada), which were both established in the 17th century in a similar climate, and have clear morphological similarities and evident differences. The first could speak about objective features inherent in the construction of cities, regardless of the socio-political and economic context, the second can indicate the unique specificities that are most characteristic of the place under consideration.

Keyword: reading urban form, morphological identity, planned cities, Krasnoyarsk, Quebec

Introduction

History is inscribed in urban tissue: the understanding of logic and specificity of a dynamic process (Caniggia and Maffei, 2001) helps to develop heritage cities, which address local cultures and identities. However, there is a difficulty in finding and explaining the key specificities of environments, usually taken for granted by indigenous researchers. A comparative reading of dialectical relationships of elements of urban form of cities, which emerged in similar conditions, may potentially help to reveal those specificities. The paper presents a part of the doctoral thesis, a general preliminary overview of the ongoing comparative morphological case study of the development of historical cores of colonial cities Krasnoyarsk (Siberia, Russia) and Quebec (Quebec, Canada), which were both established in the 17th century in a similar climate, and have clear morphological similarities and evident differences. Primary historical studies of both cities

along with numerous maps already exist and have been published for Krasnoyarsk (Bykonya, 2013; Merkulova and Merkulova, 2013; Gevel, 2012; Tsarev, 2012; Ogly, 1980; Ruzhze, 1966, etc.) and Quebec (Després et al., 2015; Larochelle and Gauthier, 2003; Larochelle, 2002; Larochelle and Lamandi, 1999; Després and Larochelle, 1996; etc.), and largely informed this comparison. This paper focuses on the formation of space that is guided by its internal constraints and potentials of the particular morphological system, taking into account also the context of this formation.



Figure 1. Quebec city (542 298 people) and Krasnoyarsk city (1 066 934 people): locations. **Figure 2.** Quebec (1) and Krasnoyarsk (2) city centres (the area of research, in scale).

Quebec and Krasnoyarsk: context.

Figure 3 demonstrates a comparative overview of political regimes (graph 1), the roles of the cities (graphs 2), dominating modes of production and economy (graphs 3) and key events (graphs 4). The red color scheme is related to Krasnoyarsk, grey - to Quebec. Both cities were the products of colonization of the beginning of the XVII century, served military purposes, while the reasons for settlement creation were trading, defence and resources. Quebec was founded by a French explorer Samuel de Champlain, in 1608; Krasnoyarsk - by Cossacks in 1628 as a military fort in Siberia. In pre-industrial Quebec, inhabitants traded their farm surpluses and firewood, later furs, for imported goods at the two city markets; a similar situation was in Krasnoyarsk. Wooden Krasnoyarsk was almost totally destroyed by fires in 1773 and 1881; a fire in 1682 destroyed the first generation of wooden houses in Quebec. Today Krasnoyarsk is the large industrial and administrative centre of Krasnoyarsk Territory and an important node on the Trans-Siberian Railway, hosting regional government. Since 2001, Quebec has been one of Canada's most prosperous cities with developed industries and service, an important port centre and regional government's host. External migration historically became a key factor for the growth and cultural development of both cities. (Fig.3)

