Environmental Engineering Presentation

Winter 2025

Faculty Members

Dr. Elsayed Elbeshbishy, P.Eng.
Anaerobic digestion. Pre-treatment of municipal solid wastes. Biohydrogen and biomethane production. Nutrients recovery from waste and wastewater. Microbial melectrolysis cell and microbial fuel cell. Anaerobic membrane bioreactor (AnMBR).

Dr. Rania Hamza, P.Eng.
Wastewater treatment, biofilm processes, aerobic granular sludge, biological nutrient removal, removal of emerging contaminants (e.g., microplastics, PFAS), resource recovery from waste streams, climate adaptation

Dr. Darko Joksimovic, P.Eng.
Modelling, decision support and optimization of urban water systems. Green and living infrastructure. Hydroinformatics.

Dr. James Y. Li, P.Eng.
Modeling of watershed processes. Stormwater management. Urban oil spill management. Modelling of urban drainage systems.

What is Civil Engineering?

Thomas Tredgold's 19th c definition of Civil Engineering

Civil Engineering is the art of **directing** the great sources of Power in Nature for the use and **convenience** of **man**;

a 21st c definition of Civil Engineering

Civil Engineering is the art of **working with** the great sources of Power in Nature for the use and **benefit** of **society**

Source: Jowitt, 2004

What is Environmental Engineering?

- Three main goals of environmental engineering
  - Protect human population from adverse environment
  - Protect environment from human activities (e.g. contamination)
  - Improve quality of human health and well-being
- Some functions that environmental engineers perform
  - Provision of safe, palatable and ample water supplies
  - Control of water, soil and atmospheric pollution
  - Proper disposal or **recycling** of ~~wastewater~~ **used water** and solid wastes

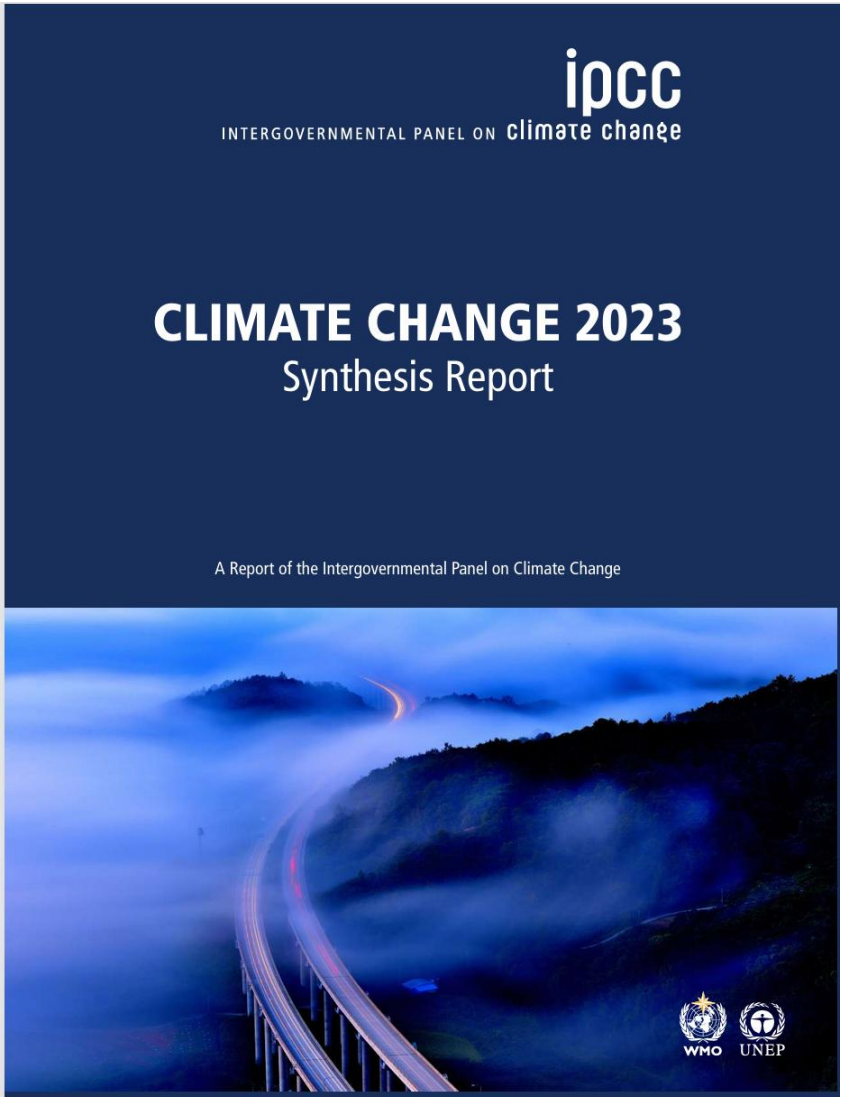
Are we doing everything we can?

