From Pocket Parks to Complete Streets: Creating an Integrated Network of Public Places in Quebec City for Sustainable Health

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As a UNESCO World Heritage Site and the only walled city north of Mexico, Quebec City is known for its rich history which often overshadows contemporary public place planning and design initiatives adapted to the city’s geography, climate and neighbourhoods.

One such effort in that regard is a unique planning and design mapping tool integrating over forty planning, environmental, social and technical indicators which have an influence on urban form. This data base helps urban designers, architects, planners, engineers, community and cultural advisors as well as city officials target those street and public space projects which would have the greatest benefits on the quality of life of residents and public health.

Inspired by the Complete Streets movement in North America, this tool is the result of an inter-service, transdisciplinary process and serves as a reference to optimize the decision-making process. It is designed to be

- Accessible for all user groups
- Flexible so a to permit the integration of a multitude of pertinent indicators
- Visual to facilitate communications between professionals, decision-makers and the public, and
- Easily upgraded, so that the most recent information or additional indicators can be integrated into the data base.

Through over-lays of pertinent indicators, opportunities for improving the streetscape and adjacent public spaces are mapped and evaluated according to their impacts on

- Creating active, animated streets and public places
- Increasing the tree cover
- Facilitating active transportation throughout the year, but especially in winter, and
- Improving public health, especially in economically and socially disadvantaged neighbourhoods.

The application of this data-based approach in numerous projects has already been shown to improve efficiency of the design and approvals processes, can be applied to existing as well as planned developments, and contributes to a better understanding of how each intervention can contribute to the creation of a fully integrated network of public streets and places.
Over the last two years, Quebec City has been developing a unique planning and urban design database integrating over forty planning, environmental, social and technical indicators to better target those streets and adjacent public spaces which should be redesigned to benefit the quality of life of city residents and public health.

Presented publicly for the first time in March, 2017, this multicriteria analysis received enthusiastic support from elected officials as well as the public and design professionals who saw in the new approach an integrated and rational framework for planning urban infrastructure improvements.

To better appreciate the importance of this tool for Quebec City, it is first necessary to understand the context in which it was developed.

Figure 1: The easternmost deep-water port along the Saint-Lawrence River, Quebec City is located approximately 725 km (450 miles) north of New York City and about 500 km (310 miles) north of Boston.

1. Background
As a UNESCO World Heritage Site and the only walled city north of Mexico, Quebec City is one of North America’s oldest human settlements. Founded over 400 years ago on a site already inhabited by large First Nations populations, Quebec City is well-known for its picturesque historic centre and surrounding neighbourhoods. Appreciated for its human scale and walkability, Old Quebec is frequented each year by several million visitors, where over the years the city and its partners have introduced substantial improvements to urban spaces and the built environment. To further pedestrian and cyclist comfort and safety in and around Old Quebec, the city is currently completing a new plan to prioritize interventions to create an integrated network of sidewalks and bike routes adapted to the historic character of the sector.

Because of the high visibility of this distinctive urban landscape as well as the quality of the materials and the details in public spaces in downtown and along major commercial streets, those projects are often seen as special interventions or exceptions, and to a certain degree that is true: The Old Quebec Heritage District represents only about 0.003% of the total land area in Quebec City. Given the professional and financial
resources that are mobilized to maintain and improve that part of the city, it would be virtually impossible, and even undesirable, to apply the same urban design standards to other neighbourhoods without considering their own unique physical, natural, historic and social environments.

2. Issues addressed

Developing approaches to deal with local issues and priorities outside of Old Quebec and its surrounding neighbourhoods became essential after the amalgamation of Quebec City with ten surrounding communities in 2001-2002.

Prior to the amalgamation, each of those communities had its own policies and procedures to infrastructure planning and design. In the years immediately following the amalgamation, no unified policy or method had been put in place to decide when and where improvements should be made to the urban landscape. Decisions were often based on immediate technical needs related to the sustainability or obsolescence of infrastructures (physical state of road networks, water mains and sewer systems) or in response to requests by interest groups or neighbourhood councils.

Over several years, numerous programmes, policies, guides and resources related to the urban design objectives for streetscapes and improving the quality of life of citizens were adopted (Sustainable Mobility Plan, Universal Accessibility Guide, Bicycle Network Master Plan, Tree Canopy Plan, etc.) but too often these tools and knowledge remained sectorial: there was no coherent vision for streetscape and public space improvements.
In 2015, the city administration defined a need to put in place a new comprehensive, systematic and interdisciplinary approach to rapidly and accurately assess the potential for upgrading streetscapes and adjacent public spaces early in the planning and design process for Quebec City’s six boroughs. A need to facilitate the sharing and communication of knowledge, opportunities and expertise among all concerned parties – from professionals and citizens to the politicians - was also expressed by the authorities.

