

# Agenda: November 3

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- Midterm
- Lecture 9: Sustainable Transportation (cont)  
Problems and Solutions
- Group Projects

# Sustainable Transportation

## History, Problems and Solutions

Historical transportation included wind for sailing ships, horses, boats on rivers and lakes - small scale and "sustainable"

Internal combustion engines: trains, steam ships, automobiles, airplanes

- initially had minimal environmental impacts but became unsustainable with increasing use.

**"A sustainable transport system is one that provides transport and mobility with renewable fuels while minimizing emissions detrimental to the local and global environment [while] preventing needless fatalities, injuries and congestion".** (Source: William R. Black, 2010, *Sustainable Transportation: Problems and Solutions*)

# Sustainable Transportation Problems and Solutions

Five problems (at least) to solve:

1. Finite and diminishing fuel reserves
2. Emissions into the local atmosphere with impacts on human and environmental health
3. Emissions into global atmosphere causing climate change
4. Loss of life and injuries\*
5. Traffic congestion

\*Road crashes are the leading cause of death among young people –they accounted for 35% of all deaths among 15-19 year olds and 30% of all deaths among those age 20-24.

# People Posing with the First Streetcar 1892



# TORONTO TRANSIT COMMISSION



In the 4th quarter of 2012, average daily ridership of public transport was **2.76 million passengers:**

Bus:	1,425,300
Subway:	1,011,700
Streetcar:	271,100
Intermediate rail:	46,400

Montreal: 2,524,500 passengers

Vancouver: 454,600

North America ???

# Melbourne Trams (Streetcars)



Melbourne network  
of trams:

250 kilometres of  
track, (83 km)

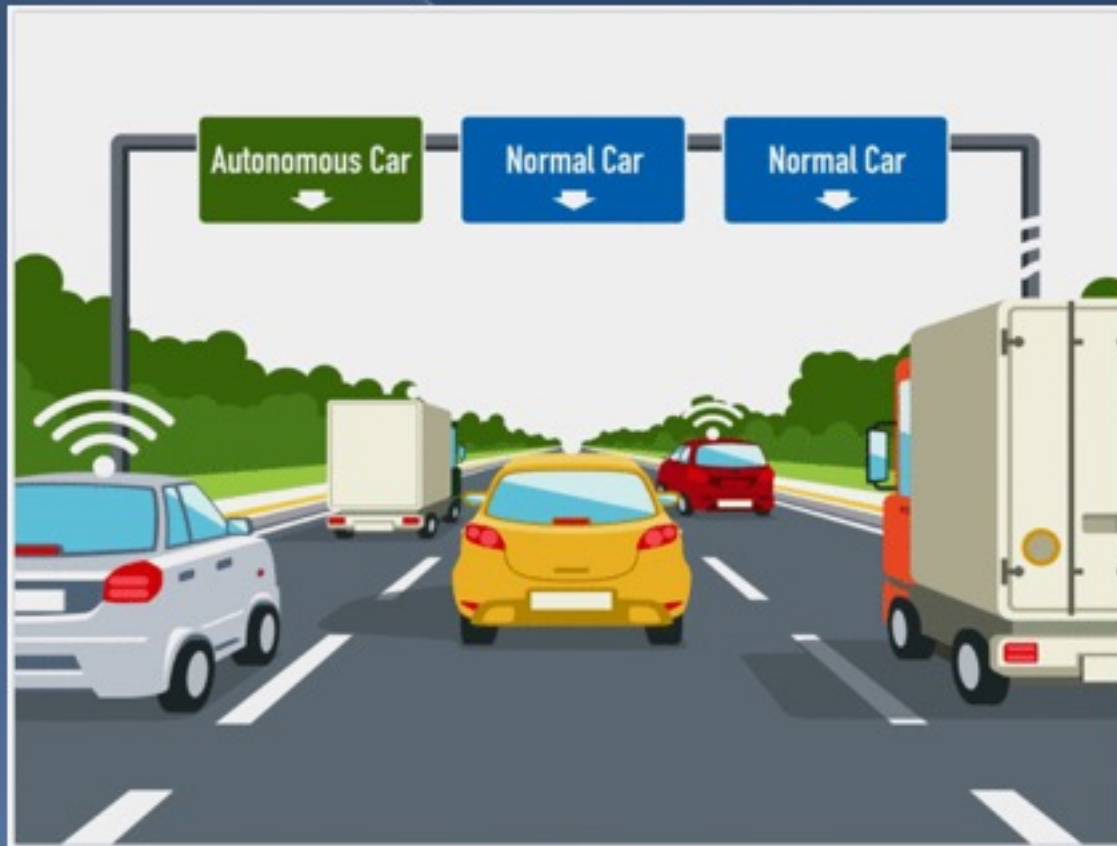
493 trams

204 million trips in  
2016-17 (100 m)