- Unprecedented heatwaves
- Need for immediate climate action:

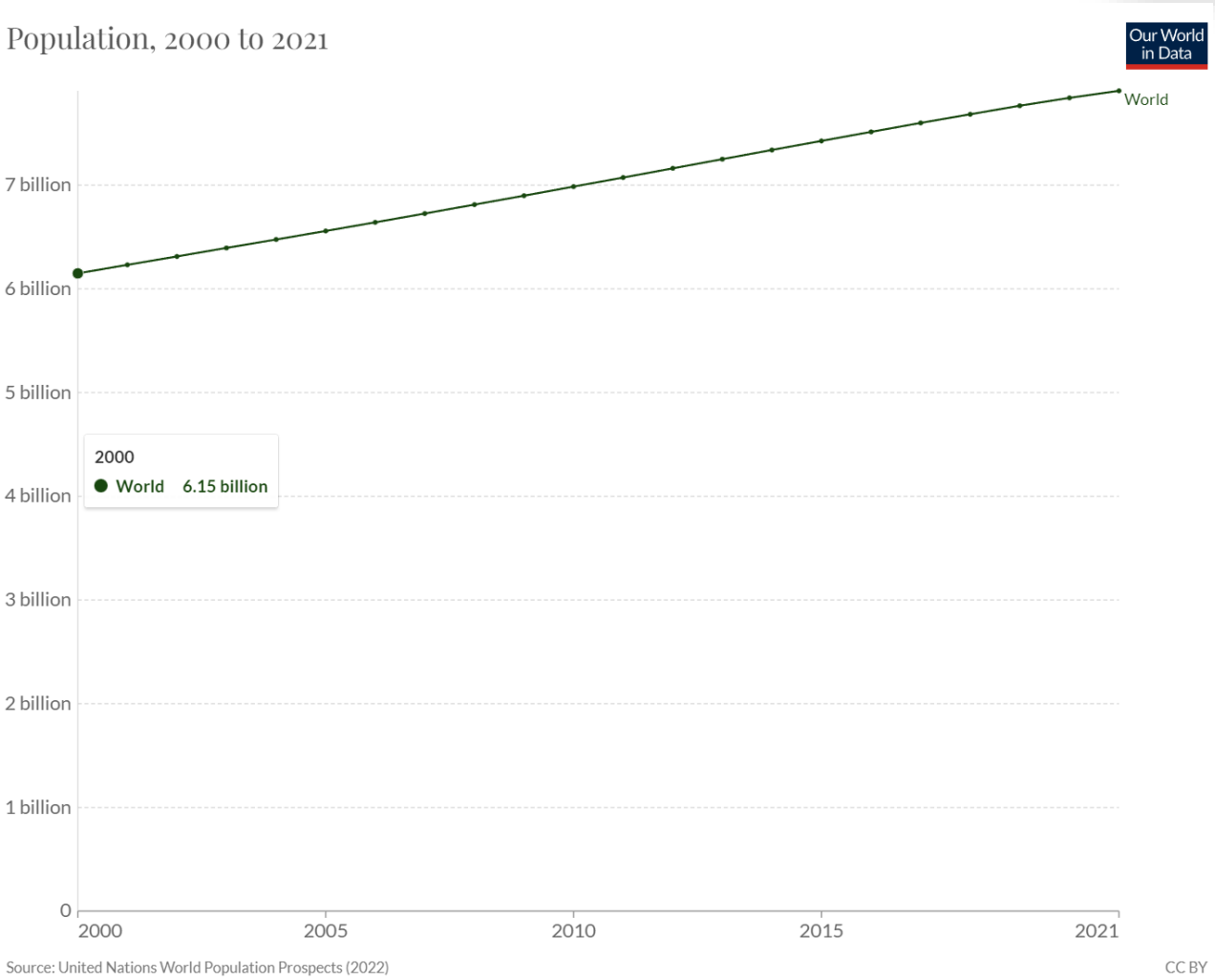
"The era of global warming has ended; the era of global boiling has arrived " – UN Secretary General António Guterres