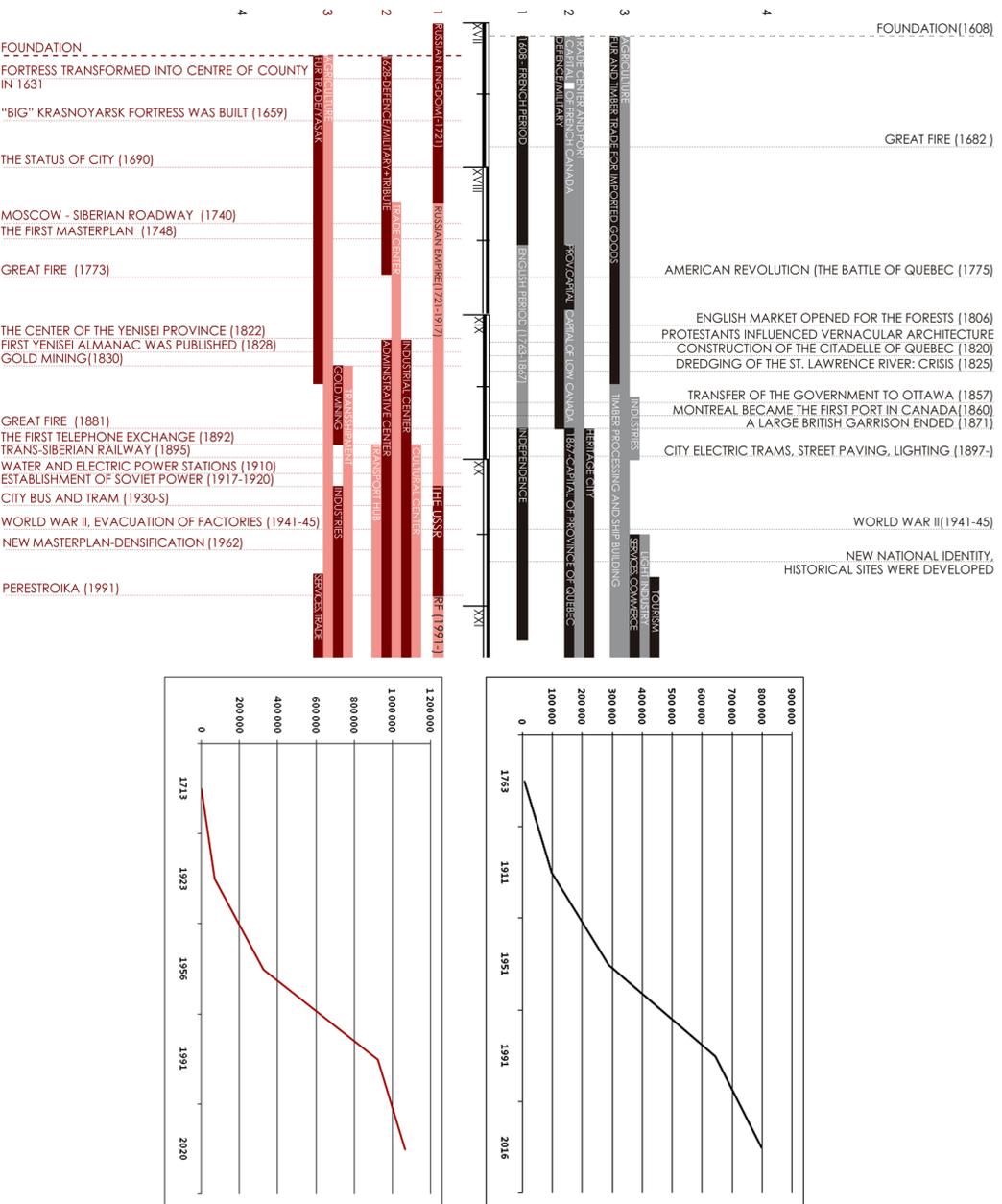


Figure 3. a - factors of development of Quebec and Krasnoyarsk, b - population growth

Methodology

The detailed factor-by-factor comparative morphological analysis (Moudon, 2019; Caniggia and Maffei, 2001; Conzen, 1960) was the main method of the given research. Scaled historical maps of Krasnoyarsk and Quebec were progressively placed under the current cadastral maps of historical centres of both cities to define urban evolution stages. The sets of 16 maps of Krasnoyarsk and 28 maps of Quebec were provided by the local archives, museums and universities. Maps were re-scaled and distorted to assure the graphic unity and consistent language of maps, the irrelevant information was removed from maps to highlight the essential features of the urban form evolution of the cities. The importance of careful redrawing the original cartographic sources was proved by many specificities of urban development, which were found in the process of redrawing: the method is considered an effective analytical tool by researchers (Oliveira and Pinho, 2006).

Results and Discussions

Connection with nature and landscape. Climate.

The climate of both Krasnoyarsk and Quebec is humid continental; both are going through four different seasons, short springs and falls, warm or hot summers, cold, windy, and snowy winters, while in Krasnoyarsk average low temperatures in winter are lower. Humidity in Quebec is significantly higher (1190 mm vs. 450 mm); in both cities, snow usually stays on the ground from mid or late November to mid or late April; the highest recorded temperature in both Quebec and Krasnoyarsk was officially +36; the coldest - -36.7 °C in Quebec, -53°C in Krasnoyarsk. Thus, climatic characteristics are quite similar, except for winter temperatures and humidity. The first fortresses of both cities were located on high terraces, near the confluence of two important rivers, one of which served the purpose of an important waterway (the Yenisei in the case of Krasnoyarsk and Saint Lawrence in Quebec), connecting the new fortresses with the important remote settlements. Placed on the natural platform, historical cores of both cities followed their contours (Fig.2). The scales of the initial settlements were also comparable, the radius was approximately 500 m: presumably, convenient distance for such conditions. The initial Krasnoyarsk had spontaneous layout, which followed the terrain and functions: in 1775, city stopped at its western border where the entirely flat terrace ended. Until the end of the XIX cent., Krasnoyarsk developed in a compact manner within the existed terrace, while Quebec started to grow beyond the natural platform before filling it, at the beginning of the XIX cent. The current total area of Quebec is more than 480 km² (> 540 inhabitants), while in Krasnoyarsk is 348 km² (> 1 million inhabitants). Thus, Krasnoyarsk is a more compact city, currently due to its infrastructural specificities. The correspondence of urban form of settlement and initial relief is visible also in details: for example, the location of vaults in Quebec and 'podklet' houses in Krasnoyarsk was linked to the topography between a lower and a higher level (Santos & Dufaux, 2020).

