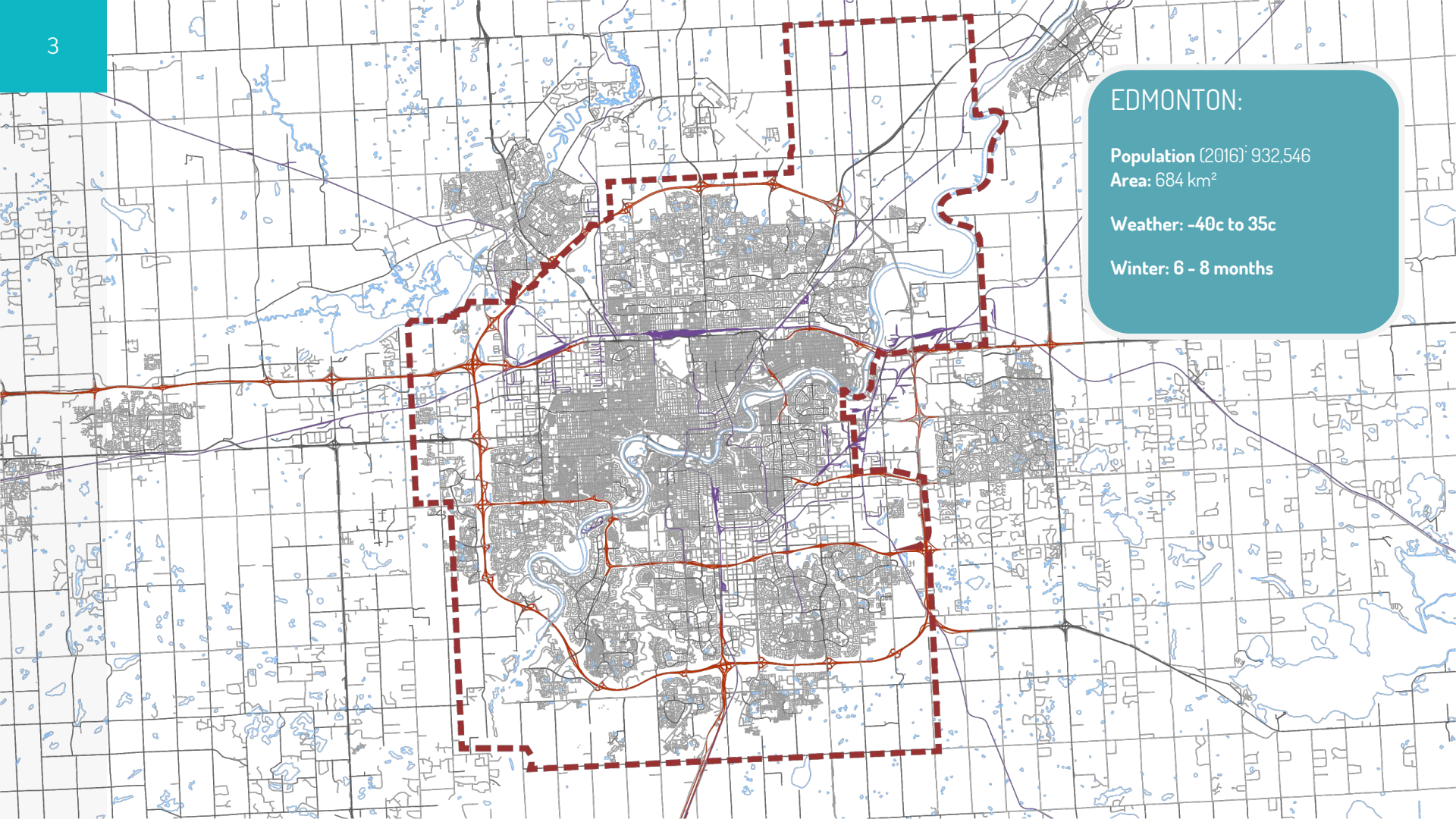




# SMART CITY TRANSPORTATION

In Edmonton, Canada





## EDMONTON:

Population (2016): 932,546

Area: 684 km<sup>2</sup>

Weather: -40c to 35c

Winter: 6 - 8 months

# PUBLIC TRANSPORTATION IN YEG

# ETS

**Founded:** 1908

**209** Bus