

FACC 100

Lecture 2: Engineering and Sustainability

Fall 2011

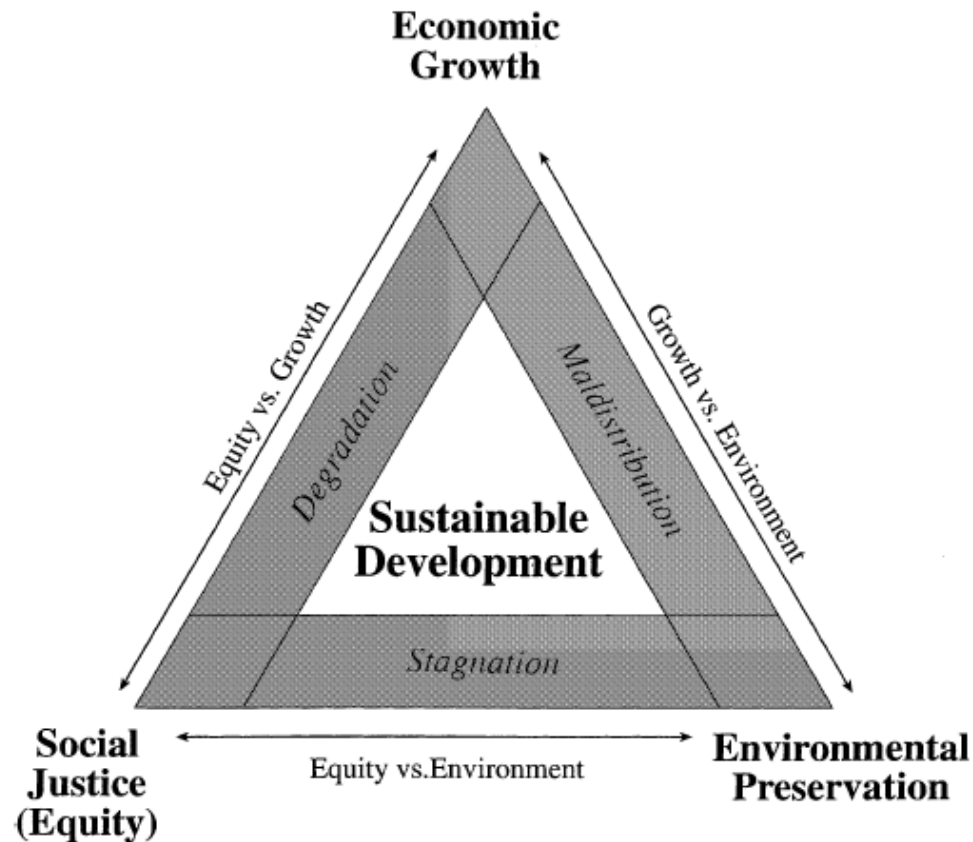
Sustainability

“Sustainable development is development that meets the needs of the present, without compromising the ability of future generations to meet their own needs.”

