Integrated Water Resource Management and the Watershed Approach

1. **Integrated Water Resource Management**
    - IWRM in Canada
2. **Watersheds and The Watershed Approach**
    - Discussion of Watershed Assignment

    BREAK
3. **Final Project - Proposal Framework**

1. IWRM Defined

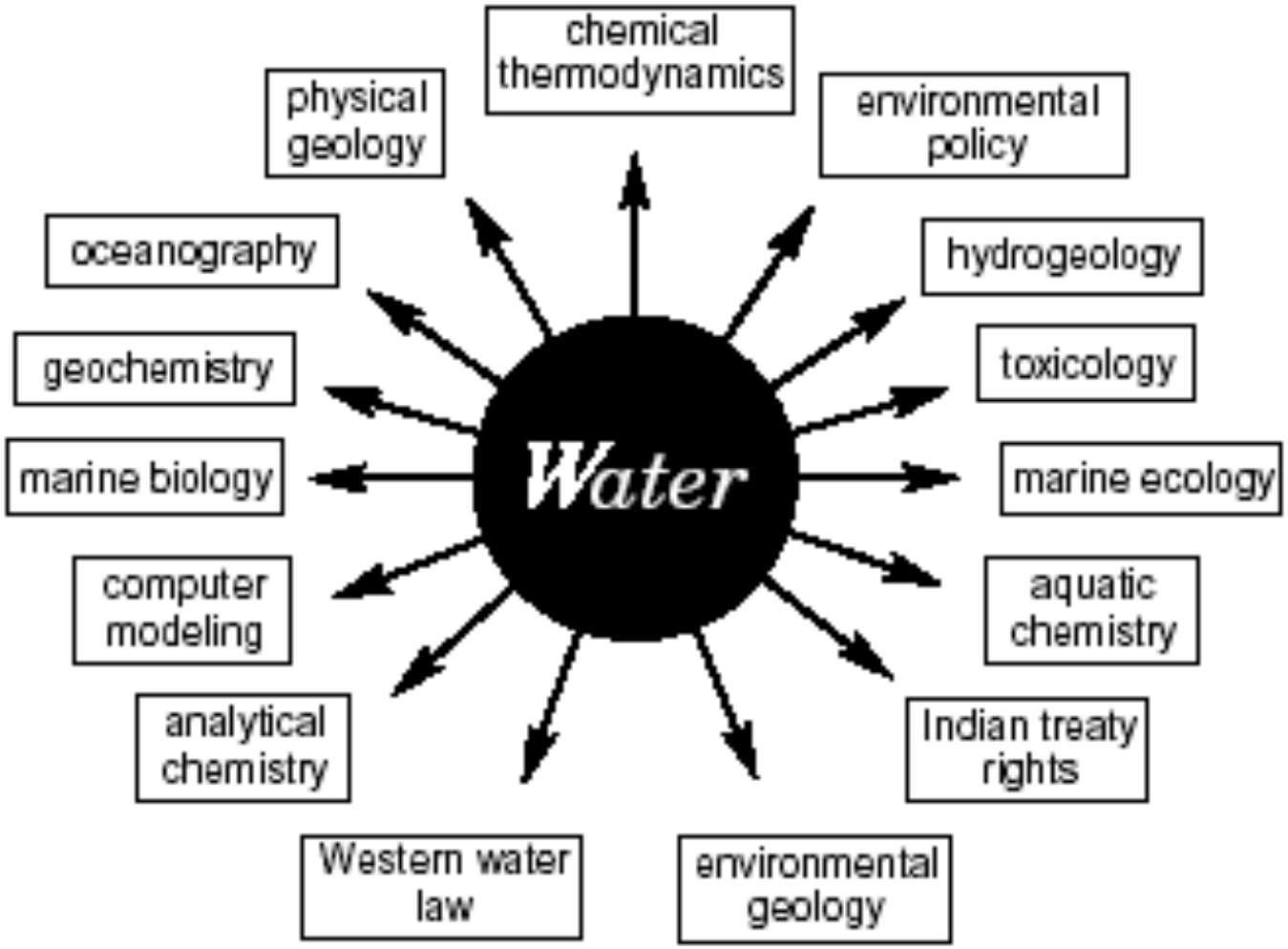
- Related issues:

  -Water Demand Management

  -River Basin Management.