Routes

**2** LRT Routes

**963** Buses

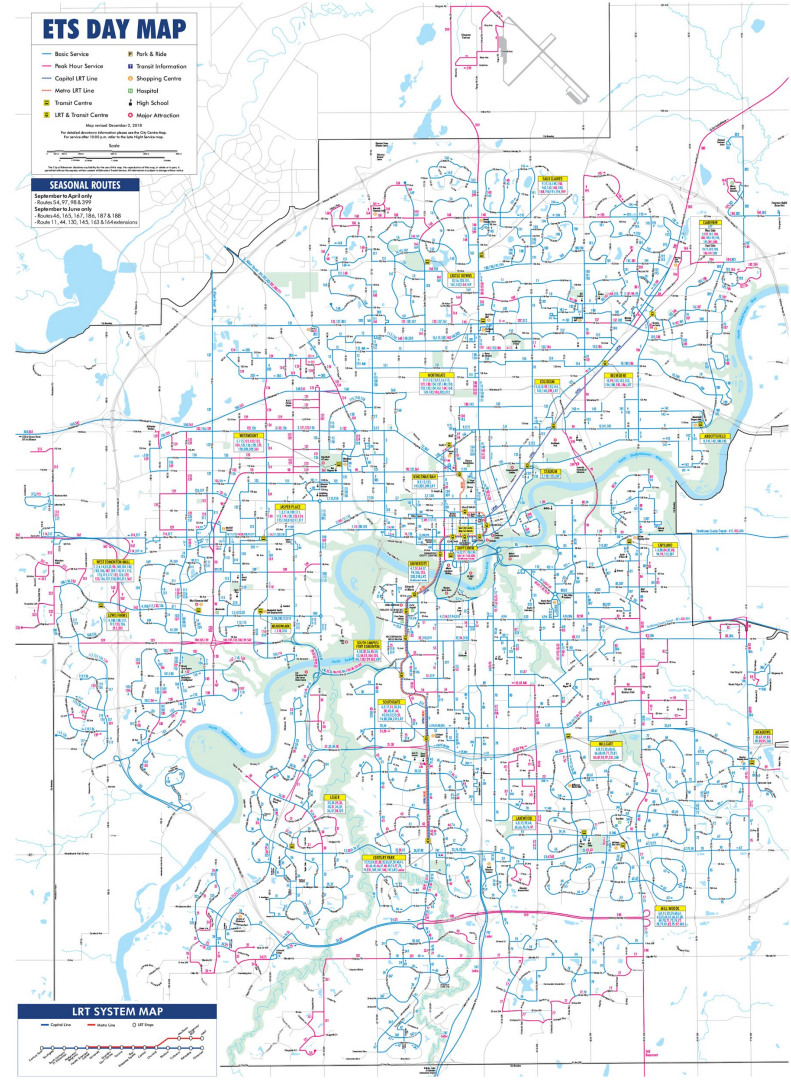
**94** Light rail Vehicles

**98** DATS vehicles

Ridership: **397,402** (weekday)



[https://en.wikipedia.org/wiki/Edmonton\\_Transit\\_Service](https://en.wikipedia.org/wiki/Edmonton_Transit_Service)



