LECTURE 2_17:
MAR. 13, 2014

URBAN ENVIRONMENTAL MANAGEMENT

SUSTAINABLE URBAN DEVELOPMENT II & MAP LITERACY 5 (MQ.5)

Text Reference: Dearden and Mitchell (2012), Ch. 13, pp. 459-465.

T. Randall, Lakehead University, WA 2014

Outline

Source: Dearden and Mitchell (2012)

- Upcoming Class Lectures:
  - March 11 (Sustainable Urban Development I)
  - March 13 (Sustainable Urban Development II & Map Literacy 5)
  - March 18 (Environmental Issues in Cities)
  - March 20 (Urban Sustainability and Best Practices in Urban Areas)
- Other lecture of interest
  - Wed. March 19th, 7 pm, Ryan Bldg 1022, "*Thunder Bay North Harbour Sediment Management Options Report.*" .. By Cole Engineering … more information and detailed documentation about the extent, characteristics and risk associated with this contamination is accessible at: http://www.infosuperior.com/thunder-bay-pac-meeting-march-19th-2014/

Film of Interest (Thursday March 13th)

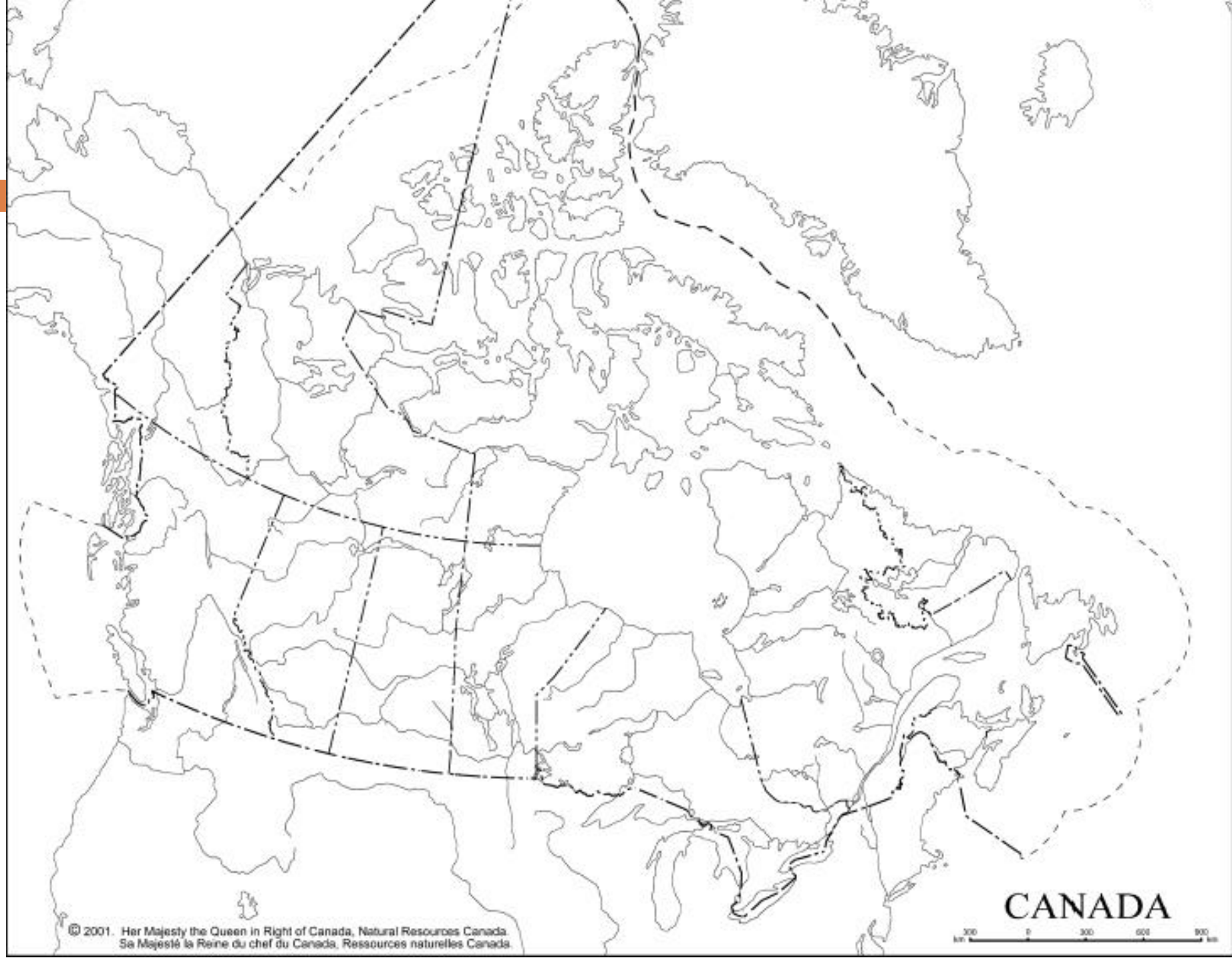
- Screening of a documentary film called **Symphony of the Soil** at the Finnish Labour Temple (314 Bay Street, above the Hoito) at 7 pm, Thursday March 13th. This is part of the "Docs on Bay" series and the director will be coming in from Los Angeles. It is a wonderful film about the planet we live on and the soil that makes us live. Admission for students and seniors is by donation (pay what you can) while everyone else has to pay a mere $7. There will also be a discussion with the director after the film.

Trailer and other information about the film found at: http://www.symphonyofthesoil.com

Map Literacy 5

Urban Environmental Management lectures

March 13, 2014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Map Literacy (list 5, March 13, 2014)

