Multi-Objective Decision Model for Urban Water Use: Planning for a Regional Water Re-Use Ordinance

A collaborative effort involving

- Illinois Institute of Technology
- Illinois Waste Management and Research Center
- Northeastern Illinois Planning Commission
- Regional stakeholders

Metropolitan Chicago water use

- Six-county area in NE Illinois is growing
- Estimated & projected water consumption
  - 2000 = 1230 MGD
  - 2030 = 1860 MGD
- Supply problems
  - Lake Michigan withdrawal is limited
  - Groundwater sources unknown, decreasing


Wastewater reuse options
Hanover 12 MGD
Egan 30 MGD
Kirie 72 MGD
North side 333 MGD
Stickney 1200 MGD
Lemont 1.6 MGD
Calumet 354 MGD
DUPAGE COUNTY
CHICAGO
LAKE MICHIGAN
HANOVER PARK
EGAN
KIRIE
NORTHSIDE
STICKNEY
LEMONT
CALUMET

Barriers and incentives

- Regulatory Issues
- Existing institutional or policy programs
- Potential human or ecological health concerns
- Technical requirements
- Economics

Optimization objectives

- Minimize costs
  - Water and wastewater treatment
  - Water distribution (new dual distribution)
  - New treatment costs (chlorination)
  - Hydroelectric facility
  - Waste heat
- Minimize potential risks
  - Human health
  - Ecosystem
- Minimize water withdrawal from Lake Michigan

Constraints

- Limited supply (surface, groundwater)
- In-stream flow requirements
  - Aeration
  - Wastewater dilution and conveyance
  - Habitat protection
  - Transportation
  - Recreation
- Treatment system capacity
- Public acceptance

Decision support system

- Capture information in an optimization model
- Present the model as a decision support system
- Work with stakeholders:
  - What objective(s) do they want to see?
  - Do we have all the constraints?
  - What and where are the reuse applications?
- Similar applications throughout Great Lakes