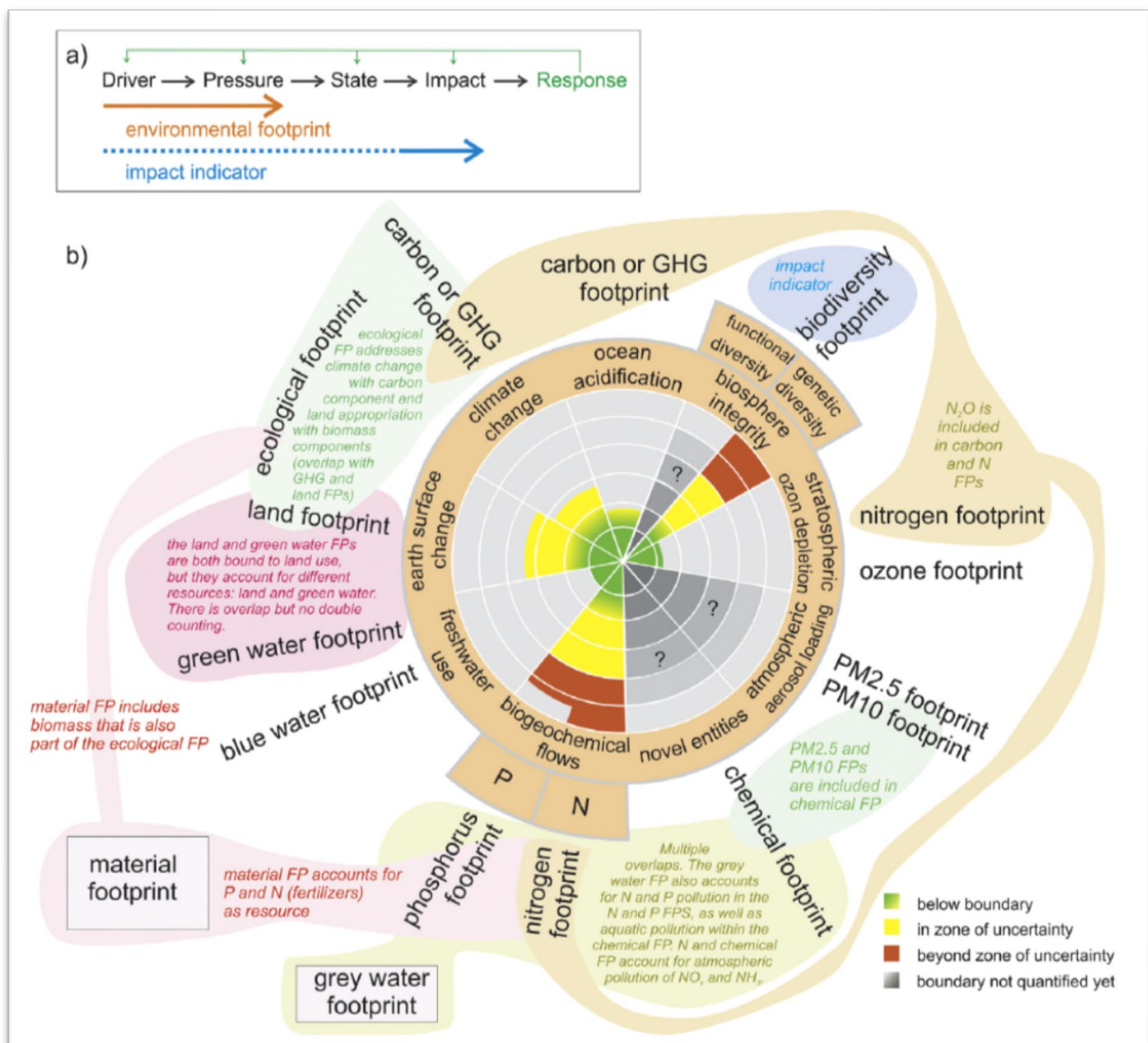


國立臺北大學自然資源與環境管理研究所
108 學年度第二學期 『清潔生產與工業生態』

課程進度(11)：環境足跡
Environmental Footprints

● DEFINITION OF ENVIRONMENTAL FOOTPRINT

- <https://dictionary.cambridge.org/dictionary/english/environmental-footprint>
⇒ the effect that a person, company, activity, etc. has on the environment, for example the amount of natural resources that they use and the amount of harmful gases that they produce.
- [Environmental Footprint Family - bringing clarity to the crowded field of footprint studies](#)
⇒ Environmental footprints quantify resource use and/or emissions. They are indicators of pressure on the Earth system. Many have emerged over the