Green Bond Program

Sustainable Development Contribution of the Société de transport de Montréal

February 24, 2017

Green Bond Program

- The Government of Quebec proceeded, on **February 24, 2017, to the first issuance of the province's Green Bond Program**
- It is a financing program dedicated to projects generating quantifiable benefits in terms of environmental protection (and more), specifically:

  1. Greenhouse gas emission reduction
  2. Climate change adaptation

- Four STM projects were chosen for the first issue of Quebec's Green Bond Program:

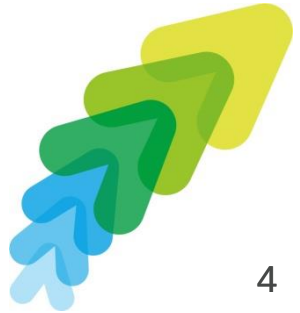
  1. **Acquisition of 458 AZUR cars**
  2. **'Reno-système' Program**
  3. **'Reno-Infrastructure' Program**
  4. **Acquisition of 258 hybrid buses**

- The Government of Quebec has committed to publish an annual **Report on Project Progress and Tracking of Benefits in Reducing Greenhouse Gas Emission and Climate Change Adaptation**

GHG BENEFITS TRACKING IN STM PROJECTS

1. GHG EMISSION REDUCTIONTHROUGH PUBLIC TRANSPORTATION
2. GHG EMISSION REDUCTION BY THE STM
3. PUBLIC TRANSPORTATION ELECTRIFICATION

1-GHG EMISSION REDUCTION THROUGH PUBLIC TRANSPORTATION



GHG Emission reduction through Public Transportation

- Public transportation is a known effective mean in reducing GHG emissions
- In 2016, a study performed by the firm Golder for the STM shows that the total GHG emissions reduction in the Greater Montreal Area amounts to **3,911,000 tons of CO_2 eq per year**
- Quantification of GHG emissions reduction was realized according to the General Guidelines of the Recommended Practice for Quantifying Greenhouse Gas Emissions from Transit by the **American Public Transportation Association (APTA)** under three factors:

    1. **Ridership Effect:** "Because of public transportation, there are fewer cars on the road"
    2. **Road Congestion Alleviation Effect:** "Because of public transportation, there is less road congestion"
    3. **Territory Density Effect:** "Because of public transportation, the territory has a greater density"

GHG Emission reduction through Public Transportation

1) Ridership Effect

"Because of public transportation, there are fewer cars on the road"

- **Objective:** Quantifying the number of vehicle-km in reduced passenger cars by users of public transportation
- **Adopted Approach:** Calculation from a modal shift rate
  - Number of travels with public transportation
  - Modal Shift Rate
  - Travelled Distances
  - Emission Rate

Results

1) Ridership Effect

- The effect of decrease in automobile traffic represents a gain of **73 5000 tons CO2 eq per year**

A 16% decrease in GHG in the Greater Montreal Area

GHG Emission reduction through Public Transportation

2) Road Congestion Alleviation Effect

"Because of public transportation, there is less road congestion"

- **Objective:** Quantifying the fuel overconsumption reduced through congestion alleviation
- **Adopted Approach:** Regional Transportation Model (EMME software of the MTQ)
  - GHG emitted by means of transporting people not using public transportation

  Minus
  - GHG actually emitted by people's road transportation means

Results

1) Road Congestion Alleviation Effect

- The automobiles Road Congestion Alleviation Effect represents a gain of **836,000 tons of CO_2 eq per year**

A 17% GHG decrease in the Greater Montreal Area

GHG Emission reduced through Public Transportation

3) Territory Density Effect

"Because of public transport, the urban development is denser"

Objective: Quantify the prevented vehicle-km due to urban densification on land next to the public transport network

Adopted Approach: Calculation from the modal transfer rate

> GHG emission for fictional scenario of urban density without public transportation
> **Minus**
> GHG emission for real scenario of urban density with public transportation

Results

1) Territory Densification Effect (Urban Densification Effect)

