

國立臺北大學自然資源與環境管理研究所

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課程進度(02)：污染預防、清潔生產、綠色生產力與企業永續

Pollution Prevention, Cleaner Production, Green Productivity, and Corporate Sustainability

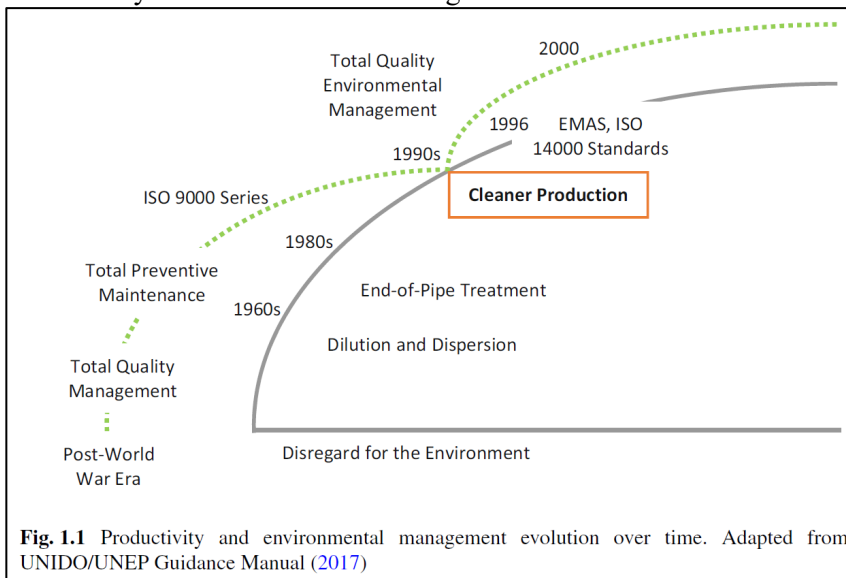
● MORE ABOUT CLEANER PRODUCTION (Silva and Gouveia, 2020)

□ The first definition of Cleaner Production (CP)

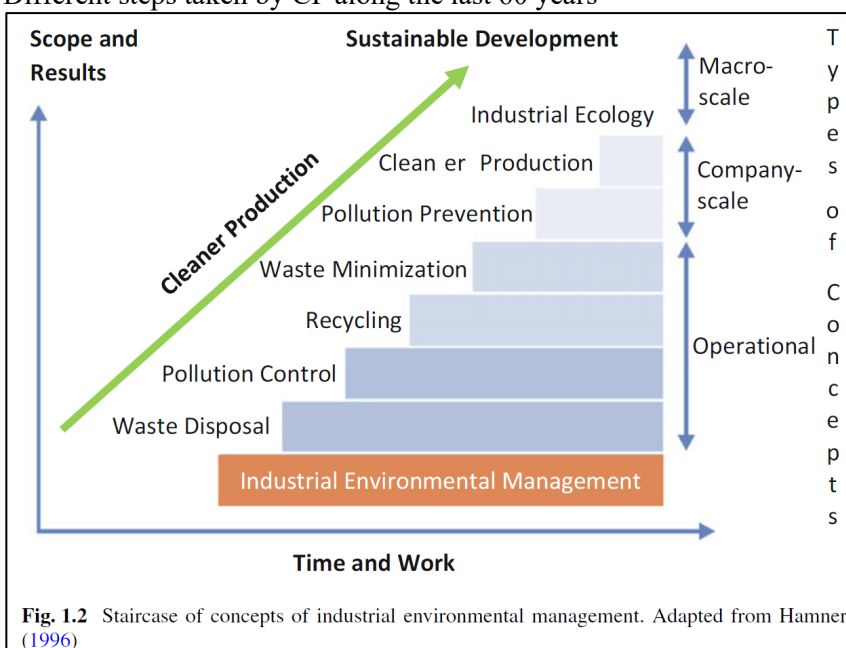
⇒ known was launched in 1990 by UNEP-IEO (United Nations Environmental Program--Industry and Environment Office) and defined CP as *the continuous application of an integrated preventive environmental strategy applied to processes, products, and services to increase overall efficiency and reduce risks to humans and the environment.*

