

WATER

By Prof KC Ho, Dr Ir Anthony Ma & Mr Samuel Kwong

Agenda

1. Syllabus
2. Water Resources-Surface and Groundwater
3. Water Quality Impact Assessment
4. Water Quality Monitoring
5. Collection, Treatment, Reuse and Disposal
6. Legislation and Policy
7. Suggested Reading Materials
8. Sample Questions

Syllabus

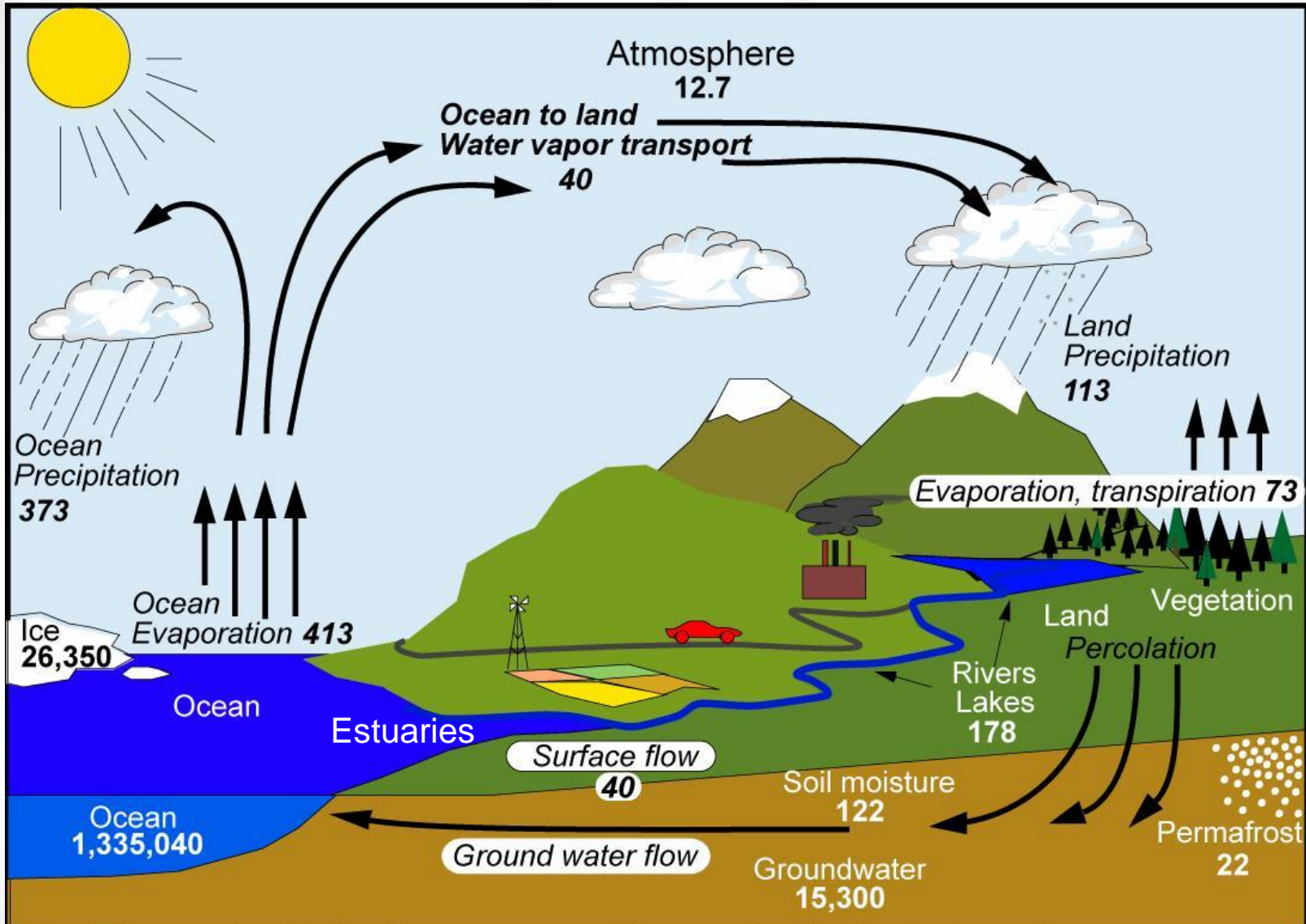
1. Water Resources-Surface and Groundwater
2. Water Quality Impact Assessment
3. Water Quality Monitoring
4. Collection, Treatment, Reuse and Disposal
5. Legislation and Policy