Family-sized car uses the sun as power and supplies energy back to the grid at the annual World Solar Challenge in Australia. The Dutch Stella Vie, carried five people at an average speed of 69 kmh Darwin - 3,000km - through middle of Australia to Adelaide. 41 vehicles

Another Dutch car, Nuna 9, won at an average speed of 81.2kmh



Robocars will dominate roadways – eventually

Transition needs to include a mix

Reduced congestion, emissions and major drop in deadly crashes.

Based on computers that never make mistakes



# Road Safety in North America: Roundabouts as an Option

Sustainable Communities  
Geography 4771

# Canada's Road Safety Ranking Among OECD Members Countries

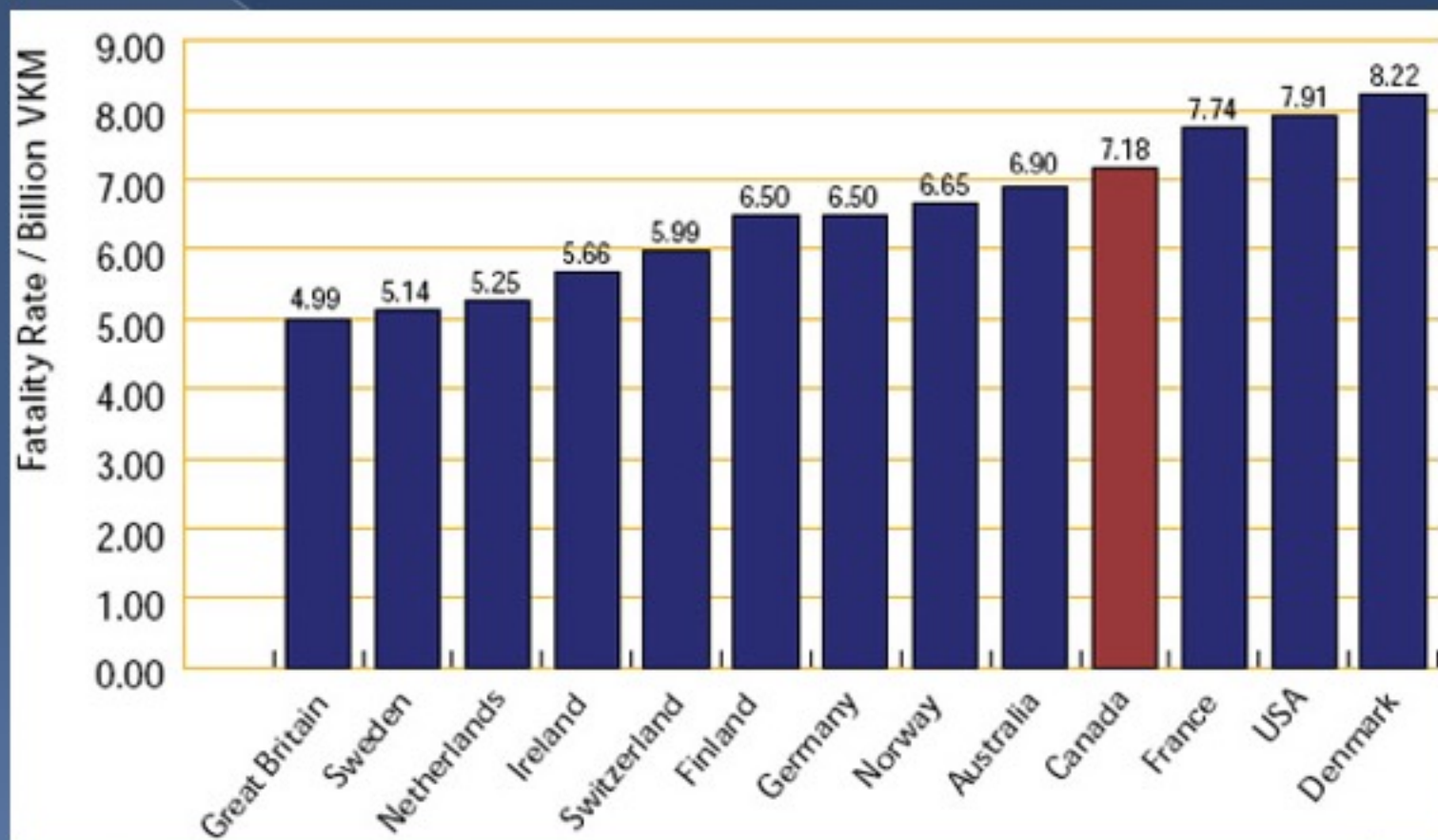


Table 1 from **Transport Canada: Motor Vehicle Safety (2008)**

# Canadian Fatalities per Billion Vehicle-km by Province/Territory

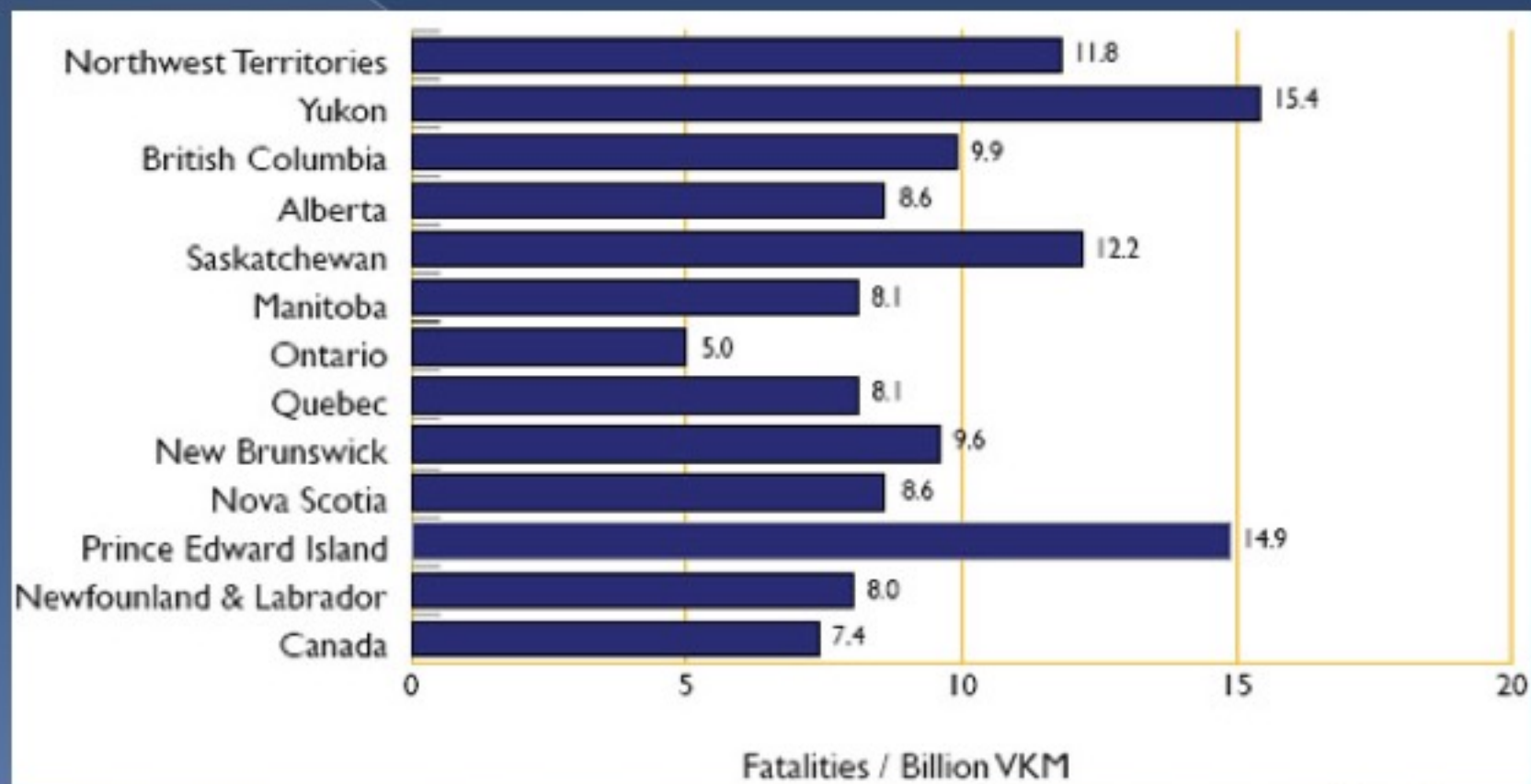
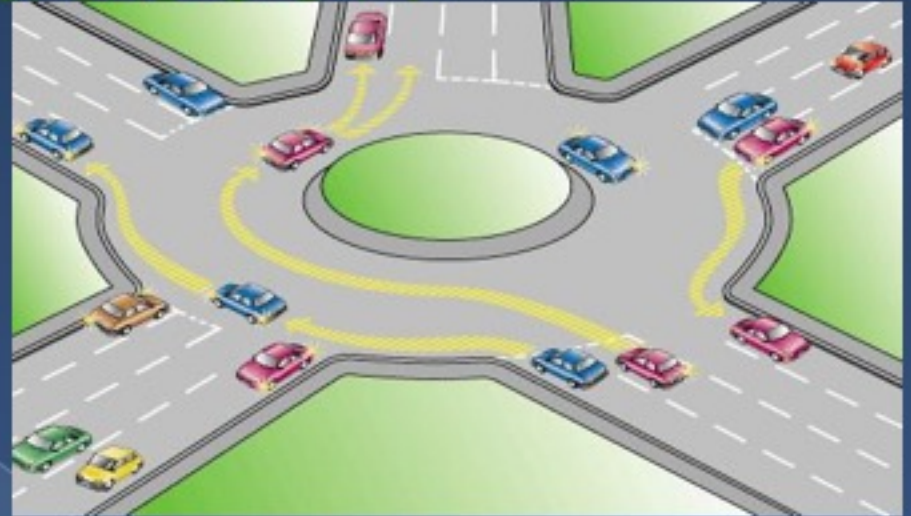