A standard definition of IWRM is the one provided by Global Water Partnership: "*IWRM is a process which promotes the co-ordinated development and management of water, land and related resources, in order to maximize the resultant economic and social* ***welfare*** *in an* ***equitable*** *manner without compromising the* ***sustainability*** *of vital ecosystems*".

Multidisciplinary vs. Interdisciplinary



The Adaptive Management Cycle

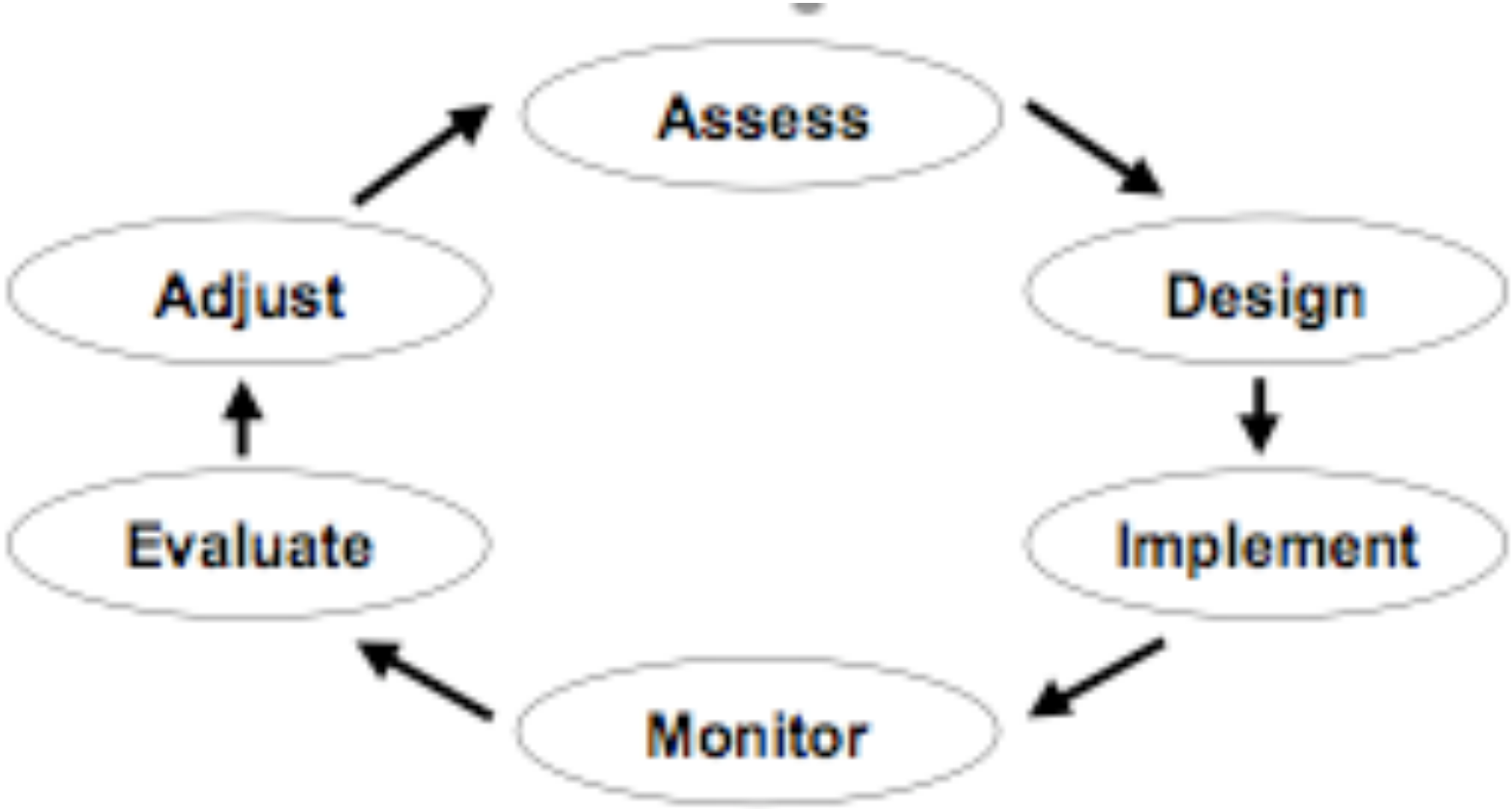


FIGURE 24.1. The adaptive management framework. Figure 1 from Nyberg 1999, copyright Queen's Printer for Ontario, 1999. Reprinted with permission.

IWRM COMMON TASKS:

The strengthening of human resources development in terms of:

- *Education / awareness creation programs*
- *Training of water managers*
- *The development of new institutions that will serve and match this goal*
- *Effective information management*
- *Environment and development*
- *The integration of water planning into national economy and financing scientific means to improve management*

COMMONLY DRIVEN BY:

1. *Increasing Water Shortages*
2. *Deteriorating water quality*
3. *Stresses on water supplies*

it is about integrating within human as well as natural systems. And much of the needed integration must take place outside the water box. To really manage and develop water in ways that advance sustainable development, an IWRM approach must be viewed as a process of change in political, social, economic and administrative systems.

- Policies and actions that deal from rain to drain
- Water-after-use
- Upstream and Downstream
- Sectors of Society

The term ‘IWRM’ and the related ideas of ‘basin planning’ or ‘drainage basin management’ represent commendable advances on the earlier preoccupation with the planning of big projects and the dominance of engineering in that planning.

IWRM in Canada:

