國立臺北大學自然資源與環境管理研究所
115 學年度第一學期『環境工程科學概論』

課程講義(02)：環境議題與永續性
Environmental Issues/Concerns and Sustainability

- KEY FACTORS OF ENVIRONMENTAL SCIENCE AND ENGINEERING
  - □ Definition of "Environment"
    環境基本法第 2 條：環境係指影響人類生存與發展之各種天然資源及經過人為影響之自然因素總稱，包括陽光、空氣、水、土壤、陸地、礦產、森林、野生生物、景觀及遊憩、社會經濟、文化、人文史蹟、自然遺蹟及自然生態系統等。
    環境影響評估法：生活環境、自然環境、社會環境及經濟、文化、生態
  - □ Media or Carriers: Air, Water, Soil, Solid Waste...
  - □ Chemical, Biological, and Physical Pollution => Aesthetic Degradation
  - □ Aspects：空水廢毒噪＋「節能減碳」：藍天綠地、青山淨水、健康永續
    ⇒節能減碳酷地球、資源循環零廢棄、去污保育護生態、清淨家園樂活化
    ⇒環境部組織法於 112 年 5 月 24 日以總統華總一義字第 11200043181 號令公布。行政院環境保護署改制為環境部，同時成立氣候變遷署、資源循環署、化學物質管理署、環境管理署等四個三級機關以及國家環境研究院。為了因應國際淨零排放趨勢及全球環境變遷，政府從「自然資源經營管理」轉變為「積極因應全球環境情勢，創造臺灣轉型機會」，整合事權擴增業務，系統性處理氣候變遷、資源循環、化學物質管理、環境品質管理及強化環境科研等五大環境議題。預期達成下列目標：
    一、積極因應氣候變遷，強化我國政策擬定推動及執行，落實階段管制目標管考作業，因應國際碳關稅及供應鏈減碳趨勢，加速推動碳定價、強化碳盤查機制，尋求減碳技術及策略，降解國際壓力並協助我國產業轉型。
    二、落實循環經濟、廢棄物減量及再利用，透過統籌各部會再利用管理權責、徵收基金推動資源循環、廢棄物再生能源、盤點分析廢棄資源，推廣循環採購永續消費及產品友善化設計等新增作法，達到減少原生物料使用、提升資源使用效率，減輕環境負荷並逐步邁向資源永續循環零廢棄目標。
    三、擴大化學物質管理標的為我國運作之化學物質，達「源頭管理延伸邊境、減少斷點防堵違法」、「串聯統整防災資源、強化應變減少災損」、「危害資訊完整傳遞、降低健康風險暴露」及「資源永續無毒轉型、接軌國際公約管理」等目標。
    四、強化數位科技環境執法，運用智能化及互聯網多元處理一般廢棄物，精進管理環境清潔衛生，透過提升調查整治技術驗證及增加土壤及地下水復育及碳匯能力，永續經營土水資源；加強污染源管制，打造低風險的生活環境，發展健康永續社區。
    五、發展氣候變遷與資源循環研究，精進環境風險評估與治理科技，促進淨零轉型與培育專業人才，結合全國研究資源建立環境智庫，提供長期穩定的整體國家環境保護政策支援。
  - □ Spatial Scales – Local, Regional, Continental, and Global
  - □ Time Scales – Second, Minute, Day, Year, Decade, Generation, Century, *etc.*

- ENVIRONMENTAL ISSUES / ENVIRONMENTAL CONCERNS
  - □ 全球尺度：氣候變遷、臭氧層破壞、棲息地與生物多樣性之減少等=> Covid-19?
    Global Scale: Climate Change, Ozone Layer Depletion, Loss of Habitats/Biodiversity
  - □ 區域性尺度：酸雨、細懸浮微粒、能見度問題、水體污染、土壤酸化／鹽化等
    Regional Scale: Acid Deposition, Visibility, Water Pollution, Soil Acidification/Salinization

□ 地區性尺度：光化學煙霧、土壤及地下水污染、廢棄物、噪音振動問題等
Local Scale: Photochemical Smog, Soil and Groundwater Contamination, Solid Waste, Noise