Communities, Jurisdictions

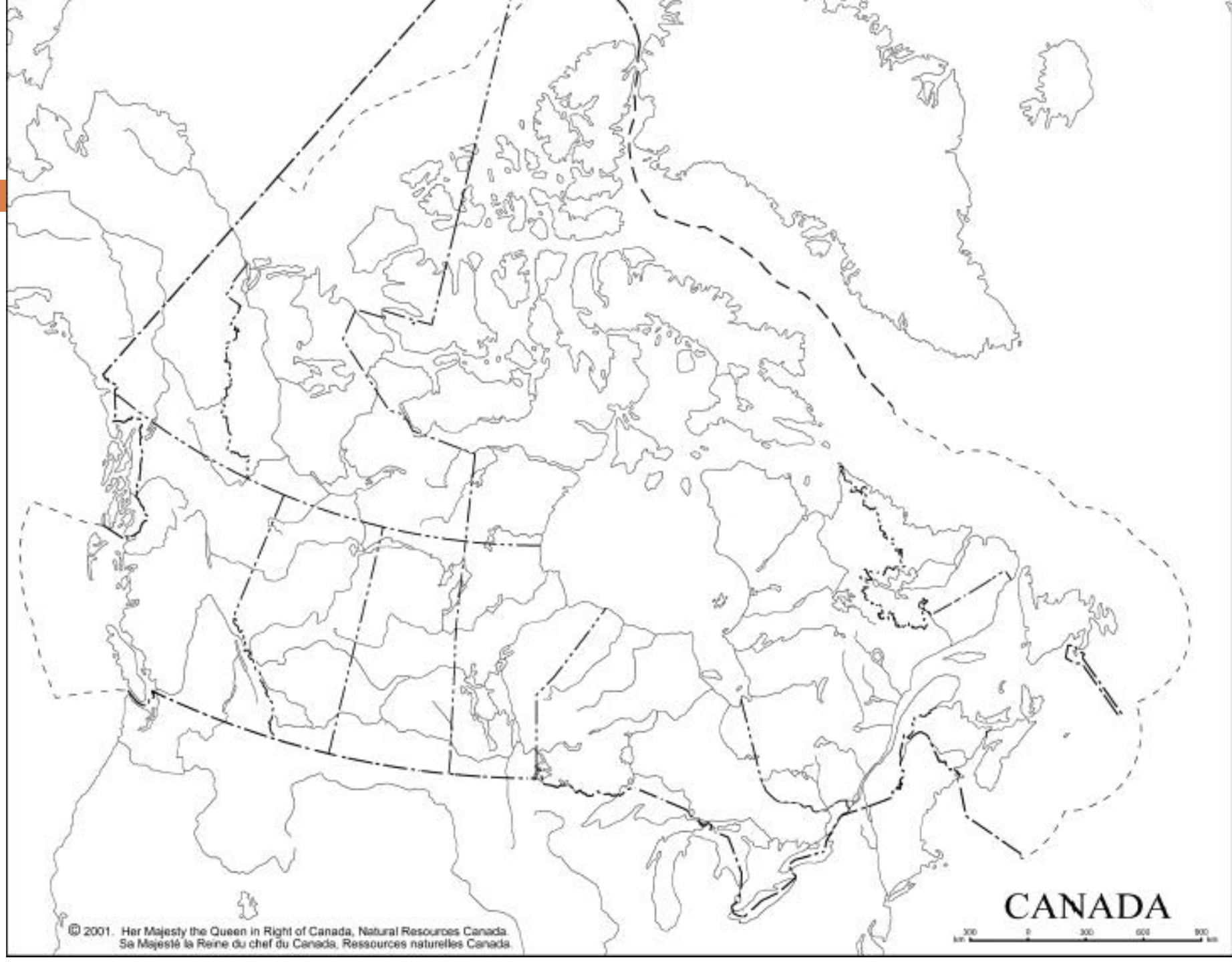
1. Hamilton
2. Niagara Region
3. Iqaluit (Nunavut)
4. Saskatoon
5. Attawapiskat First Nation

Provinces, Territories

1. British Columbia
2. Alberta
3. Newfoundland

Basics (7):

- Ottawa; Thunder Bay; Montreal; Lake Superior; Windsor; Greenland; Alaska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Recall from last lecture

Urban vs Suburban vs Exurban forms

Ecological Footprint

Sustainability

- Madrid and Granada

- **Postwar sprawl:**

  car-oriented, segregated land use, suburban sprawl around many cities (Photo: sprawl in Colorado)

Exurban Development

- non-farmers/non-loggers/non-fishers living in rural settings;

  larger-lots – often estate-sized lots;

  increased commuting distance – more distal bedroom communities

Cadallic Circle near Thunder Bay (~10 km from LU), c/o Google Earth 2011

← Near Winnipeg, photo credit: T.Randall

Gasoline use per capita versus urban density in 1990

($R^2 = 0.8594$)

- US (low density)
- European (medium density)
- Asian (high density)
- Canadian (low to medium density)