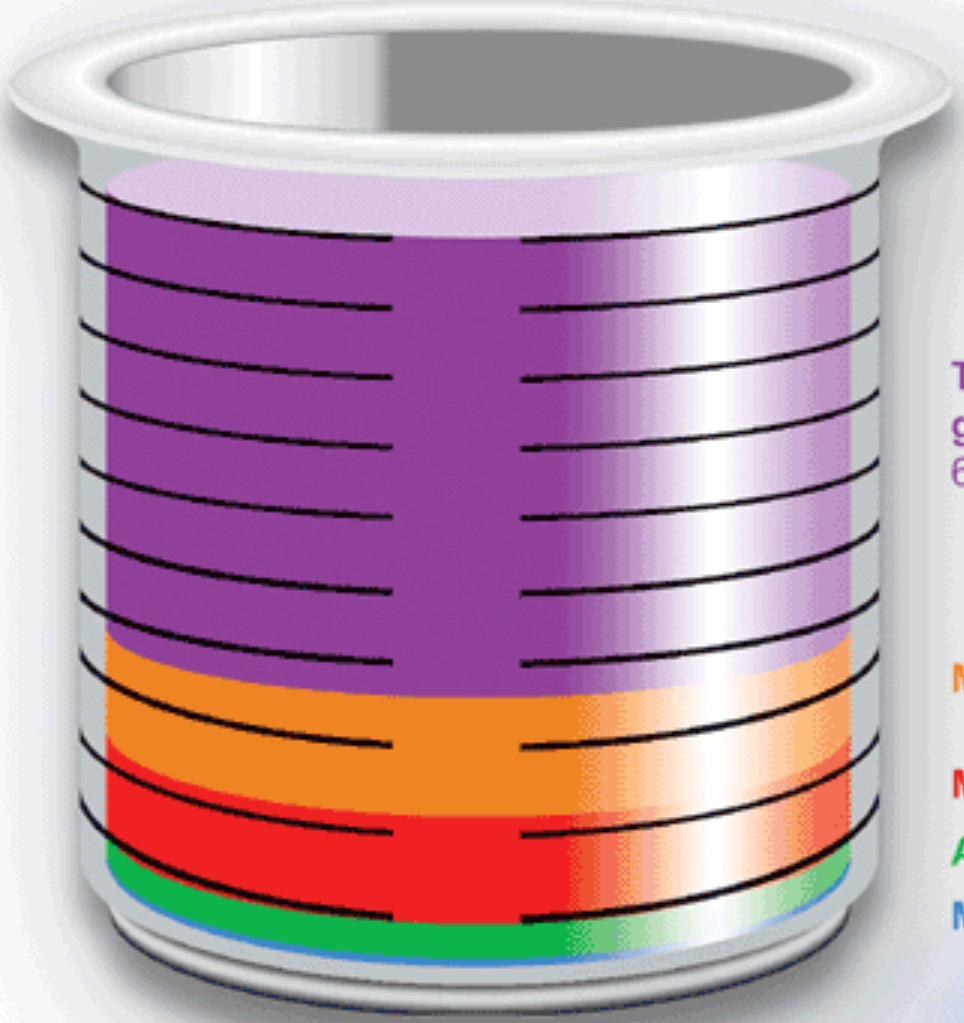
The Myth of Superabundance

A Reasonable quality of life relies on 80 L of water / day / person

- Canadians average 360 L / day / person

- 1 in 4 Canadians depend on groundwater for domestic water supplies
- Non-consumptive use (boating, swimming, skating)
