

Module -2

Environmental Management Objectives

- Environmental quality objectives
- Rationale of Environmental standards: Concentration and Mass standards, Effluent and stream standards, Emission and ambient standards, Minimum national standards,
- Environmental performance evaluation: Indicators, benchmarking.
- Pollution control vs Pollution Prevention - Opportunities and Barriers
- Cleaner production and Clean technology
- Closing the loops, zero discharge technologies



Environmental Management

Environmental management is the process of allocating natural and man-made resources so as to make optimum use of the environment in satisfying not only the present basic human needs but of the coming generations also.

The focus of environmental management is on implementation, monitoring and auditing; on practice and coping with real-world issues, rather than theoretical planning. A close integration with environmental planning is desirable.



Environmental Management Objectives

- Environmental management objective is to establish limits.
- To warn threats and identify opportunities.
- To prevent the environment issues. Solve the environmental related problems.
- To suggest measures for resource conservation.
- To develop a strategy for the improvement for quality of life.
- To identify new eco-friendly technology for sustainable development.



Environmental Quality Objectives



Reduced Climate Impact



Clean Air



Natural Acidification Only



A Non-Toxic Environment



A Protective Ozone Layer



A Safe Radiation Environment



Zero Eutrophication



Flourishing Lakes and Streams



Good-Quality Groundwater



A Balanced Marine Environment,
Flourishing Coastal Areas and Archipelagos



Thriving Wetlands



Sustainable Forests



A Varied Agricultural Landscape



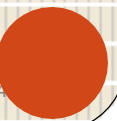
A Magnificent Mountain Landscape



A Good Built Environment



A Rich Diversity of Plant and Animal Life



1. REDUCED CLIMATE IMPACT

In accordance with the UN Framework Convention on Climate Change, concentrations of greenhouse gases in the atmosphere must be stabilised at a level that will prevent dangerous anthropogenic interference with the climate system.

This goal must be achieved in such a way and at such a pace that biological diversity is preserved, food production is assured and other goals of sustainable development are not jeopardised.



2. CLEAN AIR

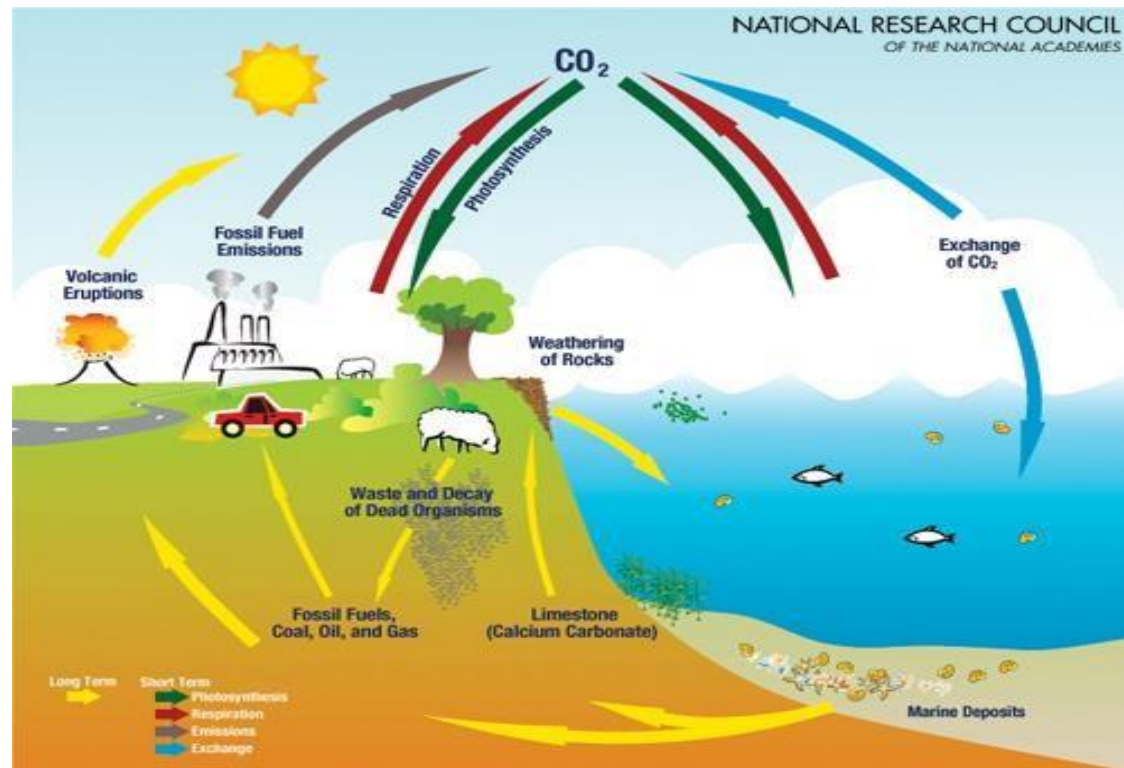
The air must be clean enough not to represent a risk to human health or to animals, plants or cultural assets.



Environmental Quality Objectives

3. NATURAL ACIDIFICATION ONLY

The acidifying effects of deposition and land use must not exceed the limits that can be tolerated by soil and water. In addition, deposition of acidifying substances must not increase the rate of corrosion of technical materials located in the ground, or water main systems, archaeological objects and rock carvings.



4. NONTOXIC ENVIRONMENT

The occurrence of man-made or extracted compounds in the environment must not represent a threat to human health or biological diversity. Concentrations of non-naturally occurring substances will be close to zero and their impacts on human health and on ecosystems will be negligible. Concentrations of naturally occurring substances will be close to background levels



5. PROTECTIVE OZONE LAYER

The ozone layer must be replenished so as to provide long-term protection against harmful UV radiation.

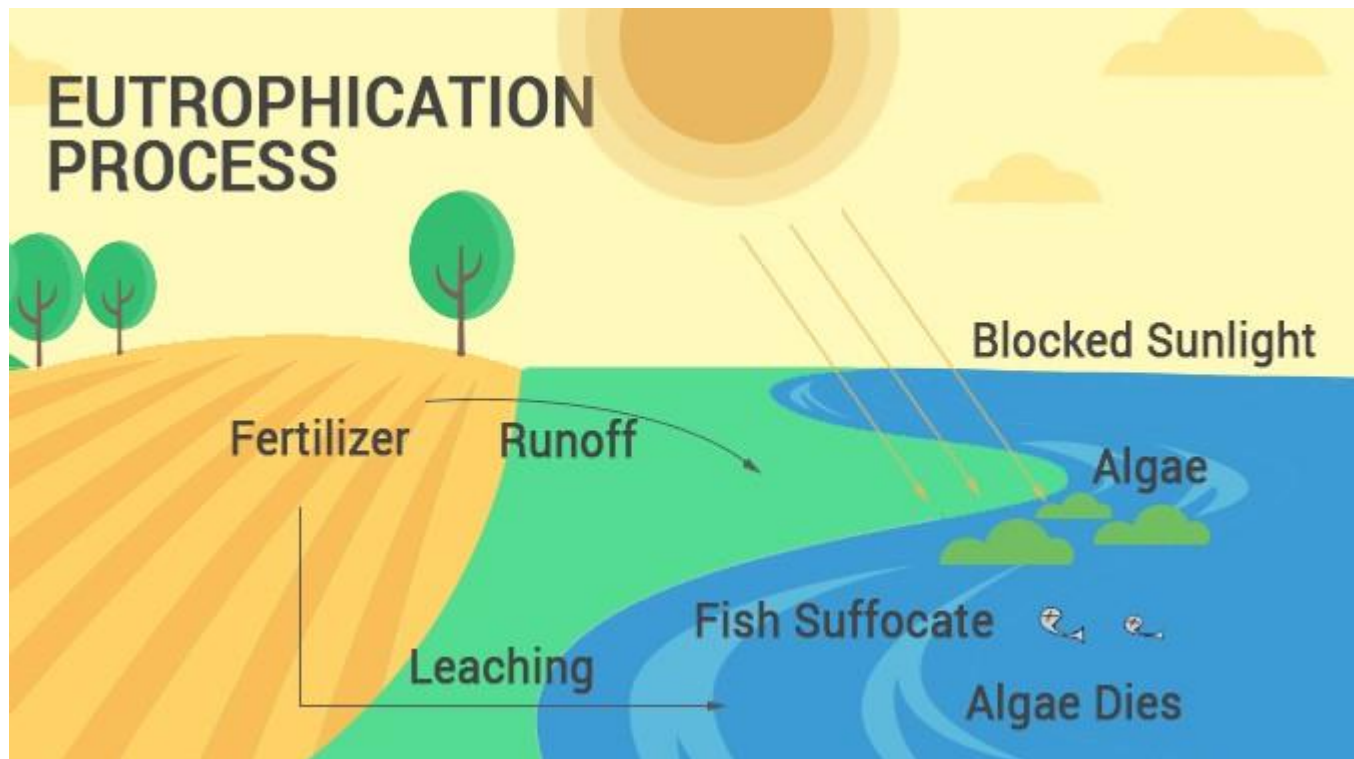
6. SAFE RADIATION ENVIRONMENT

Human health and biological diversity must be protected against the harmful effects of radiation.