Table 2 from **Transport Canada: Motor Vehicle Safety (2008)**

# What is a Roundabout?

- “a circular intersection that does not contain traffic lights, stop or yield signs where traffic flows in a counter-clockwise fashion around a center island” (City of Ottawa, 2011)

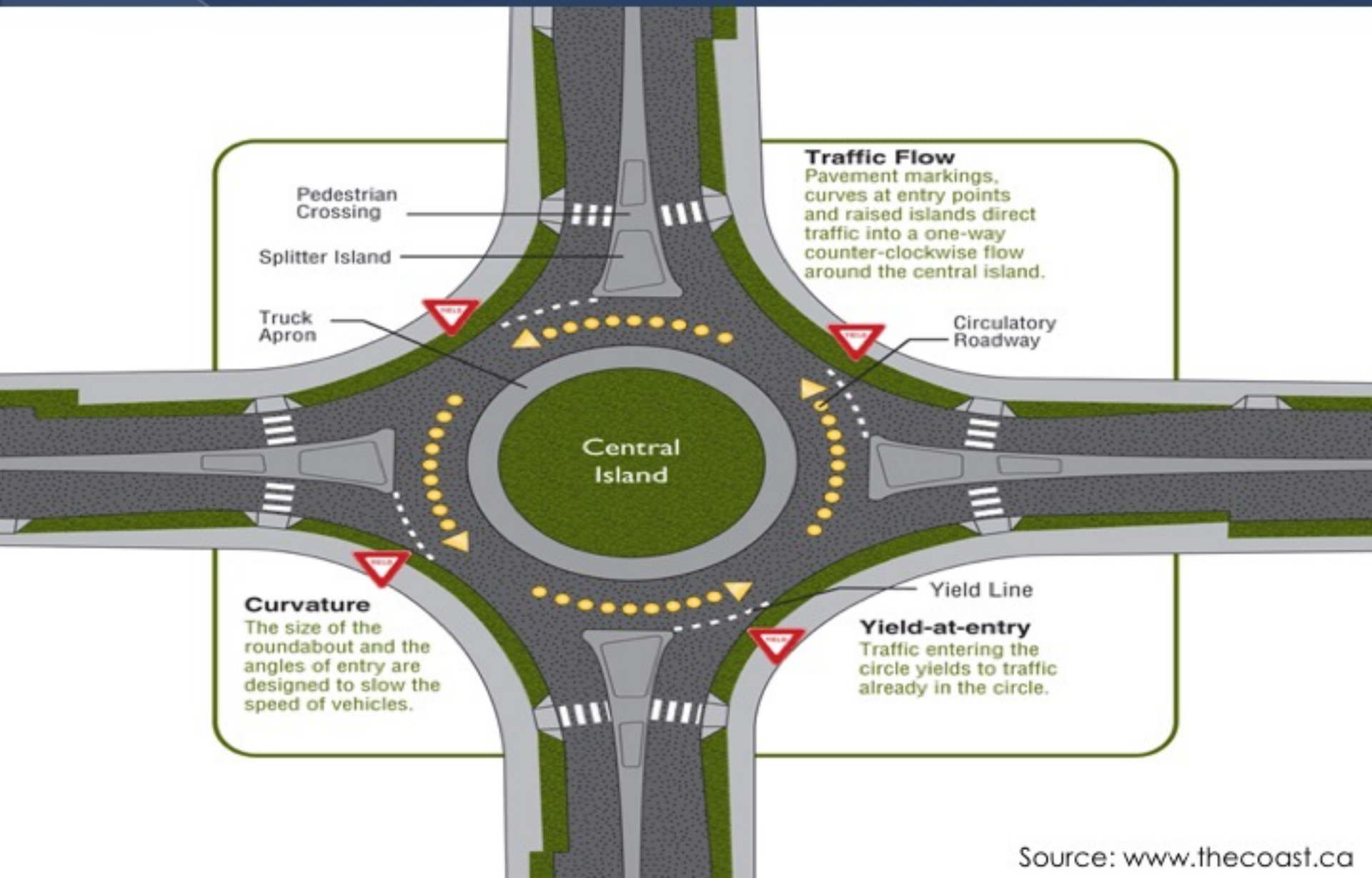


# Types

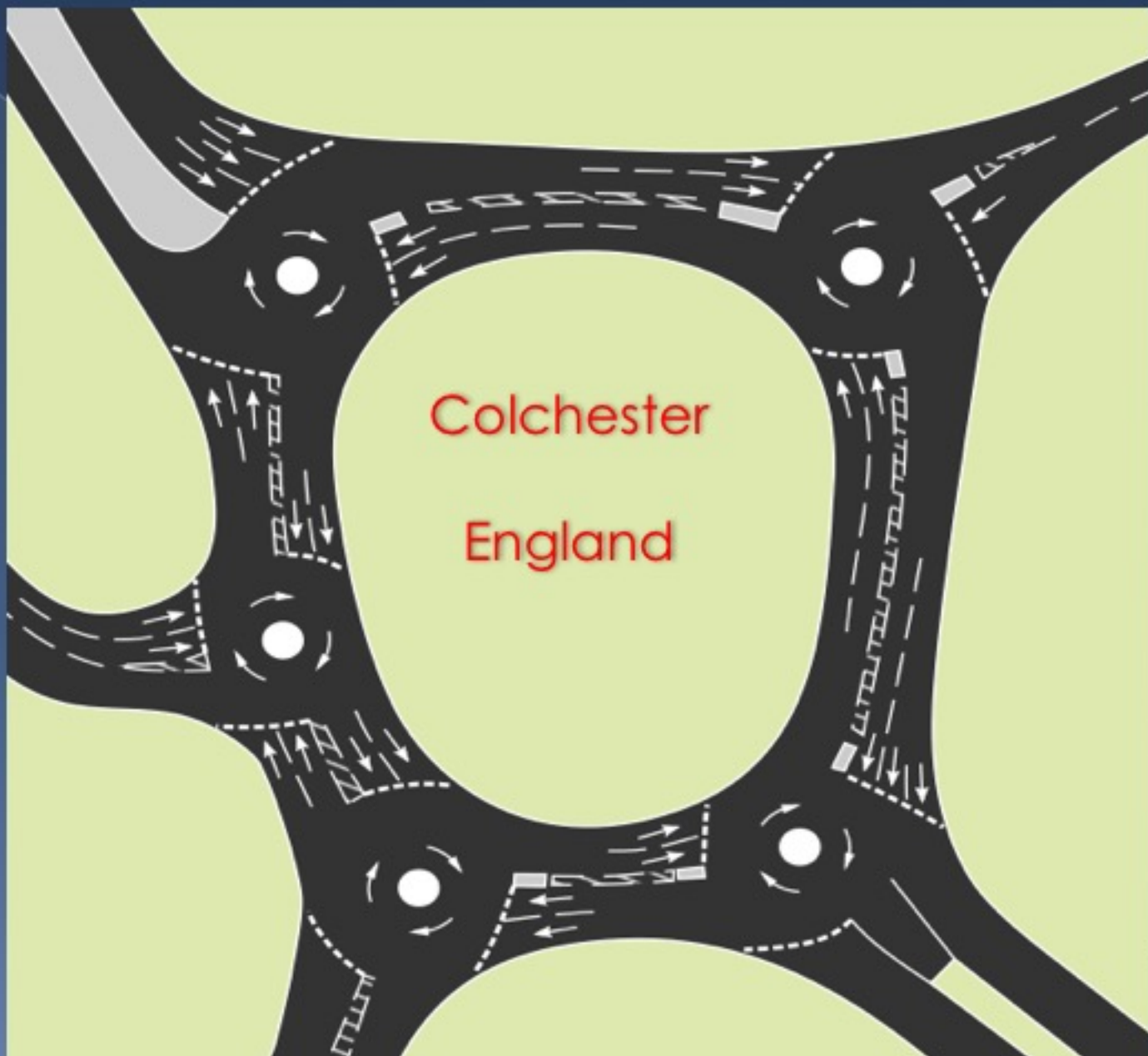
- Standard
- Mini
- Double



# Features of a Roundabout