- Water also maintains ecosystem integrity

The five main water users in Canada, 1996



Thermal power generation 64%

Manufacturing 14%

Municipal* 12%

Agriculture 9%

Mining 1%

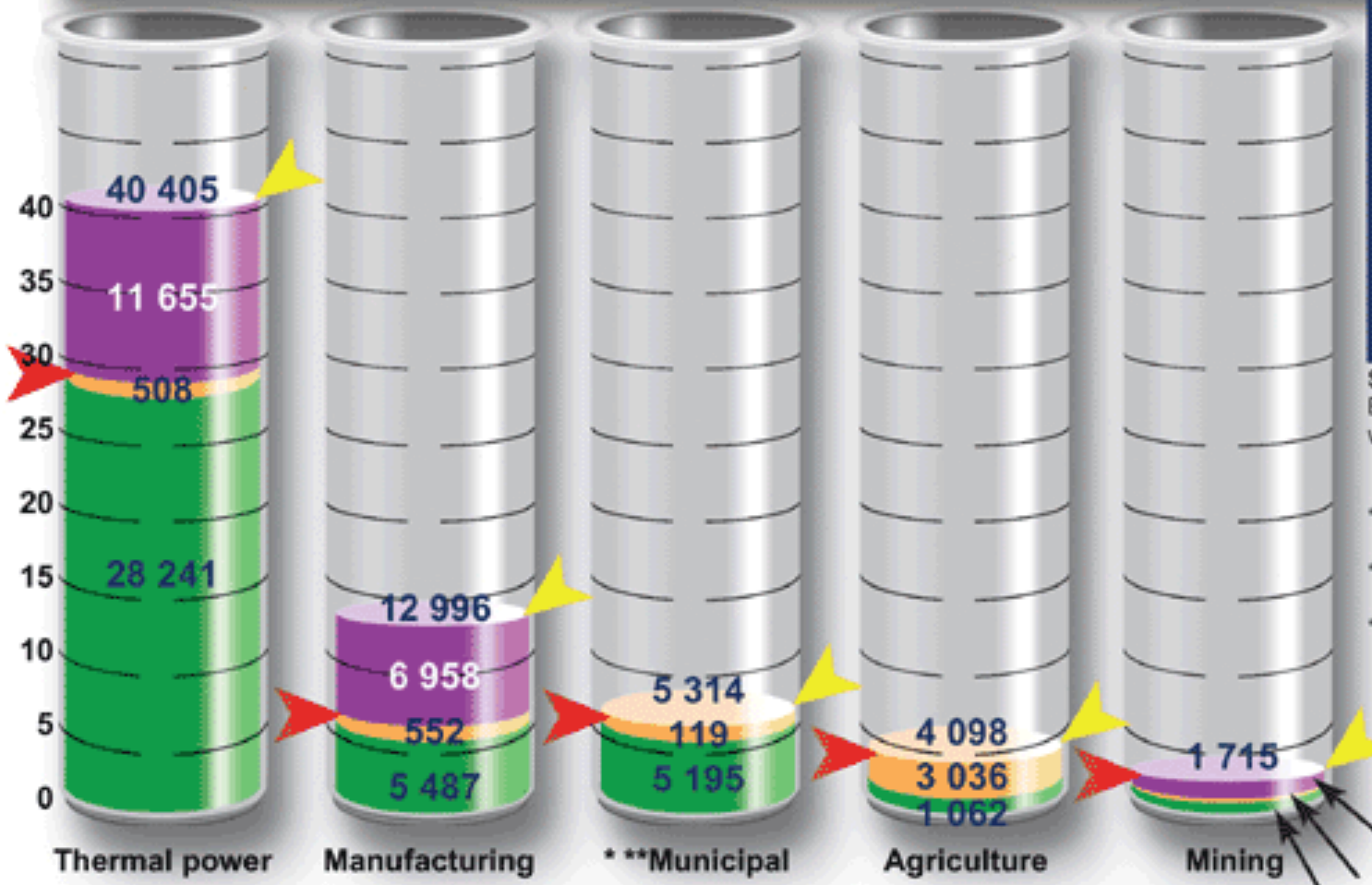
* includes rural domestic use (2%)