# YEG TRANSIT-ORIENTED DEVELOPMENT

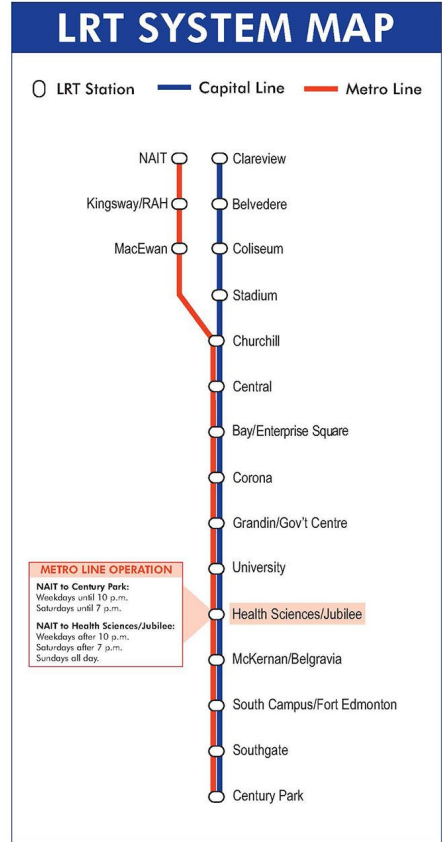
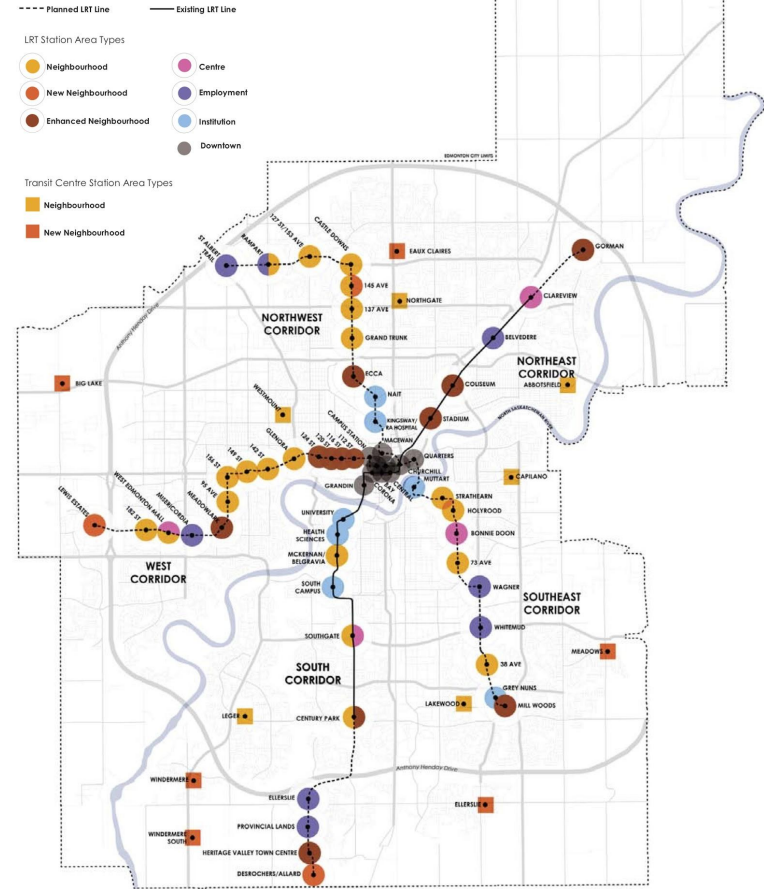


Figure 10: Station Area Types



# WEATHER IN YEG



# WEATHER IN YEG

## The 10 WinterCity Strategy Goals

### WINTER LIFE

#### Goal L1

Make It Easier to 'Go Play Outside':  
Provide More Opportunities  
for Outdoor Activity

#### Goal L2

Improve Winter Transportation  
for Pedestrians, Cyclists and  
Public Transit Users

### WINTER DESIGN

#### Goal D1

Incorporate Urban Design  
Elements for Winter Fun,  
Activity, Beauty and Interest

#### Goal D2

Design Our Communities for  
Winter Safety and Comfort

### WINTER ECONOMY

#### Goal E1

Increase the Capacity and  
Sustainability of Edmonton's  
Winter Festivals

#### Goal E2

Develop a Four-Seasons Patio Culture

#### Goal E3

Enhance the Social and  
Economic Vibrancy of Our  
Streets and Public Places

### OUR WINTER STORY

#### Goal S1

Celebrate the Season and Embrace  
Daily Living in a Cold Climate

#### Goal S2

Promote Edmonton's Great  
Northern Story Locally,  
Nationally and Internationally

#### Goal S3

Kickstart and Lead Implementation  
of Edmonton's Winter City Strategy:  
Apply a 'Winter Lens' to Our City



FOR THE LOVE OF WINTER  
WinterCity Strategy Implementation Plan

# WEATHER IN YEG (TRANSIT)

## Winter Life Action L2.3

Pilot a project in which the City of Edmonton is responsible for residential sidewalk snow **clearing in a higher density residential/transit-oriented development area**. Focus on opportunities to create white-of-ways.

## Winter Life Action L2.4

Pilot **free public transit below certain temperatures**.

## Winter Life Action L2.7

Pilot increased bylaw enforcement for **residential sidewalk snow clearing in a higher density residential/transit-oriented development area**.

## Winter Life Action L2.8

Support non-governmental organizations (NGOs) to **enhance shuttle-type transit for vulnerable street populations**, to make sure people have easy access to social agency warming shelters.

## Winter Life Action L2.10

Work with Edmonton Transit Services (ETS) and other partners to identify best options for more frequent and/or **heated and/or wind-protected transit shelters**.