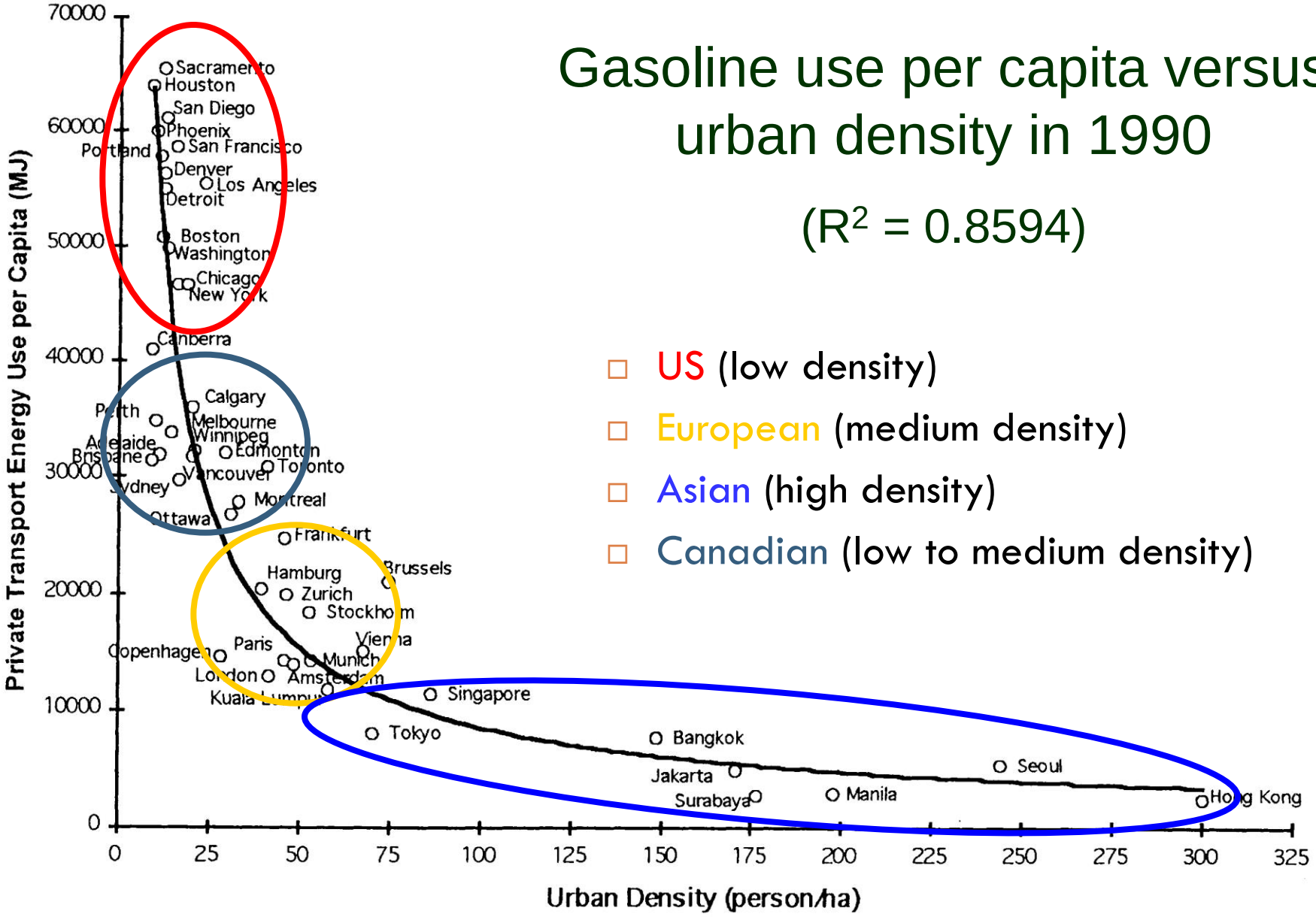


Figure 3.2. Energy use per capita in private passenger travel versus urban density in global cities, 1990.

Source: Newman and Kenworthy (1999)

Table 5.1 The Eco-Footprints and Biocapacities of Selected Nations

Country	Per Capita Eco-Footprint (global ha)	Per Capita Domestic Biocapacity (gha)	Overshoot Factor
World	2.7	2.1	1.3
United States	9.4	4.9	1.9
Australia	7.8	15.4	0.5
Canada	7.1	20.0	0.4
Greece	5.9	1.7	3.5
United Kingdom	5.3	1.6	3.3
France	4.9	3.0	1.6
Japan	4.9	0.6	8.2
Germany	4.2	1.9	2.2
Netherlands	4.0	1.1	3.6
Hungary	3.5	2.8	1.3
Mexico	3.4	3.3	1.0
Malaysia	2.4	2.7	0.9
Brazil	2.4	7.3	
China	2.1	0.9	
Thailand	2.1	0.8	
Peru	1.6	4.0	
Ethiopia	1.4	1.0	1.4
Nigeria	1.3	1.0	1.3
Indonesia	0.9	1.4	0.6
India	0.9	0.4	2.3
Bangladesh	0.6	0.3	2.0
Malawi	0.5	0.5	1.0

Source: WWF (2008).

Wackernagel and Rees (1996)

Ecological Footprint:

a measure of sustainability

Source: Rees (2010)

Sustainability

- Like an ecosystem, the planet has a finite **carrying capacity**;
- As stewards of the planet, we are responsible to **strike a balance** between our activities and environmental preservation
- Sustainability is viewed as this balance between the **Environment**, the **Economy** and **Societal Well-Being**
- Reduced consumption of **energy**, **raw materials** and **land**:
- Achieved in the 'built environment' via:
  - Use of Renewable Forms of Energy
  - Use of Recycled (rather than Virgin) Materials
  - Re-Use of Urban Land (rather than Continued Expansion onto Greenfields)

Image credit: Government of Manitoba

Outline

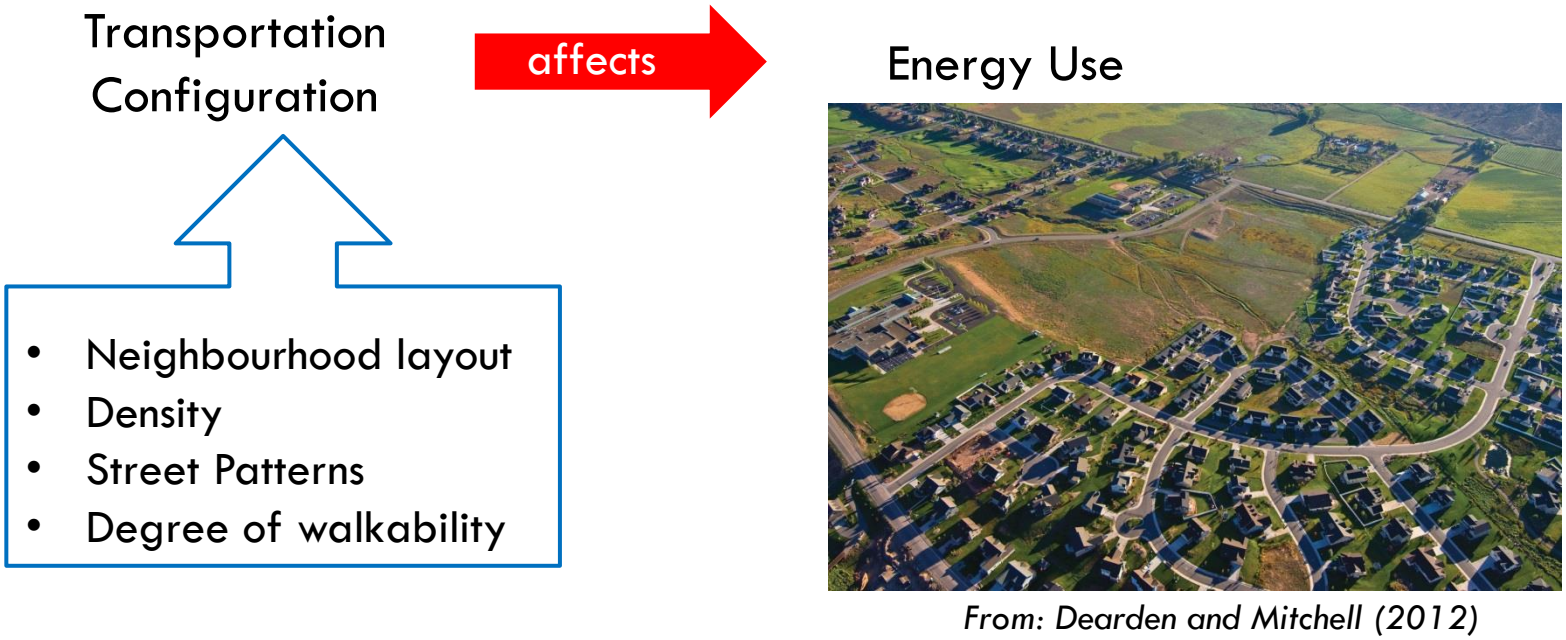
- *Activity:* Map Literacy List #5

From: Dearden and Mitchell (2012)