This new strategy was to be framed by certain principles which were developed by the city administration for municipal services under the responsibility of the Associate City Manager for Quality of Urban Life. The mission of those services (planning, civic security, transportation, culture/community life, police and fire protection, among others) is to create and maintain living environments which are well-organized, harmonious, animated and secure for all persons within the city.

To that end, city officials accorded great latitude to city employees to develop a new approach which would be framed by one overall vision: *the urban environment should be designed in a holistic fashion to reconcile objectives for physical improvements with environmental and social needs while at the same time creating inclusive, dynamic, safe and sustainable public spaces to positively impact citizens’ quality of life.*

3. Methodology
   a) Creating a core working group and defining framework

   In 2015, an interdisciplinary team was formed to reflect on how best to put into action the vision expressed by the city administration. This team was made up of professionals from the city’s planning and urban design services, engineering, public works, environmental services and economic development and included a representative from the Ministry of Municipal Affairs and two urban design interns. Their mandate involved evaluating existing policies and programmes in Quebec City, debating the pertinence of Complete Streets policies developed by other cities (in particular, those developed by Chicago, Boston, Edmonton, New York City and Ottawa) as well as their applicability to Quebec City’s needs, and defining overall principles that should be integrated into the city’s own approach.

   The most important reference for defining those principles was Quebec City’s Sustainable Mobility Plan, adopted in 2011. That plan includes several objectives and recommendations for transportation infrastructures, including the integration of new standards for street construction for an optimal and safe sharing of streets between motorists, cyclists and pedestrians. Certain targets were defined in that plan for the city's urban development between 2011 and 2030, most notably to:

   - Double the modal share of public transit (from 10% to 20%);
   - Increase active travel by 13% (from 15% to 17%);
   - Decrease motorized travel by 20% (from 71% to 57%).
With those objectives in mind, the working group needed to define a general framework for evaluating possible improvements to the urban landscape that would be based on the directives from city authorities and which would integrate principles from the Complete Streets movement. Beyond the normative, regulatory and financial framework present in all street development projects, it was first necessary to define an overall objective to highlight the city administration’s priorities as well as the city’s identity.

In addition to internal consultations with other city professionals outside the core team, the working group recommended that it was imperative to integrate public health issues into the decision-making process. That recommendation was based on an analysis of multiple socio-demographic data, especially regarding the city’s rapidly ageing population as well as numerous health indicators which pointed to important differences between socially and materially disadvantaged neighbourhoods and better-off neighbourhoods. To that end, external health professionals and institutions (medical research groups, hospitals, specialists in physical rehabilitation, etc.) were solicited to furnish their experiences, expertise, opinions and data concerning links between urban environments and public health.

The results of these consultations permitted the working group to retain the notion of linking design decisions to **sustainable health** which is a priority for the *Alliance Santé Québec* (ASQ), one of the groups consulted. The notion of sustainable health is defined by the ASQ as a comprehensive state of physical, mental and social well-being that is achieved and maintained throughout life through healthy, enriching and fulfilling living conditions and access to appropriate resources which are used responsibly and efficiently for the benefit of present and future generations.

That overall objective led to the development of a series of questions to help define more precisely which strategies would make a lasting contribution to improving the public’s quality of life. Those questions can be broken down into four themes:

**Community**
- How can our efforts improve the quality of living environments, especially those in more disadvantaged neighbourhoods?
- How can we foster the notion of inclusiveness regardless of socio-economic and cultural differences?

**Sustainable health and environment**
- How can we link design decisions with zoning to facilitate pedestrian access to neighbourhood services (stores, schools, employment, etc.) and healthy, affordable food choices?
- How can our interventions facilitate active and multi-modal travel?
- Where should efforts be deployed to reduce urban heat islands?
- What greening strategies (tree planting within or outside the street right-of-way, reducing impermeable surfaces and / or protecting existing tree cover) should be considered along each street?
Safety
• What can we do to increase comfort and perception of safety along the streets for all users but especially for the most vulnerable groups (children, elderly, cyclists and persons with physical limitations) throughout the year?
• Are there new approaches to street and public space design that can contribute to creating a better equilibrium between the different user groups, especially in residential and mixed neighbourhoods?

Finances
• How can we optimize infrastructure improvements to invest in the right place at the right time with the right amount of effort?