FOR THE LOVE OF WINTER  
WinterCity Strategy Implementation Plan



# SMART CITY IN YEG

## SMART CITY STRATEGY MOBILITY INITIATIVES



Edmonton



### SMART BUS

Edmonton Transit Service's Smart Bus technology allows buses to send, receive and broadcast real-time information to customers. The technology also allows for improvements to accessibility, safety, and collection of data. This data assists transit planners when designing transit service delivery.

The Smart Bus equipment (GPS device, close circuit camera, mobile data terminals, automated passenger counters) has been installed in over 900 City buses. The near real-time data gathered by the Smart Bus system is shared with external service providers (ex. Apple Maps, Google, etc.) through the City's Open Data platform. ([data.edmonton.ca](http://data.edmonton.ca))

### AUTONOMOUS VEHICLES

The City of Edmonton is undertaking the development of an autonomous vehicle strategy. The City is building an interconnected, multi-modal transportation system where citizens can walk, bike and ride transit efficiently and conveniently to their desired location.

The City is committed to understanding the upcoming technology so that when deployed, it is ready to incorporate autonomous vehicles into the existing transportation system. It is anticipated that automated technology could be integrated into the transit system and shared fleets in addition to the deployment of privately owned autonomous vehicles.



### SMART TRANSPORTATION

The Centre for Smart Transportation works to be a world-class transportation research, education, training and service group within the Department of Civil and Environmental Engineering at the University of Alberta.

Through partnerships with industry, government and academic agencies, the Centre for Smart Transportation aims to serve local national and global transportation needs, while advancing research and technology development and transfer.

### INTELLIGENT TRANSPORTATION

The City is engaged in partnerships with several private companies to create predictive traffic modeling. The project's first focus is on Yellowhead Trail (a major road for both commuter and heavy truck traffic) where the City's vehicle detection data feeds a predictive traffic model. Using the projected future volumes, the City adapts the signal controls to optimize the corridor and the network.

### SMART FARE

The City of Edmonton, in collaboration with the City of St. Albert and Strathcona County, is implementing a Regional Smart Fare initiative. The initiative will enable regional transit agencies to accept a variety of electronic means of payment and to transition away from paper-based transit passes/tickets and cash.

Smart Fare, when implemented, will allow riders to pay for transit fares using credit cards, debit cards, smartphones and watches, and smart cards compatible with the system.

# SMART CITY IN YEG

## Challenge Statement

Edmonton will lead the transformation of Canadian healthcare using an unprecedented municipal approach by focusing on leveraging relationships, health data and innovative technologies to provide a personalized health connection and experience as unique as the health of every Edmontonian.

*A Smart City is first and foremost a Healthy City.*



“smart cities are, especially for them to **not be defined by technologies that we want to try to implement** and instead have them be really **grounded in residents’ needs**, and for them to be judged based on their ability to deliver positive outcomes for residents, and for residents to be a really important part of the process.”

*GABE SAWHNEY,*  
JURY MEMBER  
SMART CITIES CHALLENGE



## *THE PROBLEM:*

How can smart city technologies improve the public transportation system for the citizens of Edmonton, and what are some ways it can be applied during the Winter season?