7. ZERO EUTROPHICATION

Nutrient levels in soil and water must not be such that they adversely affect human health, the conditions for biological diversity or the possibility of varied use of land and water.



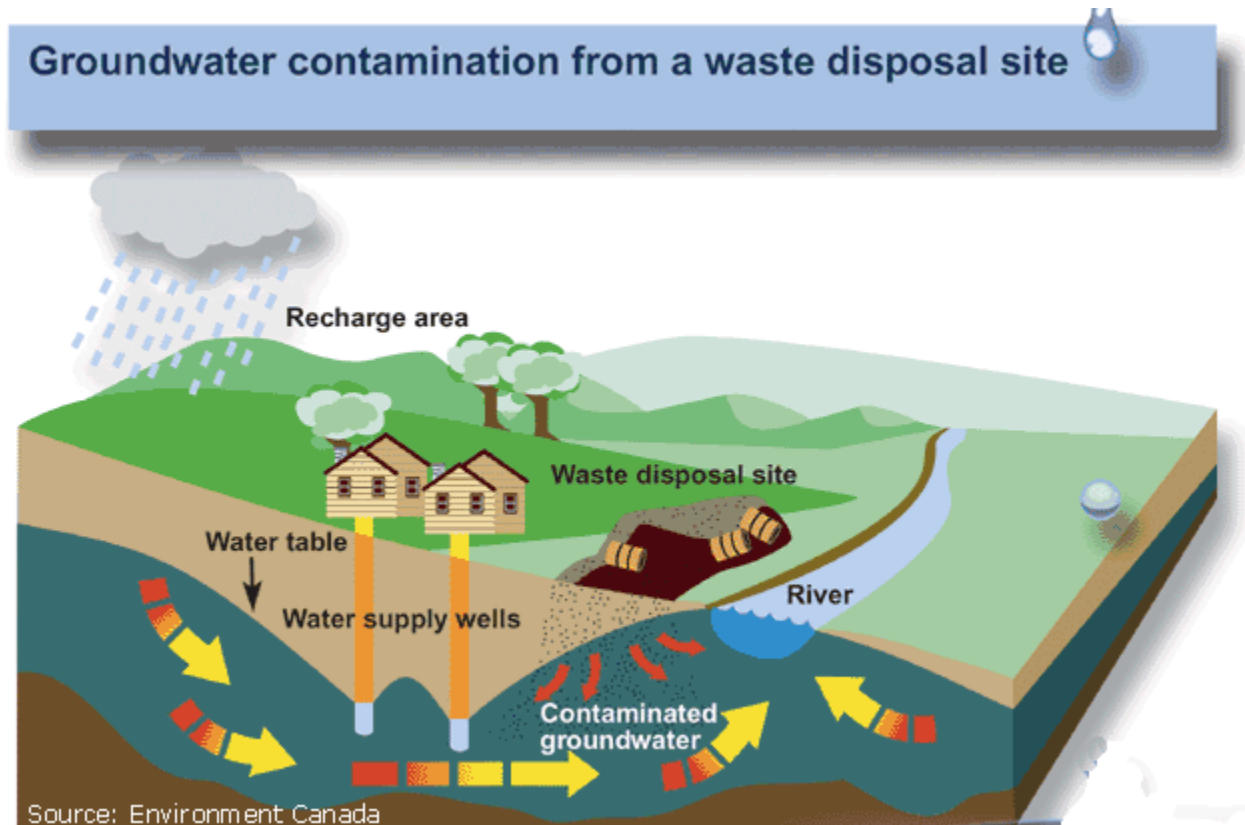
8. FLOURISHING LAKES AND STREAMS

Lakes and watercourses must be ecologically sustainable and their variety of habitats must be preserved. Natural productive capacity, biological diversity, cultural heritage assets and the ecological and water-conserving function of the landscape must be preserved, at the same time as recreational assets are safeguarded.



9. GOOD QUALITY GROUNDWATER

Groundwater must provide a safe and sustainable supply of drinking water and contribute to viable habitats for flora and fauna in lakes and watercourses



10. BALANCED MARINE ENVIRONMENT, FLOURISHING COASTAL AREAS AND ARCHIPELAGOS

The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos must be characterized by a high degree of biological diversity and a wealth of recreational, natural and cultural assets.

Industry, recreation and other utilization of the seas, coasts and archipelagos must be compatible with the promotion of sustainable development. Particularly valuable areas must be protected against encroachment and other disturbance.

11. THRIVING WETLANDS

The ecological and water conserving function of wetlands in the landscape must be maintained and valuable wetlands preserved for the future.



12. SUSTAINABLE FORESTS

The value of forests and forest land for biological production must be protected, at the same time as biological diversity and cultural heritage and recreational assets are safeguarded.

13. VARIED AGRICULTURAL LANDSCAPE

The value of the farmed landscape and agricultural land for biological production and food production must be protected, at the same time as biological diversity and cultural heritage assets are preserved and strengthened.

14. MAGNIFICENT MOUNTAIN LANDSCAPE

The pristine character of the mountain environment must be largely preserved, in terms of biological diversity, recreational value, and natural and cultural assets. Activities in mountain areas must respect these values and assets, with a view to promoting sustainable development. Particularly valuable areas must be protected from encroachment and other disturbance.

15. GOOD BUILT ENVIRONMENT

Cities, towns and other built-up areas must provide a good, healthy living environment and contribute to a good regional and global environment. Natural and cultural assets must be protected and developed. Buildings and amenities must be located and designed in accordance with sound environmental principles and in such a way as to promote sustainable management of land, water and other resources.



16. RICH DIVERSITY OF PLANT AND ANIMAL LIFE

Biological diversity must be preserved and used sustainably for the benefit of present and future generations. Species habitats and ecosystems and their functions and processes must be safeguarded. Species must be able to survive in long-term viable populations with sufficient genetic variation. Finally, people must have access to a good natural and cultural environment rich in biological diversity, as a basis for health, quality of life and well-being



Zero Discharge Technology

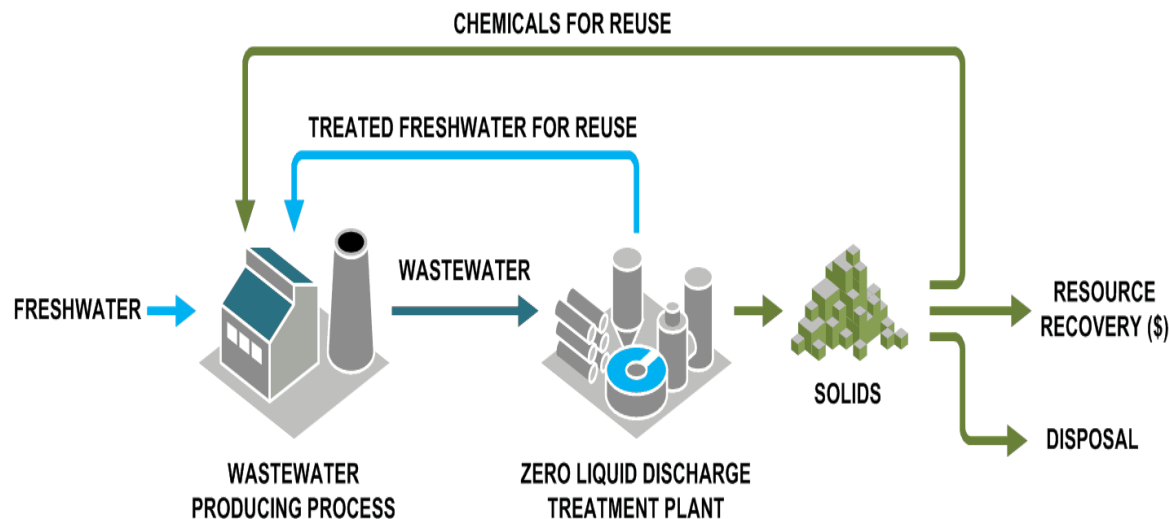
In a world where freshwater is an increasingly valuable resource, industrial processes threaten its availability on two fronts, unless the water is treated.

Many industrial processes require water, and then reduce the availability of water for the environment or other processes, or alternately contaminate and release water that damages the local environment.

Another important reason to consider zero liquid discharge is the potential for recovering resources that are present in wastewater. Some organizations target ZLD for their waste because they can sell the solids that are produced or reuse them as a part of their industrial process.

Zero Discharge Technology

Regardless of an organization's motivations to target zero liquid discharge, achieving it demonstrates good economics, corporate responsibility and environmental stewardship. By operating an in-house ZLD plant, disposal costs can be reduced, more water is re-used, and fewer greenhouse gases are produced by off-site trucking, which minimizes impact on local ecosystems and the climate.



Zero Discharge Technology

Zero liquid discharge (ZLD) is an engineering approach to water treatment where all water is recovered and contaminants are reduced to solid waste.

While many water treatment processes attempt to maximize recovery of freshwater and minimize waste, ZLD is the most demanding target since the cost and challenges of recovery increase as the wastewater gets more concentrated.

Salinity, scaling compounds, and organics all increase in concentration, which adds costs associated with managing these increases. ZLD is achieved by stringing together water treatment technology that can treat wastewater as the contaminants are concentrated.

