

Industrialisation and its Urban Impact: Morphological Analysis of the Pulp and Paper Industrial Landscape in Quebec (1880-1930)

Maxime Nadon-Roger, M. Arch., and candidate of the Master of Science Degree in Architecture (M.Sc.)¹

¹ School of Architecture, Faculty of planning, architecture, art and design at Laval University, Quebec City, Canada

Abstract

Since the end of the 19th century, the exploitation of large forests and hydrological reserve propelled the industrial development in Quebec, notably the pulp and paper sector. The morphological impact affected several scales of infrastructure: regional transportation networks, industrial sites and plants design, the urbanisation of new cities and neighbourhoods. This paper delineates the relationship between the extraction of resources, the need to attract labour and therefore the nature of the resulting urban development. Some companies acted as developers and bankers, and ensured that workers and their families were housed, entertained, cared for and educated. Other sites display less organised development where, beyond the industrial compound, the urban growth relied on local actors and practices. The research addresses the morphological characteristics developed between the global requirements of an industry tailored to serve the international markets and the constraints and potential of specific sites. In the context of actual decline, the future of these industrial sites, generally strategically located in their respective urban context, raised the issue of their recycling when the vacated infrastructure remains part of the collective industrial heritage. The prior territorial analysis covers all 125 paper mills built in Quebec between 1805 and 2015. Consequently, a sample of 16 mills provides the cases for an urban typo-morphological analysis. The result provides the facts about urban impact of mills on neighbouring settlements. It also addresses the potential regeneration of both underused industrial plots and towns.

Keyword: Urban Morphology, Industrialisation, Urban Impact, Pulp and Paper, Fringe Belt

Introduction

The pulp and paper industry was a major driver of development across Canada. In various parts of Quebec, 125 mills were built starting in 1805. In 2001, 62 remained in operation, a figure that dropped to 40 by 2015 (**Error! Reference source not found.**) (Gilbert 2015). These mills shaped the towns and cities where they were built not only through the vast sites acquired and used for industrial activities, but also through the creation or consolidation of an urban environment chiefly intended for a working-class population. Often, the building of a mill spurred urban growth in the surrounding neighbourhood, which became economically dependent on the operator as the area's main employer. The mill was at the heart of a community's development, but how did it influence planning strategies in geographic, urban, and architectural terms? Over the last 25 years, scholars interested in how Canada's industrial settlements were planned (Fortier et al. 1996, Morisset 1998, Morisset and Mace 2019) have described how the mill and the community jointly shaped the urban landscape through an embrace of idealised planning, as revealed through a certain number of case studies and textual sources.

The currently bleak outlook for the pulp and paper industry raises important questions about the future of these sites. Should they be protected as symbols of the material and intangible heritage associated with the building of modern Canada? How can transformations to this specialised fabric be understood and managed when the importance of a mill declines, and especially when it closes? What needs to be considered in efforts to reinvent the industrial brownfield that appears in its place, not to mention the urban brownfield that emerges when the surrounding neighbourhood loses its *raison d'être*?

A growing body of work in architecture and urban studies has provided insight into various issues related to specialised plots that have fallen into disuse: e.g. land use, decontamination, and governance (De Sousa 2001, Benali 2012, Cenci et al. 2014). However, few studies have explored the relationship between specialised and basic surrounding urban fabric, a relationship that has shaped the development of many industrial towns.

This study relies on morphological analysis to better understand the urban and architectural characteristics of company towns in Quebec. It explores the emergence of 16 mills located in 14 towns and cities from the perspective of the relationship between a mill plot (often as large as—if not larger than—the surrounding community) and the urban fabric it engendered. A comparative approach has allowed to probe the nature of planning, especially the extent to which representatives of outside (and often foreign) business interests and local actors were each able to shape development. The article is divided into three sections: the first discusses theories related to building types, the second explains the study methodology, and the third presents results.