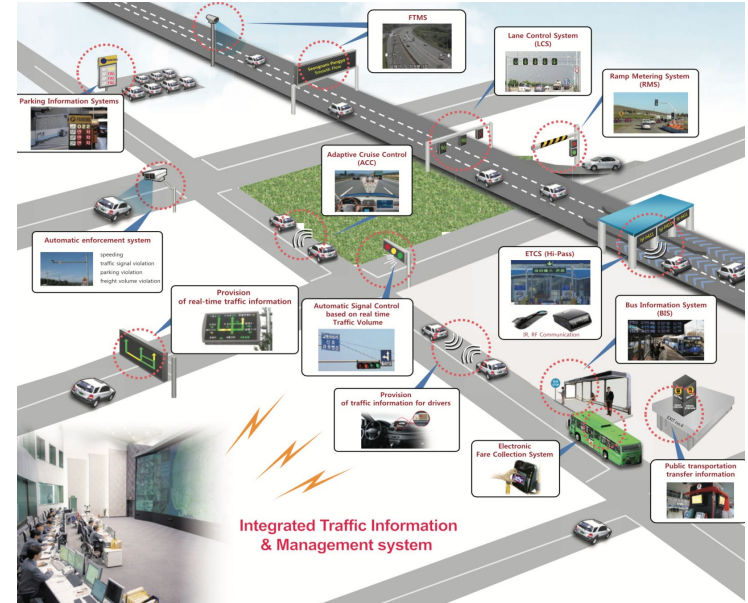
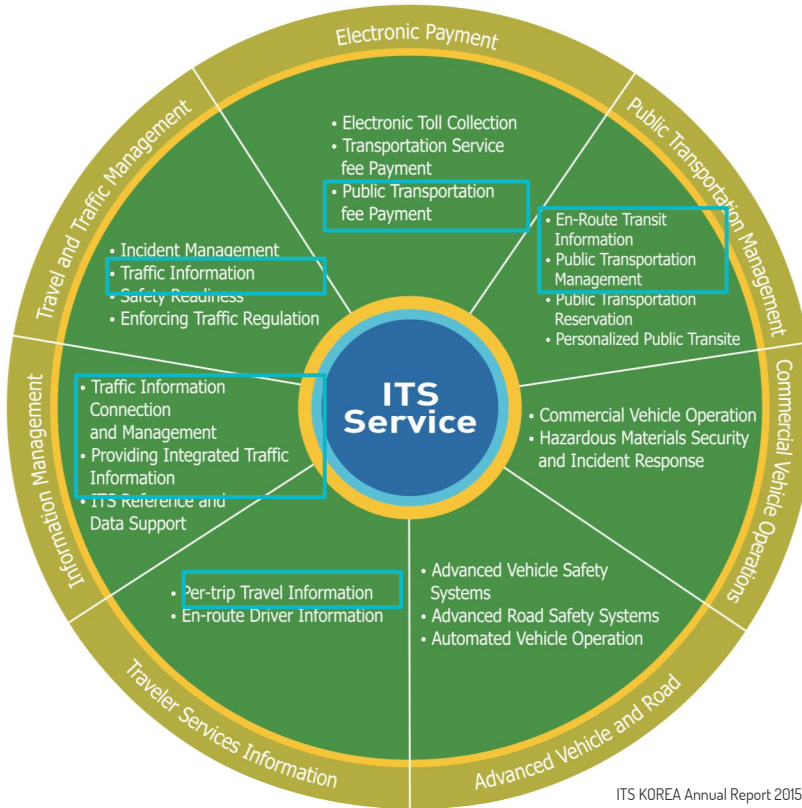


## *THE IDEA :*

Find small (in the short term) changes from smart city technologies that can be implemented over the next couple of years to begin improvement of public transportation in Edmonton for its' citizens.



# KOREA INTELLIGENT TRANSPORT SYSTEM (ITS)



# ISSUES IN YEG PUBLIC TRANSPORTATION



## Wi-fi

There is currently no wi-fi or cellular services once LRT goes underground.



## Payment System

Not electronically implemented. show Student ID, bus ticket, exact fare



## Exact Fare

No technology to count if money is correct, no change given.



## Delays

Buses, especially in winter do not show up on time.



## Bus Stops

Glass bus stops, no heating or weather protection unless at a transit hub.



## Airport Bus

Fare is different than in the city, this is an additional \$5.00 CDN, and runs every hour.



## Bus Routes/ Frequency

In recent years, bus routes have been cut for budgeting purposes



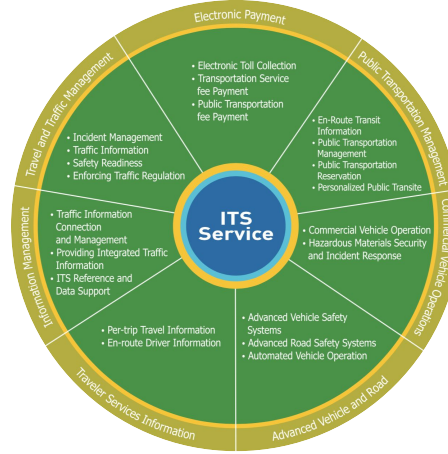
## Future LRT

Issues with signalling for the newly extended metro line.

## Not smart Enough

# APPLYING ITS TO EDMONTON

**SMART  
DATA**



**APPLICATION TO  
INFRASTRUCTURE**

**SMART  
PAYMENT**



# SMART DATA

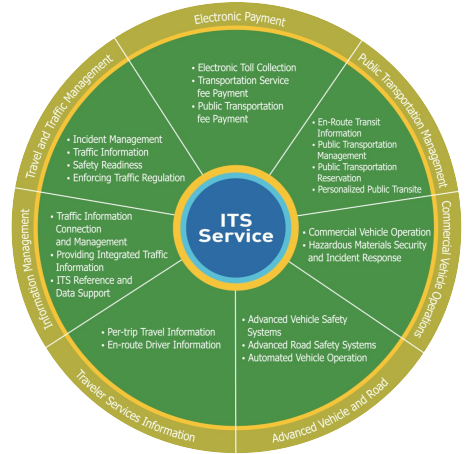
Having better 'real-time' data integration will help with mobile apps, live bus times.