Zero Discharge Technology

90 to 98% re-usable water going back to Industry as process makeup water of RO / Soft Quality Water.



Zero Discharge Technology

There are a number of benefits to targeting zero liquid discharge for an industrial process or facility:

- Lowered waste volumes decrease the cost associated with waste management.
- Recycle water on site, lowering water acquisition costs and risk. Recycling on-site can also result in less treatment needs, versus treating to meet stringent environmental discharge standards.
- Reduce trucks associated with off-site waste water disposal, and their associated greenhouse gas impact and community road incident risk.
- Improved environmental performance, and regulatory risk profile for future permitting.
- Some processes may recover valuable resources, for example ammonium sulfate fertilizer or sodium chloride salt for ice melting.

Zero Discharge Technology

Several methods of waste management are classified as zero liquid discharge, despite using different boundaries to define the point where discharge occurs.

Usually, a facility or site property line that houses the industrial process is considered the border or ‘boundary condition’ where wastewater must be treated, recycled, and converted to solids for disposal to achieve zero liquid discharge.

Zero Discharge Technology

Certain facilities send their liquid waste off-site for treatment, deep well disposal, or incineration and they consider this to qualify as zero liquid discharge. This approach to zero liquid discharge eliminates continuous discharge of liquids to surface waters or sewers, but can significantly increase cost.

Some engineers describe their designs as near-zero liquid discharge or minimal liquid discharge to highlight that they discharge low levels of wastewater, but do not eliminate liquid in their waste. For some facilities, it may be more economic to approach but not achieve complete ZLD by concentrating brine to lower volumes.

Zero Discharge Technology

Furthermore, it may be possible to avoid the creation of liquid waste on-site through careful water conservation or by treating contaminants at their source before they can enter the main flow of water.

Closing the loops

Closed-loop recycling is the process by which a product or material can be used and then turned into a new product (or converted back to raw material) indefinitely without losing its properties during the recycling process



By reducing the production and use of raw materials, closed-loop recycling minimizes harm to the environment and discourages resource depletion. In contrast, open-loop recycling is the process by which a product is recycled but has to be mixed with raw materials to become a new product, typically leading to downcycling.

Closing the loops

Ideal closed-loop systems produce no waste. They are called "closed" because products have a circular life cycle, beginning as raw materials and either being recycled into replacement products, returning to the original raw materials, or being returned to the environment as biodegradable waste.

This reduces the amount of (non-biodegradable) waste disposed, as recyclables are recovered and reused, rather than ending up in a landfill or as a pollutant.

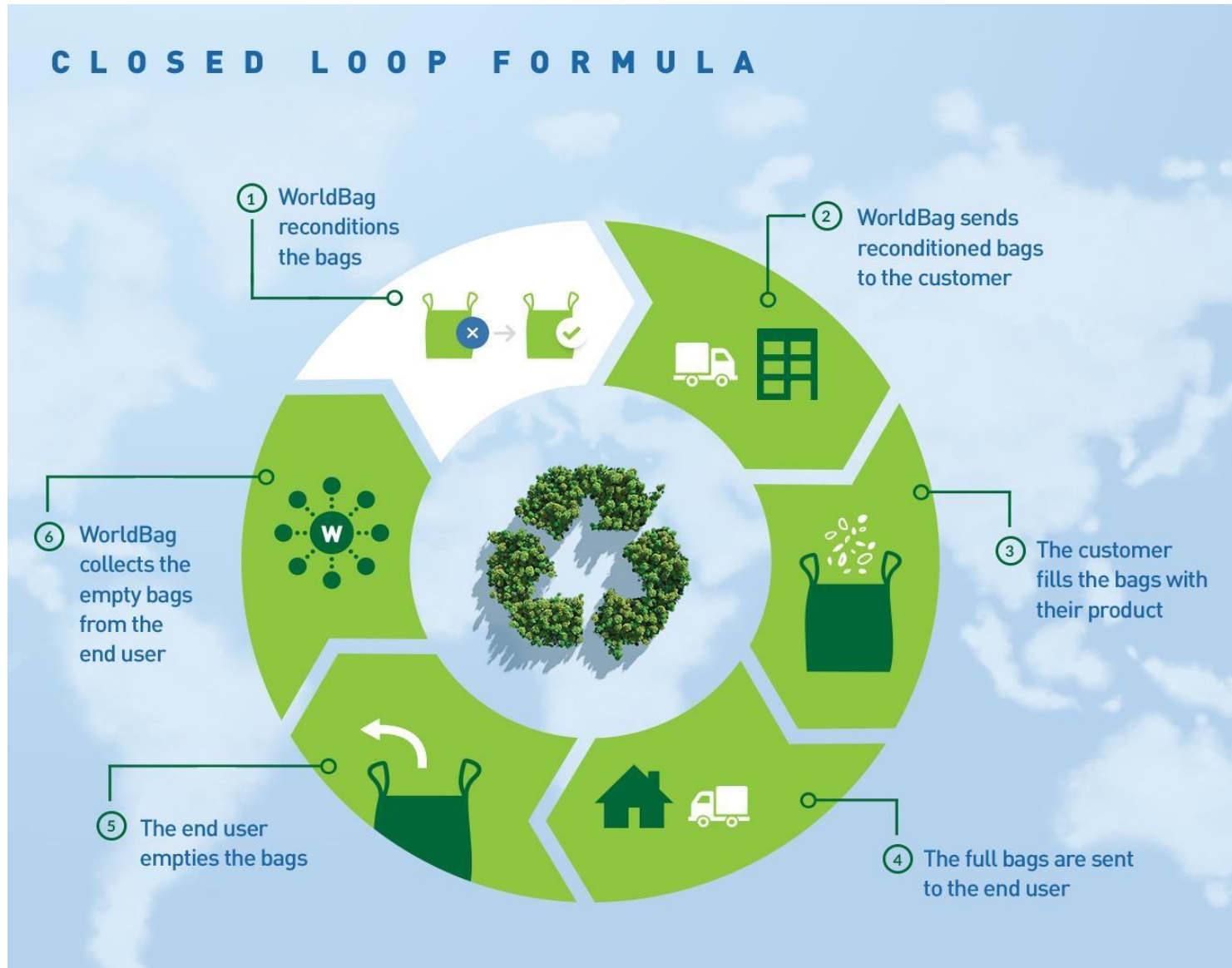
It is a stable and sustainable system in which natural resources are renewed and waste never builds up. A closed loop

Closing the loops

Closed-loop recycling involves: collecting and sorting recycled materials, extracting resources from the materials, and using those resources as inputs in the manufacturing of products practically identical to the original. Recycled materials are collected from homes, businesses, and recycling banks.

The most suitable materials for closed-loop recycling are aluminum, glass, and plastic. These are known to maintain their quality throughout many cycles of extraction, production, use, and recycling. For example, aluminum cans can be recycled and turned into new cans with practically no material degradation or waste..

Closing the loops



Closing the loops

- Under a closed-loop system, businesses reuse the same materials over and over again to create new products for purchase. It's a way to conserve natural resources and divert waste from the landfill, and increasingly, more companies are adopting it.
- Moving from a traditional linear system to a circular system, otherwise known as closing the loop, is a growing idea in the world of sustainable design and manufacturing
- Closing the loop means moving from traditional design, which looked at the linear model for design and production – make, use and dispose – to how the disposal stage could be fed back into the creation of a new product.

Cleaner production and Clean technology

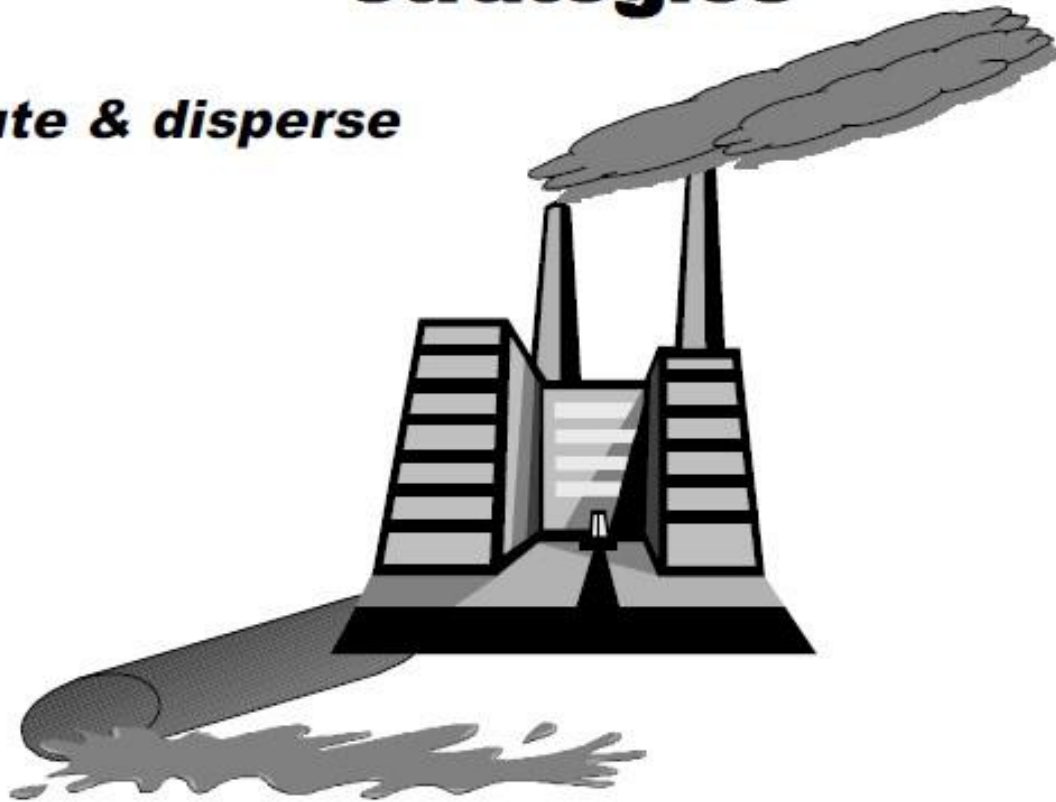
Cleaner production aims to minimize or avoid practices such as waste treatment (including stabilization, encapsulation, and detoxification), waste dilution to comply with regulations (e.g., releasing contaminated water into rivers or streams during high flow periods, blending arsenic-containing fumes with flotation