Source:
Environment Canada water use surveys and studies.

Water Use in Canada

Water use in Canada, 1996

Major water withdrawals (MCM per year)



LEGEND

- Water intake from water supply
- Gross Use
- Amount of water recirculated
- Amount consumed (evaporated, etc.)
- Water discharged

All amounts in millions of cubic meters (MCM) per year

Source:
Environment Canada
water use surveys and studies.

* Municipal data exclude water supplied to industry.
** Municipal data include estimates for rural residential water use.
*** Negative mining consumption value results from incomplete reporting of "mine water" intake or overall annual balance fluctuations in tailing ponds. An accurate mining consumption value is thus not available.

Notes: 1) Intake + Recirculation = Gross Use.
2) Intake – Discharge = Consumption (except in the municipal sector, where consumption has been estimated at 510 or 10% of intake (see #3).
3) Municipal consumption is an uncertain figure, but has been estimated. However, the difference between intake and discharge is not consumption, but non-metered sewage. If this non-metered sewage (including rainfall) was known, then the municipalities would be "net producers" of water, not consumers.
4) Data for some sectors have been extrapolated and rounded.

http://atlas.gc.ca/site/english/maps/freshwater/distribution

The Reality of Water use:

- Groundwater supports 98 % of all freshwater readily available to humans

  •US – 50% of population (37% of irrigation)
  •Canada – 26% of population

  -Ratio between use and supply creates a unique vulnerability:
  - Just 3.8 Liters of gasoline can contaminate 3.8 million litres of water
  - Groundwater is available and often does not need to be treated

Box 18.9 Sustainability Principles for Water Management in Canada

SUSTAINABILITY ETHIC

Wise management of water resources must be achieved by a genuine commitment to:

- ecological integrity and biological diversity to ensure a healthy environment;
- a dynamic economy; and
- social equity for present and future generations.