Theoretical Background: Specialised Buildings

Human settlements contain two main types of built structures: basic buildings and specialised buildings (Caniggia and Maffei 2000). The former category corresponds to structures that meet the primary human need for housing and that make up most of the built environment. By contrast, specialised buildings are larger, meet more complex needs, require greater planning, and exhibit emergent characteristics. These buildings stand out in terms of their large plots, their strategic aims, the critical awareness behind their planning and the desire for longevity reflected in their design and construction. Moreover, they play a distinctive role within the urban ecosystem, supplying the latter with its underlying structural conditions. Gian Luigi Maffei (2003) has proposed distinguishing between serial specialised buildings (convents, factories, hospitals, prisons) and nodal specialised buildings (markets, theatres, churches). The repetitive elements of the first subcategory, which includes structures located toward the urban periphery, nevertheless fit within hierarchies established by internal nodes. By contrast, nodal specialised buildings tend to stand apart, each playing a complementary role within the larger ecosystem. Furthermore, the latter are fundamentally anti-polar because they are composed of an urban fabric of their very own. Paper mills are a case in point.

Methodology

Historical-geographical approaches to urban morphology, and especially town-plan analysis from Conzenian School, have greatly influenced this study. By reconstructing the origins of a given environment through the analysis of historical maps, researchers can identify complex hierarchical relationships within an urban system. The preliminary results of this study are presented in the form of research notes. The evidence they contain serves to provide a basic sketch of the impact of Quebec pulp and paper operations on urban development. An initial Quebec-wide analysis conducted in the fall of 2020 (Figure 1), which has not been published, confirm the relative influence of certain ostensibly important structural variables, namely access to energy, to transportation infrastructure, and to raw materials (Nadon-Roger and Dufaux 2020). This analysis also made it possible to associate significant changes in these variables with key periods in the development of the pulp and paper industry (Gilbert 2015). Based on these findings, this study focus on the period from 1880 to 1930, which saw the construction of many vast industrial plants. These facilities were designed to support the harvesting of pulpwood and its large-scale processing into pulp and paper. Around 1880, hydroelectricity began to power operations. The companies that owned the mills came to play an active role in the urban development of regions—the Saguenay, the Mauricie, and the Outaouais—that had remained largely untouched by the effects of the first industrial revolution (1830–1860) (Linteau 1996).

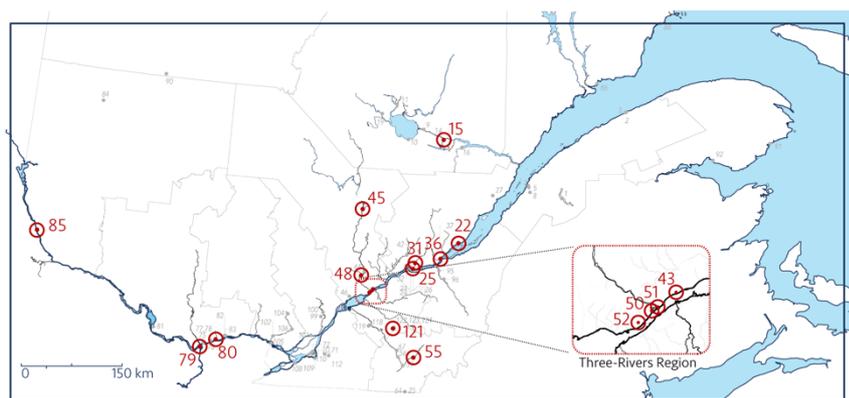


Figure 1 Map showing the locations of the 125 paper mills built in Quebec between 1805 and 2015, using the reference numbers assigned by Gilbert (2015). Mills included in the sample for this study are shown in red.

At the heart of the study is a comparative historical analysis of the relationship between two factors, namely the development of industrial plots and urban boundaries as they stood in about 1950. Easily covering the operational life cycle (25 to 30 years) of a newly constructed mill, the period of study nevertheless comes to an end before the advent of widespread automobile ownership. Topographic maps available from the National Topographic System (NTS) enable to determine the extent of urban development at the relevant time. In addition, Goad-type fire insurance atlases allowed to roughly determine the size of the plot occupied by each mill. The greater detail provided by the orthophotographs in the *Base de données sur les photographies aériennes (BDAP)*, most of which were produced in the postwar period, made it possible to compensate for the limited availability of cartographical data for certain mill locations.