Cleaner production (CP) is a preventative approach to managing the environmental impacts of business processes and products. CP uses changes in technology, processes, resources or practices to reduce waste, environmental and health risks; minimise environmental damage; use energy and resources more efficiently; increase business profitability and competitiveness; and increase the efficiency of production processes. Cleaner production is applicable to all businesses, regardless of size or type.

Cleaner production and Clean technology

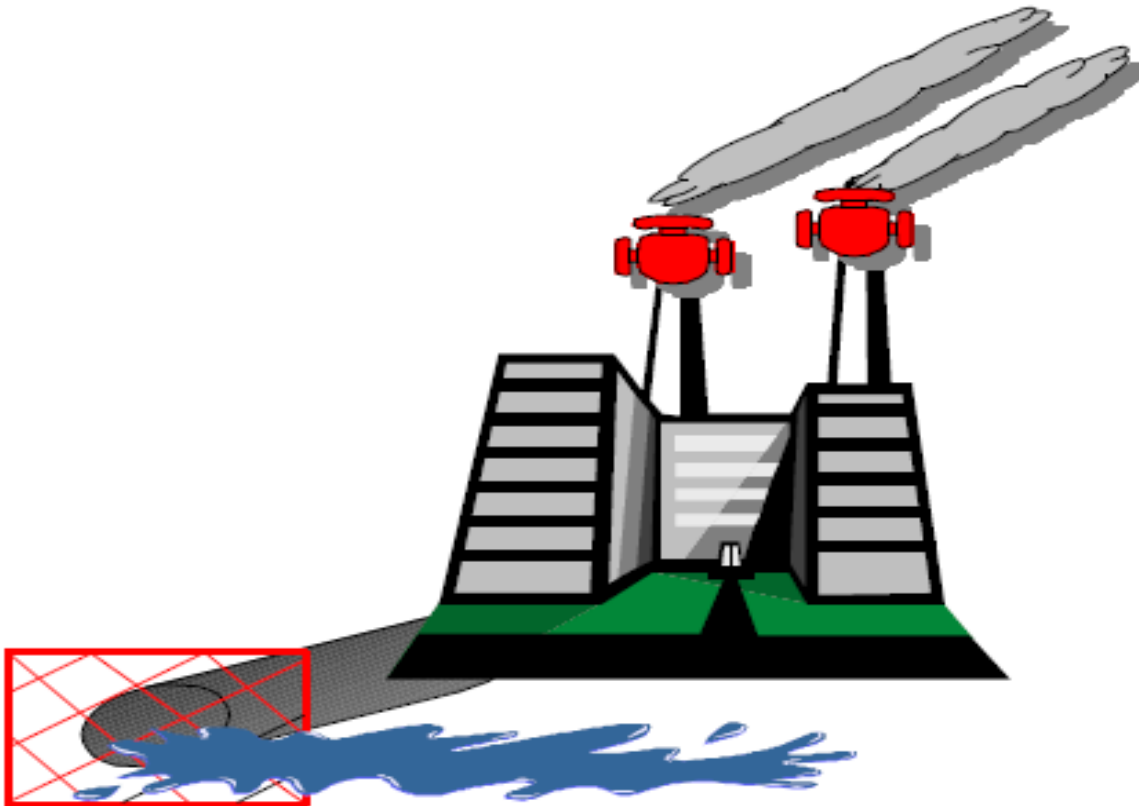
Passive environmental strategies

Dilute & disperse



Cleaner production and Clean technology

**Reactive environmental
strategies:
end-of-pipe approaches**



Cleaner production and Clean technology

Reactive environmental strategies

On - site recycling



Cleaner production and Clean technology

Proactive environmental strategies: Cleaner Production

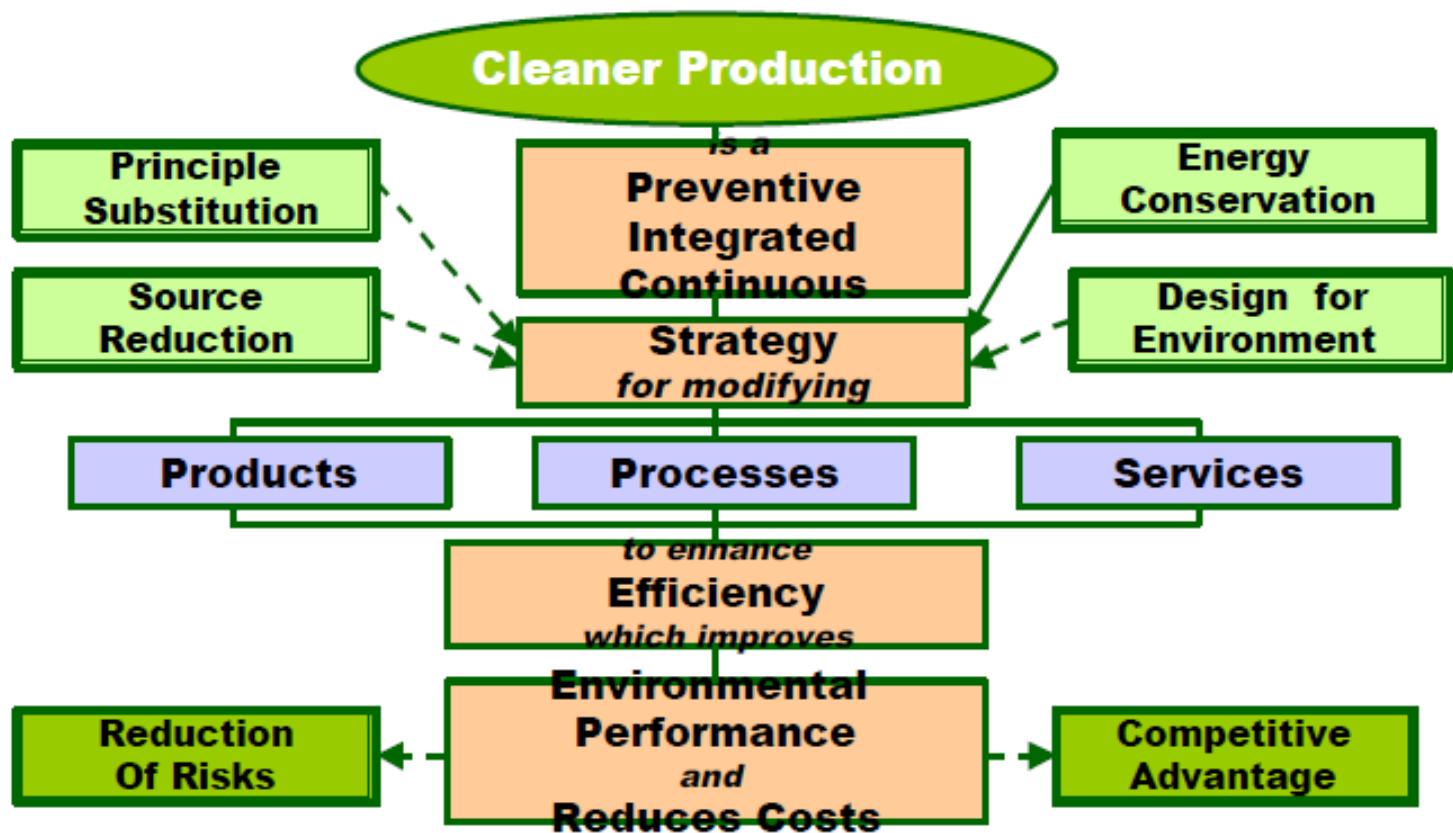


Prevention of Waste generation:

- Good housekeeping
- Input substitution
- Better process control
- Equipment modification
- Technology change
- Product modification
- Efficient use of energy resources
- On-site recovery/reuse

Cleaner production and Clean technology

Cleaner Production Definition



Cleaner production and Clean technology

Cleaner production is a preventive, company-specific environmental protection initiative. It is intended to minimize waste and emissions and maximize product output.

By analysing the flow of materials and energy in a company, one tries to identify options to minimize waste and emissions out of industrial processes through source reduction strategies.