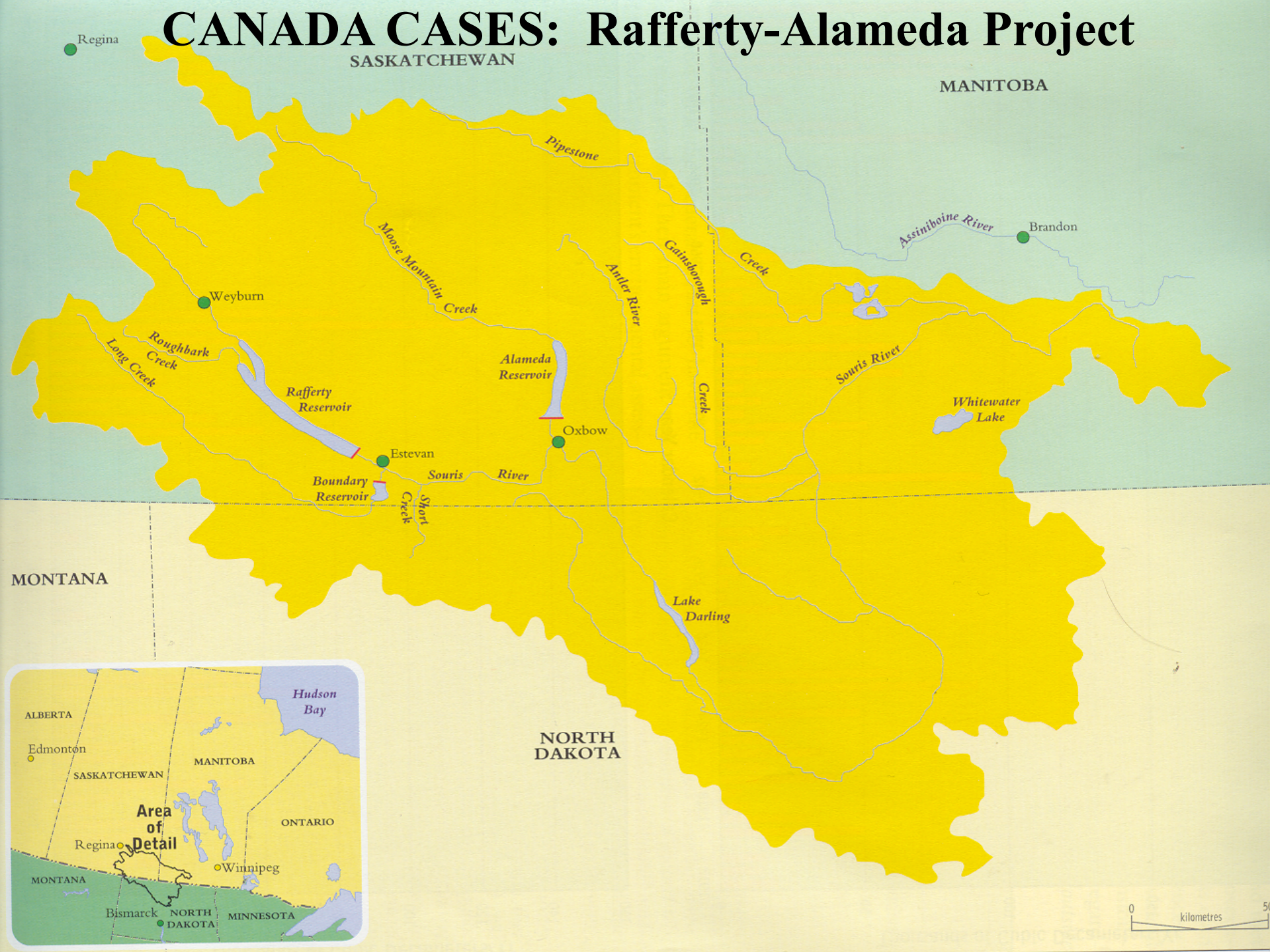
WATER MANAGEMENT PRINCIPLES

Accepting this sustainability ethic, we will:

1. Practice integrated water resource management by:
   - linking water quality, quantity and the management of other resources;
   - recognizing hydrological, ecological, social and institutional systems; and
   - recognizing the importance of watershed and aquifer boundaries.
2. Encourage water conservation and the protection of water quality by:
   - recognizing the value and limits of water resources and the cost of providing it in adequate quantity and quality;
   - acknowledging its consumptive and non-consumptive values to both humans and other species; and
   - balancing education, market forces and regulatory systems to promote choice and recognition of the responsibility of beneficiaries to pay for the use of the resource.
3. Resolve water management issues by:
   - employing planning, monitoring and research;
   - providing multi-disciplinary information for decision making;
   - encouraging active consultation and participation among all affected parties and the public;
   - using negotiation and mediation to seek consensus; and
   - ensuring accountability through open communication, education and public access to information.

