

國立臺北大學自然資源與環境管理研究所

114 學年度第一學期『環境工程科學概論』

課程講義(08-09)：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](#)
⇒保護生活環境相關環境基準 保護人體健康相關環境基準
- Self Clarification, Self Purification, Assimilation Capacity, Carrying Capacity
- [環境部 飲用水全球資訊網](#) => [安全飲用水手冊](#) [Emerging Pollutants PFAS](#)
- Effluent Standards [放流水標準](#) => [2024.12.18 放流水標準修正 4 大重點](#)
- Water Pollution Fee => [環境部水質保護網](#) => [水污費發展緣起](#)
- River Pollution Index (RPI) [河川污染指數](#) => [WQI 水質指數](#)
- [Total Maximum Daily Loads \(TMDLs\)](#) vs. Total Mass Control
- Public Water Supply, Sewage Systems, Industrial Wastewater, Water Reuse
- Tap Water vs. Drinking Water => 自來水、飲用水
⇒公共事業 => 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](#)
⇒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](#) => [溫室氣體](#) [空氣污染物](#) [園區事業廢棄物](#)
⇒[板新地區供水改善工程計畫](#)、[翡翠原水管工程計畫](#)
- 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](#)
- LID 生態工法 vs.以自然為本的解決方案 Nature-based Solutions (NBS)

● 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
 - 「[製程用水 100%全回收](#)」(友達龍潭廠) => 零排放？ [九年扭轉汙染黑歷史](#)
- HOMEWORK #5: 「水源保護區」=> 併入期末報告主題