- UN Climate Change Conference (COP28), Guterres stressed the necessity of drastic reductions in global GHG emissions within the decade to limit global temperature rise to 1.5°C.

https://www.un.org/sg/en/content/sg/speeches/2023-07-27/secretary-generals-opening-remarks-press-conference-climate

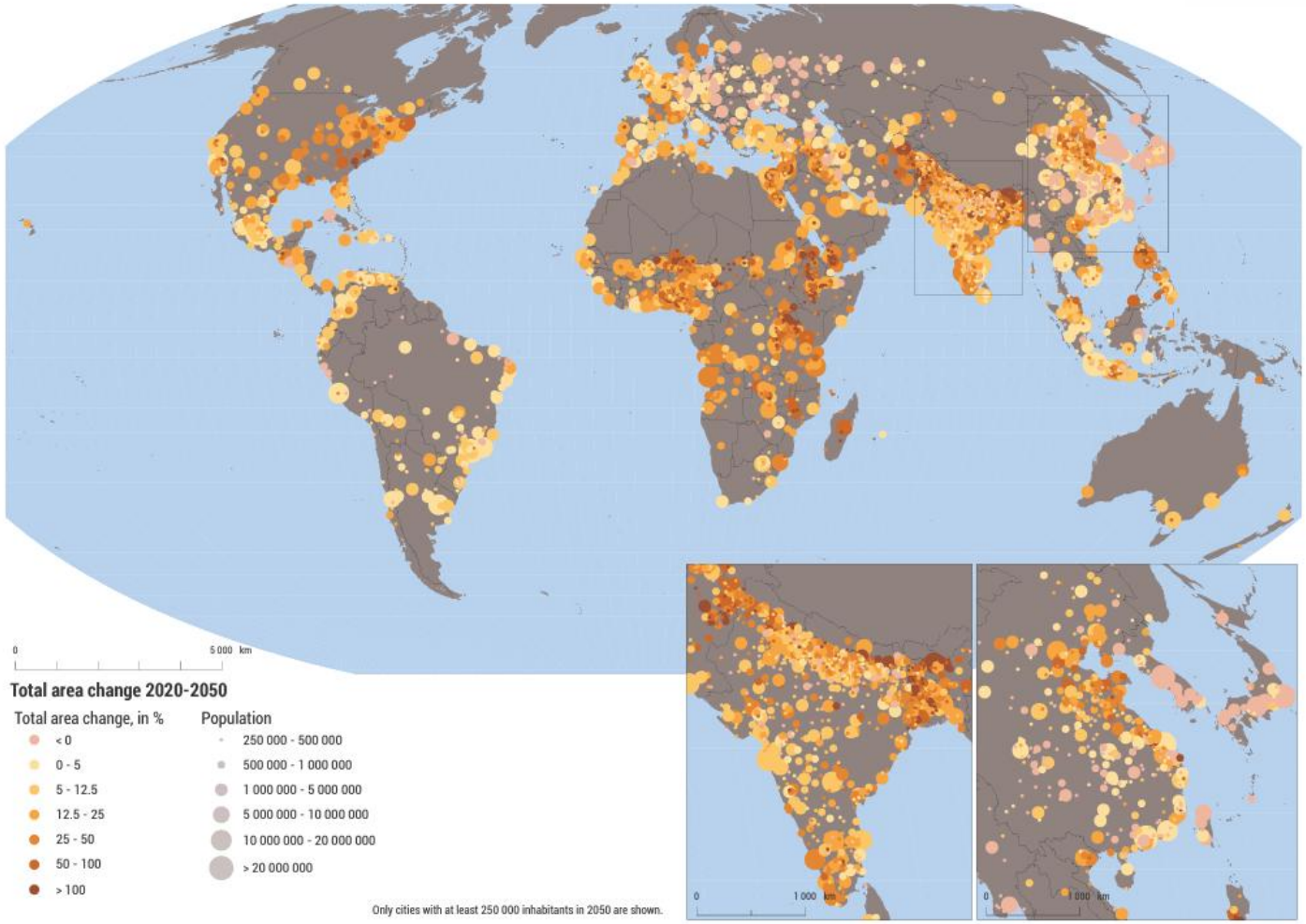


Pressing Issues and Guiding Principles
Population growth

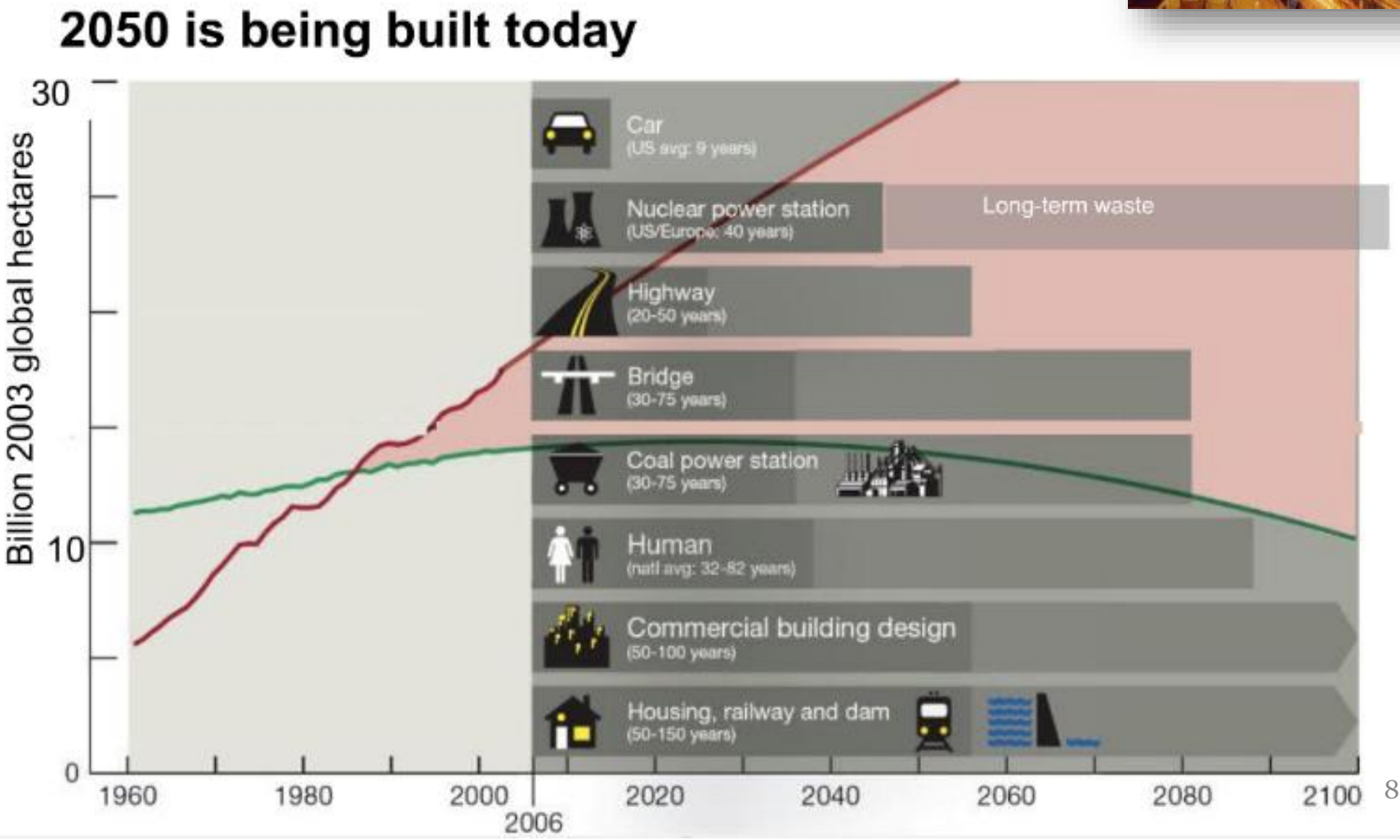


Pressing Issues and Guiding Principles
Urban growth

Map 2.1: City land area change, 2020–2050

