The Quebec City Écolobus System

Organization
Réseau de transport de la Capitale (RTC)
(Quebec City regional transportation authority)

Status
Service launched in June 2008.

Overview
The Écolobus project is the first electrical minibus system implemented in a North America city. The system, which operates in the historic Old Quebec district, consists of eight emission-free and silent electric minibuses. The buses provide free rides within Old Quebec and offer a direct link between Upper Town and Lower Town, separated by a steep escarpment, as well as links between parking lots and major intermodal transportation hubs on the district's periphery.

This project is in line with the City's goal of protecting the environment, increasing sustainability [increasing sustainable transportation options?] and offering residents a higher quality of life.

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Resources
Écolobus
(http://www.rtcquebec.ca/francais/services/nosservices_ecolobus.html)

For a complete list of resources, see the end of the document.

Community Context

Old Quebec comprises a large portion of what is referred to as Downtown Quebec City. It covers an area of approximately one square kilometre between the Quebec National Assembly to the west and the Saint Lawrence River to the east (see Figure 1 below). Old Quebec is divided into two parts – Upper Town and Lower Town – by a steep escarpment that runs roughly through its middle. The escarpment limits the number of paths between the two parts, and the few paths that exist feature steep gradients. The historic city wall along its western edge also restricts access to Upper Town from other parts of the city.

Old Quebec, a UNESCO World Heritage Site since 1985, is a major Canadian tourist destination, welcoming more than 4 million tourists a year. In addition to the large numbers of tourists staying in hotels in Old Quebec, the area also has 4,600 permanent residents. Many tourists staying in other parts of the city flood into Old Quebec daily, as do some 20,000 Quebec City residents who work and study in the area. All together, Old Quebec generates around 50,000 trips daily, of which over 80% are in made by motorized vehicles. Average daily vehicular traffic includes 24,000 automobiles, 250 public transit buses, and 1,000 trucks. Traffic volumes reach their peak during the summer due to a very large number of tour buses - anywhere from 300 to 700 per day - as well as thousands of tourists arriving in automobiles.

Old Quebec's hilly topography and unique urban form, featuring many narrow, winding streets, is a challenging environment for transportation. Given many tight turns, visual obstructions, and high volumes of pedestrian traffic, Old Quebec is difficult to navigate for conventional public transit buses. The narrow cross-sections of most streets make noise and emissions generated by combustion engines a major nuisance for visitors and residents alike. The Écolobus addresses the challenges of operating public transportation within Old Quebec while helping to improve the quality of the environment, for residents and tourists alike.

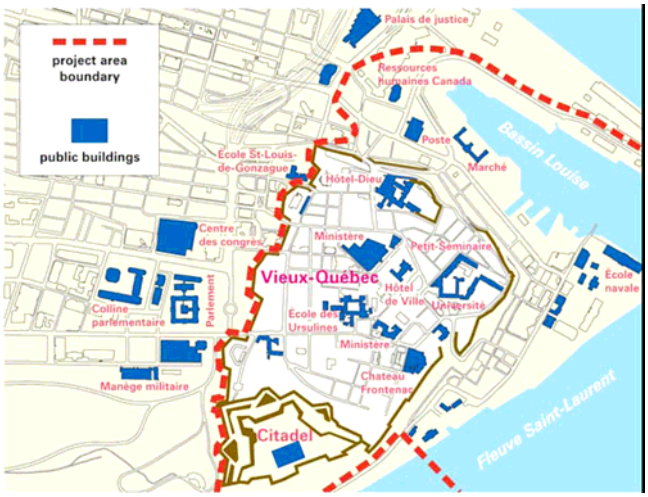
Policy Context

Over the past fifteen years, Quebec City has undertaken several studies and public consultations that led to the development of an overall public transportation plan in 1993, the *Old Quebec/Lower Town/Cap Blanc Master Plan*. The driving force of this plan was to create a more conducive environment to walking; thereby decreasing motorized vehicles traffic in Old Quebec. Eventually, a more detailed plan specifically for Old Quebec was developed – the 1999 *Old Quebec Transportation Plan*. It focuses on developing a way to reduce the number of city buses and tour buses in the Old Quebec area by integrating new modes of transportation, such as the Ecolobus. These two major documents have established a framework for responding to some of the aforementioned transportation issues in Old Quebec. They clearly emphasise the need to act in favour of more energy-efficient public transportation services. These measures must be combined with complementary measures regarding walking and bicycling facilities, as well as new parking policies. These plans also brought forth the idea of building a more sustainable environment through new public transportation solutions.