- 4 factors needing attention to meet the challenges of sustainable urban development:
  1. Urban Form;
  2. Transportation
  3. Energy Use
  4. Waste Management

Urban Form (1)

- **Urban form**
  - the type and distribution of infrastructure in cities;
  - a key factor influencing environmental quality
  - Examples: urban vs suburban vs exurban vs 'unserviced'

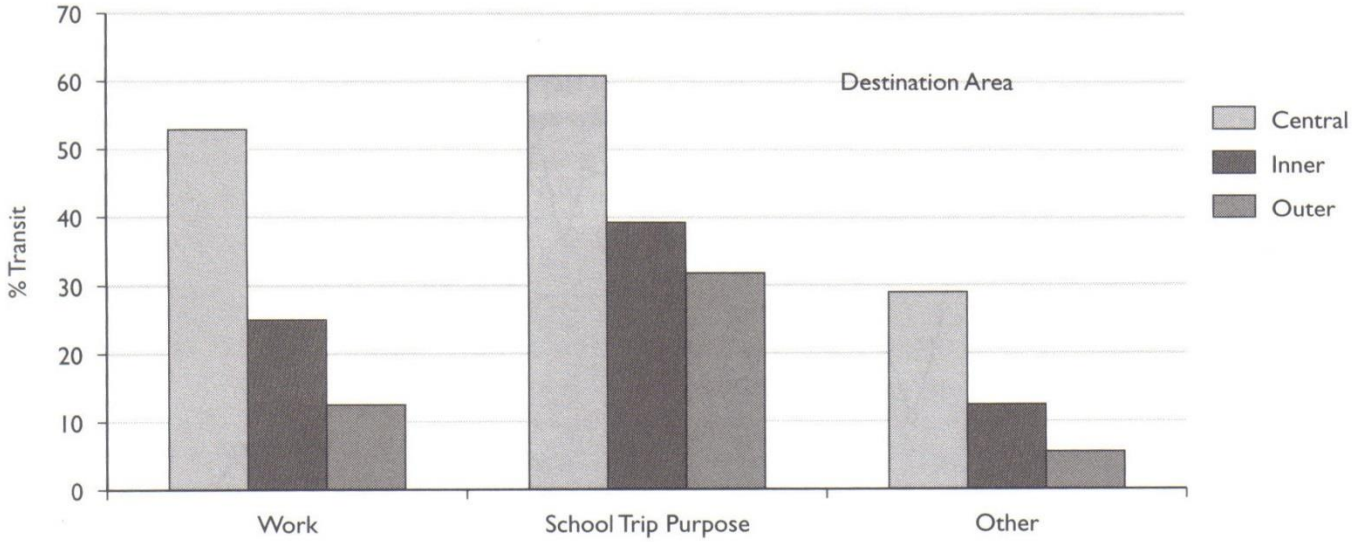


From: Dearden and Mitchell (2012)

Urban Form (2)

- Influence on choice of travel mode in central Toronto versus "inner" and "outer" ring of suburbs
- Greater transit choice made in central city for trips to work and school;

Figure 8.5 **Transit Mode Splits by Destination and Trip Purpose, Toronto, 1996**



Source: 1996 Transportation Tomorrow Survey. Toronto: University of Toronto Joint Program in Transportation.

From: Miller, E. 2000

Urban Form (3)

Building Design → affects → Energy Efficiency

Energy Use → affects → GHG Emissions

- Building materials
- Insulation
- Size
- Structure orientation (solar potential?)

http://www.sabmagazine.com/blog/2013/06/25/ecohouse-3-through-house-2013-canada-green-building-award-residential-winning-project/

Eco-extraordinaire Simon Dale went into the woods one day and built a sustainable, eco-friendly, and above all functional hobbit house for him and his family to live in whilst they worked on an ecological woodland management project. (in Wales)

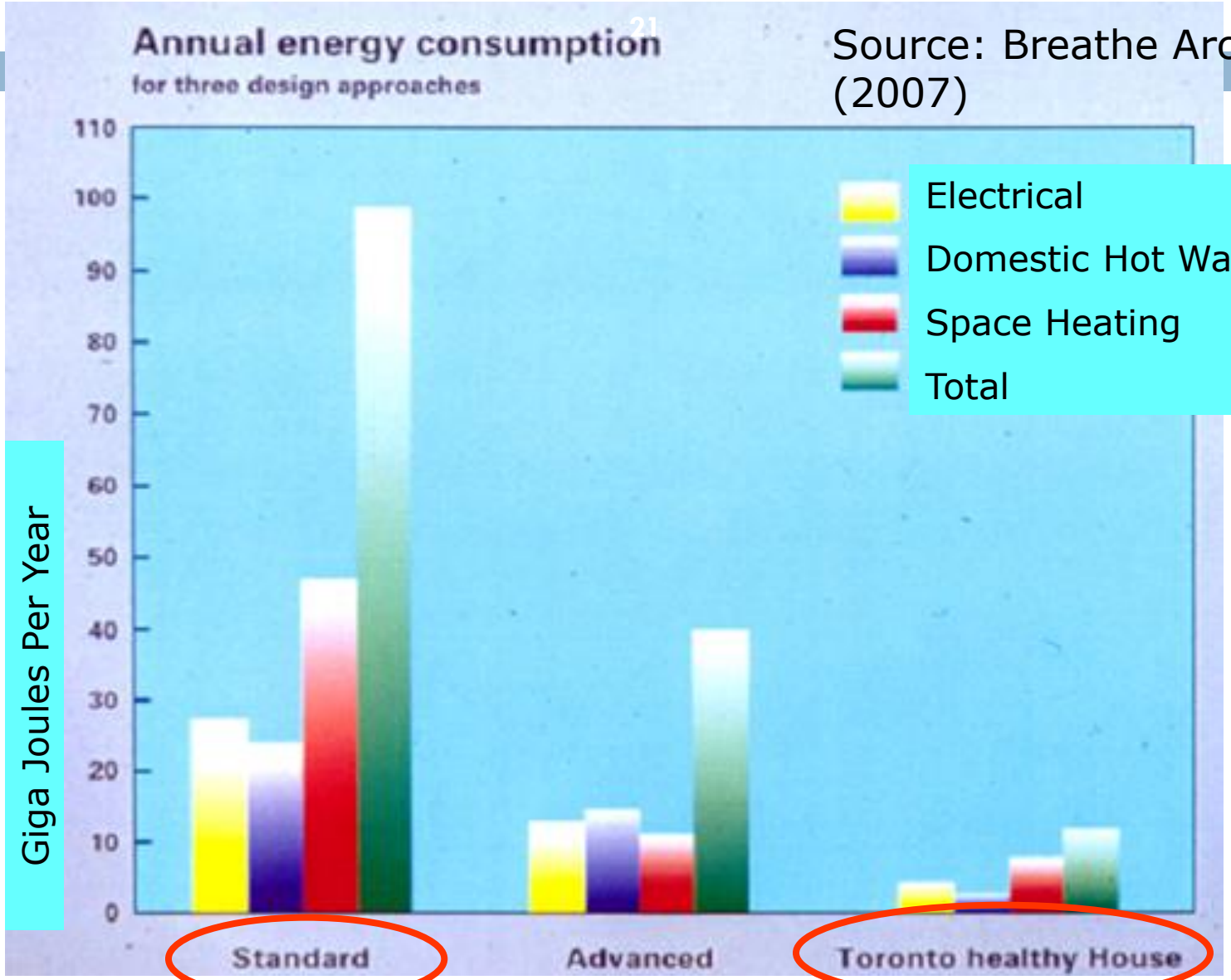
From: http://www.nerdlikeyou.com/man-builds-fully-functional-hobbit-house-in-wales/olympus-digital-camera-5/