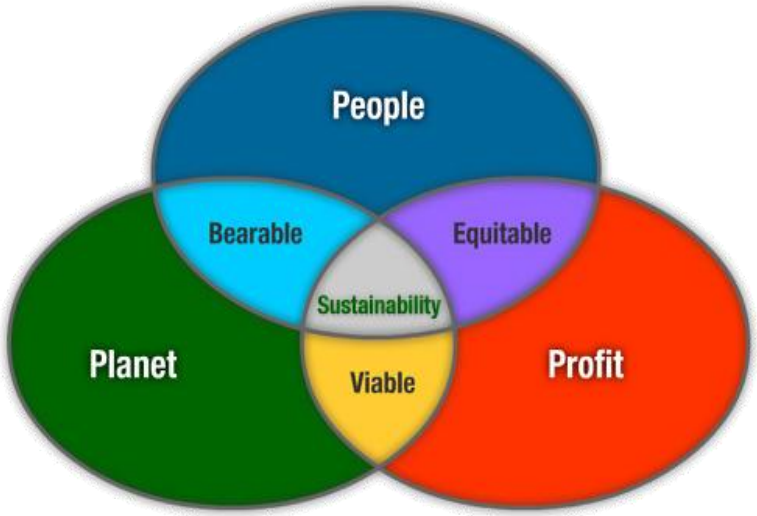


Pressing Issues and Guiding Principles
Infrastructure growth



Pressing Issues and Guiding Principles

- CSCE Guidelines for Sustainable Development
  - Climate change
  - Peak oil
  - Sustainable transportation
  - Environmental restoration
  - Ecosystem disruption
  - Ethics and equity
  - Infrastructure operation and maintenance
- We need to deal with these in
  - Planning
  - Design
  - Implementation
  - Operation
  - Decommissioning



LINEAR ECONOMY

CIRCULAR ECONOMY

SUEZ - Water Technologies & Solutions
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Did you know, in the U.S. alone, there are 436 million gigajoules (GJ) of energy available that could be derived from wastewater treatment, landfills, manure, and other organic waste streams? This statistic was the focal point of a recent article from TriplePundit in which expert Mike Theodoulou anaerobic digester projects are just the tip of the iceberg for turning waste into energy: https://bit.ly/3yzXWo9