Responding to these two policy documents, the *Réseau de transport de la Capitale* (RTC), the region's transit authority, decided to study different avenues that would permit it to address Old Quebec's transportation challenges while meeting the new sustainability objectives. In this context, the idea of establishing an "ecoroute" through Old Quebec was proposed in 2001. This led the RTC to ask the *Centre d'expérimentation des véhicules électriques du Québec* (CEVEQ) (Quebec Centre for Experimentation in Electric Vehicles) to identify a vehicle that could be used to operate the envisioned ecoroute through Old Quebec.

Through the *Integrated Travel Management Program in Old Quebec*, Quebec City and the RTC proposed five strategies to strengthen transit service and intermodal connections while reducing greenhouse gas emissions from transport in Old Quebec. They are: Implementation of the Eco Minibus routes; Create pedestrian friendly zones; improve intermodality between bicycles and mass transit at Eco Minibus stops, regulation of truck traffic, construction of a tourist bus terminal, constructing park and ride lots on the periphery of Old Quebec, and increasing parking charges in the area.

Figure 1 - Map of the Écolobus service area



Source: Réseau de transport de la Capitale

Rationale and Objectives

The principal rationale for the Écolobus project is to improve public transportation to and within Old Quebec while minimizing noise and air pollution in the area, for the benefit of visitors and residents alike.

The objectives of the Écolobus project fall into three broad categories: (1) traffic reduction; (2) sustainability; and (3) social benefits.

In terms of traffic reduction, the Écolobus system is intended to provide an alternative to conventional motorized vehicles - including automobiles, tour buses, and conventional public transit buses – for travel within, and around, Old Quebec. By reducing the volume of automobile traffic, the system is expected to relieve traffic congestion, especially during the summer peak period.

In quantitative terms, the traffic reductions expected from the implementation of the *Integrated Travel Management Program* in Old Québec include:

- 10% less automobile traffic
- 10% less truck traffic 10% fewer tour buses
- 60% fewer conventional public transit buses outside peak tourist season
- 76% fewer conventional public transit buses during peak tourist season

In terms of sustainability, the Écolobus is seen as a means of mitigating greenhouse gas emissions in Old Quebec. Being electrically powered, the Écolobuses do not produce any tailpipe emissions. The electricity used to charge their batteries is drawn from the local electrical grid, which is almost entirely fed by hydroelectric power stations. As such, the power source for the Écolobuses can be said to be both clean and renewable. In quantitative terms, the

project aims to reduce the amount of fuel consumed by conventional tour buses and transit buses by 67,500 litres per year. This will be achieved by reducing the total distance travelled by conventional buses by 112,500 km per year. This is expected to yield a 186 tonne annual reduction of CO_2 emissions.

In terms of general social benefits, the Écolobus route will facilitate travel between Upper Town and Lower Town and the surrounding areas - a benefit to residents and visitors alike. By reducing traffic volume, the Écolobus is intended to make Old Quebec safer for pedestrians. By mitigating vehicular emissions and noise, the Écolobus is intended to help provide residents and visitors with a healthier and more pleasant environment. It is also hoped to help stem the decline of Old Quebec's residential population. Finally, it also contributes to preserving historical buildings and facades that were strongly affected by cars and buses gas emissions, as well as vibrations from heavy traffic.

Actions

Selecting the Technology

Following the study conducted in 2005 by the CEVEQ, the Gulliver U520ESP minibus, manufactured by an Italian company – Tecnobus S.p.A – was tested on the chosen route. Tecnobus was selected because it was the only company able to provide the City of Quebec with buses that met their requirements, particularly with respect to climate, within a short delivery period.

There Gulliver U520ESP has several specific features that appealed to the City of Quebec, including:

- the minibus's power supply uses a low voltage, which reduces safety risks
- it has a stainless steel chassis and a fibreglass hull, which make it resistant to corrosion to due exposure to salt in the winter
- it is equipped with a de-icing system for the mirrors and a heating system for the driver's seat, as well as an autonomous air-conditioning and heating system, which allows better control of the temperature.

Table 1 - Technical specifications of the Gulliver U520ESP Minibus

Length	5.3 m
Width	2.03 m
Height	2.85 m
Floor height	35 cm
Capacity	10 places seated, 10 places standing
Accessibility	Wheel chair ramp
Maximum Speed	33km/h
Maximum Slope	16%
Batteries	ZEBRAS (Sodium liquid batteries heated between 275°C and 300°C)
Autonomy:	100km/ 12hours (8 hours in Quebec City)
Recharge time:	8 hours
Electrical consumption:	$3,25 per day

Figure 2 - The Gulliver U520ESP in RTC Écolobus livery

Source: Réseau de transport de la Capitale

Designing and Implementing the Service

The system is composed of 8 mini buses, circulating on a 5.3 km route from the Parliament Hill (Manège Militaire) to the Old port through the Old Quebec area.