Improvements of organisation and technology help to reduce or suggest better choices in use of materials and energy, and to avoid waste, waste water generation, and gaseous emissions, and also waste heat and noise.

Cleaner production and Clean technology

What Are the Benefits of Cleaner Production?



Cleaner production and Clean technology

Cleaner Production practices

1. Good Housekeeping

take appropriate *managerial* and *operational* actions to prevent:

- leaks
- spills
- to enforce existing operational instructions



Cleaner production and Clean technology

Cleaner Production practices

2. Input Substitution

substitute input materials

- by less toxic
- or by renewable materials
- or by adjunct materials which have a longer service life-time in production



Cleaner production and Clean technology

Cleaner Production practices

3. Better Process Control

modify:

- operational procedures
- equipment instructions

and process record keeping in order to run the processes more efficiently and at lower waste and emission generation rates



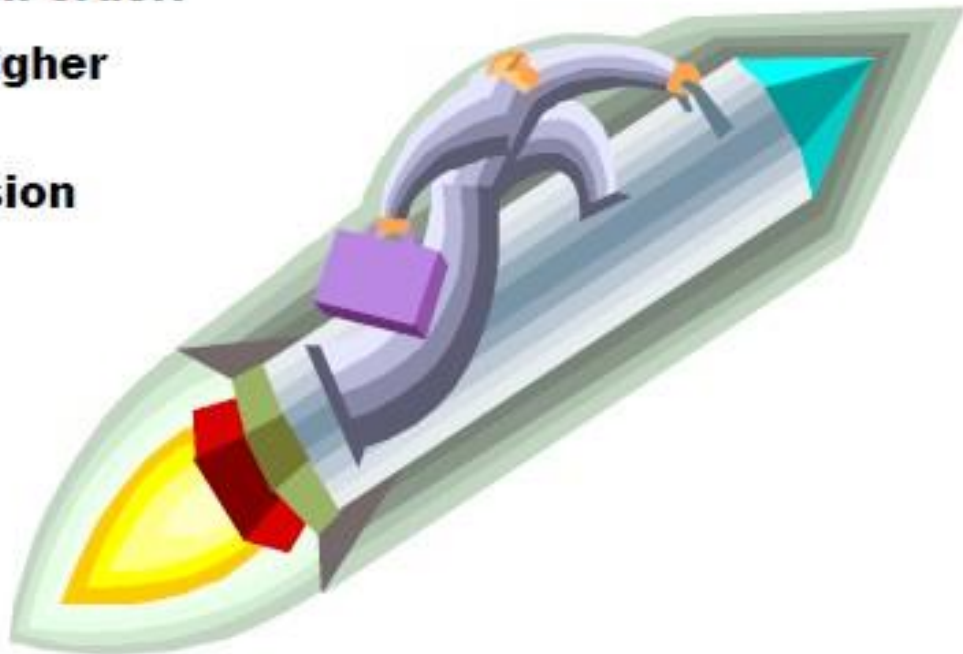
Cleaner production and Clean technology

Cleaner Production practices

4. Equipment Modification

modify the existing production equipment and utilities in order:

- run the processes at higher efficiency**
- lower waste and emission generation rates**



Cleaner production and Clean technology

5. Technology Change

replace of:

- the technology
- processing sequence
- synthesis pathway

in order to minimise waste and emission generation during production



6. On-site Recovery/Reuse

- reuse of the wasted materials in the same process for another useful application within the company



Cleaner production and Clean technology

8. Using Energy Efficiently

Reduce the environmental impact from energy use by:

- improved energy efficiency
- by using energy from renewable sources



CP versus End-of-Pipe approach

Cleaner Production

Continuous improvement

Progress towards use of closed loop or continuous cycle processes

Everyone in the community has a role to play; partnerships are essential

Active anticipation and avoidance of pollution and waste

Elimination of environmental problems at their source

Involves new practices, attitudes and management techniques and stimulates technical advances

Pollution Control and Waste Management

One-off solutions to individual problems

Processes result in waste materials for disposal a pipeline with resources in and wastes out

Solutions are developed by experts often in isolation

Reactive responses to pollution and waste after they are created

Pollutants are controlled by waste treatment equipment and methods

Relies mainly on technical improvements to existing technologies



Cleaner production and Clean technology

Clean technology, is any process, product, or service that reduces negative environmental impacts through significant energy efficiency improvements, the sustainable use of resources, or environmental protection activities.

Clean technology includes a broad range of technology related to recycling, renewable energy, information technology, green transportation, electric motors, green chemistry, lighting, grey water, and more.

Cleaner production and Clean technology

The current key sectors in the clean technology industry are:

- Sustainable energy and energy optimization to reduce dependence on fossil fuels
- The provision of clean water to all who need it
- Pollution reduction
- Recycling and waste management



Cleaner production and Clean technology

1. Sustainable Energy and Energy Optimization

Many technologies use sustainable sources of energy, or optimize energy usage to reduce dependence on carbon fuels.

- **Wind power** – This sustainable resource is typically exploited in the form of vast wind farms, often found offshore. A wind farm contains a large group of individual wind turbines connected up which generate electricity without producing any greenhouse gas emissions after construction.
- **Hydroelectric power** – This refers to the use of the gravitational force of water falling or flowing to produce electricity. Once constructed, a hydroelectric power plant will produce extremely low levels of greenhouse gases when compared to fossil fuel-based techniques.

Cleaner production and Clean technology

1. Sustainable Energy and Energy Optimization

- **Solar energy** – Two techniques are used to generate electricity from solar energy; photovoltaics (PV) or concentrated solar power systems (CSPs). The former uses the photovoltaic effect to directly convert light into an electrical current, whilst the latter uses lenses or mirrors to focus a beam of light directly onto a small area. This is converted into heat which subsequently drives a heat engine to generate electricity.
- **Geothermal energy** – This is simply the heat from the earth itself. This heat can be used similarly to the directed light beams for CSPs to heat up water to drive heat engines and generate electricity, or systems in buildings can capture the earth's naturally occurring thermal energy for space heating

Cleaner production and Clean technology

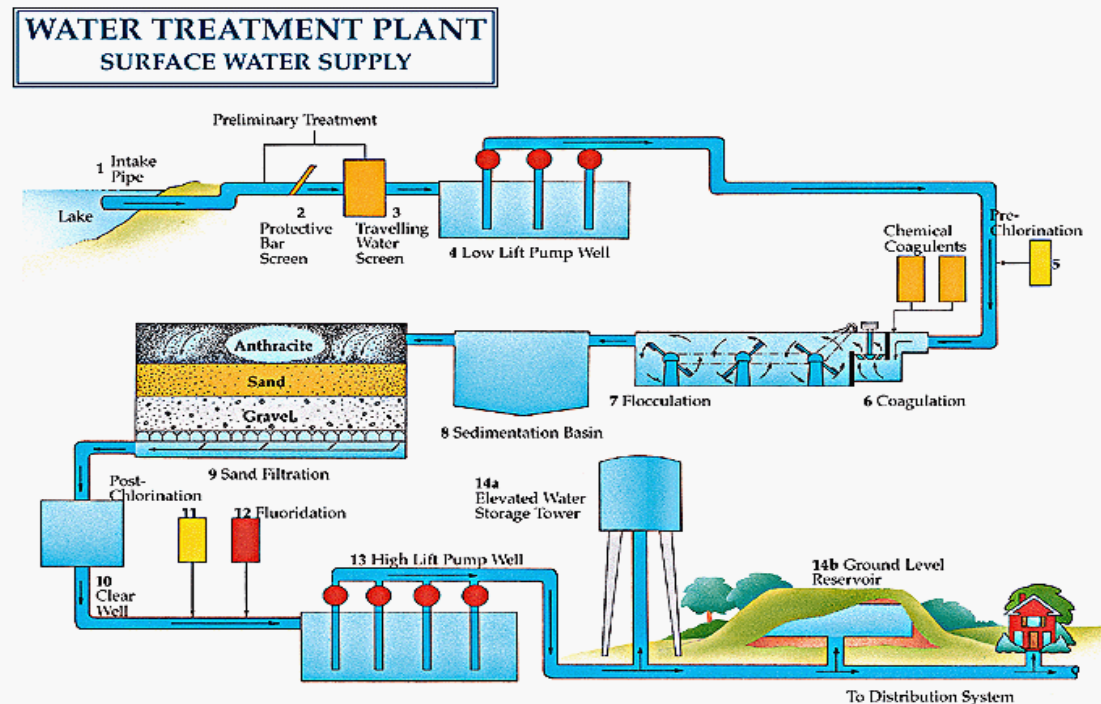
1. Sustainable Energy and Energy Optimization

- **Smart energy** – This refers to the numerous ways that energy usage can be optimized with the introduction of connected energy consumption, automated energy distribution, and responsive energy supply – all made possible with the advent of the Internet of Things (IoT).
- **Energy reduction** – This encompasses all of the ways that energy usage is reduced from the demand side, including automated systems, human behavior management, sustainable development, and sustainable building management.

Cleaner production and Clean technology

2. Clean Water

- **Water treatment** – This refers to the treatment of raw water to ensure that it is safe for human consumption.
- **Wastewater treatment** – The conversion of wastewater into water that can then be entered into the water cycle or reused is referred to as wastewater treatment.