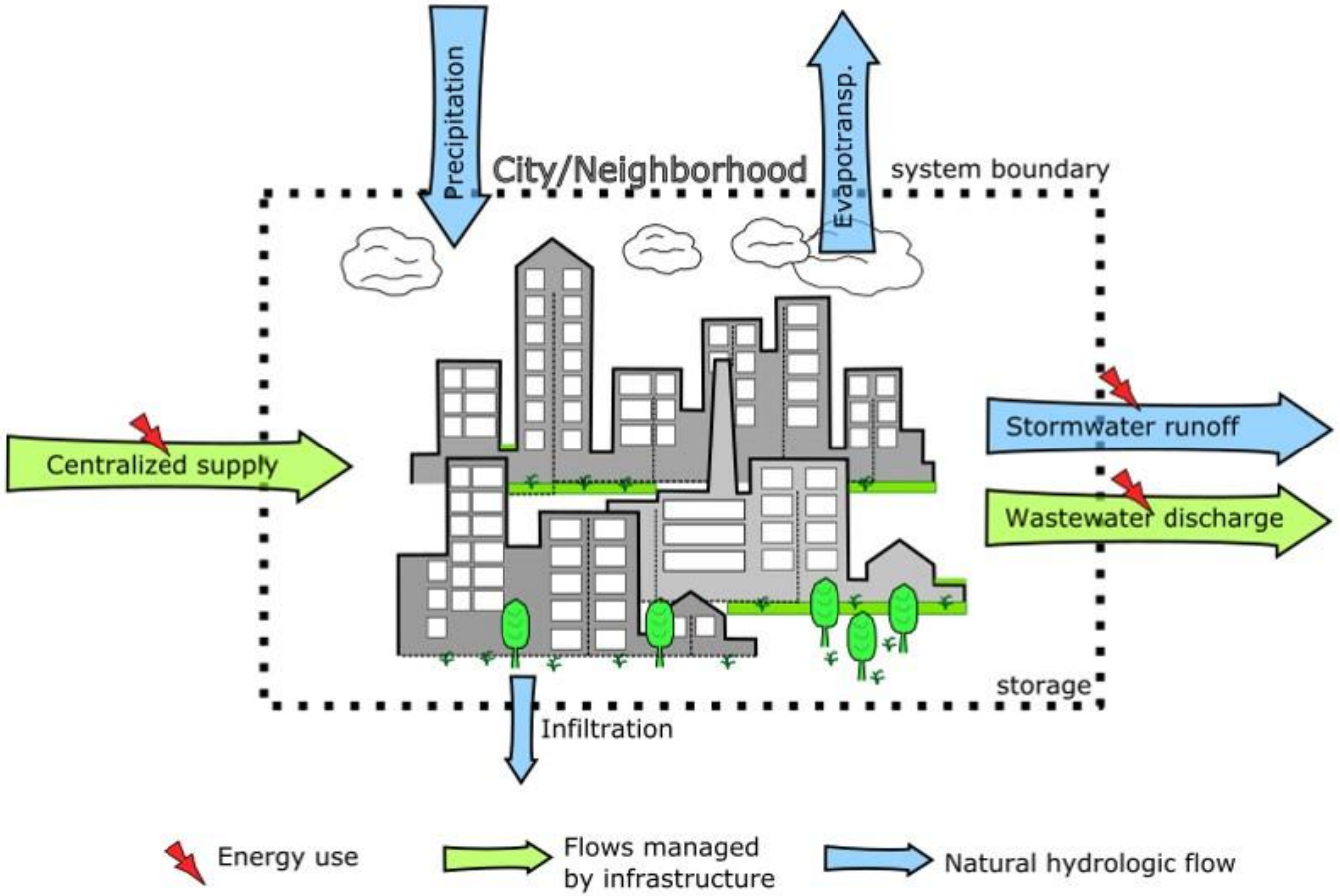
Turning Waste into Energy Holds Big Opportunities

triplepundit.com • 4 min read

It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.