A purposeful sampling method was based on four criteria to select a representative sample of urban environments (n=16, N=125). First, the towns and cities covered by the study were home to a mill built

between 1880 and 1930. Second, at least some cartographic data had to be available for each location. Third, the regional distribution of the communities in the sample corresponds to the historical distribution of pulp and paper mills in Quebec. Finally, the sample includes case studies involving both major and remote centres.

Results and Discussion

A Model of Organic Coexistence

The basic fabric of these urban environments did not take on a concentric or circular form. Rather, it tended to stretch out parallel to the mill (**Error! Reference source not found.**). And in contrast to the traditional model of successive development phases driven by economic and building life cycles, pulp and paper operations tended to develop along anti-nodal lines and according to the life cycles of production processes. Although each community's mill played a central role in urban development, it was not centrally located in geographic terms. To begin with, the characteristics of the Quebec transportation system rarely served to support a concentric model of urban development, as in the case of a medieval model built around its historic centre. Furthermore, the presence of natural morphological features (topographical or hydrographical in nature) and anthropogenic features (such as railways, port infrastructure, and hydroelectric transmission lines) tended to see mills established at a waterfront location hemmed in by the barriers created by such features.

Table 1 Industrial land use in relation to the total urban area in 1950, according to the three approaches to selecting the location of a mill (SA: Specialised area in hectares; UA: Urban area in hectares; %: SA/UA).

	Approach 1 (n=7)			Approach 2 (n=6)			Approach 3 (n=3)			Sample (n=16)		
	SA	UA	%	SA	UA	%	SA	UA	%	SA	UA	%
Average	32.9	73.6	107%	24.0	84.3	38%	28.1	40.1	89%	28.7	71.3	78%
Median	29.0	53.7	59%	30.8	70.9	39%	23.4	44.0	53%	29.6	52.2	44%

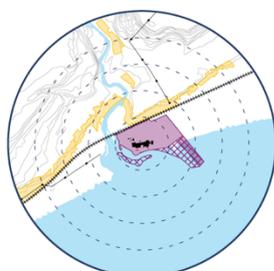
A Typological Analysis of Pulp and Paper Mill Locations

Analysis of the sample reveals three approaches to selecting the location for a mill (**Error! Reference source not found.**). First, some companies chose a site on the edge of an existing town or city, in cases where suburban development meant that the larger plots were scarce and therefore more expensive. For instance, the mills in Quebec City, Hull, Three-Rivers, Donnacona, and Beaupré were all built on backfilled sites along the waterfront. This approach involved creating a site that was not only sufficiently large but also free of financial and legal constraints.

Second, some mills were built in an agricultural area not far from an existing settlement. Family farms tended to be few near locations whose agricultural potential was limited by topography and soil quality. Adjacent waterways supported industrial production and carved out irregularly shaped sites that contrasted with the

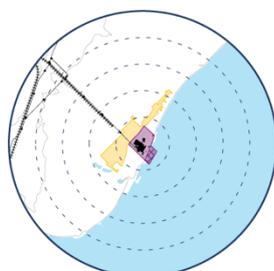
surrounding seigneurial agricultural lands. It led to the birth or growth of various Quebec towns, including Kénogami, Masson, Pont-Rouge, Kingsey Falls, East Angus, and Cap-de-la-Madelaine.

Finally, planned company towns were built from scratch in areas unsuitable for agriculture, but well situated in relation to forest resources, hydroelectric facilities, and railways. This approach was followed in Shawinigan, Témiscaming, and La Tuque—the communities that closely followed the company town model.



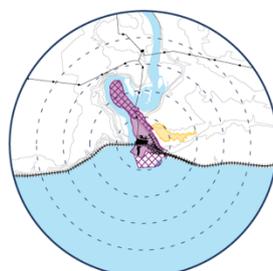
22 - Beaupré (107 ha)

Basic : 54.8 ha
Special : 35.1 ha
Reserve : 17.0 ha
Mill (LUC) : 20,000 m² (5.7%)



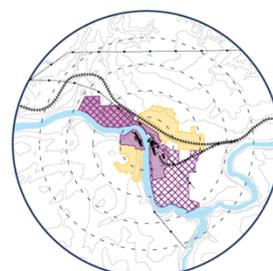
43 - Cap-de-la-Madelaine (34.8 ha)