Toronto "Healthy House" Key Features

1. Off-grid – completely self-sufficient with respect to: water, energy, wastewater;
2. All concrete was 78% recycled natural materials;
3. 1700 sq. foot semi-detached home;
4. Built in 1997
5. Infill location, on a laneway in urban Toronto

Photo credit:
www.fims.uwo.ca/newmedia/newmedia2004/energy

Annual Energy Consumption



Source: Breathe Architects (2007)

Benefits of the Toronto Healthy House

- Annual Thermal Energy Cost:
  - $80 versus $800 (1996 dollars)
- Annual Water Use:
  - 120 L per day versus 1050 L per day (f
    of 3)
- Total Operating Cost:
  - Under $300 annually
  - TR's House (Thunder Bay)
    - Heat via natural gas ($1500)
    - City Water ($500)
    - Electricity ($1000)

www.fims.uwo.ca/newmedia/newmedia2004/energy

At least $3000 annually

Source: Breathe Architects (2007)

Urban Form (4)

- **Urban sprawl** contributes to loss, disruption, or degradation of adjacent agricultural land, environmentally sensitive areas, natural habitats, and water and air quality

Suburb-Farmland Interface

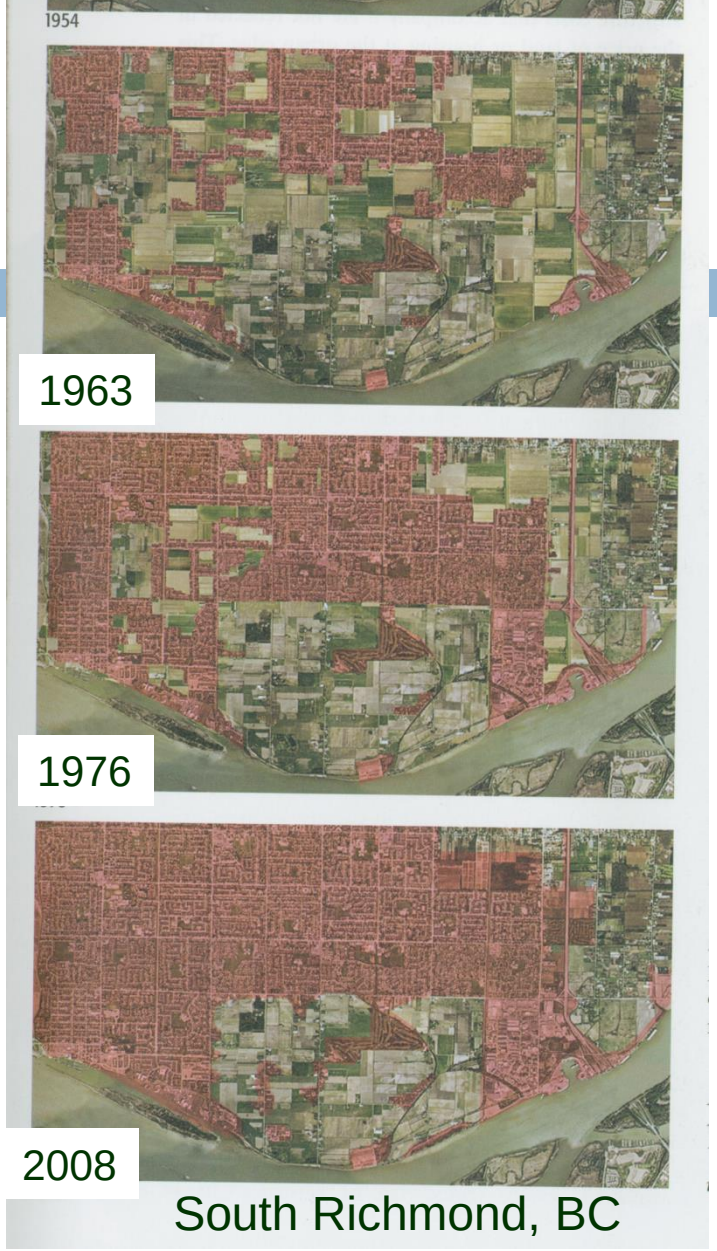
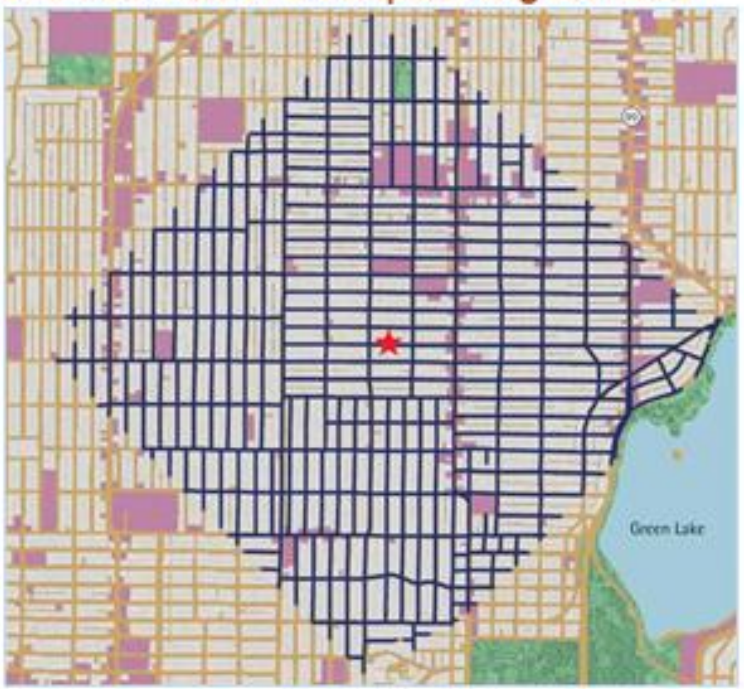