□ Cleaner Production Evolution Process

⇒ Productivity and environmental management evolution over time



⇒ Different steps taken by CP along the last 60 years



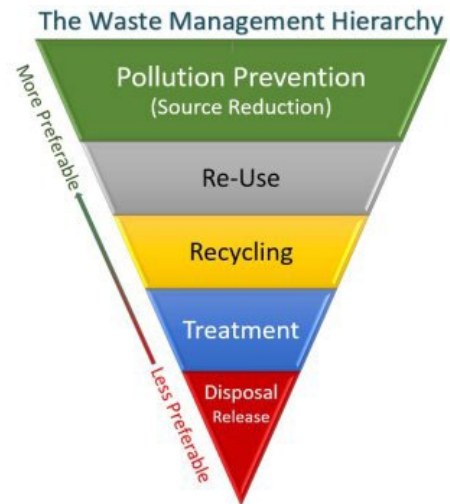
□ What is the Relationship among Cleaner Production, Pollution Prevention, Waste Minimization and ISO 14000 =>清潔生產與 ISO14000 => 綠色工廠標章

⇒ Waste Minimization (WM) is the reduction, to the extent feasible, of hazardous waste that is generated or subsequently treated, sorted or disposed. It includes any source reduction or recycling activity undertaken by a generator that results in either (1) the reduction of total volume or quantity of hazardous waste, or (2) the reduction of toxicity of hazardous waste, or both, so long as such reduction is consistent with the goal of minimizing recent and future threats to human health and the environment.

● **POLLUTION PREVENTION**

□ Cleaner Production (CP) and pollution prevention are synonyms, although the sense of the second seems broader than the first. Indeed, pollution prevention is usually used in the USA, as this term has its roots linked to the first approach done, with the Pollution Prevent Act, in 1990.

⇒ Pollution prevention (P2) is any practice that reduces, eliminates, or prevents pollution at its source before it is created. As shown by the EPA Waste Management Hierarchy, P2, also known as “source reduction,” is fundamentally different and, where feasible, more desirable than recycling, treatment or disposal. It is often more cost effective to prevent pollution from being created at its source than to pay for control, treatment, and disposal of waste products. When less pollution is created, there are fewer impacts to human health and the environment.



□ Specific Pollution Prevention Approaches

⇒ In the energy sector, pollution prevention can reduce environmental damages from extraction, processing, transport, and combustion of fuels. Pollution prevention approaches include:

- Increasing efficiency in energy use;
- Use of environmentally benign fuel sources.

⇒ In the agricultural sector, pollution prevention approaches include:

- Reducing the use of water and chemical inputs;
- Adoption of less environmentally harmful pesticides or cultivation of crop strains with natural resistance to pests; and
- Protection of sensitive areas.

⇒ In the industrial sector, examples of P2 practices include:

- Modifying a production process to produce less waste
- Using non-toxic or less toxic chemicals as cleaners, degreasers and other maintenance chemicals
- Implementing water and energy conservation practices
- Reusing materials such as drums and pallets rather than disposing of them as waste

⇒ In homes and schools examples of P2 practices include:

- Using reusable water bottles instead of throw-aways
- Automatically turning off lights when not in use
- Repairing leaky faucets and hoses
- Switching to "green" cleaners

□ Pollution Prevention Timeline | US EPA

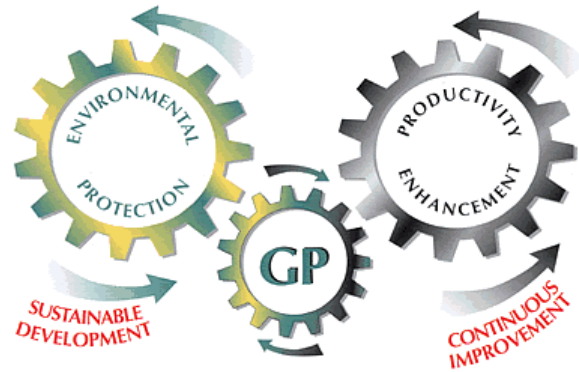
□ 3M Pollution Prevention Pays (3P) Program

⇒ An industry first, 3M’s 3P program, developed in 1975, is based on the belief preventing pollution is more environmentally effective, more socially acceptable, and more economical than treatment. The program has prevented 2.88 million short tons of pollutants and saved over \$2.37 billion (by 2022).

● 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 (https://www.apo-tokyo.org/wp-content/uploads/2021/05/ind_gp_mggp.pdf)
- ⇒ Handbook on Green Productivity (https://www.apo-tokyo.org/wp-content/uploads/2021/05/gp-hb_gp.pdf)
- ⇒ **Environmental, Social, and Governance (ESG) Factors and Green Productivity:** The Impacts of Greenwashing and Competence Greenwashing on Sustainable Finance and ESG Investing

□ 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.