- Brundtland Commission of the United Nations, 1987

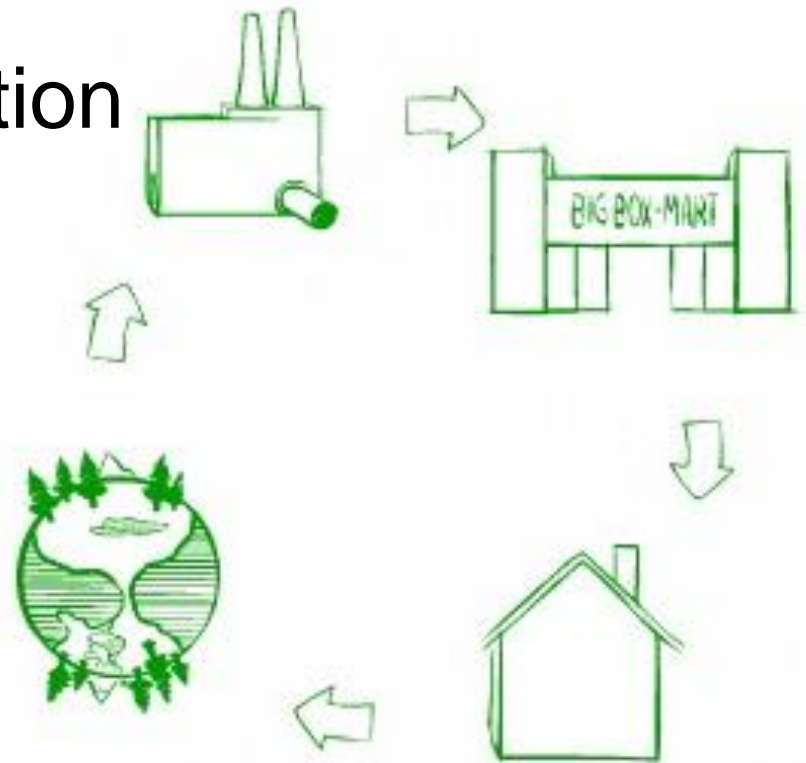
Sustainable Development

Emphasizes 3 main goals & balances 3 tradeoffs
(Feitelson, 2002)



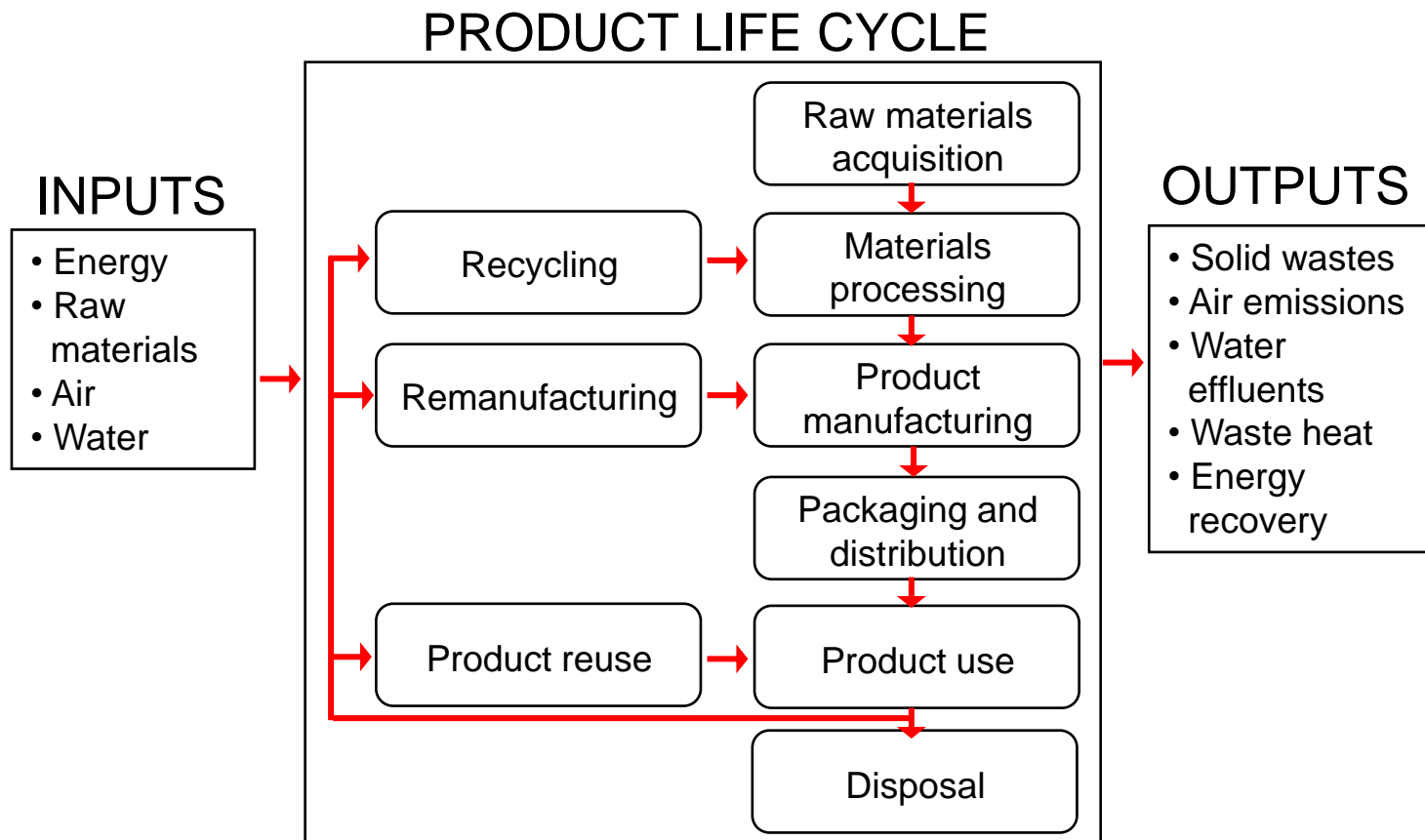
Paradigm Shift in Engineering

- Green chemistry
- Zero waste
- Closed loop production
- Renewable energy



Paradigm Shift in Engineering

- **Lifecycle Analysis (LCA)**
- Energy and mass balance approach for every stage of a product's life cycle



Lifecycle Analysis

Which is the greener option?