Basic : 22.5 ha
Special : 10.0 ha
Reserve : 2.3 ha
Mill (LUC) : 20,300 m² (20.3%)



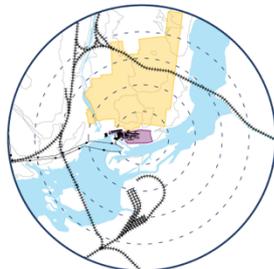
25 - Donnacona (41.8 ha)

Basic : 6.7 ha
Special : 13.0 ha
Reserve : 22.1 ha
Mill (LUC) : 20,200 m² (15.5%)



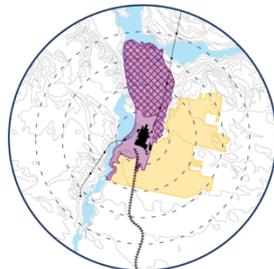
55 - East Angus (130.6 ha)

Basic : 44.0 ha
Special : 23.4 ha
Reserve : 63.2 ha
Mill (LUC) : 23,500 m² (5.1%)



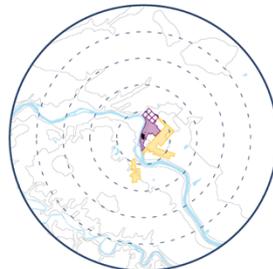
79 - Hull (154.6 ha)

Basic : 145.9 ha
Special : 8.7 ha
Reserve : 0.0 ha
Mill (LUC) : 27,800 m² (31.9%)



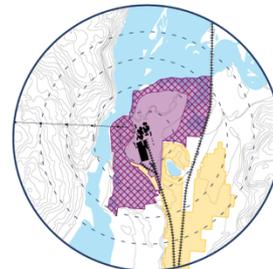
15 - Kénogami (230.5 ha)

Basic : 131.0 ha
Special : 31.3 ha
Reserve : 68.2 ha
Mill (LUC) : 48,000 m² (15.4%)



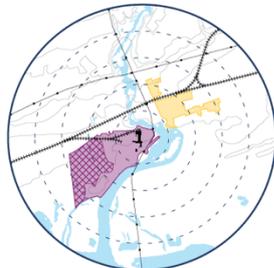
121 - Kingsey Falls (20.9 ha)

Basic : 12.7 ha
Special : 5.6 ha
Reserve : 2.6 ha
Mill (LUC) : 3,600 m² (6.5%)



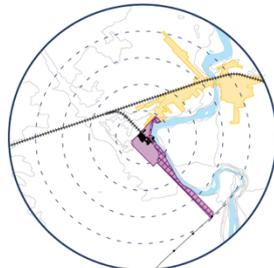
45 - La Tuque (302.8 ha)

Basic : 124.9 ha
Special : 73.5 ha
Reserve : 104.5 ha
Mill (LUC) : 62,000 m² (8.4%)



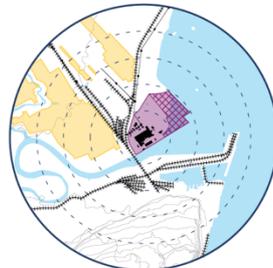
80 - Masson (108.7 ha)

Basic : 25.5 ha
Special : 47.7 ha
Reserve : 35.6 ha
Mill (LUC) : 15,300 m² (3.2%)



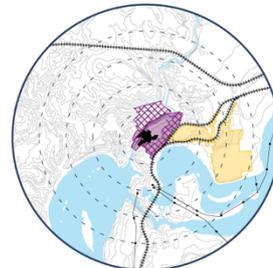
31 - Pont-Rouge (79.5 ha)

Basic : 53.7 ha
Special : 12.4 ha
Reserve : 13.4 ha
Mill (LUC) : 18,300 m² (14.7%)



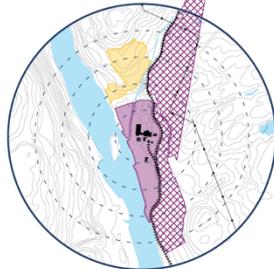
36 - Quebec City (190.7 ha)

Basic : 139.5 ha
Special : 33.6 ha
Reserve : 17.6 ha
Mill (LUC) : 46,100 m² (13.7%)