In the XVII century, Yenisei river was the only "road" to the Eastern Siberia (Bykonya, 2013); the St. Lawrence River was important for the colonization of New France: it was the only axis of penetration towards the interior of the continent from the North Atlantic. In Quebec, the division of the territory was intended to ensure the optimal access from the river (Larochelle & Gauthier, 2003) (Fig.4). The peripheral emptiness of the river banks characterized the first centuries of Krasnoyarsk, several temporary peasant estates existed on the lower bank and later disappeared; on the contrary, in the early Quebec, the sustainable historical settlement was located on the lower terrace of the cape, under the cliff on the river bank. At the moment, in both cities, parks and walking areas near the bank of the main river are located. In Krasnoyarsk, the division of the city was also orthogonal to the river, corresponding to the N-S and E-W directions, also to avoid "wind corridors" in winter. In this respect, the Military camp in Krasnoyarsk is of interest: its orthogonal grid is oriented similarly to the grid in the city centre, while the grid of the surrounding areas is oriented accordingly to the main direction of winds (the direction of the runway of a

former airport located nearby dictated the direction of the main streets of new neighbourhoods), which makes this area uncomfortable. (Fig.4).



Figure 4. Quebec (retrieved from (Larochelle & Gauthier, 2003)) and military camp in Krasnoyarsk city. Land division.

Polarities. Nodes.

Both cities began as colonial fortifications and trade centres: poles were filled with corresponding functions - trade, defence, ideology (religion), administration and reflected the collective mission and values of the state significance. In both cities, the main polarity is still associated with the location of initial settlement, survived through times in a complex of specialized buildings; it has a symbolic value as the founding site, having been directly influenced by changing collective systems of significances at the same time. In both cities, new parliament appeared near the former urban fringe along with the second main polarity with the city grew to the west (anti-polar/polar transformation). Main specialized buildings were "stretched" along the main (matrix) road, forming also linear polarities (Fig.5 maps 3-4). With the city growth, the system of nodal points was developed, signifying the increasing importance of everyday life of communities and following the complication of an urban organism. Structurally, almost all new developments continued the established formative process with its system of nodes and poles (Fig.5 maps 3-4).

Urban structure.

Both cities started their development spontaneously. In Krasnoyarsk plan of 1748, forming process (Caniggia and Maffei, 2001) is visible: the middle, most straight and wide road, which goes from the small fortress to the western city gate, with the frontal plot sides oriented to it, could be considered "matrix", the orthogonal - "building roads", opposite ends of which are connected by "connecting routs" (Fig.5). The road, which connects the pole and northern city exit was another "matrix". In Quebec, authors distinguished three categories of routes, determined by agricultural division: rectilinear courses, broken orthogonal courses and curvilinear courses; the routes can belong entirely to one category, or certain segments can alternately belong to different categories (Larochelle and Gauthier, 2003). The elements of regular masterplan first appeared on the maps of Quebec in 1716, continuing the existing spontaneous structure, which was gradually logically included into a more regular grid, while in Krasnoyarsk regular orthogonal grid completely changed the existing spontaneous settlement in 1775, preserving at the same time general logic of space. Morphologically, planned city is a case of urban organism, it contains a degree

of organicity: in Krasnoyarsk, organic elements were grouped into the serial composition (Caniggia& Maffei, 2001). In Quebec, regular layout continued to grow and become more explicit in the English period, mostly outside the city walls. Socio-political changes affected urban form: an increasing regularity in masterplan could be considered a symptom of state centralization and a statement of colonization (In Quebec, the English colonial period). The configuration (prolonged rectangle) and composition of a regular grid in Krasnoyarsk and Quebec are comparable in newer morphological regions, while the size of block in Krasnoyarsk is much bigger; in Quebec, a regular configuration of new regions is visible, while historical part remained spontaneous and relatively untouched. The current central part of both cities relies on three main roads (including "matrix", connecting historical core with contemporary centrality), the space among them is filled with highly specialized dense urban tissue with characteristics of centrality (Fig.5).