1. Water Resources – Surface and Groundwater

1. Water Resources – Surface and Groundwater

- 1.1 Types of Water Systems (*e.g., lakes, rivers, estuaries, oceans, groundwater*)
- 1.2 Hydrological Cycle
- 1.3 Components of Water Systems
 - 1.3.1 Water quality: physical, chemical and biological characteristics
 - 1.3.2 Hydrology
 - 1.3.3 Bottom sediment: physical, chemical and microbiological properties
 - 1.3.4 Aquatic ecology
- 1.4 Water Quality Standards
 - 1.4.1 Beneficial uses (*e.g., potable water supply, recreation, agricultural, industrial, fish and wildlife, navigation*) and related water quality requirements
 - 1.4.2 Water quality objectives

Hydrological Cycle



Units: Thousand cubic km for storage, and *thousand cubic km/yr* for exchanges

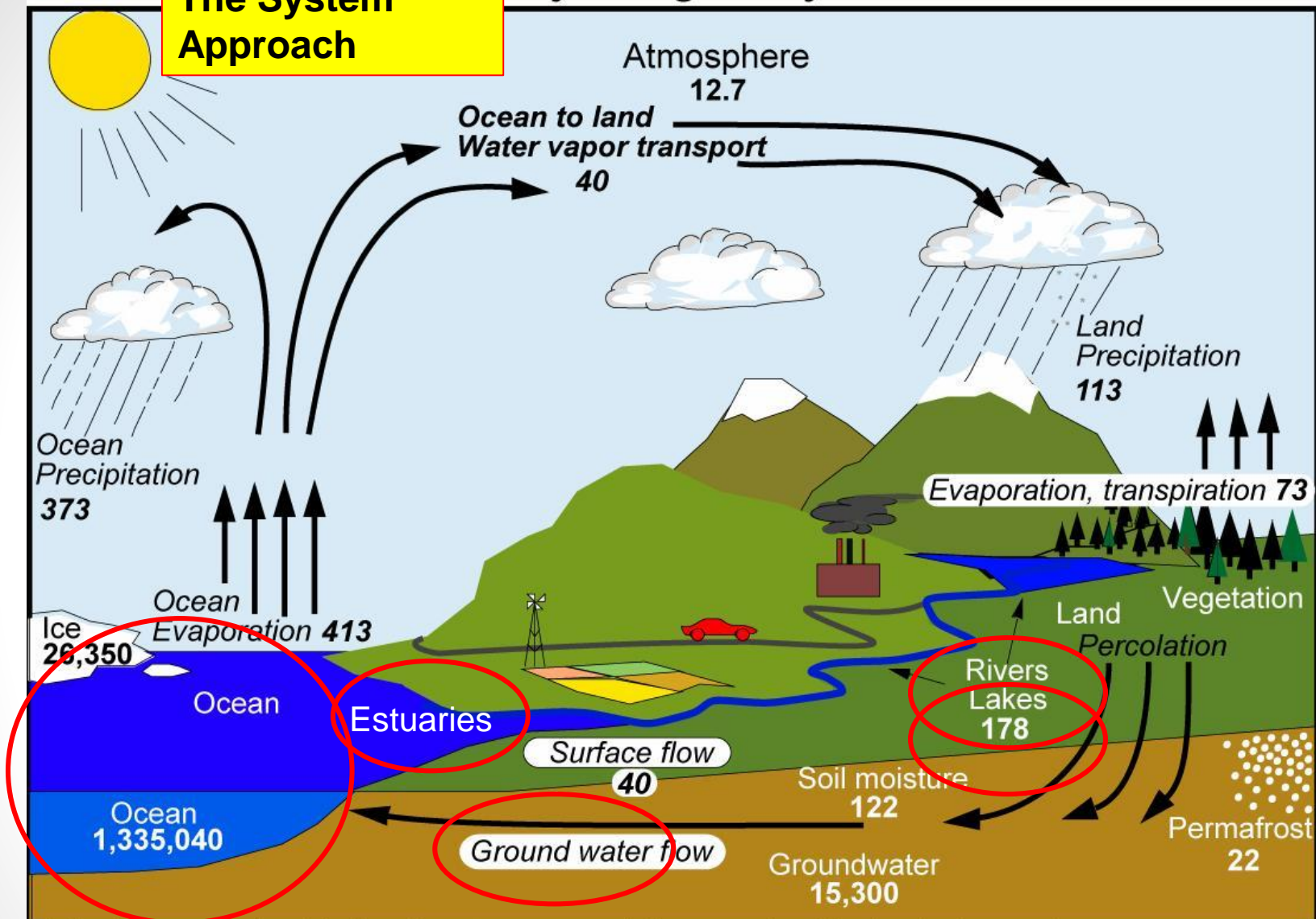
Source:

https://www.google.com.hk/search?biw=1371&bih=745&tbm=isch&sa=1&q=hydrological+cycle+diagram&oq=Hydrological+&gs_l=img.1.1.0j0i30k1l9.27184.32857.0.35059.15.14.1.0.0.0.64.840.14.14.0...0...1.1.64.img..0.14.803.p8GeNmGTes8#imgrc=CMC0xB0id77XmM:&spfl=1497595464255

Copyright © 2017 Hong Kong Institute of Qualified Environmental Professionals Limited All Rights Reserved.

The System Approach

Hydrological Cycle



Units: Thousand cubic km for storage, and *thousand cubic km/yr* for exchanges

WATER

Source:

https://www.google.com.hk/search?biw=1371&bih=745&tbm=isch&sa=1&q=hydrological+cycle+diagram&oq=Hydrological+&gs_l=img.1.1.0j0i30k1l9.27184.32857.0.35059.15.14.1.0.0.0.64.840.14.14.0...0...1.1.64.img..0.14.803.p8GeNmGTes8#imgcr=CMC0xB0id77XmM:&spf=1497595464255

Copyright © 2017 Hong Kong Institute of Qualified Environmental Professionals Limited All Rights Reserved.



HKIIEP
香港環專會

2. Water Quality Impact Assessment

2. Water Quality Impact Assessment

2.1 Assimilative Capacity and Water Pollution

- 2.1.1 Organic and inorganic pollution
- 2.1.2 Microbial pollution
- 2.1.3 Eutrophication
- 2.1.4 Toxicants
- 2.1.5 Oil, debris, litter
- 2.1.6 Thermal pollution

2.2 Sources of Water Quality Impact

- 2.2.1 Point source (*e.g., outfalls, treatment works' discharge*)
- 2.2.2 Non-point or diffuse source
- 2.2.3 Anthropogenic activities (*e.g., dredging, dumping and filling, bathometric or shoreline changes, aquatic traffic activities*)

2.3 Assessment and Prediction of Water Quality Impact

- 2.3.1 Sensitive receivers and pollution load quantification
- 2.3.2 Baseline quality
- 2.3.3 Qualitative and quantitative prediction

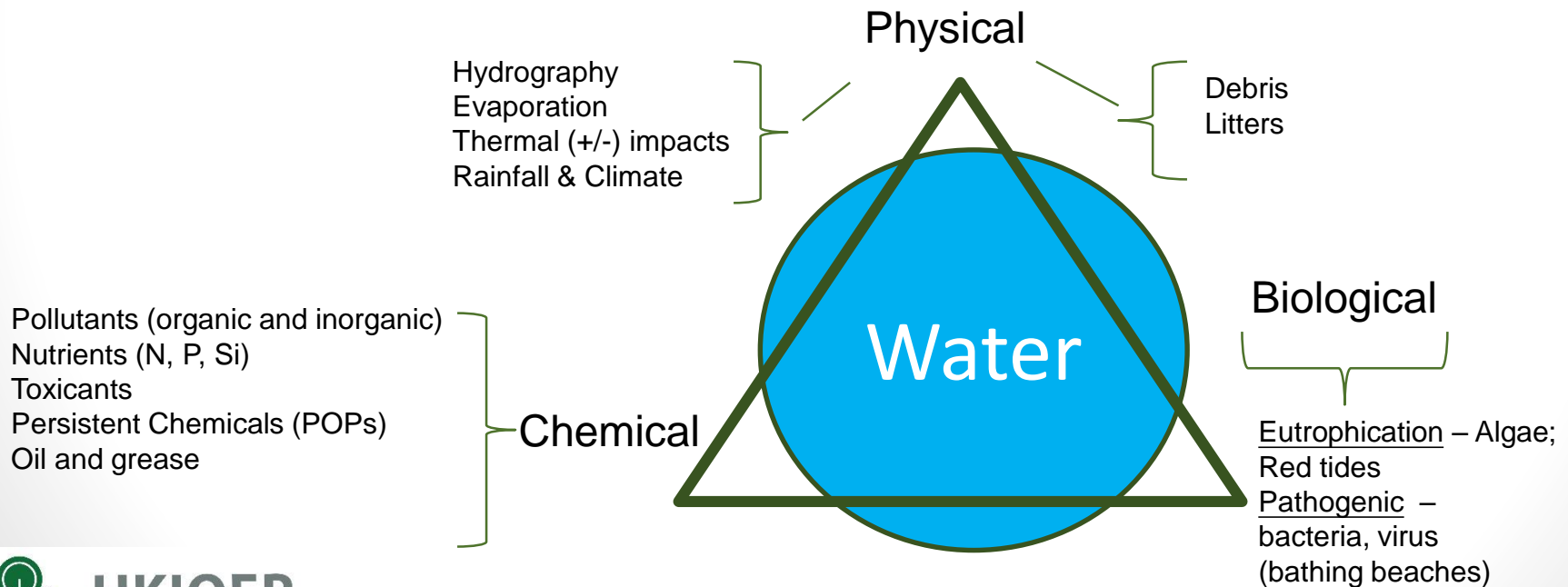
2.4 Water Quality Impact Prevention and Mitigation