□ 利害相關者(Stakeholders): Social Responsibility => Corporate Sustainability and ESG

□ Environmental Concerns
(Chp.2 -- Reddy et al., 2019, *Sustainable Engineering Drivers, Metrics, Tools, and Applications*)

⇒Global Warming and Climate Change; Ozone Layer Depletion

⇒Desertification and Deforestation; Loss of Habitat and Biodiversity

⇒Air Pollution, Smog, and Acid Rain (Acidic Deposition)

⇒Water Usage and Pollution, Eutrophication, Salinity => See Water Desalinization

⇒Wastes and Disposal; Land Contamination; Land Use Patterns

⇒Visibility; Odors; Aesthetic Degradation; Thermal Pollution; Noise => Light Pollution

□ 16 Biggest Environmental Problems of 2026

⇒Global Warming; Politicization of the Climate Crisis; Biodiversity Loss; Plastic Pollution; Deforestation; Air Pollution; Food Waste; Melting Ice Caps and Sea Level Rise; Ocean Acidification; Traditional Agriculture; Soil Degradation; Food and Water Insecurity; Fast Fashion and Textile Waste; Artificial Intelligence; Overfishing; Cobalt Mining

- SUSTAINABILITY
  - □ Definition of "Sustainability"
    - ⇒Webster dictionary defines sustainability as "relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged."
    - ⇒The National Environmental Policy Act of 1969 made sustainability a national policy in which we would "create and maintain conditions, under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations."
    - ⇒The US EPA further defines a sustainable approach as a systems-based approach that seeks to understand the interactions which exist among environmental, social, and economic pillars to better understand the consequences of our actions. Ideally, sustainable solutions protect the environment, strengthen our communities, and foster prosperity.
    - ⇒The concept of sustainable development has its origins in the UN document, Our Common Future, also known as the Brundtland Report. The report (WCED, 1987) defined sustainable development as *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*.
  - □ Green Engineering
    - ⇒Green engineering is the design, commercialization, and use of processes and products in a way that reduces pollution, promotes sustainability, and minimizes risk to human health and the environment without sacrificing economic viability and efficiency. => LCA
  - □ Water Resources
    - ⇒"Water: too much, too little, too dirty" => Flood, Draught, Water Pollution
    - ⇒Quantity and Quality of water
  - □ Green Buildings
    - ⇒The US EPA defines green building as "the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's lifecycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. Green buildings are also known as sustainable or high-performance buildings."
  - □ Energy Resources
    - ⇒Fossil Fuels, Nuclear Energy, Renewable Energy => Sustainable Energy Resources
    - ⇒Reserves/Production Ratio (R/P ratio)

□ Alternative Energy Resources
⇒Nuclear Energy
⇒Renewable Energy

□ Mineral Resources
⇒Precious Metals, Rare Earth Metals
⇒Non-Metal Minerals

□ Transition vs. Transformation
⇒Transition of electricity shares
⇒Transformation of social structure to adapt to climate change

- 環境相關之中央政府機關/構

□ 環境部：環境部組織法 (112 年 8 月 22 日施行)
⇒綜合規劃司、環境保護司、大氣環境司、水質保護司、監測資訊司
⇒氣候變遷署、資源循環署、化學物質管理署、環境管理署、國家環境研究院

□ 行政院其他部會
⇒內政部國家公園署、內政部國土管理署 (112 年 9 月 20 日施行)
⇒農業部農村發展及水土保持署、農業部林業及自然保育署、農業部農田水利署、農業部生物多樣性研究所 (112 年 8 月 1 日施行)
⇒經濟部水利署、經濟部產業發展署、經濟部能源署、經濟部產業園區管理局、經濟部地質調查及礦業管理中心 (112 年 9 月 26 日施行)
⇒海洋委員會海洋保育署 (107 年 4 月 28 日施行)
⇒交通部中央氣象署 (112 年 9 月 15 日施行)

- 鄰近地區之環境主管機關

□ 中國大陸生態環境部



□ 日本環境省 => 環境省組織図

□ 核能（核電）安全、生態保育、國家公園（國立公園）主管機關
⇒內政部、自然資源部、環境省

環　境　省　機　構　図（令和8年8月1日）