Figure 3 - Real Time Mini Bus Display System

Source: Réseau de transport de la Capitale.

Implementing Complementary Measures

Aside from choosing the technology, the RTC has implemented a variety of complementary measures to maximize the effectiveness of the project on mitigating traffic congestion and improving the quality of the environment. Some of these measures are directly related to the Écolobus service itself, including:

- priority measures for Écolobuses during peak periods (advanced green lights and reserved lanes)
- high quality bus stops, with distinctive signage, enclosed waiting areas, displays with real-time bus schedule information
- fare-free access.

Other measures have been implemented which are expected to indirectly encourage use of the Écolobus, including:

- increased parking charges in Old Quebec
- improved the pedestrian and cycling environment through sidewalk and crosswalk enhancements, provision of bicycle paths, and the installation of bicycle parking
- restrictions on heavy truck access to Old Quebec – Semi-trailer trucks prohibited in the area; commercial delivery hours restricted for heavy trucks
- restrictions on tour bus access to Old Quebec – They are only allowed into Old Quebec to bring passengers to hotels and the tourist coach terminal.
- diversion of tour buses to a new intermodal transportation hub (from which the Écolobus can be taken into Old Quebec)
- public education campaign to increase awareness and the use of public transportation, including the Écolobus
- establishment of a travel demand management department (*Bureau de gestion de la mobilité*) – This department is the result of a partnership between the federal and provincial governments. It has the specific mandate to monitor the development of the project according to the priorities defined. It is a mediator between the project stakeholders, residents, and transportation authorities. It is also in charge of conducting the first satisfaction survey.

Figure 2 - An Écolobus travelling through Old Quebec

Source : Gris Orange Consultant Inc

Results

The RTC launched the Écolobus service in June 2008. The system initially operated with a relatively limited frequency of service. The public response was so positive that the RTC promptly proceeded to implement an expanded service schedule with an average headway that varies from 10 minutes during peak hours (11:00am to 10:00pm) to 20 minutes during off-peak hours (5:30am to 11:00am and 10:00pm to 1:00am).

According to the first user satisfaction survey, conducted in May 2009, more than 82% of the participants stated that they were very satisfied or satisfied with the Écolobus system. The average daily ridership during the summer of 2008 was over 2,000 passengers, significantly exceeding the City's and the RTC's expectations.

Definitive studies of the Écolobus's impact on traffic volumes and emission levels in Old Quebec have yet to be carried out. Anecdotal evidence from local officials suggest that the Écolobus system is succeeding in reducing the number of car and buses in Old Quebec and is helping to creating a more pedestrian friendly environment.

Participants

The implementation of the Écolobus system was made possible thanks to ongoing cooperation between local partners, as well as the participation of the provincial and federal ministries of transportation. The main actors included:

- *Réseau de transport de la Capitale*: The regional transit agency contributed to the acquisition of the mini buses. It is also the only operator of this service in Quebec City.
- Ville de Québec: Quebec City has financially supported the project, but also more indirectly

through the implementation of related measures (e.g.: bicycle parking facilities, truck traffic regulations)

- Transport Canada financially supported the Project (e.g.: Mini Bus acquisition, operation, maintenance)
- Transports Québec financially supported the project.

Local residents, citizen associations and various local interest groups also participated in the planning and implementation of the project.

Costs and Funding

This pilot project is mainly funded by the federal government, through Transport Canada's Urban Transportation Showcase Program (UTSP); the provincial government (via Transports Québec, the ministry of transportation); the RTC; and City of Quebec. The direct costs of the program and the costs of related measures are detailed in Table 2 below. The same table also details the amount funding for the program and the related measures provided by each of the abovementioned agencies.