- 2.4.1 Point source (*e.g., treatment and outfall disposal*)
- 2.4.2 Diffuse source (*e.g., source control, best management practices, end-of-pipe treatment*)
- 2.4.3 Mitigation of impact due to anthropogenic activities (*e.g., dredging, dumping, bathometric or shoreline changes*)
- 2.4.4 Water quality impact monitoring

3. Water Quality Monitoring

3. Water Quality Monitoring

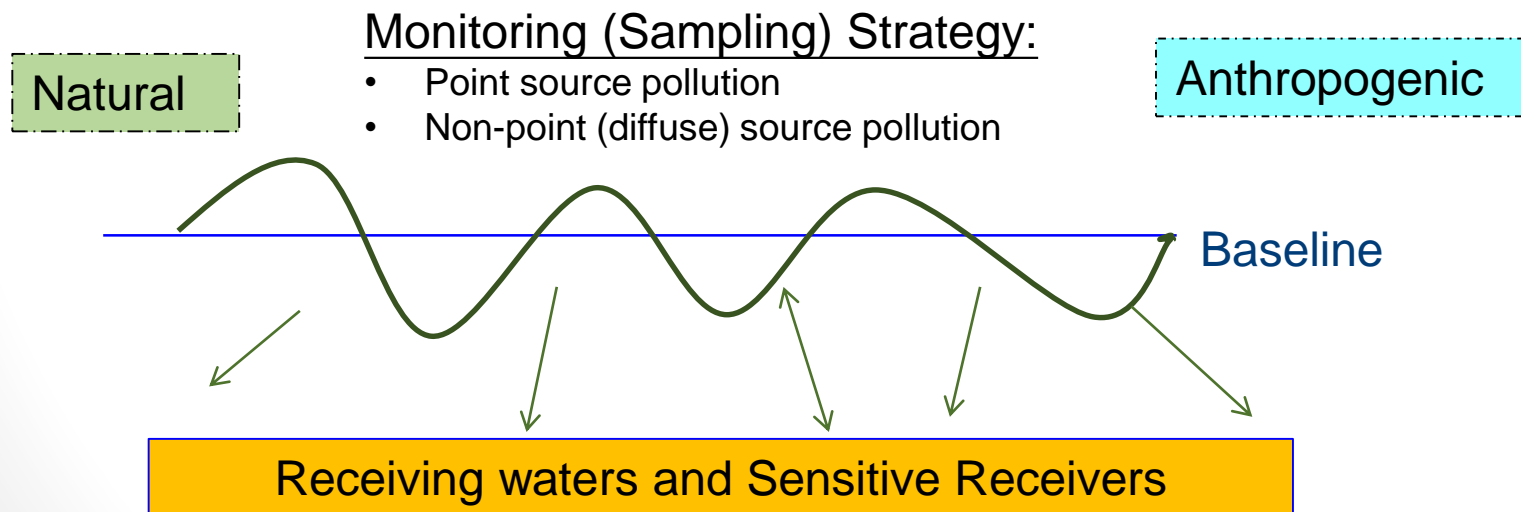
- 3.1 Monitoring of Ambient Aquatic Environment
- 3.2 Specific Monitoring Programmes (*e.g., bathing beach quality*)
- 3.3 Quality Assurance and Quality Control of Monitoring Programmes