- The Urban Densification Effect represents a gain of **2,341,000 tons of CO_2 eq per year**
- It represents a prevented consumption close to **1 billion litres of fuel per year**

A 22% GHG decrease in the Greater Montreal Area

GHG Emission reduced through Public Transportation

- The category that has the biggest impact in decreasing and preventing GHG emission is the Urban Densification Effect with **2,341,000 tons of CO2 eq per year**
- The category that has the second-biggest impact in decreasing and reducing GHG emissions is the Road Congestion Alleviation Effect with **836,000 tons of CO_2 eq per year**
- The category with the smallest impact in decreasing and reducing GHG emissions, although still relevant, is the Ridership Effect with **735,000 tons of CO_2 eq per year**
- The results of this study show a total of reduced GHG emission for the Greater Montreal Area of approximately **3,911,000 tons of CO_2 eq per year**
- This represents approximately **35% of the total attributable emission of the road transport on the CMM territory**

This represents approximately 35% of the total attributable emissions from road transportation on the CMM territory.

2- GHG EMISSION REDUCTION BY THE STM

GHG Emission Reduction by the STM

- The emissions caused by public transportation can be divided in two categories: **emissions produced** and **emissions avoided** by public transportation.
- Emissions caused by public transportation include mainly emissions due to mobile sources (buses, metro cars and service vehicles) as well as fixed sources related to standing structures.
- **The STM reported direct GHG emissions of 164,800 tons of CO_2 equivalent for the year 2015.**

GHG Emission Reduction by the STM

- In its **Plan stratégique organisationnelle 2025**, the STM has committed to pursue its efforts in reducing its own passenger-kilometre GHG emissions
- The STM aims at a **GHG emission reduction of 6% per passenger-kilometre** by 2025 (from 47.4 g of CO_2 eq per passenger-kilometre in 2015 to 44.7 g of CO_2 eq per passenger-kilometre in 2025)
- **The acquisition of AZUR metro cars and hybrid buses is essential to improve the service offer and reach the target of reducing the STM's GHG emission per passenger-kilometre.**

Target	2015	2020	2025
GHG emission per passenger-km (g of CO_2 eq) (edited version 2 of 23/02/2017)	47.4	46.2	44.7

GHG Calculation per Passenger-km

GHG Emission

- The STM greenhouse gases (GHG) emission is calculated consistently with the ISO standard 14064:

- Direct Emission (scope 1):
  - Direct emission of mobile sources (bus, service vehicles and STM work vehicles),
  - Direct emission of fix sources (building gas heating, diesel generators),
  - Other direct emissions (loss of refrigerant fluids, aerosol use).
- Indirect emission associated with electricity consumption (scope 2).

- Indirect emission (scope 3) linked to taxis completing part of the service offer of public transportation.

- The emission factors used are the ones from the most recent National Inventory Report available with the exception of the factor associated with hydroelectricity from Hydro-Québec.

Passenger-km

- Passenger-km represents the accumulation of the travelled distances by STM clients on its network. The ridership (number of rides) is converted in distances by using the ratios from the original study “Origine Destination” conducted every 5 years. The ratios are the repartition of the ridership per mode (metro or bus) and the travelled distances per mode.

3-PUBLIC TRANSPORTATION ELECTRIFICATION

Public Transportation Electrification

- In 2015, more than **69.5% of the 413 million travels** carried out on the STM network used electricity.
- **The acquisition of the AZUR metro cars and hybrid buses** is essential to the increase in proportion of travels using electricity.
- **Thanks to the new hybrid buses and AZUR cars, the STM aims to increase travels using electricity on its network from 69.5% in 2015 to 90.4% in 2025**

Cibles	2015	2020	2025
Trips using electricity	69,5%	79,7%	90,4%

Calculation of Electricity-Powered Travels

Electricity-Powered Travels

- Electricity-Powered Travels correspond to travels made by metro, hybrid buses (diesel-electric propulsion) or electric buses. According to the study Origine Destination, annual ridership (number of rides) is split by mode (bus or metro).

- Bus travels are then split between diesel buses, hybrid buses and electric buses with respect to fleet composition.