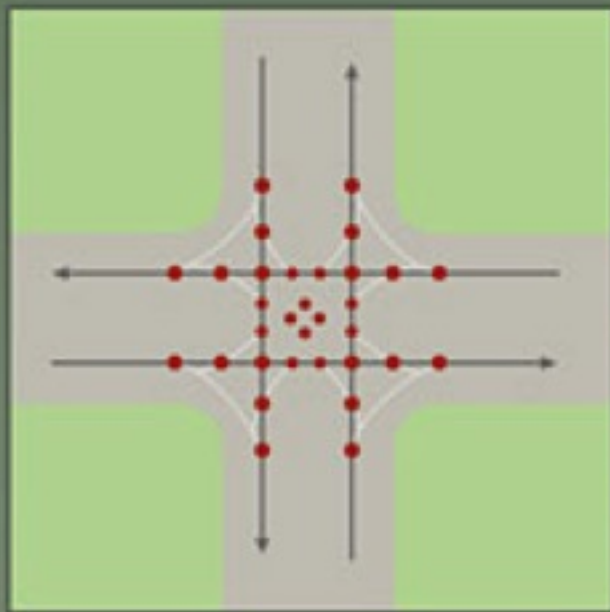




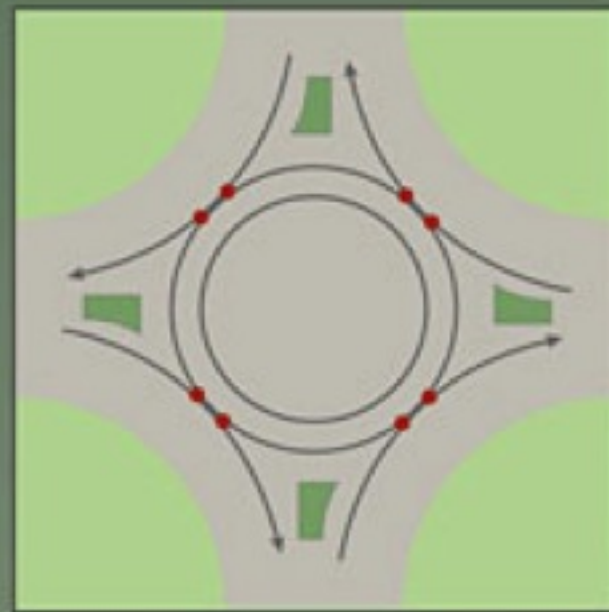


# Roundabout Safety: Conflict Diagram

With roundabouts, head-on and high-speed right angle collisions are virtually eliminated.