3. Water Quality Monitoring

3. Water Quality Monitoring

- 3.1 Monitoring of Ambient Aquatic Environment
- 3.2 Specific Monitoring Programmes (*e.g., bathing beach quality*)
- 3.3 Quality Assurance and Quality Control of Monitoring Programmes



4. Collection, Treatment, Reuse and Disposal

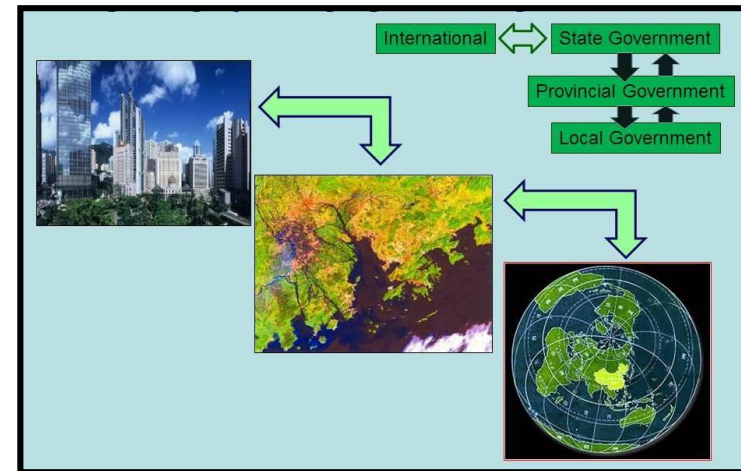
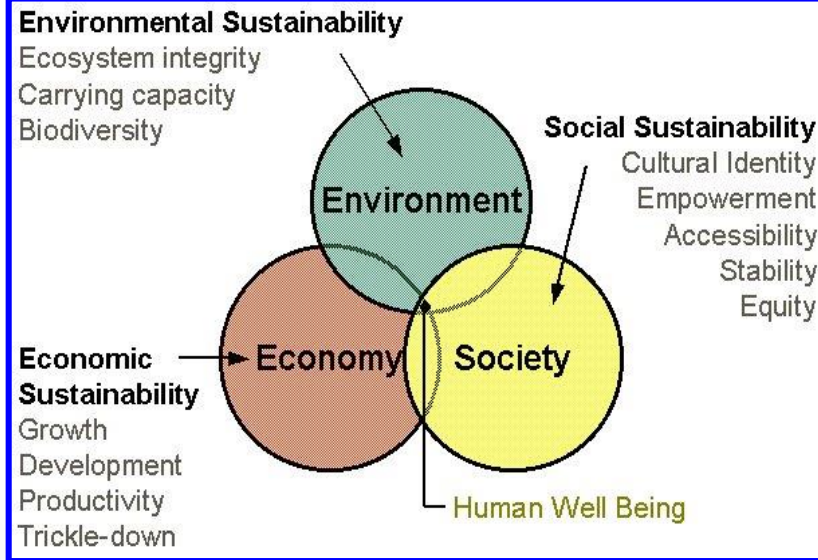
4. Collection, Treatment, Reuse and Disposal

- 4.1 Objectives of Prevention, Control & Treatment
- 4.2 Pollution Prevention Methods (*e.g., material substitution, spill and leak prevention, process modifications, on-site recovery*)
- 4.3 Pollution Control and Treatment Methods
 - 4.3.1 Collection/distribution systems (*combined sewerage, separate conveyance system*)
 - 4.3.2 Water and wastewater treatment processes
 - Physical (*e.g., screening, sedimentation, flocculation, filtration, etc.*)
 - Chemical (*e.g., coagulation, neutralization, chemical precipitation, disinfection*)
 - Biological (*e.g., suspended growth reactors, attached growth reactors, natural systems*)
 - 4.3.3 Advanced wastewater treatment (*e.g., nutrient removal, membrane filtration, membrane bioreactor*)
 - 4.3.4 Sludge management and disposal
 - Sludge treatment (*e.g., thickening, anaerobic digestion, aerobic digestion, dewatering*)
 - Sludge disposal (*incineration, landfill*)
- 4.4 Wastewater Effluent Reuse

