

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(02)：減廢、污染預防、清潔生產、綠色生產力
Waste Minimization, Pollution Prevention, Cleaner Production, Green Productivity

● WASTE MINIMIZATION

□ Waste Minimization (<https://archive.epa.gov/epawaste/hazard/wastemin/web/html/faqs.html>; **Not the current information**): Waste Minimization refers to the use of source reduction and/or environmentally sound recycling methods prior to energy recovery, treatment, or disposal of wastes. EPA's preferred hierarchical approach to materials management includes source reduction, recycling, energy recovery, treatment, and finally, disposal.

- ⇒ **Source reduction**, commonly known as **pollution prevention (P2)**, reduces or eliminates the generation of waste at the source and refers to any practice that reduces the use of hazardous materials in production processes.
- ⇒ **Recycling**, or reclaiming value from production by-products, can often be used when P2 is not economically practical. Recycling includes the reuse or recovery of in-process materials or materials generated as by-products that can be processed further on-site or sent offsite to reclaim value.
- ⇒ **Pollution Prevention**, often called P2, means source reduction, or preventing pollution at its source, before it is generated. It includes any practice that reduces the quantity and/or toxicity of pollutants entering a waste stream. Examples include equipment or technology modifications, reformulation or redesign of products, substitution of less toxic raw materials, improvements in work practices, maintenance, worker training, and better inventory control.

● RESOURCE EFFICIENT AND CLEANER PRODUCTION (<http://www.uneptie.org/scp/cp/index.htm>)

□ From Cleaner Production to “Resource Efficient and Cleaner Production”

The term Cleaner Production was defined by UNEP in 1990 as: “The continuous application of an integrated environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment”. This definition has been used as the working definition of all programmes related to the promotion of cleaner production and still continues to be a valid definition.

Nonetheless, the confluence of global economic and environmental crisis that has occurred in recent years has consolidated the understanding of the interdependence between our economic and environmental systems and provided a new impetus to international efforts to promote the transition towards more sustainable industrial systems and Green Industry. This has required the broadening of the definition of cleaner production to include resource efficiency which is a key element of the transitions towards Green Industry and Green Economy.

Cleaner production requires changing attitudes, responsible environmental management and evaluating technology options. Other preventive approaches, such as eco-efficiency and pollution prevention, serve similar goals.

□ What is Resource Efficient and Cleaner Production (RECP)

Resource Efficient and Cleaner Production continuously applies integrated and preventive strategies to processes, products and services. This increases efficiency and reduces risks to humans and the environment. RECP specifically works to advance

- ⇒ Production Efficiency – through optimization of productive use of natural resources (materials, energy, water) at all stages of the production cycle;
- ⇒ Environmental Management - through minimization of the adverse impacts of industrial production systems on nature and the environment;
- ⇒ Human development – through minimization of risks to people and communities, and support to their development.

- 《中华人民共和国清洁生产促进法》(2002/06/29 通过、2012/02/29 修正)
 - ⇒ 本法所称清洁生产，是指不断采取改进设计、使用清洁的能源和原料、采用先进的工艺技术与设备、改善管理、综合利用等措施，从源头削减污染，提高资源利用效率，减少或者避免生产、服务和产品使用过程中污染物的产生和排放，以减轻或者消除对人类健康和环境的危害
- Additional Definition of Cleaner Production
 - ⇒ Industrial Ecology and Cleaner Production (Handbook of Industrial Ecology: Chap.4)
 - ⇒ Cleaner Production (Sustainable Industrial Design and Waste Management: Chap. 2)

● GREEN PRODUCTIVITY

- APO Definition of Green Productivity
 - ⇒ APO Definition: Green Productivity (GP) is a concept that evolved to address the growing concern of consumers and stakeholders of business communities. Alarmed by ever-increasing negative impacts of development activities on the environment, society has started demanding environment-friendly goods, processes, and services. To address that demand, the APO developed the concept of GP as a strategy for enhancing productivity while improving environmental performance. It is the application of appropriate productivity and environmental management tools, techniques, and technologies to reduce the environmental impact of organization's activities, goods, and services. GP aims to ensure environmental protection while making business profitable. GP recognizes that the environment and development are two sides of the same coin. For any development strategy to be sustainable, it needs to have a focus on quality, profitability, and the environment, referred to as the triple focus of GP.