Per 1000 cups

Energy (kg oil)	2.1	3.8
Raw Materials (kg)	2.5	22.2
Air Emissions (g)	93.8	214
Water Emissions (g)	31.5	700

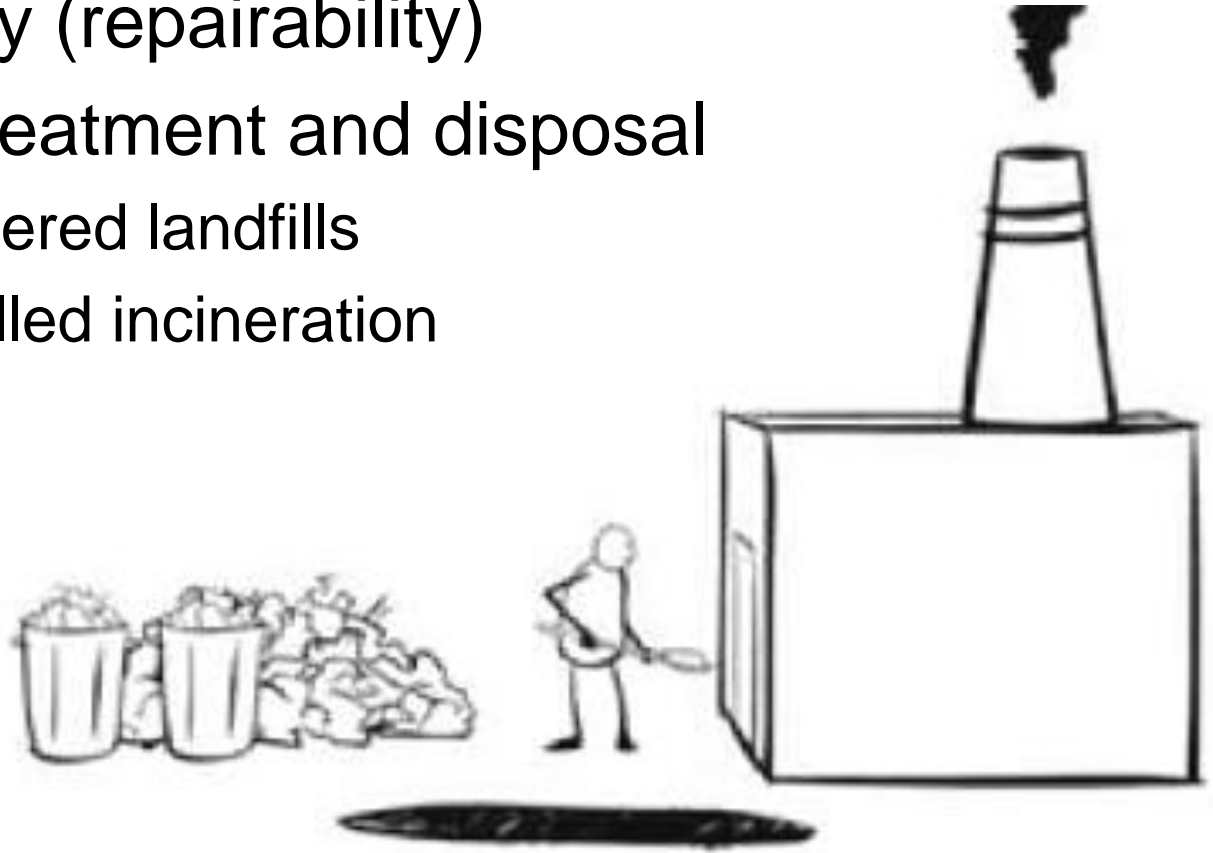
Paradigm Shift in Engineering

- **Maximizing recyclability**
 - Design of packaging
 - Facilitating recycling of components
 - Manufacturer take-back policies
 - Vehicles
 - Tires
 - Electronic waste