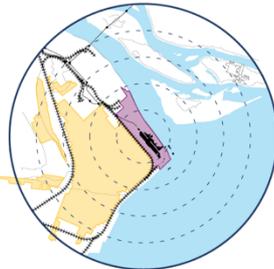
48 - Shawinigan (85.9 ha)

Basic : 50.8 ha
Special : 13.2 ha
Reserve : 21.9 ha
Mill (LUC) : 29,300 m² (22.2%)



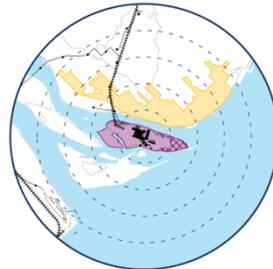
85 - Témiscaming (247.1 ha)

Basic : 34.0 ha
Special : 60.1 ha
Reserve : 152.9 ha
Mill (LUC) : 40,100 m² (6.7%)



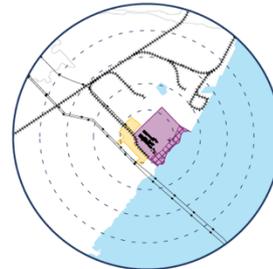
50 - Trois-Rivières (229.7 ha)

Basic : 197.7 ha
Special : 32.0 ha
Reserve : 0.0 ha
Mill (LUC) : 39,800 m² (12.4%)



51 - Trois-Rivières (123.0 ha)

Basic : 86.9 ha
Special : 30.3 ha
Reserve : 5.8 ha
Mill (LUC) : 31,100 m² (10.3%)



52 - Trois-Rivières (47.4 ha)

Basic : 10.7 ha
Special : 29.0 ha
Reserve : 7.8 ha
Mill (LUC) : 31,400 m² (10.8%)

(Yellow: Urbanised Area 'basic'; Purple: Specialised Area 'Special'; Purple hatching: Reserve Area).

Figure 2 Comparison of land use around 1950. The maps display natural features, along with the location of railway infrastructures and transmission lines. Specialised areas don't include the reserve. Each circle represents a 2 km radius divided into 400m increments.

The Mill Site

Pulp and paper companies sought out level mill sites to facilitate the production process. In hilly locations, such as Témiscaming and La Tuque, the basic urban fabric was relegated to higher elevations, whereas available lowlands were reserved for the mill. The average land use coefficient (LUC) for the mills in the sample was 13.0%. This refers to the ratio of the land occupied by the building itself to the total size of the specialised area without the reserve area. Meanwhile, the footprints of individual mills varied from 3,600 m² to 62,000 m² (**Error! Reference source not found.**). And although plot sizes also varied significantly, the low average LUC suggests that mills were generally built on industrial plots that were much larger than required to meet short-term needs.

Indeed, except Hull and one of Trois-Rivières mills (50), in all cases under study, land was set aside at the mill site for future development. The companies that built four of the 16 mills in the sample also acquired—but did not use or develop—a plot adjacent to the mill site. Although very large (up to 152.9 ha), these outer reserves were too small to supply the corresponding mills with pulpwood. However, the relative position of these lands created an additional urban boundary. In Témiscaming, and East Angus, it could have easily supported a second phase of urban development. The other 10 mills, such as those in La Tuque, Kenogami, Masson, and Donnacona, were built on massive plots encompassing many hectares of steep, wooded lands—inner reserve—that would not have been conducive to an expansion of pulp and paper operations. Both reserve types therefore reflect a planning strategy that remains to be interpreted.

Table 2 Mill footprint characteristics according to the three approaches to selecting a location

	Approach 1 (n=7)		Approach 2 (n=6)		Approach 3 (n=3)		Sample (n=16)	
	m ²	LUC	m ²	LUC	m ²	LUC	m ²	LUC
Average	35 100	14.5%	27 100	11.7%	22 700	11.8%	29 800	13.0%
Median	31 400	13.7%	25 700	11.4%	23 500	10.1%	28 550	11.6%