Source: Canadian Water Resources Association (1994).

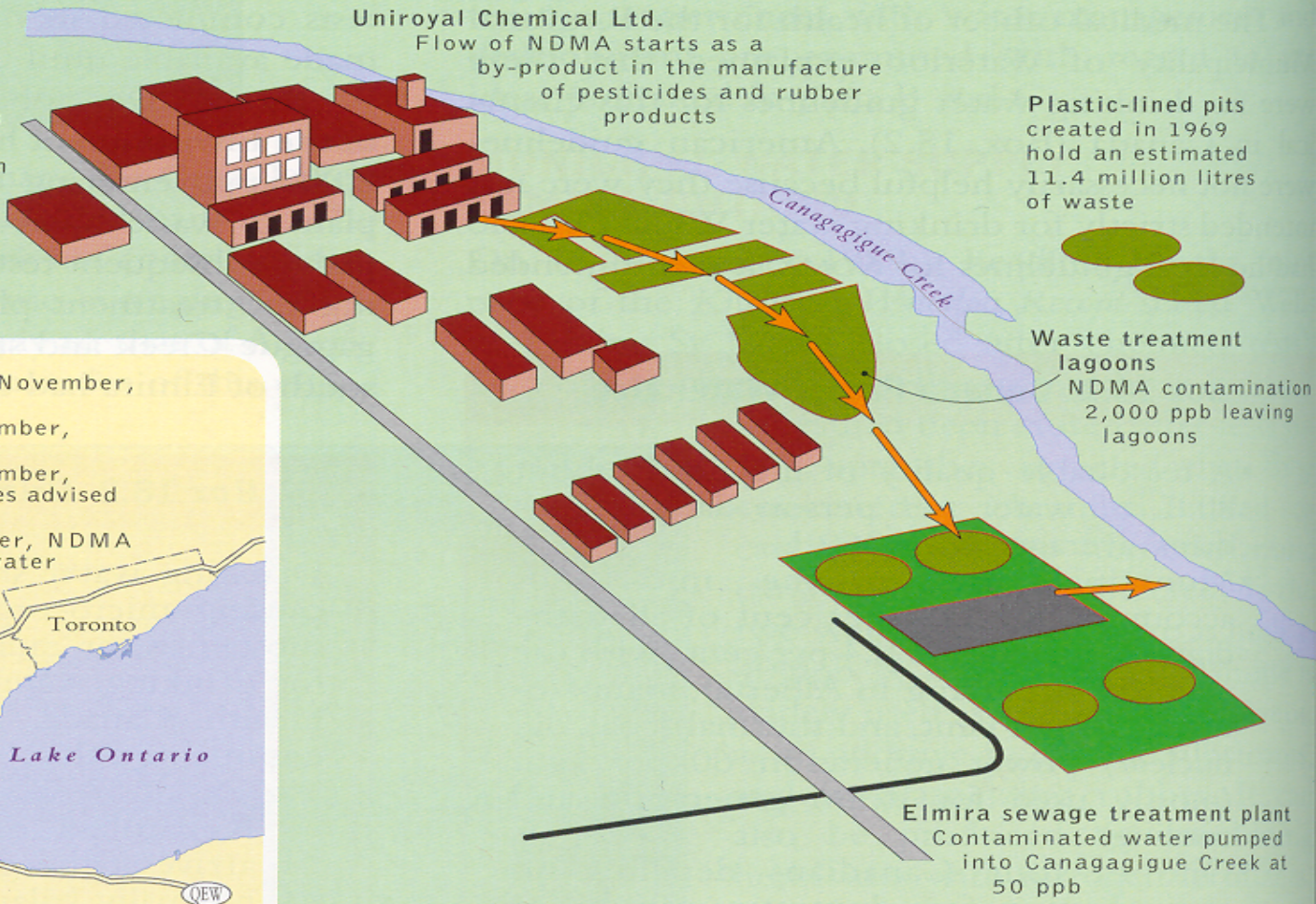
CANADA CASES: Rafferty-Alameda Project



c) Elmira Municipal Water Supply

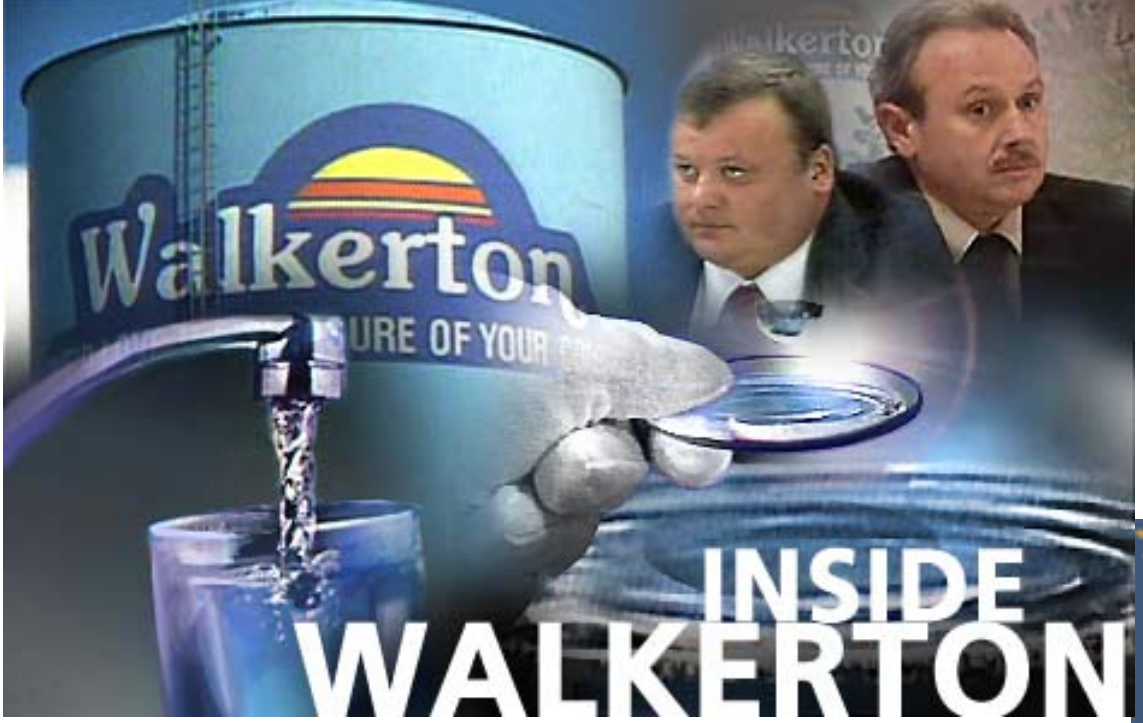
Uniroyal background

- Established 1941 as Naugatuck Chemical in a vacant boot-making factory
- Plant has produced pesticides, herbicides, and industrial compounds
- 260 hourly employees and 107 salaried employees
- Seventeen employees laid off as a result of NDMA contamination
- 30 December Uniroyal was ordered to eliminate NDMA from waste water
- 11 January politicians tell Uniroyal to launch clean-up



NDMA facts

- N-nitroso dimethylamine
- Caused cancerous tumours in all animal species tested
- Found in atmosphere around large cities
- Found in malt beverages like beer
- By-product of cigarette smoke



- Improper chlorine treatment
- Equipment being repaired
- Operators had insufficient training
- Private Co. falsified monitoring
- Provincial Monitoring inadequate

- May 2000
- Water supply contamination from E-Coli Bacteria
- 7 died and 2300 became ill
- E-Coli from manure on fields near water supply
- Shallow well and fractured bedrock
- Exacerbated by Rainfall
- Farmer followed proper practices

Kashechewan FN

Ontario orders partial evacuation of northern reserve