The responses to those questions were grouped into three axes adapted to Quebec City’s reality.

The first axis was the development of active streets:
• Prioritize the pedestrian experience and human scale to stimulate intermodality and public transit.
• Value physical activity for a healthy city.

The second axis was the development of green streets:
• Accord a priority to eco-responsible interventions by improving the tree canopy, especially in underprivileged neighbourhoods, reducing impermeable surfaces, and integrating efficient new standards for street lighting.
• Contribute to sustainable improvements in air and water quality.

The third was the development of streets adapted to winter:
• Enable the population to remain active throughout the year and in complete safety.
• Contribute to making winter an engine of activity so that the population can experience the city to its full potential.

The challenge then became: How can these intentions be translated into action?

b. An innovative tool: A multicriteria data base
To that end, the City of Quebec submitted the question to an outside consortium of independent experts who had signed a unique, open-ended research contract with the city to explore new methods for improving the performance of city services and to develop new expertise and wide-ranging concrete benefits for companies and municipalities. With representatives from the private sector as well as from research centres at Laval University in Quebec City and the National Institute of Scientific Research, that consortium proposed a specialized, interdisciplinary team coordinated by two university professors: one in urban planning specialized in decision-making processes in spatial planning, and a second in business administration specialized in operations and decision systems. In addition, a research associate in planning and regional development was integrated into the research group. That team - the Unité mixte de recherche en sciences
urbaines (UMRsu) – immediately set out to further study the question and see how a fresh perspective could bring an innovative response to the city’s needs.

To better define the strategy which could be proposed for Quebec City, the results of the working group’s reflections as well as the overall objectives of the Complete Streets movement were presented to the UMRsu with four additional requirements:

- That the tool permit the rapid identification of priorities for decision-makers;
- That it be visually accessible to facilitate communications with city authorities, project team members, and the community;
- That it be flexible so that it could be easily updated on a regular basis, and
- That it ensures citizen participation in the project design process.

URMsu recommended the development of a data base integrating **multicriteria analysis**. Multicriteria analysis a decision-making approach to evaluate a set of options according to different qualitative aspects and points of view to determine their ranking, classifications or choices. It is often used in multidisciplinary contexts because it allows for the inclusion of elements from different domains.

After evaluating different multicriteria options, it was agreed upon that the approach that was best adapted to the city’s needs was a mathematically-based computer software programme called MACBETH (**M**easuring **A**ttractiveness by a **C**ategorical **B**ased **E**valuation **T**echnique) developed by researchers in Portugal and Belgium. To the best of the consortium’s knowledge and that of the working group, that software had never been used for the identifying priorities for streets and public spaces as proposed by the City of Quebec.

The MACBETH software involves an interactive approach requiring only qualitative judgments about the differences between two elements to evaluate the relative attractiveness of the options. By a similar process, weights are generated for the criteria. Judgments are encoded in the software which automatically checks their consistency, and generates a numeric scale.

To carry out this study, several meetings took place with key players involved in the process. The objective was to build a model of stakeholder preference for the city. Through discussions and debates among participants, a consensus and common value system was created. The model included all criteria, scales and weights.

At the start of this process, 11 criteria related to agreed-upon objectives for the development of user-friendly streets were defined by the city's professionals, including, among others, the tree canopy, transit options, bike network, pedestrian circulation, social and material deprivation, security and degree of street connectivity. By comparing different theoretical scenarios for street design, priorities were defined to hierarchize street typologies best adapted to residents’ needs, preferences and health.
The road network was hierarchized in 10 levels, in accordance with the priorities given to the 11 criteria identified in the analysis. Street hierarchies were mapped using ArcGIS to visualize the relative differences and to identify links between different streets with similar characteristics or potentials. The higher the ranking, the more pertinent it appeared that a street should be redesigned in accordance with the objectives of the Complete Streets approach and those defined by the working group.

By clearly showing that not all streets present the same level of interest for investing time, energy and financial resources into their redesign, the effort deployed will be proportional to the streets’ potential role in creating an integrated network for active transportation options and improvements to the well-being of its residents as well as the natural and built environments.

After testing this approach in a study area in downtown Quebec City where the results demonstrated the model’s efficiency, pertinence and accuracy, an additional contract was granted to the UMRsu team to complete the cartography for all the city’s 22,000 street segments. Preliminary results for those streets outside the study area show that this methodology is applicable as much in the city center as in the peripheral neighbourhoods.
Those results also demonstrate that approximately 25% of all city streets could be considered for improvements in accordance with the research objectives.

c. Limits of a multicriteria approach
While this approach allows the city to rapidly identify design opportunities, eliminate arbitrary decisions, justify decisions to intervene and promote transparency in the decision-making process, it is not a design tool and does not replace the final judgment of professionals or elected officials.