Paradigm Shift in Engineering

- **Minimizing waste**
 - Green chemistry
 - Durability (repairability)
 - Waste treatment and disposal
 - Engineered landfills
 - Controlled incineration



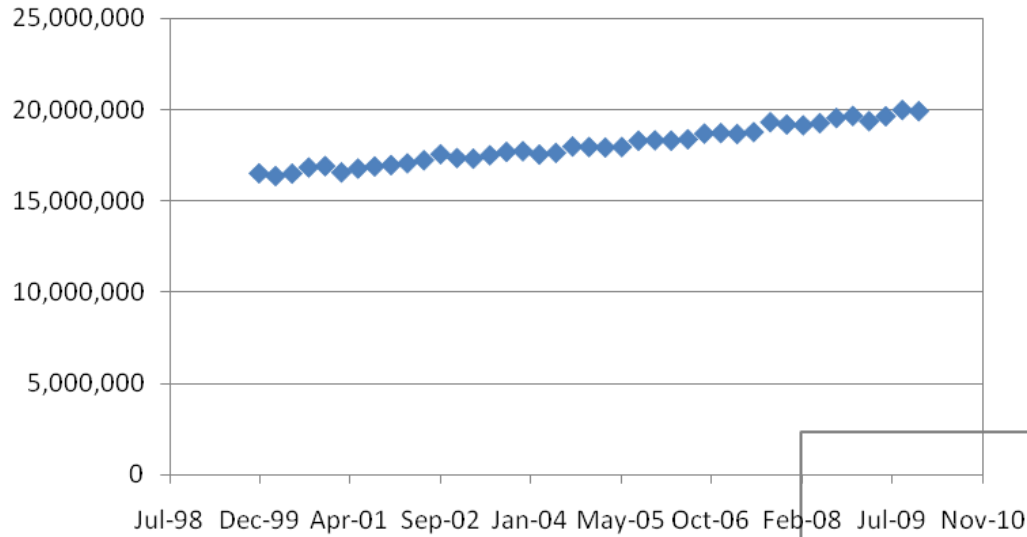
Technological Solutions

- **Reducing Energy Consumption**
 - Better transport

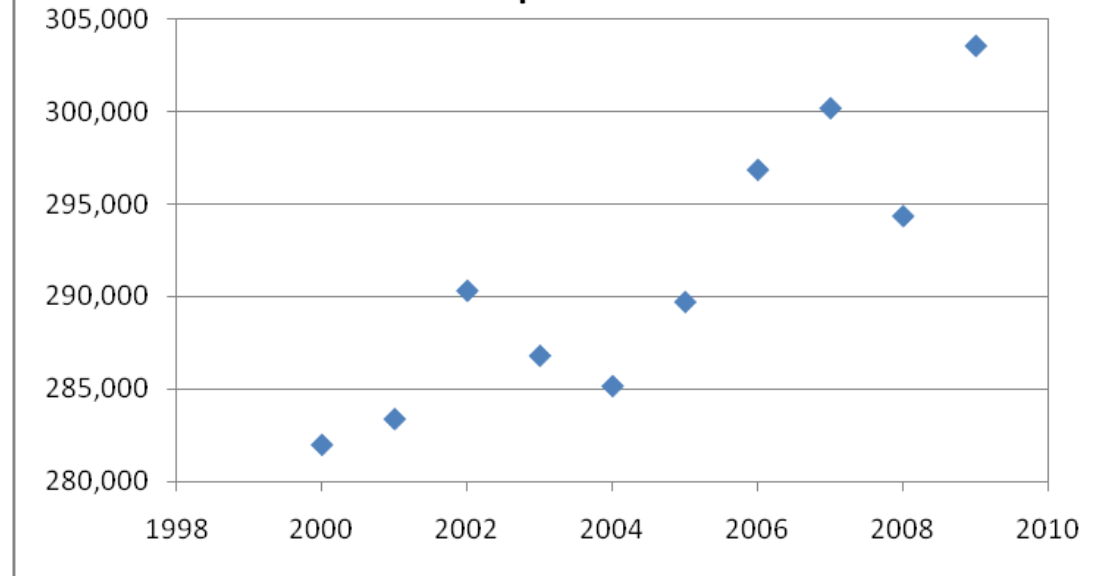


Trends in registered vehicles and Km travelled in Canada

Registered vehicles up to 4.5 tonnes