Cleaner production and Clean technology

3. Pollution Reduction

- **Emission control** – There are several methods to reduce global emissions. The adoption of clean technologies, such as the sustainable energy sources listed above, as well as a transition from conventional gasoline-powered vehicles to biofuel and electric vehicles, are just a few of the suggested ways to control emissions.
- **Pollutant monitoring** – Air monitoring stations which provides annual reports on the volume of pollutants. Similar techniques of monitoring the levels of air pollutants are employed around the world, including the use of satellites and drones to create impartial, accurate monitoring reports.

Cleaner production and Clean technology

3. Pollution Reduction

- **Remediation of polluted sites** – When a request for environmental remediation of a location is made by government or other land remediation authorities, immediate action must be taken by the landowners to ensure the location is made safe for humans and animals. This can involve cleaning soil, groundwater, surface water, or sediment by removing pollutants and contaminants.



Cleaner production and Clean technology

4. Recycling and Waste Treatment

- **Recycling of consumer products** – The majority of consumer products in today's market have many parts or components which can be recycled. Once a product reaches its "post-consumer" stage, it should be sorted correctly to ensure it does not end up in landfills.
- **Reduction and treatment of toxic waste** – Often in the form of dangerous chemicals or materials, toxic or hazardous waste should be treated very carefully. Most governments have plans in place for the reduction, collection, treatment, and regulation of toxic and hazardous waste.

Pollution Control vs Pollution Prevention - Opportunities and Barriers

Pollution Prevention

EPA defines *pollution prevention* as:

- Source reduction.
- Use of non-toxic or less-toxic alternatives.
- Implementing conservation techniques.
- Re-using materials rather than putting them into the waste stream.

Pollution Control vs Pollution Prevention - Opportunities and Barriers

Pollution Prevention Opportunities

- s Reducing or eliminating toxic materials
 - u replacing a material in the production line
 - u reformulating the product
 - u installing new or modifying existing process equipment
- s Closed loop (on-site) recycling
- s Developing new technology that helps others implement P2
- s Involves holistic approach

Pollution Control vs Pollution Prevention - Opportunities and Barriers

Pollution Control

Pollution control is the **process of reducing or eliminating the release of pollutants into the environment**. It is regulated by various environmental agencies which establish pollutant discharge limits for air, water, and land.

Pollution Control vs Pollution Prevention - Opportunities and Barriers

Pollution Control Opportunities

- s End of pipe treatment
- s Open loop (off site) recycling
- s Incineration or disposal
- s Burning waste for energy recovery
- s Transferring waste from one medium to other
- s Incorporation of waste into products or by-products

Pollution Control vs Pollution Prevention - Opportunities and Barriers



Environmental Performance

Evaluation: Indicators, benchmarking

Environmental Performance Evaluation (EPE) is “an internal process and management tool designed to provide management with reliable and verifiable information on an ongoing basis to determine whether an organization’s environmental performance is meeting the criteria set by the management of the organization”.

Environmental Performance Evaluation (EPE) is an internal management process that uses indicators to provide information comparing an organization’s past and present environmental performance with its environmental performance criteria.

EPE, as detailed in this International Standard, follows a “Plan-Do-Check-Act” management model.

Environmental Performance

Evaluation: Indicators, benchmarking

The steps of this ongoing process are the following:

1. Plan

- planning EPE;
- selecting indicators for EPE

2 Do: Using data and information which includes:

- collecting data relevant to the selected indicators;
- analyzing and converting data into information describing the organization's environmental performance;
- assessing information describing the organization's environmental performance in comparison with the organization's environmental performance criteria;
- reporting and communicating information describing the organization's environmental performance.

3. Check and Act: Reviewing and improving EPE.

Environmental Performance Evaluation: Indicators, benchmarking

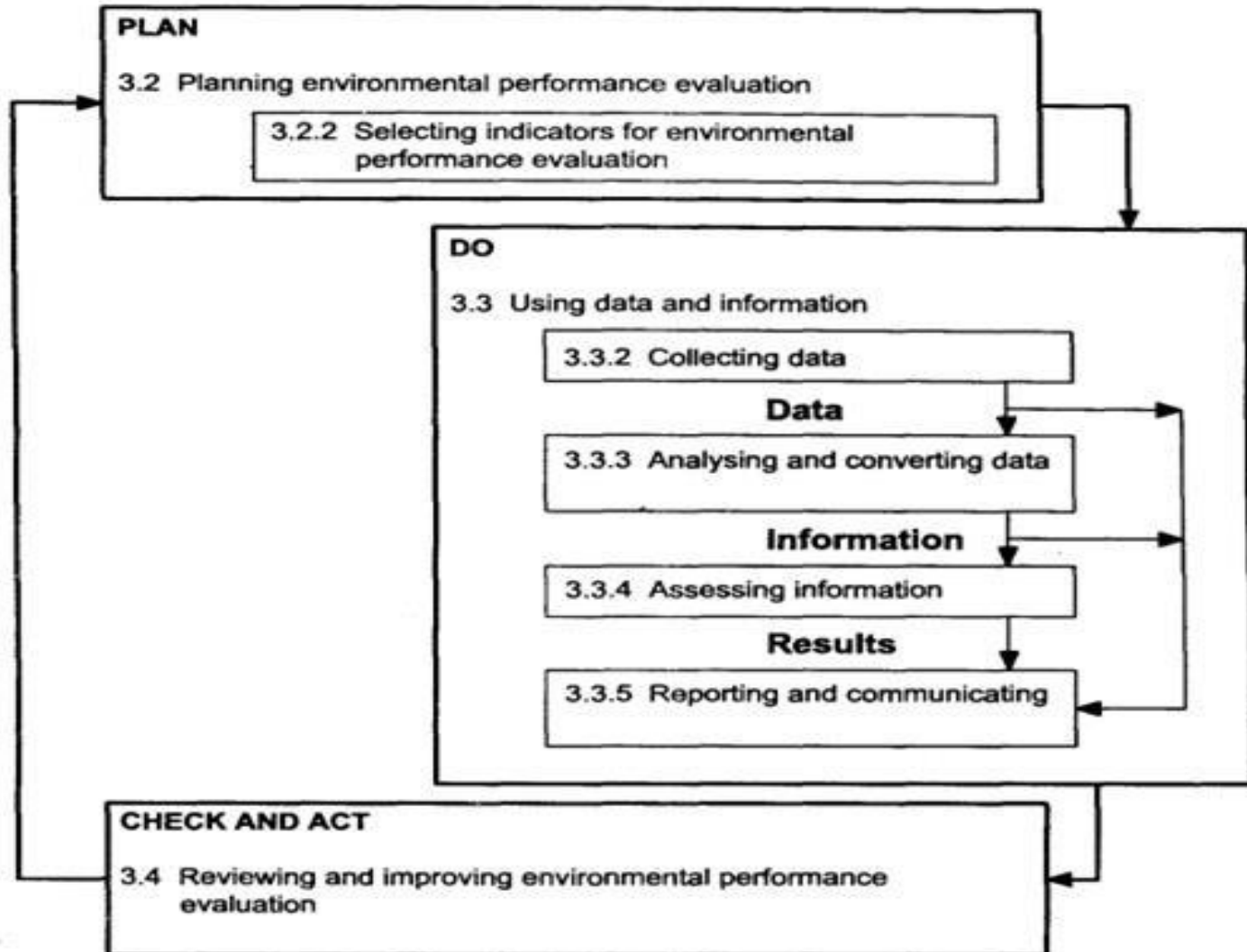
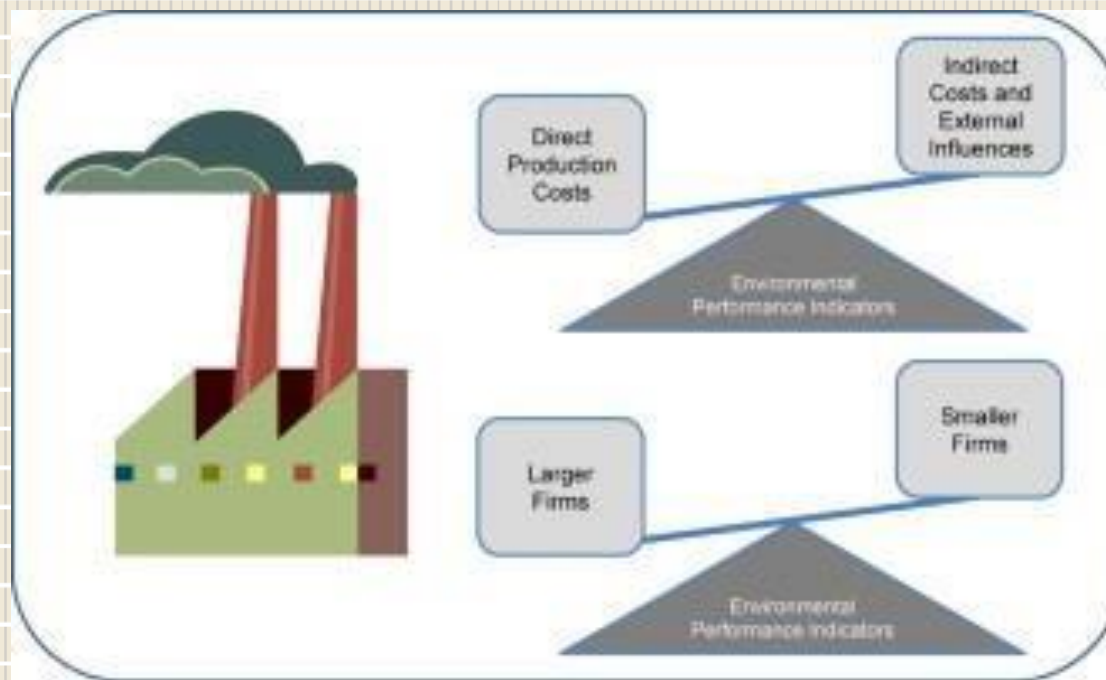


Figure 1 — Environmental performance evaluation

Environmental Performance Evaluation: Indicators, benchmarking

Environmental Performance Indicators provide information that helps evaluation and decision making within organizations that engage in environmental efforts.