Photo credits: *Alternatives Journal* Vol. 34 Issue 3, 2008

- A compact urban form is most environmentally desirable

One-Mile Walk in a Compact Neighborhood



A one-mile walk in Seattle's Phinney Ridge takes you through a grid-like street network with a mix of residences and businesses.

One-Mile Walk in a Sprawling Suburb

A one-mile walk in Bellevue, WA with cul-de-sacs and winding streets has few shops and services within walking distance.

Maps courtesy of Lawrence Frank & Co. and the Sightline Institute.

Urban Form (5)

- The External Advisory Committee on Cities and Communities reported in 2006 that:
  - The average Canadian home is farther from a city centre than a decade ago
  - Commuting times and traffic congestion have increased
  - The proportion of low-rise, low density homes is increasing
  - House sizes have increased but people per house decreased
  - Sprawl causes higher infrastructure and service costs and less effective public transit, displaces habitat and prime agricultural land, and degrades water quality

From this same report…

"the principal land use challenge" for the immediate and foreseeable future is to reduce our sprawl…"

Transportation (1)

- Urban areas with **high population density in their cores** lead to more efficient and effective land use;
- They are also much more likely to be able to provide **effective** (and economically viable) **public transit**


photo credits: TR, Nov 2011

City Density (du/ha)	Level of Transit Service (Pushkarev & Zupan, 1982) [based on Net Residential Density]
< 10	No Viable Transit Service
10.1 - 17.5	Minimal Bus Service
17.6 - 22.5	Intermediate Bus Service
22.6 - 37.5	Intermediate Bus or Light Rail Service
> 37.5	Frequent Bus or Light Rail Service

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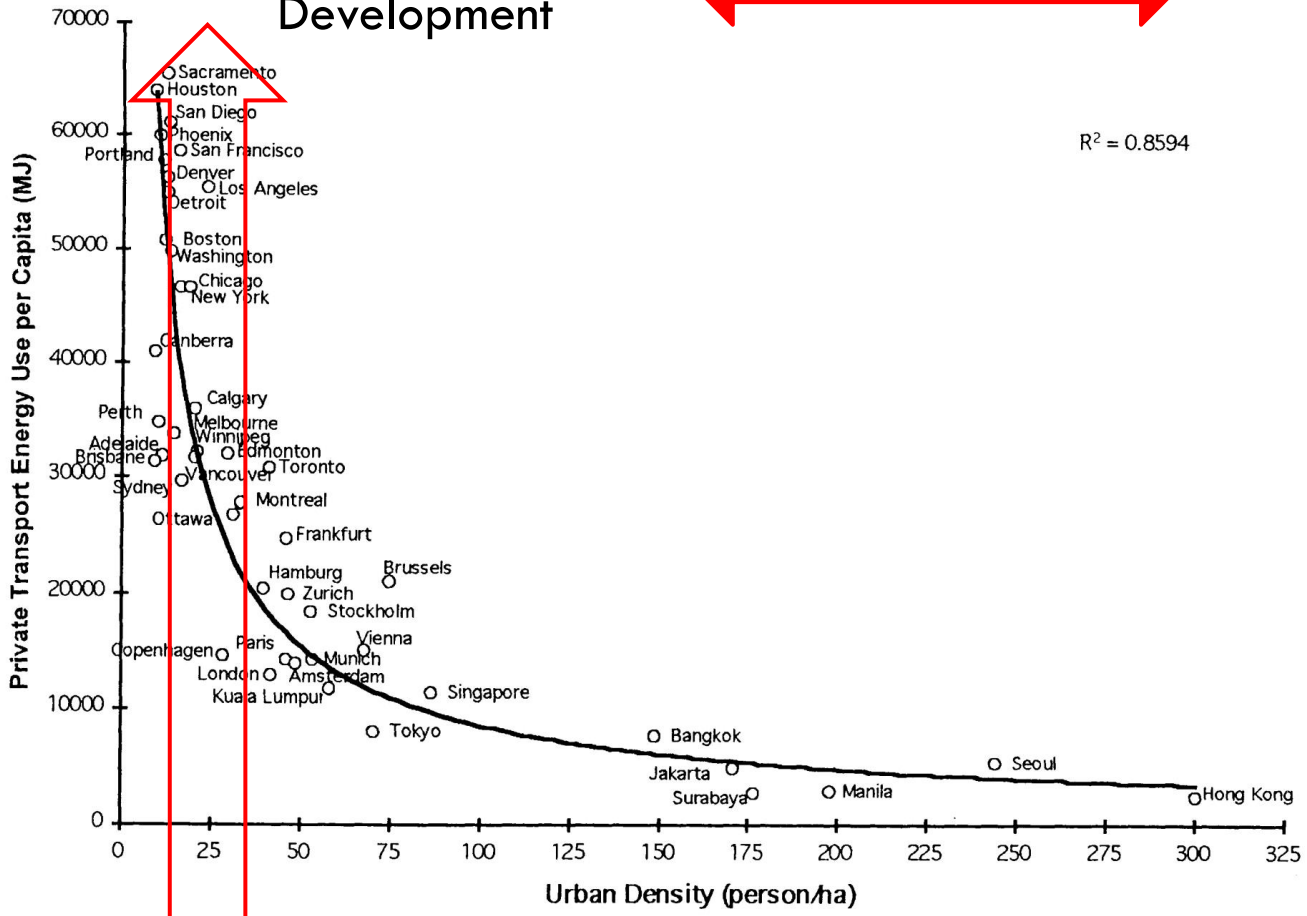
Densities to support economically viable transit service (based on Puskarev and Zupan, 1982)