If the multicriteria analysis developed by the URMsu team allows the rapid identification of opportunities, the tool does not necessarily provide an understanding of what needs to be done to properly identify the preferred street design. Another level of analysis would be needed to arrive at a more complete evaluation of a street’s potential.

d. Defining the preferred street design
Hence, the importance of a second level of analysis by a specialized team to identify those components of the street to assure that the preferred design adequately responds to the vision and objectives that were convened with city authorities at the beginning of the exercise.

To translate the results of the multicriteria analysis into plans, high-potential projects (that is, the approximately 25% of the streets identified in the first part of the multicriteria analysis) are referred to a standing committee made up of professionals in transportation, engineering, planning, urban design, and environment. As needed, additional professionals are invited to offer complementary input. The mandate of this committee is to validate the results of the multicriteria analysis by analyzing nearly 30 additional indicators to more precisely identify those components which would contribute to attaining the objectives of user-friendly streets and healthy neighbourhoods. Those indicators include details of the functional classification of the streets, mixed-use zones, community and health services, heat islands, grocery stores and restaurants, and access to schools, parks and recreational facilities, among others.

Over the next several years, several other indicators will be added to the data base, including a new master plan for the Cap-Rouge, Saint-Charles, Beauport and Montmorency Rivers (2017-18), a public utilities master plan (2017), a parks and green space master plan (2017-18) and priority elementary and secondary school renovations (~2020).

The standing committee is also mandated to prepare preliminary designs and to validate the financial impacts of the different scenarios. The committee may recommend that projects requiring major changes to the existing design be delayed to allow the development of multiple scenarios and to plan public consultations, as needed.
This last point is essential to developing a large consensus for the streets designs. The type of public consultation varies with the complexity and the nature of each project, but to date, three consultation tools have been introduced in this process:

- **Web surveys** to join the population quickly and to better understand the needs and the preferences of the citizens
- **Design workshops** which allow citizens and city professionals to interact on planning issues, to validate or develop scenarios for street redesigns
- **Public presentations** to listen to the population’s opinions on possible designs to identify the optimal scenario.
4. Testing the methodology in pilot projects

Since initiating this study in 2015, several pilot projects have been undertaken to validate and improve the methodology. The projects which were included in this process were chosen to offer a wide variety of street typologies, scales and costs to better evaluate the impacts and the efficiency of this new approach.

a. Rue Saint-Ambroise

Located in the heart of the Saint-Sauveur neighborhood, the 450-metre-long rue Saint-Ambroise is an important link between surrounding neighbourhoods. A socially disadvantaged neighbourhood, Saint-Sauveur has a limited tree cover. Sidewalks are generally narrow with numerous obstacles (especially utility poles) which makes walking comparatively difficult, especially in winter.

In the first step of the process, rue Saint-Ambroise was studied according to the 11 indicators of the multicriteria analysis to identify its potential for improvements. The
second step in the analysis was the application of the approximately 30 additional indicators to define the design strategy. To validate the results of these analyses, an online survey of residents was conducted which allowed the design team to confirm the role that the street plays in facilitating access to schools, parks, bicycle paths and neighbourhood services.

To address those issues, certain objectives were convened with the residents, notably to:

- Confirm the rue Saint-Ambroise as a priority pedestrian connection;
- Promote active travel;
- Improve pedestrian safety and comfort;
- Reduce urban heat islands.

Interventions include widening sidewalks where feasible, decreasing the distances of pedestrian crossings at intersections, decreasing the urban heat island effect by adding trees and planting strips, relocating utility poles to remove obstacles along sidewalks, and creating a small park at a strategically located underutilized property. In addition, a portion of the street which is currently two-way will become one-way to improve safety.

![Figure 8: Rue Saint-Amboise: Before and after](image)

Source: SADU, Ville de Québec

b. Avenue du Chanoine-Morel

The analyses undertaken by the working group for the redevelopment of the avenue du Chanoine-Morel demonstrated the overriding need to reduce urban heat islands. In fact, despite a high canopy index for the Sillery neighbourhood in which this street is located, this street is virtually devoid of trees and greenery in general.

An on-line survey of over 100 residents confirmed those observations, and a large majority of them expressed a willingness to sacrifice on-street parking if that would allow for improvements to the tree cover.

