

國立臺北大學自然資源與環境管理研究所

112 學年度第一學期『環境工程科學概論』

課程講義(09-10)：水質管理與水處理技術
Water Quality Management and Water Treatment Technology

● INTRODUCTION

- Water Bodies and Water Uses => [地面水體分類及水質標準](#)
- Self Clarification, Self Purification, Assimilation Capacity, Carrying Capacity
- Effluent Standards [放流水標準](#); Emerging Pollutants; and Water Pollution Fee
- River Pollution Index (RPI) [河川污染指數](#) => [WQI 水質指數](#)
- [Total Maximum Daily Loads \(TMDLs\)](#) vs. Total Mass Control
- Water Reclamation and Water Reuse => [再生水資源發展條例](#)
=> [開發單位使用再生水辦法](#)
- Public Water Supply, Sewage Systems, Industrial Wastewater, Water Reuse
- Tap Water vs. Drinking Water => 自來水、飲用水
=> Infrastructure vs. Environmental Protection => Public Utility
=> 社區自設公共給水設備、簡易自來水
- Drinking Water Quality Standard 飲用水水質 vs. Tap Water Quality Standard
=> [飲用水水質標準](#)、[自來水水質標準](#)、[再生水水質標準及使用遵行辦法](#)
=> [蘇揆主持板新二期計畫第二階段通水 實現雙北共飲翡翠水](#)、
=> [板新地區供水改善二期工程計畫執行現況與展望](#)、[翡翠原水管工程計畫](#)

● WATER POLLUTANTS AND THEIR SOURCES

- Point Sources vs. Non-point Sources
- Oxygen-Demanding Material: Organic Pollutants => “Equivalent”
- Nutrients => N&P => CTSI ([卡爾森指數](#) Carlson Trophic State Index)
- Pathogenic Organisms: Virus, Bacteria, Protozoa...
- Suspended Solid => SS => Air Pollutants: Particulate Matter (PM) and TSP
- Salts (Dissolved Solid) => TDS and Salinity
- Toxic Metals and Toxic Organic Compounds
- Heavy Metals and Heat => Arsenic 核電廠溫排水=>燃煤電廠海水法除硫

● WATER QUALITY MANAGEMENT IN RIVERS

- Effect of Oxygen-Demanding Wastes on Rivers
- Biochemical Oxygen Demand (BOD)
=> Chemical Oxygen Demand (COD)
=> Decay (Aerobic Decomposition): First Order Reaction
- Dissolved Oxygen and Water Quality: Temperature and Indicator Species
- DO Sag Curve (De-oxygenation and Re-aeration)
- Effects of Other Pollutants on Water Bodies
- Biological Indicators

- WATER SUPPLY ENGINEERING
 - [自來水到我家：取水、導水、淨水、送\(配\)水](#)
 - 自來水工程、給水工程、上水道工程
 - ⇒ 集水工程 Collection Works
 - ⇒ 輸(導)水工程 Transmission Works
 - ⇒ 抽水工程 Pumping Works
 - ⇒ 淨水工程 Purification Works
 - ⇒ 配水工程 Distribution Works

- WATER TREATMENT ENGINEERING (PURIFICATION WORKS)
 - Water Treatment Units
 - ⇒ Gas Transfer; Ion Transfer; Solid Transfer
 - ⇒ Solute Stabilization ⇒ Desalination
 - ⇒ Sanitation, Hygiene and Aesthetical Considerations (Potability)
 - Water Treatment Components (Steps)
 - ⇒ Gridding and Screening
 - ⇒ Coagulation (混凝) and Flocculation (膠凝) ⇒ PAC
 - ⇒ Sedimentation ⇒ Primary and Secondary (even Tertiary sedimentation)
 - ⇒ Filtration and Disinfection ⇒ THM (Tri-Halogen Methane)
 - Advanced Water Treatment: Potability and other Aesthetical Considerations
 - ⇒ Ion Exchange; Reverse Osmosis (RO); Ultra-filtration: Membrane; UV & O₃

- SEWAGE ENGINEERING AND WASTEWATER TREATMENT ENGINEERING
 - Sewage Systems or Sewers: Sanitary Wastewater and Stormwater Runoff
 - ⇒ Combined vs. Separate Sewage Systems
 - ⇒ Pipelines vs. Channels: Pipe Flow vs. Open Channel (Open Surface) Flow
 - Classification of Wastewater Treatment Plants
 - ⇒ Primary Treatment 一級處理
 - ⇒ Secondary (Biological) Treatment 二級 (生物) 處理
 - ⇒ Tertiary (Advanced) Treatment 三級 (高級) 處理
 - Sludge Treatment
 - ⇒ Anaerobic Digestion; Dewatering and Drying ⇒ Water Content; Disposal
 - ⇒ Sludge and Biomass: Integrated Wastewater Treatment Plant

- OTHER CONSIDERATIONS
 - Water Bill: 水費單 ⇒ [台灣自來水公司](#)；[台北自來水事業處](#)
 - 水源保護區劃設、管理、回饋 ⇒ 自來水法、飲用水管理條例
 - [水質淨化現地處理](#)；[水質淨化工程篇](#)；[水質自然淨化工法](#)
 - 生態工法 vs. 以自然為本的解決方案 Nature-based Solutions (NBS)

- HOMEWORK #6 (2023/11/28 Due):

請整理《自來水法》及《飲用水管理條例》所定義之「水源保護區」類別，並概要估計其面積占台灣本島總面積之比例。