Transportation (2)

Low Density Urban Development

Auto Dependent Cities



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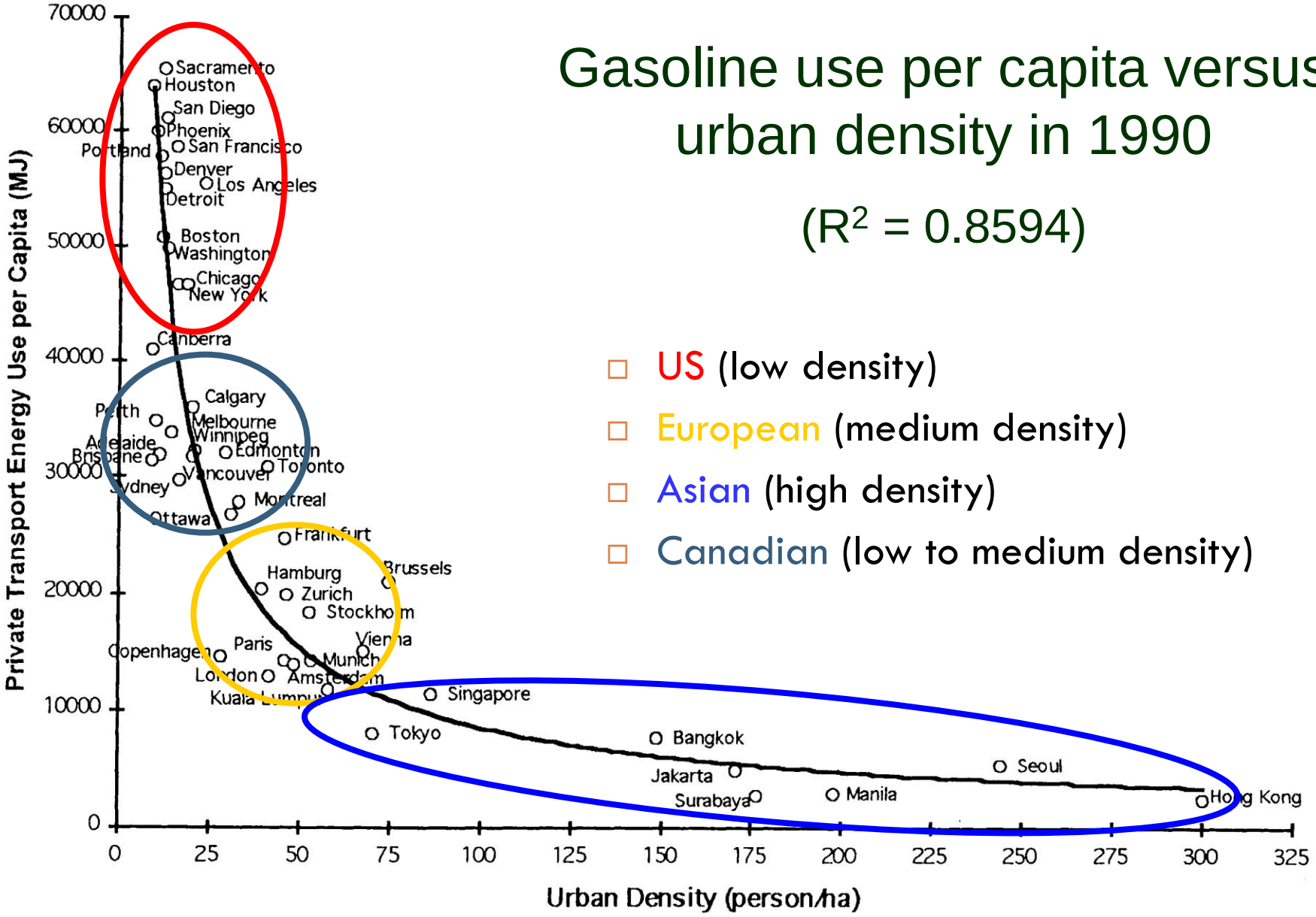

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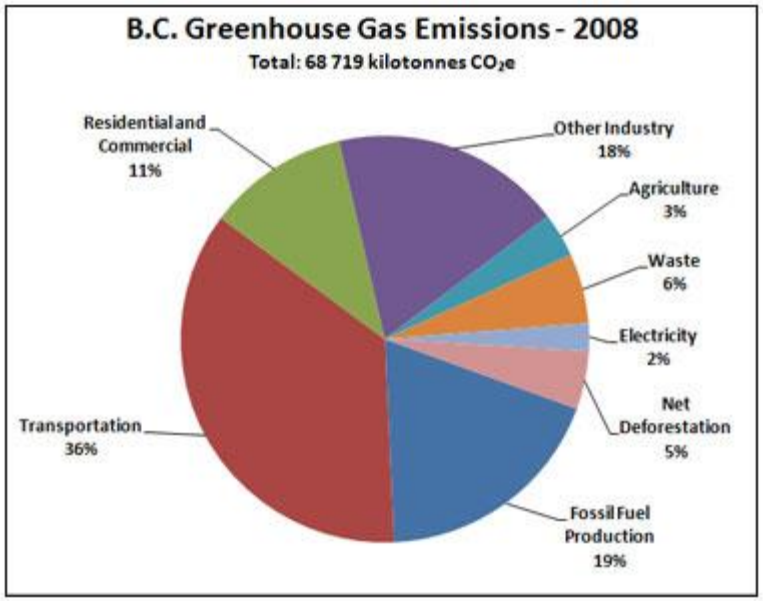
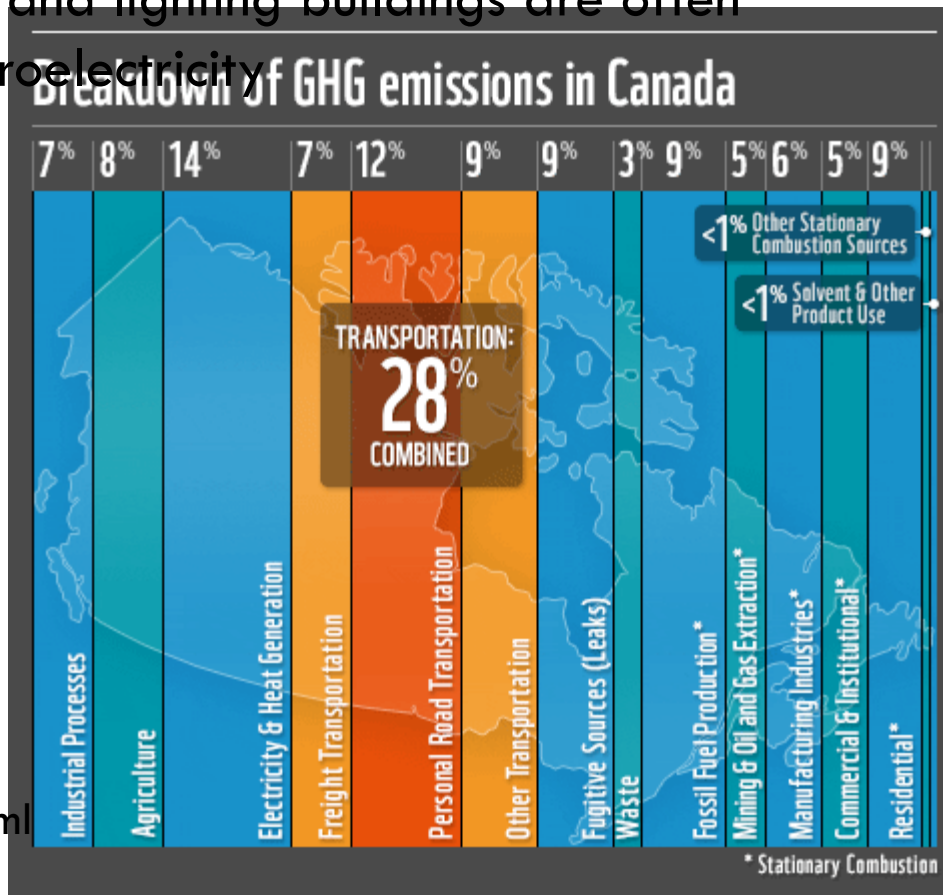
Transportation (2)