[ Traditional intersection ]



[ Roundabout ]

● Potential vehicle conflict point

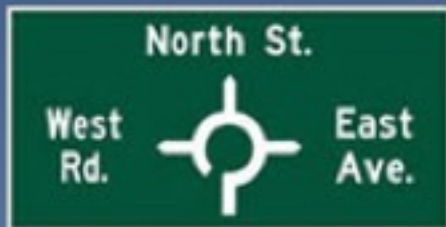
# Roundabout Safety

- ⦿ All vehicles slow to enter roundabout
- ⦿ Reduced Conflict Points
- ⦿ Reduced number of injury and property damage crashes

# Roundabouts in Ontario



Slow down; the roundabout is 300 metres ahead



Directional guide signs show the exits and where they will take you.

Ontario **Ministry of Transportation**

<http://www.mto.gov.on.ca/english/ontario-511/roundabouts.shtml>

# Roundabout Safety

## ◎ Roundabout Basics

- > Slow down on approach to the roundabout
- > Look left
- > Yield to traffic within the roundabout
- > Merge in to traffic flow

# High Speed Rural Roundabouts

- Crash analysis shows reduction in crashes at rural high speed roundabouts
  - > 62-68% reduced total crashes?
  - > 85-88% reduced injury crashes
- Factors include
  - > reduced speeds on all approaches
  - > reduced conflict points
  - > change in the type of crashes

# Reduced Wait Times

- No stopping
- Continually move around
- Reduce speed
- No left hand turns
- Decrease in times vary



# Reduced Congestion

- Handle higher traffic volumes
- Size proportional to volume



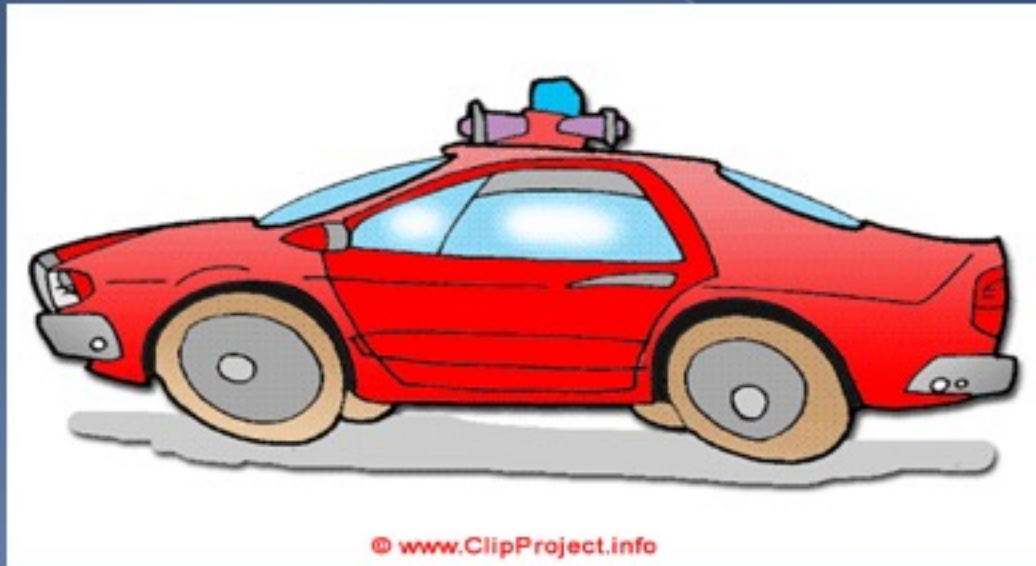
# Reduced Noise

Studies suggest a 1-2 db decrease  
Less start and stop  
Continuous street speeds

Source: Google Images

# Traffic Calming

- “installation of barriers and other physical measures to reduce traffic speeds and/or cut-through volumes - in the interest of street safety, liveability, and other public purposes” (Institute of Transportation Engineers, 2011)

