EES C21

Urban environmental issues of the Greater Toronto Area

Winter 2015

Nick Eyles

Tuesday 7-9 pm Room: HW214

Our world is increasingly urban and by 2050 it is estimated that 5 billion people will live in an urban area. The growth of large 'supercities' (defined by populations greater than 2 million) is proceeding at an astonishing pace. In 1950 there were 43 such cities, today 200 with 19 of them having more than 20 million inhabitants. Currently, a sixth of the world's population (>1 billion people) live in urban slums and by 2030 fully one third of the world's population will live in an active tectonic area: recurring earthquakes, wastes, drinking water, food and security are major environmental issues.

Today, 80% of Canadians live in an urban area, a complete reversal of the situation 100 years prior. The effects are far reaching creating what is called an '*urban shadow'*. This refers to regional and global environmental impacts (i.e., well outside the city itself) that arise from the need to import energy, food, construction materials and other resources matched by the complementary export of waste materials (municipal, industrial and radioactive waste etc). The risk from natural hazards (e.g., earthquakes, severe weather) increases as urban areas become larger and denser; the regional climate is also altered and there are massive negative impacts on watersheds, air and water quality, hydrological cycles and groundwater systems. Most cities face the challenge of 'historic wastes' disposed of in the past under lax environmental regulation. Large areas of cities are underlain by 'historic fill' (often contaminated waste materials) which requires the use of geophysical techniques to map, and a variety of geochemical tools to remediate. The cost is a major impediment to reuse of 'brownfield' sites.

This course will provide you with an overview of the geology of Canada's cities including ice-age glacial deposits. We will then proceed to examine the impacts of urban development on watersheds and waterfronts principally across the Greater Toronto Area but we will also touch on global issues. We will examine the geological aspects of site assessment (what is there and where is it?) and cleanup and remediation. It will interest students from a broad range of disciplines from specialist environment scientists to those interested in urban planning and design, city studies or urban ecology.

A weekend field trip will familiarize you with many of these issues across southern Ontario and New York State (e.g., Love Canal). What you learn in this course can be applied to any urban area.

Lectures

Week 1: (6th January) Introduction, course scope, grading practice and expectations. Assigned reading: Chapters 1 and 2 of textbook and Chapter 22 of Eyles (2002).

Week 2, 3: (13th and 20th January) Geology of Canadian cities: a four layer model. 1: Pre Cambrian 'basement' rocks, 2: Paleozoic and Mesozoic 'cover' rocks, 3: glacial sediments and 4: the 'built landscape'.
Reading: Chapters 1 and 2 of textbook and Chapter 22 of Eyles (2002).

Week 4: (27th January) Landfilling and the legacy of historic wastes in urban areas

Weeks 5, 6 (3rd and 10th February) Invited lectures: Dr. Kathy Wallace: *Remediating the built landscape and contaminated site clean-ups in Ontario*

Week 7: (17th February) No Class: Reading week

Week 8: (24th February) Impact of urbanization of surface waters and watersheds

Week 9: (3rd March): Invited lectures: Dr. Mandy Meriano: *Impact of urbanization on groundwater*

Week 10: (10th March): Urban development in Canada's north; living on permafrost in a warming climate.

Week 11 (17th March) Earthquakes and urban areas in Canada

Field Trip
Saturday-Sunday March 21-22nd: *Impacts of urbanization on watersheds and waterfronts* e.g., Beare Road landfill, the Port Industrial District, Frenchman's Bay, Hamilton Harbour, Love Canal, Hyde Park (NY State) etc. Overnight accommodation on Saturday will be in Niagara Falls. Note: A current passport with six months remaining or US entry visa is required.

Week 12: (24th March) Invited lecture: Dr. Monique Hobbs, Nuclear Waste Management Ontario. *Nuclear waste management in Ontario: the deep storage option.*

Week 13: (31st March) Class discussion: are urban areas environmentally sustainable? What are pressing research and policy issues? Exam revision

Assessment
Mid-term exam: 30%
Final Report: 30% (due March 31st)
Final Exam: 35%
Contribution to Discussions 5%

The topics and formats for the Final Report will be circulated later.

Note: The usual caveats about plagiarism apply to this course; plagiarized work will be given a grade of zero and you will be reported to the Dean. Late work will be docked 10% of the mark per day. Missed test or lab exercise and late hand-ins will only be excused for cases in which the absence was entirely beyond your control (e.g., medical reasons), and only if the proper U of T support documentation is completed and submitted. Without this we are under no obligation to accept late work.

Course material:
The prime source of information is: Eyles, N. 1997: (Editor) *Environmental Geology of Urban Areas*, Geological Association of Canada (especially Chapter 2: Environmental geology of the Greater Toronto Area) Geotext No. 3. This is on short term loan from the library.

Eyles, N. 2002: *Ontario Rocks*. Fitzhenry and Whiteside, Markham.

I will also assign additional readings from week to week.

Contact information:
Office hours: Tuesdays 10-12 (or by appointment) in SY205
Check Blackboard regularly for announcements.
TA office hours: TBA

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