GP methodology consists of six major steps, broken down into 13 tasks. These tasks are accomplished using GP tools such as checklists, material balance, Pareto charts, etc. in combination with GP techniques such as 5S, the 3Rs, etc.



- ⇒ A Measurement Guide to Green Productivity
(http://www.apo-tokyo.org/publications/wp-content/uploads/sites/5/ind_gp_mggp.pdf)
- ⇒ Handbook on Green Productivity
(http://www.apo-tokyo.org/publications/wp-content/uploads/sites/5/gp-hb_gp.pdf)
- A Quick Introduction to Green Productivity:

Green Productivity (GP) is a strategy for simultaneously enhancing productivity and environmental performance for overall socio-economic development that leads to sustained improvement in the quality of human life. It is the combined application of appropriate productivity and environmental management tools, techniques and technologies that reduce the environmental impact of an organization's activities, products and services while enhancing profitability and competitive advantage.

 - ⇒ Good Housekeeping:

GP techniques include awareness programs and the 5S management techniques which focus on keeping processes, equipment, workplaces and work forces organized, neat, clean, standardized and disciplined. Other good housekeeping techniques relate to measures that prevent the loss of

materials, minimize waste, conserve and save energy, and improve operational and organizational procedures.

⇒ Design Change:

The environmental impact of a product is to a large extent determined by its design. By taking environmental considerations into account during product planning, design and development -- and so designing environmentally compatible products -- a company can minimize the negative impact of its products and process on the environment.

⇒ Process Modification:

Process modification is a key GP technique which encompasses both simple and more complex changes -- from replacing inefficient or old processes with new technology. to totally changing the production process used. Such alterations can also involve energy conservation techniques such as the use of efficient appliances and the re-use and recycling of heat.

⇒ Waste Management: Waste stream segregation and the promotion of recycling, reuse and recovery are two broad techniques used to reduce the amount of waste a company produces and to improve waste disposal. Off-site recycling is often implemented if on-site recovery and reuse of resources is not feasible. Often substantial improvements can be made in the nature and quantity of waste produced by the substitution or purification of some material inputs.

● CLEAN DEVELOPMENT MECHANISM

□ The Clean Development Mechanism (CDM)

The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO₂, which can be counted towards meeting Kyoto targets.

⇒ The mechanism is seen by many as a trailblazer. It is the first global, environmental investment and credit scheme of its kind, providing a standardized emission offset instrument, CERs.

A CDM project activity might involve, for example, a rural electrification project using solar panels or the installation of more energy-efficient boilers.

The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets.

⇒ A CDM project must provide emission reductions that are additional to what would otherwise have occurred. The projects must qualify through a rigorous and public registration and issuance process. Approval is given by the Designated National Authorities. Public funding for CDM project activities must not result in the diversion of official development assistance.

The mechanism is overseen by the CDM Executive Board, answerable ultimately to the countries that have ratified the Kyoto Protocol.

□ 溫室氣體抵換專案管理辦法

抵換：指事業採行減量措施所產出之減量額度，用以扣減排放源之排放量。

抵換專案：指為取得抵換用途之排放額度，依中央主管機關認可之減量方法提出計畫書，其計畫書經中央主管機關核准及查驗機構確證，且所有設備、材料、項目及行動均直接與減少排放量或增加碳匯量有關的專案。

⇒ 小型、微型

⇒ 確證、查證

● HOMEWORK ASSIGNMENT #1 (2020/03/17):

請定義 Eco-Efficiency，並就企業經營之投入與產出項目（inputs and outputs），研提 Eco-Efficiency 之對應指標，並討論“Factor 4”在管理領域之可能意涵（implications）。