Figure 5. Maps 1,2 - Quebec in 1742 and Krasnoyarsk city in 1748; maps 3,4 - current Quebec and Krasnoyarsk.

Matrix roads.

Originally interurban roads became the parent routes of the new urban fabrics, turning into internal main streets and unifying axes of the new districts; such roads often connected the main polarity with the city entrances. In Krasnoyarsk, Mira street was an interurban "trading line", now it constitutes the history of a place, connecting the centre of centres with other localities. In Quebec, the originally interurban path (today Saint-Louis, Grande-Allée, Chemin Saint-Louis and boulevard Laurier) constitutes a nodal line of major importance, matrix: it joins in a straight line the Place d'Arms to the peripheries (Larochelle and Gauthier, 2003). The buildings built on its margins bear witness to the history of the Capital. Mira in Krasnoyarsk is now shorter and doesn't directly connect the centre with the metropolitan area, not any

more serving the purpose of metropolitan transit road, being interrupted near the musical theatre. This changed the initial meaning of the road but preserved its local significance and its image of historical walkable lane and concentration of heritage. The first period of Grande-Allée was formed with villas, building type built on large plots, surrounded by gardens and outbuildings, and located at a distance from the road. Several plots, originally occupied by villas, are now occupied by institutional or administrative complexes, or residential developments. Similarly, in Krasnoyarsk, the matrix road was marked by the orientation of facades of the individual mansions, which were later transformed into specialised buildings.

Secondary streets.

In Krasnoyarsk, the secondary roads, perpendicular to the "matrix" (N-S direction), corresponded mainly to the side edges of the newly drawn plots. In the second half of the XIX century, some of them obtained the specific importance, and their spontaneous trade, administrative, commercial, etc. specialization increased; streets developed due to the development of secondary nodes and poles, which were marked by the concentration of specialized buildings (ports, railway stations and large industrial enterprises, etc., most of them still exist); street names reflected the collective identities of communities. The inequality of streets was marked by the presence/absence of pavement and stone-made buildings. The location of some primary streets was determined by the former location of important elements, for example, city walls before the revolution of 1917. The development of streets of Quebec also demonstrated specificity: first, linear growth along the main roads, and after - gradual filling of agricultural lines, while building roads went parallel to the matrix (P. Gauthier), contrary to the classic model. Thus, secondary roads mainly express local specificities of both cities.

Interurban expressways.

Certain routes, at the beginning only local, became either a "collector" in the network or integrated into a new important route, which gives access to the hinterland. The position of a current expressway - Veinbauma street corresponds to the western border of the Krasnoyarsk city of the 1770s. In Quebec, similarly, the modern highway (Avenue Honoré-Mercier/Saint-Sacrement) intersects the historic part of the city along the former city border. The place feels like a discontinuity, a "wind wall" for pedestrians, separates the city and negatively influences walkability and permeability. In Quebec, restructuring pathways Boulevard Charest, boulevard René-Lévesque were designed without anticipating the healing mechanisms of the traumatized urban fabric (Larochelle and Gauthier, 2003). In Krasnoyarsk, due to the lack of funds, the radical restructuring processes were quite rare, and similar handmade "borders" are carefully adjacent to natural borders (Bryanskaya street). Essential factors unite expressways Champlain in Quebec and Dubrovinskogo in Krasnoyarsk: typically, both are passing along the banks of important rivers, along the heritage zones and the central parts of the cities, both need for facilitating access to the water; have low permeability, located between two natural urban barriers close to each other (the cliff to the north and the St. Lawrence River to the south in Quebec; in Krasnoyarsk, the road passes alternately along

the lower part of the embankment, then along the upper part, keeping the Yenisei to the South). New types foreign to the local culture, which inevitably lead to a state of crisis, highways are non-convertible into intra-urban roads with the growth of the city, they are indifferent to the territory and history, cannot constitute public space (Larochelle and Gauthier, 2003).

Fringe belts and peripheries.

The riverbanks of both cities initially corresponded to the peripheries, hosted warehouses, industries, docks, etc with the exclusion of Place Royale in Quebec, which bears the symbolic value. In the XIX century, in Krasnoyarsk, the transformation on the "anti-polar" riverbank of Yenisei began: it was transformed into an embankment with a significant road and specialized buildings. At the beginning of the XIX century, central park and adjustment territories in Krasnoyarsk were an urban outskirts with military camp, churches and cemetery, intended to be transformed into the new centre; however during WW-II industrial objects were placed along the chain of squares and parks, reinforcing the anti-polar character and the "fringe belt" behaviour. In Quebec, the city walls were preserved along with a "fringe belt", which still exist in the form of a park, also fragmenting the tissue.