Environmental Performance

Evaluation: Indicators, benchmarking

- *The first objective* of environmental performance indicators is to measure and evaluate environmental burdens, environmental problems that need to be solved
- *The second objective* is to provide a common foundation of information between an organization and interested parties
- *The third objective* is to provide a common foundation of information for macro-level environmental policies of the national and local governments.

Environmental Performance

Evaluation: Indicators, benchmarking

Types of environmental performance indicators

ISO standard describes two general categories of indicators for EPE:

- Environmental Performance Indicators (EPIs); and
- Environmental Condition Indicators (ECIs).

There are two types of Environmental Performance Indicators:

- Management Performance Indicators (MPIs)
- Operational Performance Indicators (OPIs)

Environmental Performance

Evaluation: Indicators, benchmarking

ISO 14031; 4.1.2 Indicators for EPE

Two categories of indicators for EPE:

i. **Environmental condition indicators (ECIs):**

> provide information about the **condition of the environment** which could be impacted by the organization.

ii. **Environmental performance indicators (EPIs):**

a) **Management performance indicators (MPIs):**

> provide information about **management efforts** to influence the environmental performance of the organization's operations.

b) **Operational performance indicators (OPIs):**

> provide information about the **environmental performance** of the organization's operations.

Environmental Performance

Evaluation: Indicators, benchmarking

Indicators: Categories and types

Some examples of Environmental Indicators

Environmental condition Indicators (ECI)

- Water quality of nearby lake
- Regional air quality
- Noise pollution level at peak periods
- Atmospheric CO2 emissions (ppm)

Management Performance Indicators (MPI)

- Number and results of environmental audits conducted
- Staff member training
- Supplier assessments

Operational Performance Indicators (OPI)

- Absolute Energy consumption (KWh)
- Waste per unit of output
- Transportation volume
- Volume of products shipped



Rationale of Environmental Standards

Environmental standards are administrative regulations or civil law rules implemented for the treatment and maintenance of the environment.

Environmental standards should preserve nature and the **environment**, protect against damage, and repair past damage caused by human activity.

Environmental standards are typically set by government and can include prohibition of specific activities, mandating the frequency and methods of monitoring, and requiring permits for the use of land or water.

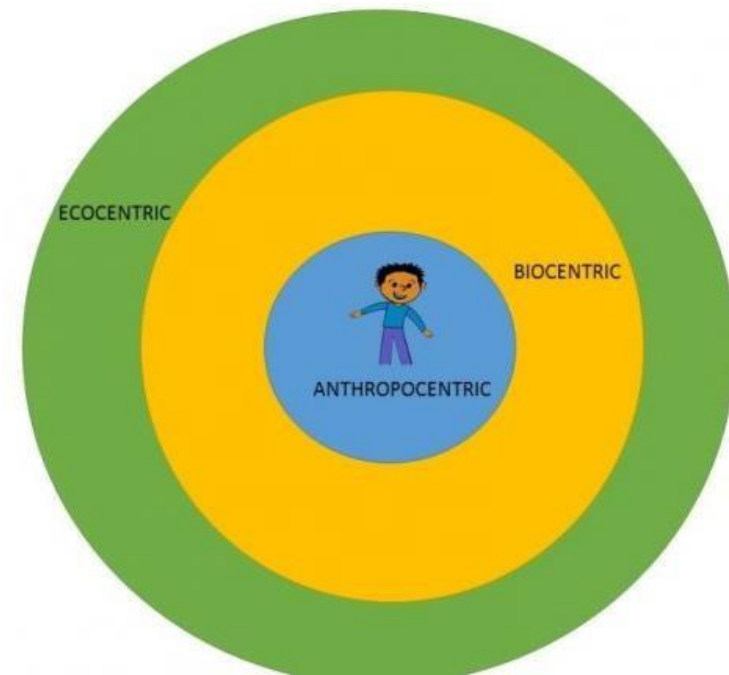
Standards differ depending on the type of environmental activity.



Rationale of Environmental Standards

Historically, the development of environmental standards was influenced by two competing ideologies: ecocentrism and anthropocentrism.

Ecocentrism frames the environment as having an intrinsic value divorced from the human utility, while anthropocentrism frames the environment as only having value if it helps humanity survive. This has led to problems in establishing standards



Rationale of Environmental Standards

- In recent decades, the popularity and awareness of environmentalism has increased with the threat of global warming becoming more alarming than ever since the Intergovernmental Panel on Climate Change (IPCC) released their report in 2018.
- The report asserts that based on scientific evidence “if human activities continue to at this rate it is predicted to increase in-between 1.5-2 °C over pre industrial levels in-between 2030 and 2052”.
- Busby argues that Climate change will define this century and that it is no longer a faraway threat. In turn, the demand for protecting the environment has risen.

Rationale of Environmental Standards

Developments in science have been fundamental for the setting of environmental standards. Improved measurements and techniques have allowed scientists to better understand the impact of human-caused environmental damage on human health and the biodiversity which composes the natural environment

Therefore, environmental standards in modern times are set with the view that humans do have obligations toward the environment, but they can be justified in terms of obligations toward other humans. This means it is possible to value the environment without discarding anthropocentrism. Sometimes called prudential or enlightened anthropocentrism.

Rationale of Environmental Standards

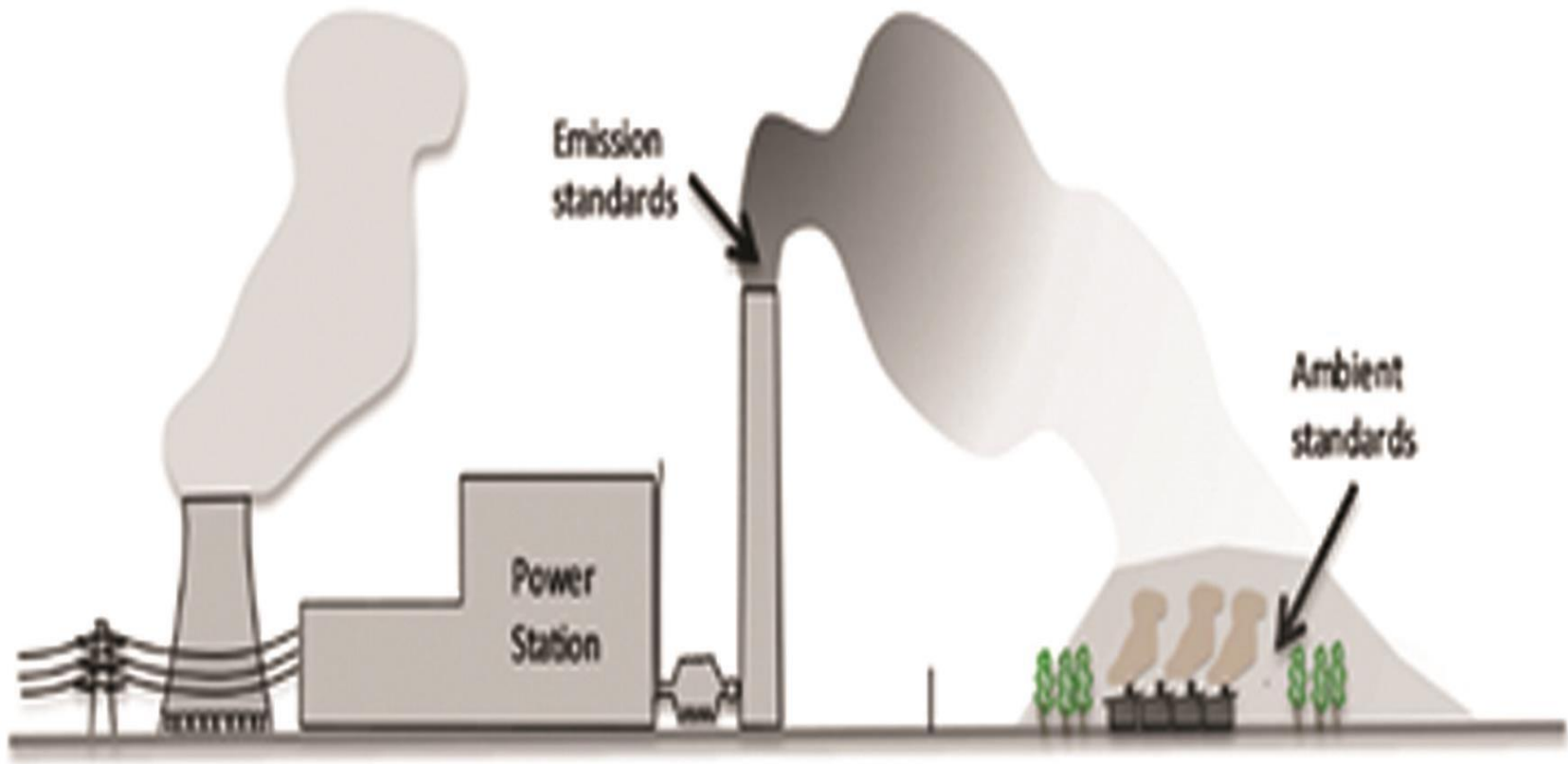
This is evident as environmental standards often characterize the desired state (e.g. the pH of a lake should be between 6.5 and 7.5) or limit alterations (e.g., no more than 50% of the natural forest may be damaged). Statistical methods are used to determine the specific states and limits the enforceable environmental standard.