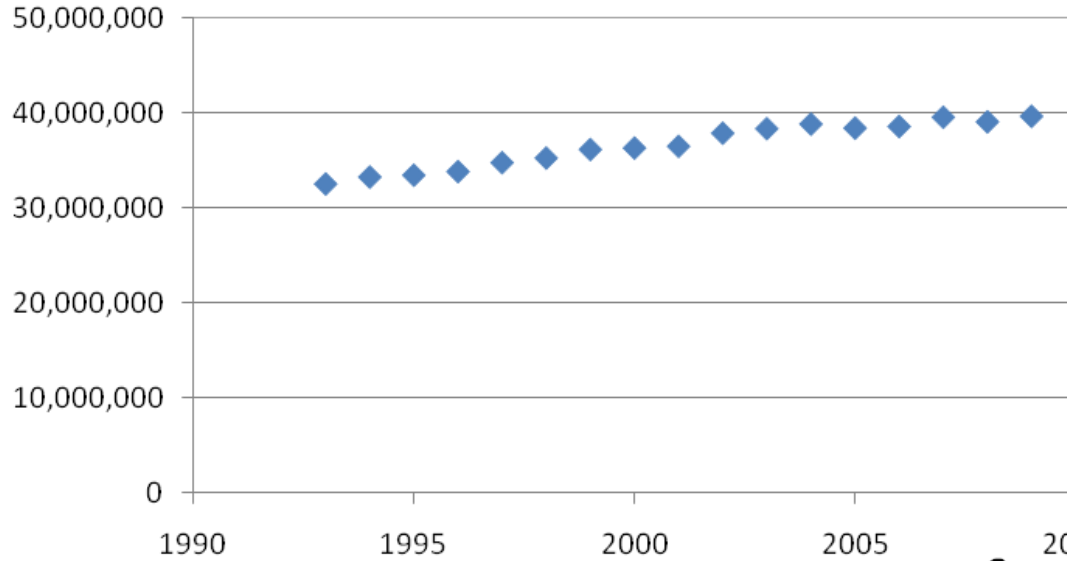


Vehicle kilometers (x1,000,000) Vehicles up to 4.5 tonnes

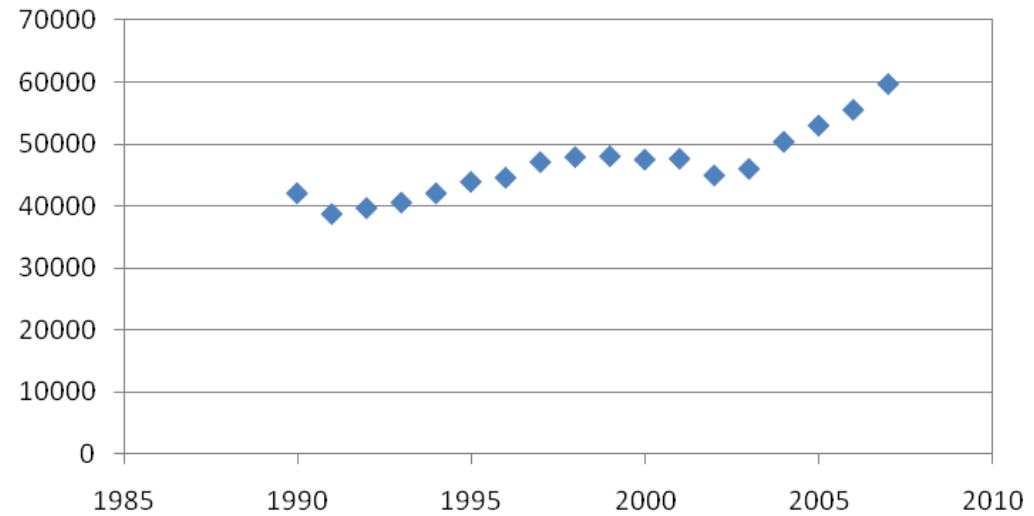


Trends in gasoline sales and GHGs

Canada: Net sales of gasoline (liters x 1,000)



Canada: Transportation CO2-eq (kilotonnes)



How far can technology take us?

**Do you think we will be able to
maintain our standard of living
well into the future?**

Demand management vs. supply

What is the best way to reduce the demand for energy?