past two decades. Well-known examples include the carbon, water and ecological footprints, but the environmental footprint family also includes the land, nitrogen, phosphorous, material, biodiversity, chemical, PM and ozone footprints.
⇒ Environmental footprint family to address local to planetary sustainability and deliver on the SDGs (Vanham et al., 2019) *



● PRODUCT AND ORGANISATION ENVIRONMENTAL FOOTPRINT PEF/OEF

□ The Environmental Footprint (EF) is a life cycle assessment (LCA) based method to quantify the environmental impacts of products (goods or services)

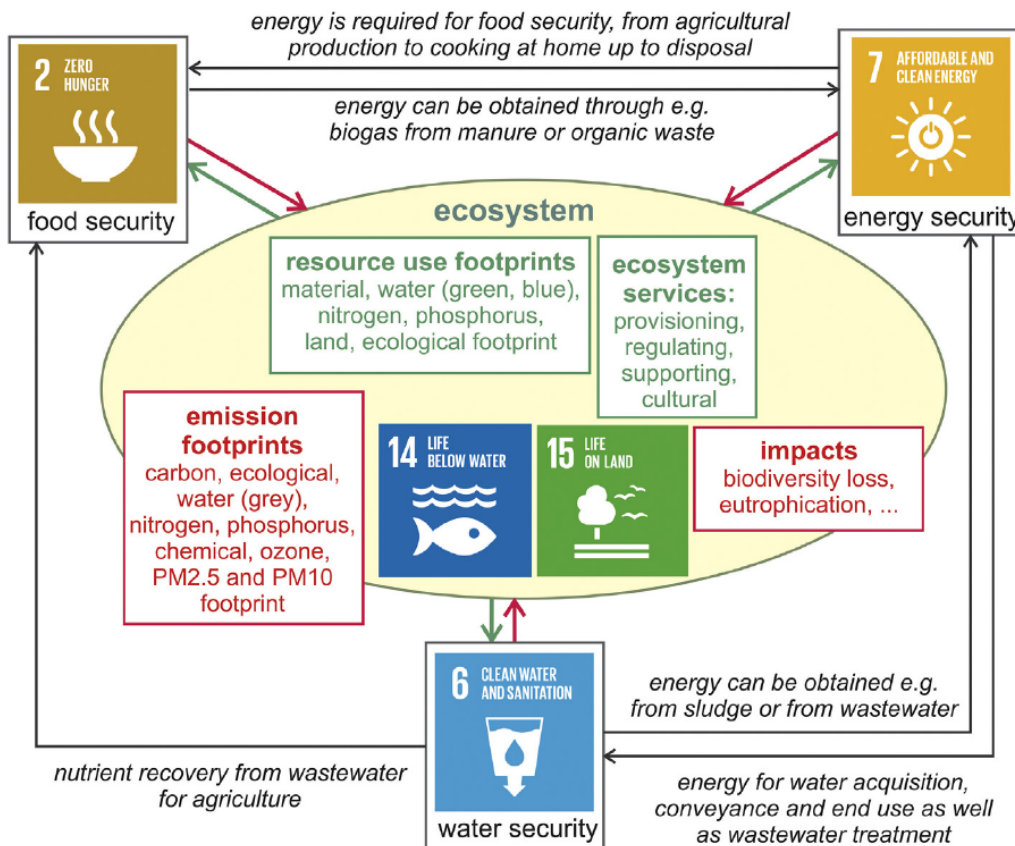
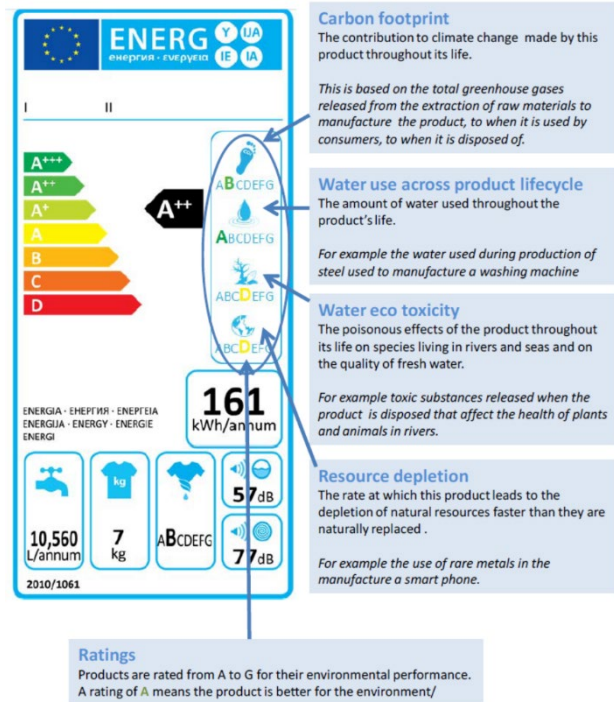
□ 歐盟產品環境足跡 15 項指標