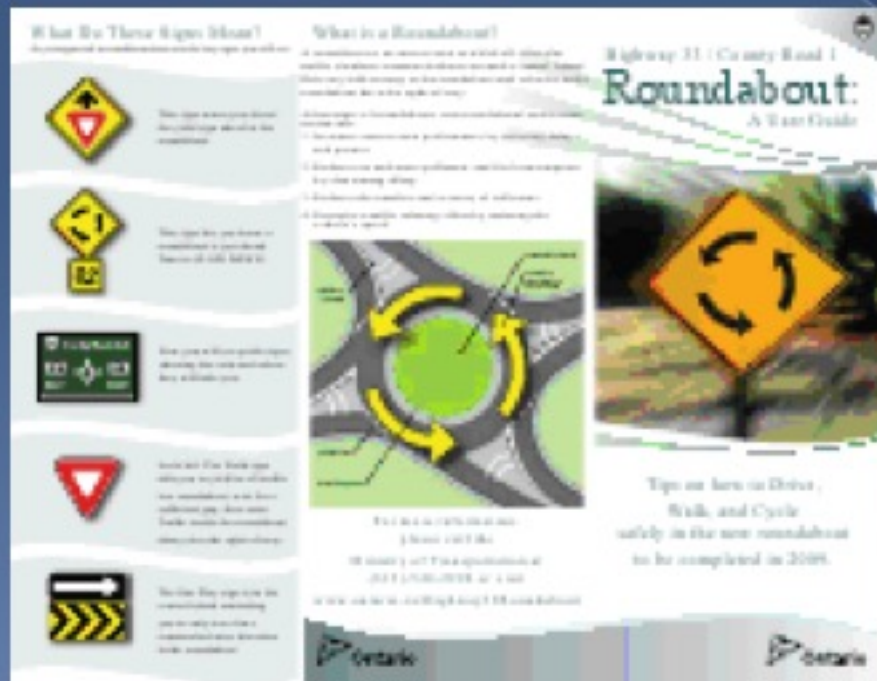




# Education

- Public Education
  - Media
  - Brochures
  - Seminars

- Driver Education
  - Brochures
  - Driver Education Classes
  - Public Meetings



# Benefits of roundabouts

**Safety** : lower speeds and fewer points of conflict reduces the potential for serious crashes and injury

**Lower speeds** : vehicles need to slow down unlike for a green light, reducing the likelihood of a serious crash

**Higher capacity** : high volume of vehicles turning left is handled better by a roundabout than by a left-turn signal at a traditional intersection

**Fewer stops and reduced delays** : yielding at the entry of a roundabout takes less time than waiting for a green light at an intersection or for a gap in traffic at a stop sign

**Less idling and air pollution** : fewer delays reduces fuel consumption and improves air quality by reducing emissions

**Lower maintenance costs** : roundabouts eliminate maintenance and electricity costs associated with traffic signals

**Aesthetically pleasing** : there is an opportunity for landscaping within the central island of a roundabout

# Safety: Pedestrian

- Pedestrians have the right of way
- Only go when suitable
- Be aggressive when crossing
- Only have to look one way
- Reduced speeds



Source: Google Images

# Safety: Bikers

- Experienced bikers enter roundabouts
- No markings for bikers
- No or minimal increase in safety
- One lane roundabouts are safer for bikers
- Ride in the middle of the lane



Source: Google Images

# Ontario and Canadian Examples

- Hamilton, Ontario
- Ottawa, Ontario
- North Bay
- Ajax, Ontario
- Waterloo, Ontario
- Toronto, Ontario
- 2009: First highway roundabout in Ontario (Hwy 33 near Picton)
- Also in all other provinces and the Yukon



Source: City of Hamilton

# North American “Roundabouts” vs. European “Traffic Circles”

- Not traditionally the same concept
- Europe uses “traffic circles” and (uncommon) traffic signals in certain situations

Quebec

Are

# Discussion

- Do you agree or disagree that roundabouts should be implemented in North American cities? Why or why not?
- In Thunder Bay, or your hometown, should roundabouts be implemented to control traffic? Give examples as to why or why not a roundabout is a good/bad idea.
- Do you believe that common misconceptions, including European examples, cloud public judgement of the effective use of roundabouts in North American cities?

# Sources

<http://www.mto.gov.on.ca/english/ontario-511/roundabouts.shtml>

Also, as noted on various slides



## Outposts and Lodges on Whitewater Lake



Ion: 50.8752925 -89.4783151  
50°52'31.1"N 89°28'41.9"W