Contributions from Section 2:

- Urban design, city planning
- More energy efficiency
- Telecommuting, ICT
- Reduce need for energy
- Increase the price of energy
- Reduce supply ???
- Fiscal Incentives for purchase of energy efficient goods
- Education
- Reduce population

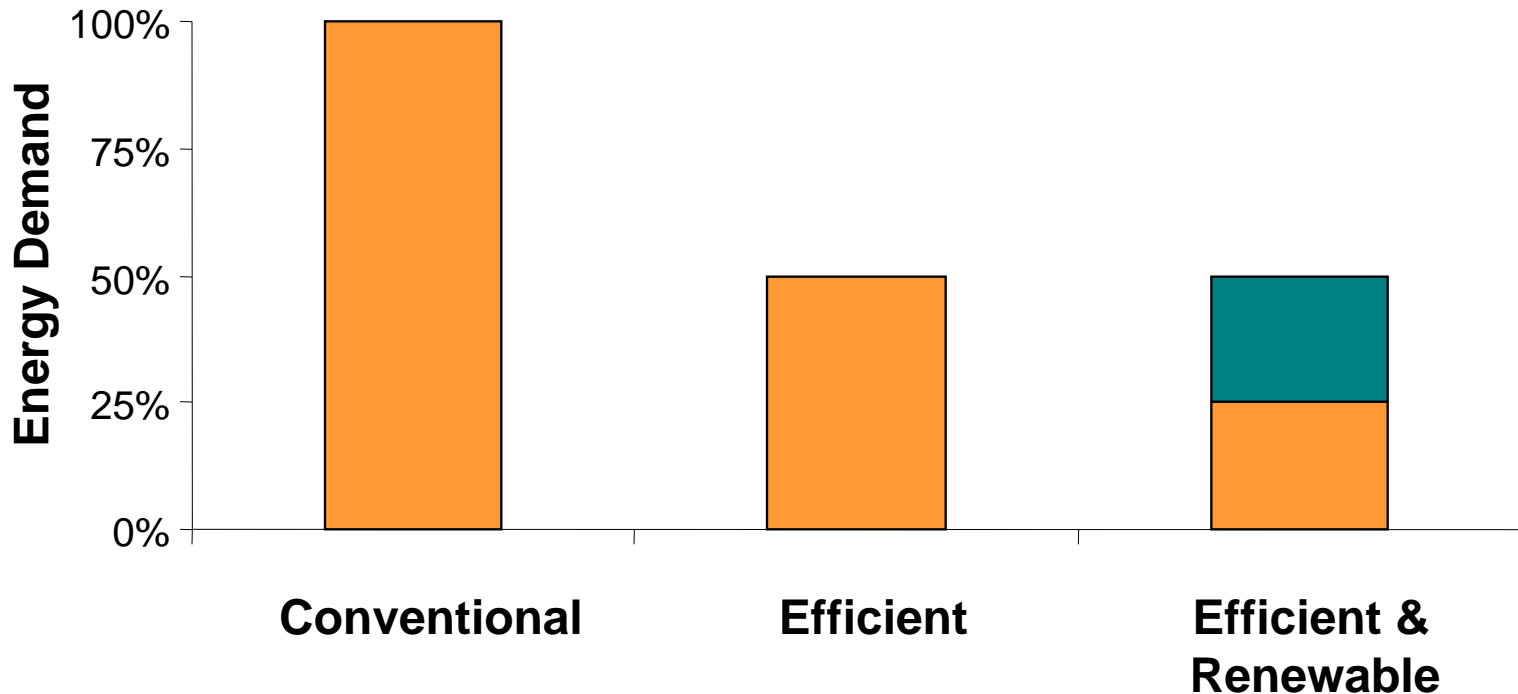
What is the best way to reduce the demand for energy?