Urban grain.

Up until the middle of the XX century, dominating dwelling type in both cities had similar characteristics: "log cabin" - a basic cell, made of laying logs horizontally otop of each other, which was placed in the "courtyard type" of base building (Fig. 6). In both cities, fires and relief stimulated the appearance of a specific type of house, the basement or the first floor of which was made of stone or brick. Siberian city stems from the ideas of village and fortress, which was reflected in the character of units of the urban fabrics. XVIII century brought regular grids, but the unit embodied tradition: double-row courtyard houses - attached small "fortresses" or "nests", made spontaneously, surrounded by fences, devoid of permeability and transparency, was perceived as a unit, the perimeter of which was fixed by roads-voids; the inner structure of the unit was less important, that is why flexible and changeable. Quebec as a cultural collage demonstrates also a collage of identities in different morphological regions, each region corresponds to specific building type, similarly in Krasnoyarsk in the XX century Soviet planning tradition brought a collage of new morphological regions. In the cultural tradition of the XX century, the "neighbourhood" module corresponded to a comfortable walking distance - 500-800 m both in Quebec and Krasnoyarsk. In these modules, specialized buildings such as churches or schools occupied the centres. The period after WWII brought significant growth to both cities along with the development of "hyper-grid" (Moudon, 2019).

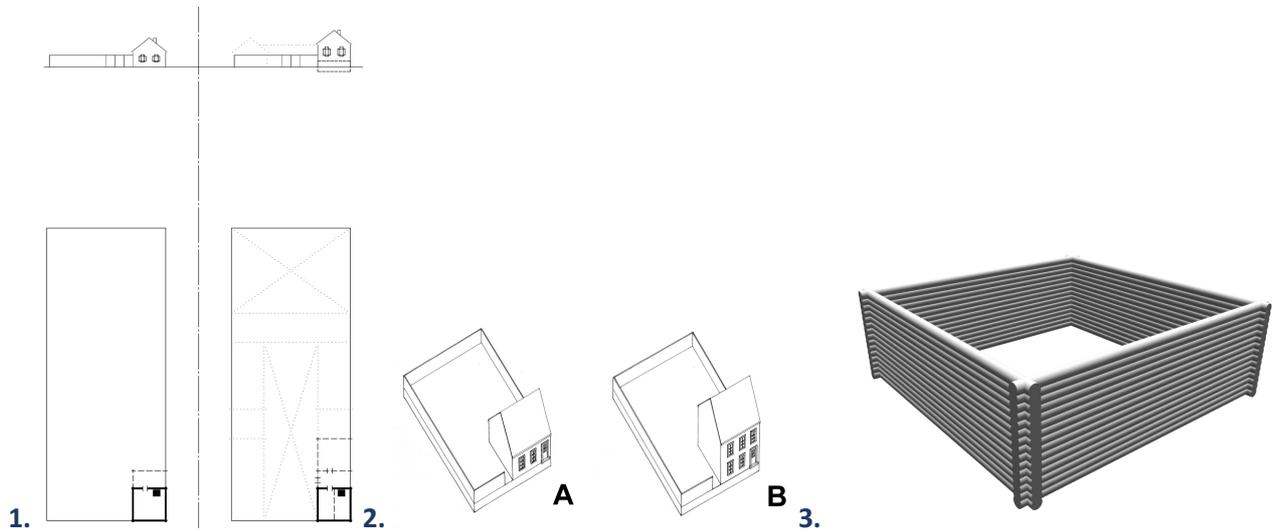


Figure 6. Courtyard house types: Siberian (1), Canadian by Prof. P. Gauthier(2) and the construction technique (3).

Conclusions

Similar climatic, geomorphological, hydrographical, topographical and other natural features of the cities visibly induced similar "internal" spatial logic of their development in many aspects. Thus, before focusing on key transformations that can be explained by socio-political and cultural shifts, a general assessment of morphogenetic patterns influenced by the constraints and potentials internal for the morphological system is essential. When the urban fabric presents a planned orthogonal grid, we can recognize the process of transformation of the urban fabric throughout the hierarchically produced order between the roads that have come to be determined over time (readable in the arrangement of the entrances of the buildings, in the distribution of commercial activities, the height of building and largeness of the street). At the same time, the persistence of the local vernacular tradition is readable even in a planned city and constitutes the part of local identity, especially on a small scale. Next, the influence of shifts in socio-political and cultural spheres and modes of production on urban fabric should follow, focusing on those that had a key morphological impact that couldn't be explained otherwise, to ultimately inform architects and urban planners.

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