⇒ 溫室效應(Climate Change)、臭氧層破壞(Ozone Depletion)、對淡水生態毒性(Ecotoxicity for aquatic fresh water)、人類毒性--癌症效應(Human Toxicity-cancer effects)、人類毒性--非癌症效應(Human Toxicity-non-cancer effects)、顆粒物質/呼吸道無機物質(Particulate Matter/Respiratory Inorganics)、電離輻射--人體健康影響(Ionising Radiation - human health effects)、光化學臭氧形成(Photochemical Ozone Formation)、酸化(Acidification)、優養化--陸地(Eutrophication-terrestria)、優養化--淡水(Eutrophication - aquatic - fresh water)、優養化--海水(Eutrophication - aquatic - marine)、資源耗竭--水(Resource Depletion - water)、資源耗竭--礦物、化石燃料(Resource Depletion - mineral, fossil)、土地轉變(Land Transformation)

⇒ 生命週期環境衝擊結果應取得查(驗)證機構核發之查證聲明書/證書。查證依據標準可為 ISO 14025:2006 或 ISO 14067:2018 或 ISO 16759:2013。
<https://www.idbcfp.org.tw/ViewData.aspx?nnid=241>

□ Principles in conducting a PEF study

⇒ Relevance / Completeness / Consistency / Accuracy / Transparency



● CARBON FOOTPRINT OF A PRODUCT

□ ISO TC-207

Environmental management

⇒ SC7, Greenhouse gas management and related activities

⇒ ISO/TS 14067:2013

⇒ ISO 14067: 2018

⇒ ISO/TR 14069:2013 Greenhouse gases -- Quantification and reporting of greenhouse gas emissions for organizations -- Guidance for the application of ISO 14064-1

□ Carbon footprint of a product CFP

⇒ sum of GHG emissions (3.1.2.5) and GHG removals (3.1.2.6) in a product system (3.1.3.2), expressed as CO₂ equivalents (3.1.2.2) and based on a life cycle assessment (3.1.4.3) using the single impact category (3.1.4.8) of climate change