An Atypical Model: The Urban Fringe Belt

From a morphological perspective, industrial plots are typically susceptible to pressures associated with urban development. In particular, the literature describes centrifugal forces that tend to push such activities toward the periphery (Strappa 2018). Recognised in the field of urban morphology for some 80 years, the “urban fringe belt” concept describes urbanised areas that were once on the periphery but have since been firmly embedded within an urban area. Such a process occurs during any period of strong growth. However, these mixed-use areas remain recognisable within the larger urban system based on how they separate older residential developments from newer ones (Whitehand and Morton 2004, p. 275). The origin of fringe belts can be traced to the succession of city walls that historically separated an urban area from its hinterland in

Herbert Louis study about Berlin in 1936. The concept has also been applied to building life cycles, as well as to urban landscapes and transportation innovations (Whitehand 1994). More recently, it has been adopted as an urban planning tool (Whitehand and Morton 2004). With regard to paper mills in Quebec, the concept proves relevant to patterns of urban development in Quebec City, Trois-Rivières, Hull, and Cap-de-la-Madeleine, as well as those in previously rural sites such as Kénogami. In theory, the industrial brownfield that appears when a pulp mill closes represents an opportunity for redevelopment. After all, the size of such sites provides room for a wide range of urban activities and living environments.

However, this study highlights two major issues with this hypothesis. In the case of pulp and paper mill towns, before the advent of widespread automobile ownership, huge land area was dedicated to industrial activities compared to urban plots. These urban environments, which only emerged because of local industrial activity, therefore have no choice but to envision the rapid redevelopment of those same sites. Planning strategies, often involve the demolition of industrial buildings—as in Beaufré, Port-Alfred, Trois-Rivières, and Shawinigan—leaving behind a stark and barren brownfield and depriving the community of any vestige of its industrial origins. From this perspective, the specialised and basic fabric remain dependent on each other. The unresolved aspects of their coexistence have essentially turned them into each other's brownfields.

Meanwhile, in the case of larger urban environments with more diversified economies, redevelopment efforts face three major constraints. First, the uses and buildings planned for the former industrial sites themselves rarely accommodate the need to revitalise surrounding urban areas. Second, from a planning perspective, the redevelopment of vast plots can prove challenging for municipalities, causing them to rely on real estate developers to ensure a balance between private and public interests, thereby reverting to a pre-1950s approach to urban development. Finally, since the 1960s, political, legal, and fiscal measures have encouraged urban sprawl and the development of new commuter suburb in rural areas (Généreux and Dufaux 2019). As a result, the redevelopment of a site surrounded by or adjacent to the urban fabric, even when such a site is centrally located, tends toward suburbanisation.

Limitations of the Study

One of the main gaps in this analysis relates to the inability to isolate the direct impact of pulp and paper companies on urban development. Setting aside isolated industrial towns like Témiscaming and La Tuque, most of the other urban areas included in the study did not depend on the pulp and paper industry as the sole driver of economic and social development, since a town or city existed before the mill was built.

Conclusions

This paper provides new insight into the relationships between industrialisation and urban development, and between planning (in terms of both its nature and its extent) and local action, thereby shedding light on the bilateral dynamics that underlie these two seemingly distinct fabrics. More broadly, it contributes to a better

understanding of industrial towns, as well as Quebec towns and cities in general, during the first half of the twentieth century. Unlike the situation in the archetypal planned industrial towns described in the Canadian literature, these preliminary results suggest that the urban impact of pulp and paper companies had more to do with balancing increasingly powerful international dynamics and local structural conditions than with the faithful reproduction of a familiar paternalistic model. Indeed, the specialised fabric and the adjacent basic fabric appear to have depended on each other in surprisingly complex ways, based on a multitude of factors. This relationship, which developed along anti-nodal lines in response to natural and anthropic morphological constraints, was also shaped by the infrastructure required to support industrial production. Such a level of coexistence and interdependence makes it difficult to transform the urban or architectural features of one piece of urban fabric without doing the same with the other. Finally, the pedestrian matrix, a key consideration in urban development prior to the mid-1950s, was subsequently neglected in the context of automobile suburbs that have remained the focus of public policy ever since. Despite the limitations noted above, this comparative morphological analysis demonstrates the capacity for such an approach to reveal the characteristics of development in territorial, urban, and architectural terms. These various development choices serve to nuance the interpretation of urban history, including the history of planned communities.

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