—CHARLES DARWIN

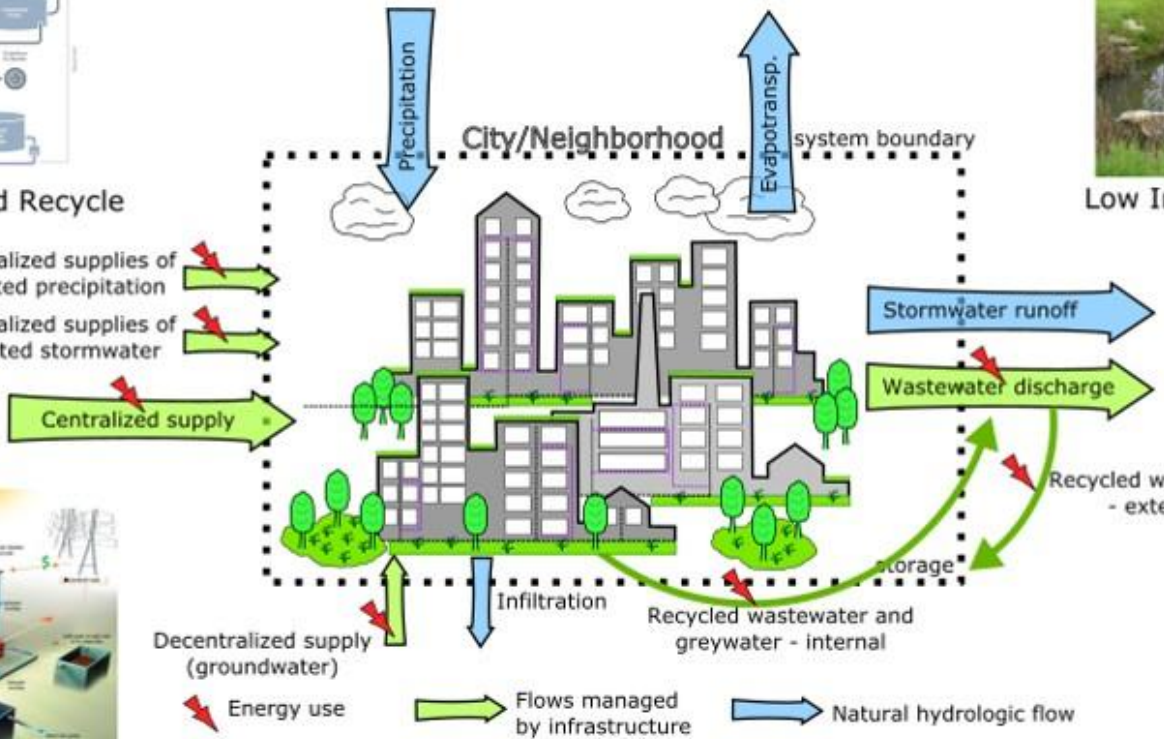
Urban water cycle - traditional



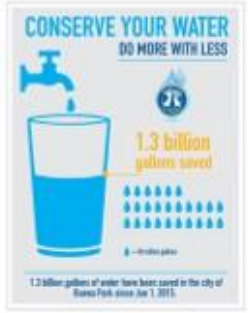
Urban water cycle – 21st Century

Water Reuse and Recycle

Low Impact Development (LID) / Green Infrastructure



Green Buildings



Water demand and supply management

Courses in Environmental Stream

- 2nd Year
  - MEC522 Fluid Mechanics
  - CVL502 Hydraulic Engineering
- 3rd Year
  - CVL 400 Hydrology and Water Resources
  - CVL 602 Municipal Engineering
- 4th Year
- CVL 300 Environmental Science and Impact Assessment
  - CVL 901 Municipal Solid Waste Management
  - CVL 903 Water Resources Engineering
  - CVL 920 Water and Wastewater Treatment
  - CVL 71A/B Environment Capstone Design Project

Capstone Projects

Project Number	Group Name	Company	Project Title
1	EcoSolutions Engineering	TY Lin International Group	Residential Block Site Plan
2	Multitech Insight	City of Toronto	Servicing Design for a Subdivision Project
3	Hydrosphere Solutions	Independent Consultant	Retrofit of Highpoint Pond, Milton
4	Aquacon Utilities Engineering	City of Markham	Development of a Watermain Asset Management Plan for a Greater Toronto Municipality
5	Aquae Melius Engineering Consulting	Stantec Consulting Ltd.	MacMorrison Park Storwater Retrofits (WEAO Student Design Competition)
6	CALM Consulting Engineers	WSP Canada Inc.	Development of an operation plan to maintain water quality in a municipal water distribution system

For more information… LinkedIn

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