5. Legislation and Policy

5. Legislation and Policy

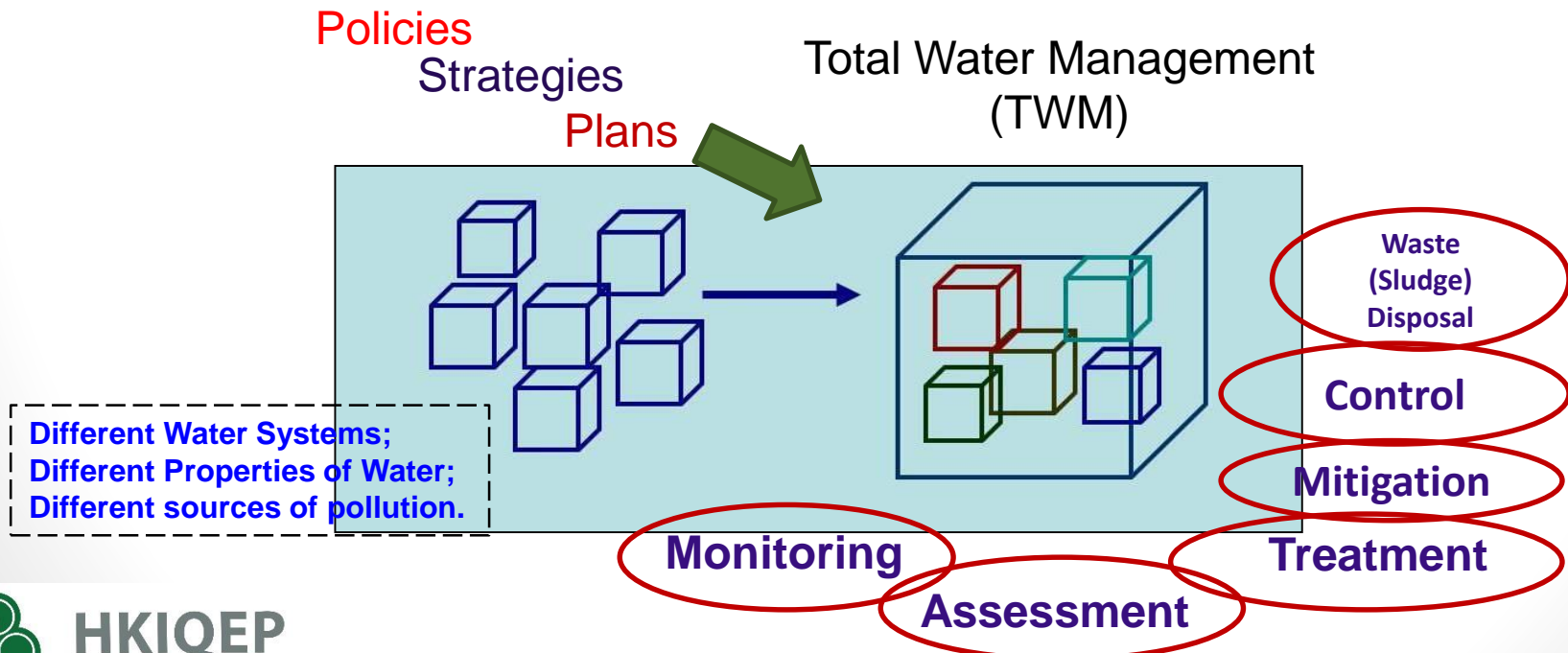
- 5.1 Policy, Strategy and Plans for Water Quality Control and Improvements
- 5.2 Water Pollution Control Related Regulations
- 5.3 Total Water Management



5. Legislation and Policy

5. Legislation and Policy

- 5.1 Policy, Strategy and Plans for Water Quality Control and Improvements
- 5.2 Water Pollution Control Related Regulations
- 5.3 Total Water Management



Suggested Reading Materials

- Metcalf & Eddy, *Wastewater Engineering*, McGraw Hill, Recent editions
- WHO Guidelines for drinking-water quality, fourth edition
- World Health Organization (Water resources)
www.who.int/water_sanitation_health/resources/en
- Environmental Protection Department, HKSAR
www.epd.gov.hk
- Water Supplies Department, HKSAR
www.wsd.gov.hk
- Drainage Services Department, HKSAR
www.dsd.gov.hk
- Recommended Study Materials, Text Books & Resources of Qualified Environmental Professional (QEP) Certification, The Institute of Professional Environmental Practice