Table 2 - Distribution of Costs and Funding for the Écolobus project

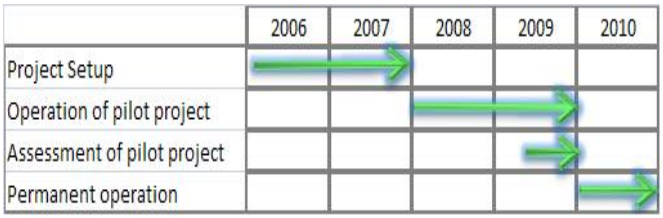
Activity	Cost ($M)	Contribution ($M)			
		Federal	Provincial	Quebec City	RTC
Direct Activities					
Vehicle acquisition	5.4	0.9	2.4	0.3	1.8
Vehicle operation (2 years)	1.9	0.1	1.0	-	0.8
Storage, maintenance, Installation	0.6	0.6			
Subtotal	**7.9**	**1.6**	**3.4**	**0.3**	**2.6**
Related Activities					
reserved lanes	0.1	0.1	-	-	-
traffic lights priority	0.05	0.05	-	-	-
bicycle parking facilities	0.05	-	-	0.05	-
pick up and drop off zones for tourist buses	0.3	-	-	0.3	-
information and marketing	0.04	0.04	-	-	-
studies and planning	0.2	0.2	-	-	-
other facilities	0.01	0.01	-	-	-
Project Total	**8.6**	**2.0**	**3.4**	**0.7**	**2.6**

Timeline

The first step towards the Écolobus project was made in 2001 when the Transport Canada launched a study about the use of alternative-fuel powered buses in Quebec's climate. The CEVEQ was then mandated to identify a vehicle that would be able to meet the RTC's requirements in terms of sustainable transportation for a route in Old Quebec called the *Parcours Écologique* ("eco-route").

Planning of the current Écolobus pilot project began in 2006 and continued through 2007. The project was launched in June 2008 and is intended to continue operating at least until the end of 2009. Pending the outcome of a planned assessment of the project (ongoing at the time of writing), the City and the RTC are supposed to either discontinue the pilot or make the system permanent as of early 2010. Given the positive public response to the project and preliminary evidence that the project is meeting its goals, it seems likely that the Écolobus will be made permanent.

Figure 3 - Timeline for the Écolobus project



Source: Ville de Québec & Réseau de transport de la Capitale, 2008. Modified by Gris Orange Consultant Inc., 2009

Lessons Learned

The decision makers and planners responsible for the Écolobus project had to overcome a number of challenges in designing the Écolobus system. In particular, a major challenge was finding a way of operating the system safely and reliably in the context of Old Quebec's topography (many steep grades), urban form (narrow streets, tight turns), and the harsh winter climate (icy roadways, extreme low temperatures). A key issue was finding a vehicle capable of operating under the aforementioned conditions.

Other specific initial challenges included:

- Being able to operate the eight electric minibuses autonomously (without external power) for 19 hours a day, 7 days a week.
- Difficulties in estimating ridership and managing crowding on the buses, whose capacity is 20 passengers, especially during the summer peak

tourist period. The frequency of the service had to be increased soon after it was launched.

- Training drivers, as operation of the electric minibuses is significantly different from that of conventional buses.
- Training of mechanics, unfamiliar with maintenance of electric vehicles
- Modification of some vehicle components for the extreme winter conditions. For example, a diesel-based heating system had to be added because the Gulliver minibuses built-in heating was insufficient on colder winter days.
- Technical issues, such as the overheating of batteries because of overload buses, hills, and insufficient driver draining
- Communication with the Italian bus supplier, complicated by differences in technical standards between Europe and Canada and linguistic barriers.

Next Steps

In order to make the Écolobus system more efficient, the RTC plans on making a few route adjustments in the fall of 2009. Simultaneously, the transit authority is slated to implement a program intended to encourage workers to use public transit to commute to work in Old Quebec instead of using their own motor vehicles. The first report of the *Comité de pilotage* (Pilot Program Committee) also emphasizes the need for increasing intermodality with tour buses, which has lagged thus far. Finally, the RTC is preparing to make the Écolobus service permanent as of 2010.

Resources

Centre d'expérimentation des véhicules électriques du Québec (CEVEQ), *Expérimentation d'un minibus électrique dans le Vieux-Québec*. Rapport Final, Québec City, April 2007.

Chapon, H.; Ville de Québec, *Le service d'Écolobus dans le Vieux-Québec*, Congrès annuel de l'AQME, Sherbrooke, 8 mai 2009.

Chapon H.; Réseau de transport de la Capitale; et Ville de Québec, *Integrated Management of Travel in Old Quebec*, Urban Transportation Showcase Program, Phase 2 – Detailed Proposal. May 2003.

Réseau de transport de la Capitale (RTC), « Les Couleurs du Progrès », Rapport Annuel 2008. http://www.rtcquebec.ca/_site/documents/applications/pdf/RTC_rapport2008.pdf

Ville de Québec et Réseau de transport de la Capitale (RTC), *Integrated Management of Travel in Old Quebec*, Powerpoint Presentation presented to Transport Canada, Toronto, September 19th, 2008.

Ville de Québec et Réseau de transport de la Capitale (RTC), *Integrated Management of Travel in Old Quebec*, Powerpoint Presentation presented to Transport Canada, September 24th, 2007.