<https://tti.tamu.edu/researcher/tti-selected-for-federal-contract-to-evaluate-connected-vehicle-projects/>

## SENSORS + GEOTRACKING

- ▷ Traffic Information Connection and Management
- ▷ Providing Integrated Traffic Information
- ▷ En-Route Transit Information
- ▷ Per-trip Travel Information
- ▷ Traffic Information
- ▷ Incident Management





# SMART PAYMENT

Running an efficient transportation system means money. With the current fare payment system, it is difficult to track who is using public transit, and where they are going.



## ETS FARES IN YEG

# \$3.25 CDN

Per Trip (2,728 KRW)

# \$91.50

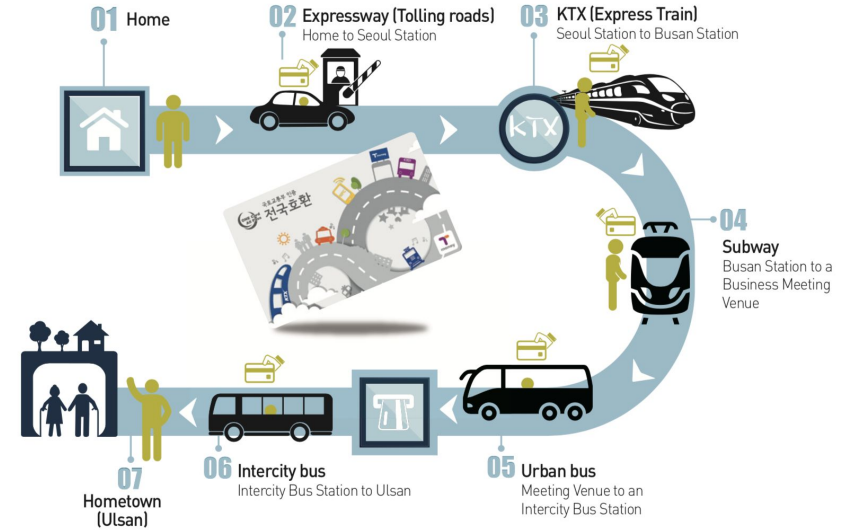
Monthly Adult Pass (76,809 KRW)

# \$55.00

Monthly Student Pass (46,169 KRW)

# SMART PAYMENT

- ▶ All-in-one transit card
- ▶ Resolve counterfeit bus passes
- ▶ Free-riders
- ▶ Help with budgeting, loss of revenue
- ▶ Track daily ridership



## Cooperation(MOU)

- Central & Local governments
- Transport Corporations
- Card Companies

## Transport modes

- Urban bus
- Railway(Express rail)
- Regional bus(express bus)
- Airport
- Subway
- Public bicycles

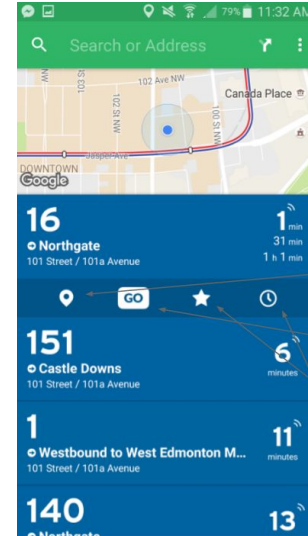
## Transport facilities

- Expressways(Tolling roads)
- Public parking lots



# INTEGRATION

Once smart data has been better optimized in the background, it can be better integrated into mobile apps, bus shelters, and eventually, road infrastructure.



Press on route tile for more options

See stop info (next image)

GO (travel companion)

Favourite this route

Upcoming and scheduled departure times

City of Edmonton's Open Data Portal

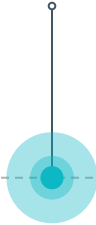
# GOOGLE HOME BUS STOP

- ▶ Smart home technology, utilized outdoors.
- ▶ Integration with OpenCity Wifi
- ▶ 'Real-Time' Information
- ▶ Adjust temperature
- ▶ Adjust lights