Penalties and other procedures for dealing with regions out of compliance with the standard may be part of the legislation

Advantages of Environmental Standards

- Appear to be simple and direct.
- Apparently set clearly specified targets.
- Appeal to people's sense of getting environmental pollution reduced immediately.
- Are consistent with our ethical sense that pollution is bad and ought to be declared illegal.
- Conform to an operation of the legal system, which is to define and stop illegal behaviour.

Emission and ambient standards



Emission and ambient standards

Emission Standards

- **Emission standards** are never-exceed levels applied directly to the quantities of emissions coming from pollution sources.
- Emission standards can be set on a wide variety of different bases. For example:
 - Emission rate (e.g., kilograms per hour),
 - Emission concentration (e.g., parts per million of biochemical oxygen demand, or BOD, in wastewater),
 - Percentage removal of pollutant (e.g., 60-percent removal of waste material before discharge).
- In the language of regulation, emission standards are a type of performance standard, because they refer to end results that polluters who are regulated must achieve.

Emission and ambient standards

Ambient Standards

- An **ambient standard** is a never-exceed level for a pollutant in the ambient environment.
- For example, an ambient standard for dissolved oxygen in a particular river may be set at 3 parts per million (ppm), meaning that this is the lowest level of dissolved oxygen that is to be allowed in the river.

Emission and ambient standards

Ambient vs. Emission Standards

- Setting emission standards at a certain level does not necessarily entail meeting a set of ambient standards. This is due to naturally occurring processes.
- Sometimes the environment will convert a certain type of pollutant into something more damaging. As a result, ambient environmental quality depends on emissions and natural degradation. This is often the case with organic pollutants.
- Researching the link between emission levels and ambient quality levels is a major part of environmental science.

Emission and ambient standards

Pollutant	Time weighted average	Concentration of Ambient Air		
		Industrial area	Residential rural & other area	Sensitive area
Sulphur dioxide (SO ₂)	Annual ^a	80 µg/m ³	60 µg/m ³	15 µg/m ³
	24 h ^b	120 µg/m ³	80 µg/m ³	30 µg/m ³
Oxides of nitrogen (NO ₂)	Annual ^a	80 µg/m ³	60 µg/m ³	15 µg/m ³
	24 h ^b	120 µg/m ³	80 µg/m ³	30 µg/m ³
Suspended Particulate Matter (SPM)	Annual ^a	360 µg/m ³	140 µg/m ³	70 µg/m ³
	24 h ^b	500 µg/m ³	200 µg/m ³	100 µg/m ³
Respirable Particulate Matter (size Less than 10 µm) RPM	Annual ^a	120 µg/m ³	60 µg/m ³	50 µg/m ³
	24 h ^b	150 µg/m ³	100 µg/m ³	75 µg/m ³
Lead as Pb	Annual ^a	1.0 µg/m ³	0.75 µg/m ³	0.50 µg/m ³
	24 h ^b	1.5 µg/m ³	1.0 µg/m ³	0.75 µg/m ³
Carbon monoxide	8 h ^b	5.0 mg/m ³	2.0 mg/m ³	1.0 mg/m ³
	1 h	10.0 mg/m ³	4.0 mg/m ³	2.0 mg/m ³

Effluent and stream standards

Effluent Standards:-

- They are generally established for the effluent from industry and municipality waste water treatment plant to be discharge into stream, land, sewer, ocean etc.
- Effluent standard system is carried out to control the following stream standard system.
- No detail stream analysis is required to determine exact amount of waste treatment, effluent standard can serve as a guide to establish the stream classification or during organization of any pollution abutment program.

Effluent and stream standards

Effluent Standards:-

- Unless the effluent standards are upgraded, this system does not provide any effective protection for an over loaded stream.
- Main disadvantage of this type of standards is that there is no control over total volume of polluting substances added to stream each day.

Effluent Standards

Parameter	Unit	Effluent Discharge Standards						
		Africa				Asia		
		Nigeria	Tanzania	Ghana	Uganda	Thailand	Malaysia	India
Temperature	°C	40	-na-	-na-	35	40	40	-na-
pH	-	6–9	6.5–8.5	6–9	6–8	5.5–9	5.5–9.0	6.5–8.5
BOD	mg O ₂ /L	30–50	30	50	50	20–60	50	30
COD	mg O ₂ /L	60–90	60	250	100	120–400	100	250
Oil and grease	mg/L	10	5	5	10	5–15	10	10
DS	mg/L	200	3000	1000	1200	3000	-na-	-na-
SS	mg/L	25	100	50	100	50	100	50–100
Total N	mg/L	10	10	-na-	10	-na-	-na-	10

Effluent and stream standards

Stream Standards:-

- The system is based on establishing classification or standard quality for a stream & regulating any discharge to the extent, necessary to maintain the established stream classification or quality
- The primary objective of stream standards is to protect and preserve each stream for its best usage on a equitable basis for both upstream & downstream uses.

Effluent and stream standards

Stream Standards:-

- The stream standard system is the prevention of excessive pollution regardless of type of industry or other factors such as location of industry or municipality.
- Pollution abutment should be considered in the decisions concerning location of a plant just as carefully as the labours, transportation, market & other conditions.
- It also allows the public to establish goals for maintaining quality of water for present as well for future needs.

Stream Standards:-

S.NO.	Parameter	Requirement desirable Limit	Remarks
1.	Colour	5	May be extended up to 50 if toxic substances are suspected
2.	Turbidity	10	May be relaxed up to 25 in the absence of alternate
3.	pH	6.5 to 8.5	May be relaxed up to 9.2 in the absence
4.	Total Hardness	300	May be extended up to 600
5.	Calcium as Ca	75	May be extended up to 200
6.	Magnesium as Mg	30	May be extended up to 100
7.	Copper as Cu	0.05	May be relaxed up to 1.5
8.	Iron	0.3	May be extended up to 1
9.	Manganese	0.1	May be extended up to 0.5
10.	Chlorides	250	May be extended up to 1000
11.	Sulphates	150	May be extended up to 400
12.	Nitrates	45	No relaxation
13.	Fluoride	0.6 to 1.2	If the limit is below 0.6 water should be rejected, Max. Limit is extended to 1.5
14.	Phenols	0.001	May be relaxed up to 0.002
15.	Mercury	0.001	No relaxation

Treated Effluent Quality of Common Effluent treatment Plant [Concentration in mg/l except pH & Temperature]			
Parameters	Into inland surface waters	On land for irrigation	Into Marine Coastal areas
pH	5.5-9.0	5.5-9.0	5.5-9.0
BOD [3days at 27 °C]	30	100	100
Oil & Grease	10	10	20
Temperature	Shall not exceed 40 °C in any section of the stream within 15 meters down stream from the effluent outlet	-	45 °C at the point of discharge.
Suspended Solids	100	200	(a) For process waste water-100 (b) For cooling water effluent 10 percent above total suspended matter of effluent cooling water
Dissolved Solids (inorganic)	2100	2100	-
Total residue chlorine	1.0	-	1.0
Ammonical nitrogen(As N)	50	-	50
Total Kjeldahl nitrogen(as N)	100	-	100
Chemical Oxygen Demand	250	-	250
Arsenic (as As)	0.2	0.2	0.2
Mercury (as Hg)	0.01	-	0.01
Lead (as Pb)	0.1	-	1.0
Cadmium (as Cd)	1.0	-	2.0
Total Cadmium (as Cr)	2.0	-	2.0
Copper (as Cu)	3.0	-	3.0
Zinc (as Zn)	5.0	-	15
Selenium (as Se)	0.05	-	0.05
Nickel (as Ni)	3.0	-	5.0
Boron (as B)	2.0	2.0	-
Percent Sodium	-	60	-
Cynide (as CN)	0.2	0.2	0.2
Chloride (as Cl)	1000	600	-
Fluoride (as F)	2.0	-	15
Sulphate (as SO ₄)	1000	1000	-
Sulphide (as S)	2.8	-	5.0
Pesticides	Absent	Absent	Absent
Phenolic compounds (as C ₆ H ₅ OH)	1.0	-	5.0
Note: All efforts should be made to remove colour and unpleasant odour as far as possible.			