A design workshop was organized to evaluate different hypotheses, and a consensus rapidly developed around one design strategy. That scenario includes reducing the width of the northern section of the street from over 18 m to 11 m which will allow for planting more than 35 trees, and creating a one-way, shared street on the southern section with a
substantial increase in the tree cover.

Given the proximity of an elementary school and the objective of facilitating access to schools on foot or by bicycle, a second priority has been given to improving the pedestrian experience by widening the sidewalks and reducing the length of crosswalks.

Finally, angled parking will be replaced by parallel parking to improve cycling safety.

c. **Rues Saint-Jean and Turnbull**

The analyses and design workshops with residents for the redevelopment of Saint-Jean and Turnbull Streets showed that pedestrian safety, increased vegetation and the addition of bike lanes were the principal improvements that were needed to better respond to the needs of the population.

The project includes the widening of sidewalks, improving pedestrian safety at crosswalks, planting nearly 50 trees and creating a public square. The investments for these changes represent 4% of the total budget, demonstrating that substantial improvements to the urban environment are possible with minimal financial impacts.
d. Chemin de la Canardière
In the context of this project, a new public square is planned, including the addition of a bicycle corridor and a planting strip. The sidewalks are to be widened, will be barrier-free and will be textured for the visually impaired. A raised intersection will bring sidewalks and streets to the same level, eliminating a frequent source of accidents for pedestrians in winter. This design will also contribute to a reduction in automobile speed.

![Figure 11: Chemin de la Canardière: Before and after](source: SADU, Ville de Québec)

e. Route de l’Église
The redevelopment of the route de l’Église promotes the comfort and safety of pedestrians and cyclists as well as the addition of greenery. The sidewalks will be widened and designed without obstacles, and a bi-directional bike path will be introduced but separated from the roadway by plantings.

Along this 900-meter-long street, approximately 170 trees will be planted along with 1,000m of shrubs and perennials. The tree canopy will increase from 9% to nearly 40%.

![Figure 12: Route de l’Église: Before and after](source: SADU, Ville de Québec)
5. Benefits

By basing design decisions on rational analyses of over forty indicators, explaining options and/or recommendations to elected officials and to the public has been greatly simplified and has been shown to improve efficiency of the design and approvals process. In addition, by eliminating what could be perceived as arbitrary choices without adequate justification, this data-based tool offers increased transparency and credibility in decisions touching street and public space designs. It is estimated that in most cases, this new approach accelerates the planning and preliminary design phases by a minimum of six to nine months and has greatly contributed to improved communications between all actors involved in the process.

Mapping those indicators helps professionals, decision-makers and the public visualize possibilities and opens the door to seeing possible links between different issues and projects – whether they be existing infrastructures or new developments - that might have been overlooked had they been presently individually or simply in tables or charts. In addition, the data base is designed to be easily upgraded, so that the most recent information or additional indicators can be integrated and new mapping generated with minimal effort.

An additional strength of this tool is that there is no pre-defined catalog of street or public space designs: options are developed in consultation with the public and city administrators, and the design possibilities are then communicated and validated in consultation with the same groups. In some cases, temporary interventions (tactical urbanism) are planned to evaluate new ideas and the reactions of the local population to proposed changes to their environments before investments in permanent solutions are undertaken. Eventually, as this approach is applied on a city-wide scale, a catalog of possible and proven design solutions will be compiled for a wide variety of contexts and street typologies, further simplifying their implementation.

Furthermore, by widening the decision-making process to include public health and quality of life issues, it is possible to directly reach a larger sector of the population that might not ordinarily feel concerned by changes or improvements to their environments, thus improving citizen engagement for a more positive, constructive and efficient participatory process.

This unique multicriteria approach is not a solution in and of itself but part of an overall effort by the City of Quebec to assure the continued improvement of quality public services. Its application in numerous projects has already been shown to improve the efficiency of the design and approvals process and can be applied to existing as well as planned developments. It contributes to a better understanding of planning issues, the physical, social and environmental differences between the multiple neighbourhoods within the city, and helps rapidly identify opportunities and constraints. Finally, being able to visualize simultaneously the relationships between various municipal projects and social, economic and environmental issues, this approach illustrates how each intervention can contribute to the creation of a fully integrated network of public streets and places.
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For a list of the documentation (including links to Complete Streets policies which inspired the present research) as well as projects being planned or already completed using this methodology, please consult the Rues conviviales page on Quebec City’s Web site (in French only): https://www.ville.quebec.qc.ca/planification_orientations/amenagement_urbain/rues-conviviales/index.aspx