# LONG TERM GOALS

**BUS PRIORITY  
LANES**



**LRT EXPANSION**



**LANE  
CONTROL**



# IF IMPLEMENTED



Connected Citizens



Integration with Airport Bus



Improve Response Times



LRT Expansion



Bus Route Prioritization



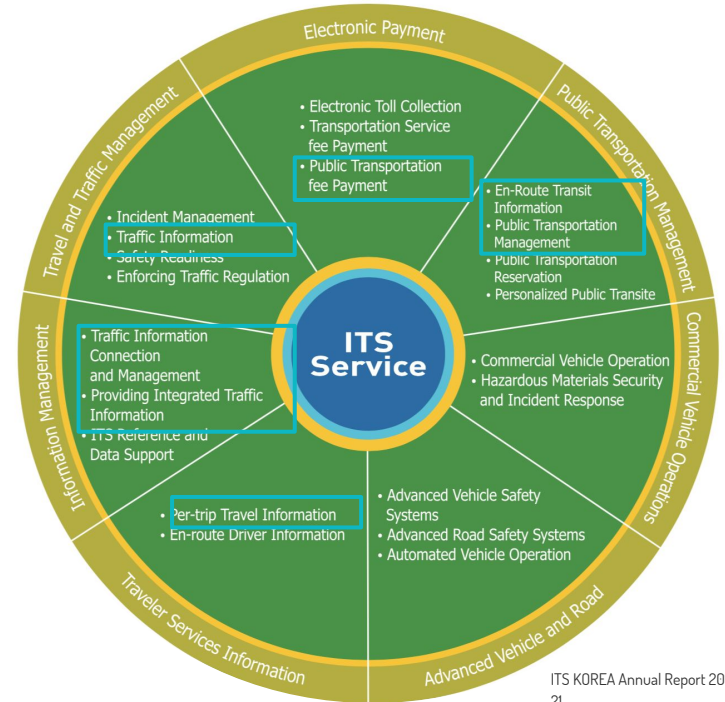
Smart Payment Methods



Automatic Change



Smart Bus Shelters





### SMART CITY:



“smart cities are, especially for them to **not be defined by technologies that we want to try to implement** and instead have them be really **grounded in residents' needs**, and for them to be judged based on their ability to deliver positive outcomes for residents, and for residents to be a really important part of the process.”

GABE SAWHNEY.

### THE PROBLEM:



How can smart city technologies improve the public transportation system for the citizens of Edmonton, and what are some ways it can be applied during the Winter season?

### THE IDEA:

Find small (in the short term) changes from smart city technologies that can be implemented over the next couple of years to begin improvement of public transportation in Edmonton for its' citizens.



A city where, in the short term is able to have public transportation improve the year-round user experience through smart technologies, and make the city a more favourable place to live and move around in.



# DETAILED PLAN

Although Edmonton has current smart technologies implemented, it is not used to its full potential.

By taking the existing infrastructure and improving it to make it operate and integrate better, then it would be a good place to begin using that smart technology to improve the current user experience for public transportation. Once the improvement and the background tasks are dealt with, then it would be the right time to being applying the data onto the citizens.

Gabe Sawhney describes, “smart cities are, especially for them to not be defined by technologies that we want to try to implement and instead have them be really grounded in residents’ needs.” As someone who was born and raised in Edmonton, I had many experiences of taking public transit, and feel that the Intelligent Transport System (ITS) that is currently implemented in South Korea can be a good starting point.

The concept for implementing ITS Korea’s Smart technologies in Edmonton for the short term should begin with small steps. ITS Korea covers a variety of concepts of how its’ smart technologies can benefit the public and safety of the roads. Taking what ITS has to offer, the first step to implementing this in Edmonton would be to figure out the logistics and operations of how the existing data can be used, and what type of future data collection is required. Then begin implementing it into technologies such as smart payment. Lastly, Application to infrastructure can begin with small steps as well. Infrastructure ranges from bus shelters to road infrastructure and traffic light programming.

## **SMART DATA**

With the use of sensors, data can be automatically programmed to gather necessary information on traffic situations in the city, where the current buses are, and determine whether or not there is a delay. The information gathered can help form the basis to help with ‘traffic information connection and management’ and ‘providing integrated traffic information,’ identified by ITS Korea.

# DETAILED PLAN

Sensors can be integrated with CCTV and that smart data can be used to in the operations room in case there was an accident on the road that could potentially slow down traffic. This will help improve 'real-time' tracking, and response times whether it is for an traffic collision, construction, snow-clearing during the winter months, or other road maintenance issues. Ultimately, reducing delays in on the roads.