Contributions from Section 1:

- Population decrease
- Efficiency (appliances, transporting electricity, harvesting, alternative energy)
- Education
- Financial
- Moving away from consumer-based economy
- Densification, land-use, planning
- Lifestyle, buy locally, recycle,
- Global economy: BAD
- Taxation

Sustainability

- **How to reduce demand?**
- Two equally important approaches
 - Renewable energy
 - Improved efficiency



Sustainability Initiatives at McGill



- Students have demanded change
- McGill named a campus sustainability leader by the Sustainable Endowments Institute in their annual green report card

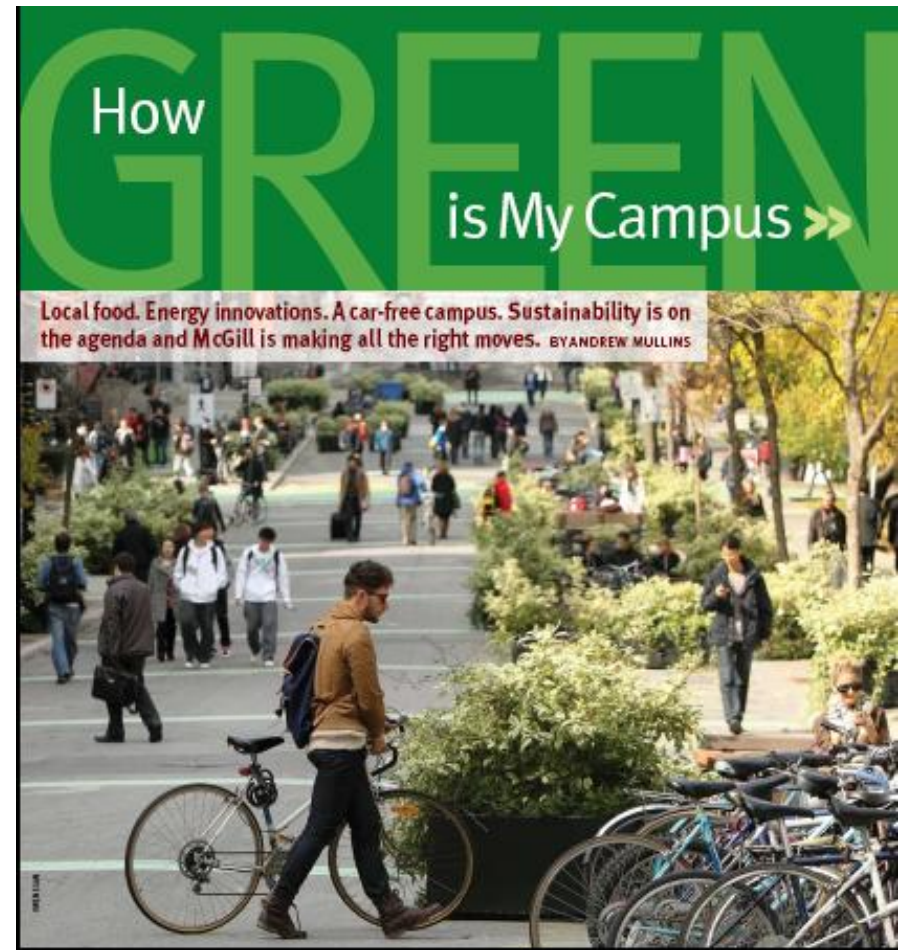
*Associate Vice-Principal
(University Services) Jim Nicell*



McGill

Sustainability Initiatives at McGill

1. Lower campus became a pedestrian zone
2. Bicycle parking spots doubled
3. City of Montreal has ceded McTavish to McGill to manage



Sustainability Initiatives at McGill

4. Industrial composter installed on lower campus to handle 60 tons of food waste from McGill dining halls, offering up six tons of compost to be used across campus



MODEL T240

Sustainability Initiatives at McGill

5. Switch to high efficiency lighting
6. Surplus heat generated by McGill's computer server room used to preheat the fresh air going into Otto Maass Building
 - Supplies almost a quarter of the building's annual heating needs



Sustainability Initiatives at McGill

7. McGill Food and Dining Services

- Serve only sustainable fish and seafood
- Eco-stations to collect plate scrapings for the composter and recyclables
- Reusable “eco-clamshell” containers instead of disposable take-out packaging



Sustainability Initiatives at McGill

8. Sustainability Projects Fund (SPF)
 - \$800,000 initiative to promote sustainability ideas on campus
 - Students, staff and faculty apply for funding to test an idea for a project
 - Students voted in a referendum to contribute a 50-cents-per-credit fee to support the fund, with contributions being matched by the University

Sustainability Projects Fund administrator Lilith Wyatt, environmental officer Kathleen Ng, and director of sustainability Dennis Fortune



Sustainability Initiatives at McGill

9. Farmers' market near the Three Bares fountain brings farm-fresh food to campus