⇒ CFP-PCR product category rules

□ 台灣產品碳足跡 / 碳標籤

⇒ 碳足跡(Carbon Footprint)可被定義為與一項活動(Activity)或產品的整個生命週期過程所直接與間接產生的溫室氣體排放量

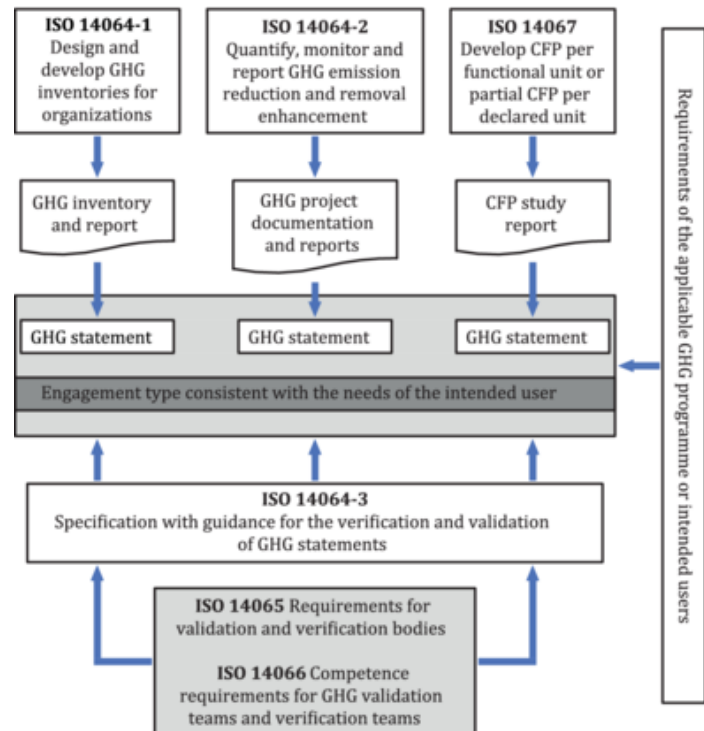
⇒ 碳足跡標籤(Carbon Footprint Label), 又稱碳標籤(Carbon Label)或碳排放標籤(Carbon Emission Label), 是一種用以顯示公司、生產製程、產品(含服務)及個人碳排放量之標示方式, 其涵義是指一個產品從原料取得, 經過工廠製造、配送銷售、消費者使用到最後廢棄回收等生命週期各階段所產生的溫室氣體, 經過換算成二氧化碳當量的總和。

⇒ 產品碳足跡計算 > 產品碳足跡計算準則 > 我國產品與服務碳足跡計算指引

⇒ Measure Emissions and Establish a Baseline: Inventory / Offsetting / Carbon Neutral

□ Carbon Footprint Analysis (Reddy et al., 2019: Chp.8)

⇒ Measure Emissions and Establish a Baseline: Inventory / Offsetting / Carbon Neutral



● WATER FOOTPRINT

□ Water footprint (Hoekstra et al., 2011)

⇒ The water footprint is an indicator of freshwater use that looks at both direct and indirect water use of a consumer or producer. The water footprint of an individual, community or business is defined as the total volume of freshwater used to produce the goods and services consumed by the individual or community or produced by the business. Water use is measured in terms of water volumes consumed (evaporated or incorporated into a product) and/or polluted per unit of time. A water footprint can be calculated for a particular product, for any well-defined group of consumers (for example, an individual, family, village, city, province, state or nation) or producers (for example, a public organization, private enterprise or economic sector). The water footprint is a geographically explicit indicator, showing not only volumes of water use and pollution, but also the locations.

⇒ ISO 14046:2014 (TC207, SC5 Life cycle assessment)

⇒ Water footprint: Metric(s) that quantifies the potential environmental impacts related to water

⇒ Blue / Green / Gray water footprint vs. water footprint impact assessment (availability / scarcity)

□ Ecological Footprint and Water Footprint of Taipei (Lee, 2019)

⇒ Taiwan's Ecological Footprint: 42~58 times of Taiwan's area

⇒ Bioproductive land - cropland, grazing land, fishing ground, forestland, and built-up land.