Current ETS buses in Edmonton are equipped with GPS trackers and CCTV. From personal user experience the GPS data from the bus to the web, and to connect that real-time bus information with the citizens of Edmonton is still lacking. Only those who have smartphones with access to cellular data would be able to access the information, and sometimes the information is misleading and/ or wrong.

## **SMART PAYMENT**

As an Edmontonian, and someone who has worked in the City of Edmonton organization, budget is an extremely important factor for anything to become implemented. Therefore once data is collected and compiled in a way that is smart to implement to the public, electronic payment systems should be put in place.

Smart Payment has been in the works for many years now in Edmonton, and a part of this includes neighbouring municipalities such as Sherwood Park, Strathcona County and the City of St. Albert. As this program to this day is still in the planning stages, it would be efficient to cooperate with not only neighborhooding municipalities, but also the banks. In Korea, bank cards can act as a transportation card as well. This makes one less card for the residents to remember, and makes the usage of public transportation simpler and easier. Using the smart technologies, this card can eventually become integrated with all forms of transportation such as taxis, express buses, airport buses, entering national parks, etc; much like how the T-money or PayGo card system in South Korea.

A single fare in Edmonton for public transportation lasts a total duration of 90 minutes. If a smart fare system was integrated, it would be able to track the distance each person has been travelling for and charge necessary fees based on distance travelled. Charging based on distance travelled will also make more sense for those who are transferring to the airport bus as the additional \$5.00 on top of the base transportation fare would make the total cost to the airport \$8.25, and too pricey for some travellers.

# DETAILED PLAN

Furthermore, Edmonton in the past had a lot of issues with counterfeit bus passes. The tap-on, tap-off system will allow the bus driver to focus more on his surroundings and worry less about whether the cards and passes flashing in front of them are legitimate. With a better payment implementation program, many of the problems that the current fare system face can be solved. For example, counterfeit bus passes, or those 'forgetting their bus pass' and trying to get on the bus without paying.

Implementing Smart payments can not only help with budgeting and lost revenue, but it can also keep track of daily ridership. Having this information would be valuable to help determine when and where buses should run, and how frequently. It will help prioritize the areas where transit is needed the most, and help adjust routes where people are not taking public transit. Present day, the City of Edmonton is mostly conducting ridership by hand, or camera sensors; both of which have high margin of human error.

## **INTEGRATION**

Although the City of Edmonton prides itself in open data, it has yet to reach the point where that data can be integrated seamlessly into the lives of the regular citizen. 'Real-time' information apps include google maps, and the transit app. However, more information than just bus arrival times can be offered to the citizens. Information such as bus schedules, bus frequency and detours can also be integrated.

For smart data integration, the data collected could provide a more cohesive outlook on how to integrate the LRT system with the buses to ensure that transfers between the two modes of public transportation are able to move citizens in a quick and efficient manner. Adding to the user experience, signalling of traffic lights can also favour the pedestrian if the system knows that a bus is approaching a bus stop. Current road situations in Edmonton heavily favour the automobile, causing dangerous situations for the public transit user who is trying to cross the street to catch the bus or train.

# DETAILED PLAN

## SHORT TERM INTEGRATION

Beginning with physical short term goals, improvements to the current bus shelters to include 'real-time' bus and weather information will make the public transportation user get an idea on when the bus/ LRT would arrive. For the winter months, lit and heated bus shelters using smart technology such as GoogleHome can be implemented (as piloted in Chicago). With the expansion of the CityWide OpenWiFi initiative in Edmonton, connecting these smart devices through wi-fi and feeding information to the public in a timely manner will also boost the user experience of public transportation in the city.

If this plan is implemented, in the short term between 3-5 years, it would be possible for the city of Edmonton improve its public transportation system dramatically with a new way of organizing and interpreting data, and creating a more user friendly interface for smartphones and bus arrival real-time information boards. Lastly, it would improve the user experience especially during the colder months of the year, and will also help those in need find a warm place to stay.

## LONG TERM INTEGRATION

In the long term, as the budget permits, the City of Edmonton can look into the physical integration of smart technologies into the road system. This includes installation of new sensors, construction of bus priority lanes, installation of lane control lights, and, LRT expansion. Currently a the new Valley Line LRT is being constructed to connect the south east of the city to the downtown core. However, the Metro Line LRT which is currently operational, is still facing many signalling issues for the past couple of years since completion. If the City of Edmonton and its partners are able to find a way to integrate the short term vision outlined in this plan, it is possible that the many of the problems that are experienced by taking public transportation can be alleviated and improved in the future development and expansion of ETS.

# THANK YOU,

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