- Transportation is a major contributor to GHG emissions because most vehicles are powered by fossil fuels
- Energy used for heating, cooling and lighting buildings are often from cleaner sources such as hydroelectricity



http://www.livesmartbc.ca/learn/emissions.html



Energy Use (1)

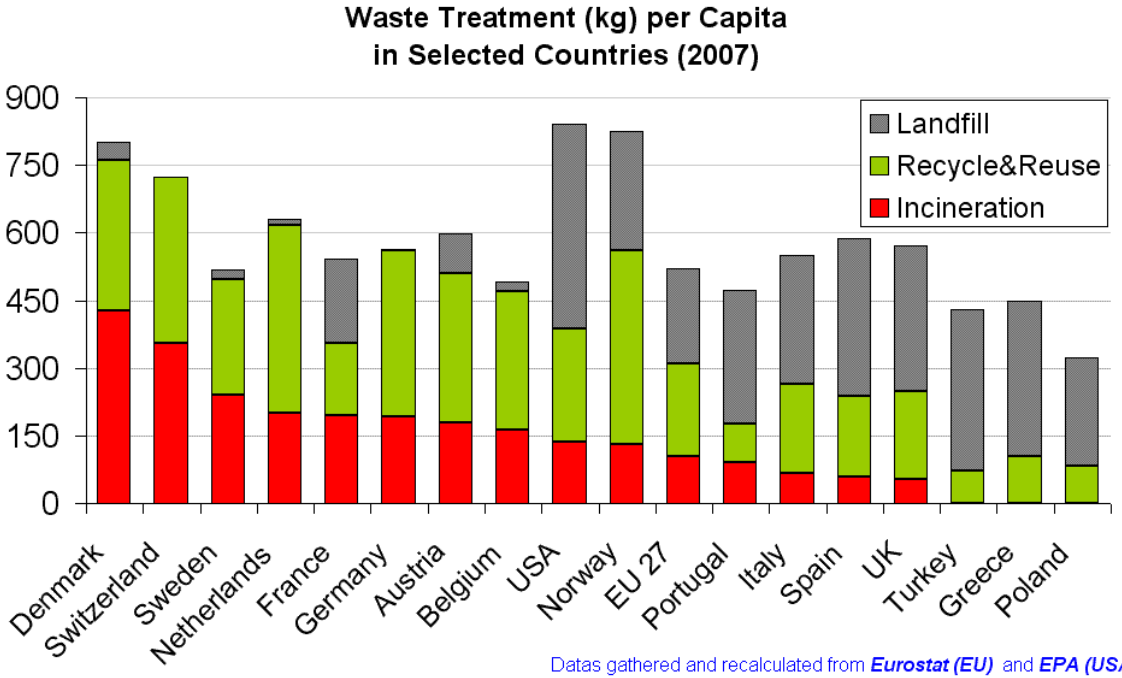
- Buildings in Canada (residential, commerical, industrial) account for >60% of Greenhouse Gas Emissions;
- Energy use in residential buildings a function of:
  - Construction materials
  - Shape of and orientation of the building
  - Internal temperature settings (i.e., operation)
  - Internal use
  - Climatic conditions
  - !!! Housing type and urban form (sfh vs duplex vs apartment/condo)
- Many opportunities to improve energy efficiency in both existing and new construction.
  - E.g., new LEED-certified buildings at the Lakehead Orillia Campus.

Waste Management (1)

- Waste generation a function of:
  - Demographic characteristics (household size; age structure; annual income)
  - Type of dwelling (e.g., single family home vs apartment)
  - Geographic location (e.g., close to market for 'recyclables') (e.g., recycled newsprint requirement for California newspapers … effect on Mackenzie papers mills in northern BC)
  - Time of year

Waste Management (2)

- Integrated approaches to Municipal Waste Management:
  - → divert from landfill, via
    - Source reduction
    - Reuse and Recycling Programs
    - Thermal treatment (i.e. incineration with energy recovery)



SWARU incinerator (Hamilton), demolished in 2002.

Waste Management (3)

- Waste Exports
  - International (Metro Toronto to Michigan)
  - Domestic (Greater Vancouver to Cache Creek, BC)

Cache Creek (or “Trash” Creek?)

Looking Ahead to the next lectures

Upcoming Class Lectures:

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- March 18 (Environmental Issues in Cities)
- March 20 (Urban Sust. & Best Practices in Urban Areas)

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References

- Dearden, P and Mitchell, B. 2012. *Environmental Change and Challenge*, Fourth Edition, Don Mills, Ontario: Oxford University Press {Chapter 13: 'Urban Environmental Management'}