Implementing BAT in India: Development of Environmental Standards

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- As per the Water Act, 1974 and Air Act, 1981 and Environment (Protection) Act, 1986, Ministry of Environment, Forest and Climate Change (MoEF&CC)
  - formulates and notifies standards for emission or discharge of environmental pollutants viz. air pollutants, water pollutants and noise limits, from industries, operations or processes.

- The standards are framed in consultation with the concerned stakeholders.
- The process is based on the best practices and techno-economic viability.
- The notification of standards also involves formulation of load-based standards i.e. emission/ discharge limits of pollutants per unit of product obtained/ processes performed to encourage resource utilization efficiency and conservation aspects

- COINDS *(Comprehensive Industry Document Series)* intended to cover various aspects of different types of industrial units in the country with respect to their number, locations, capacities, types of product usage of raw materials, process adopted, waste minimization, pollution prevention and control measures.
- Minimal National Standards *(MINAS)* have been evolved as a result of the COINDS.

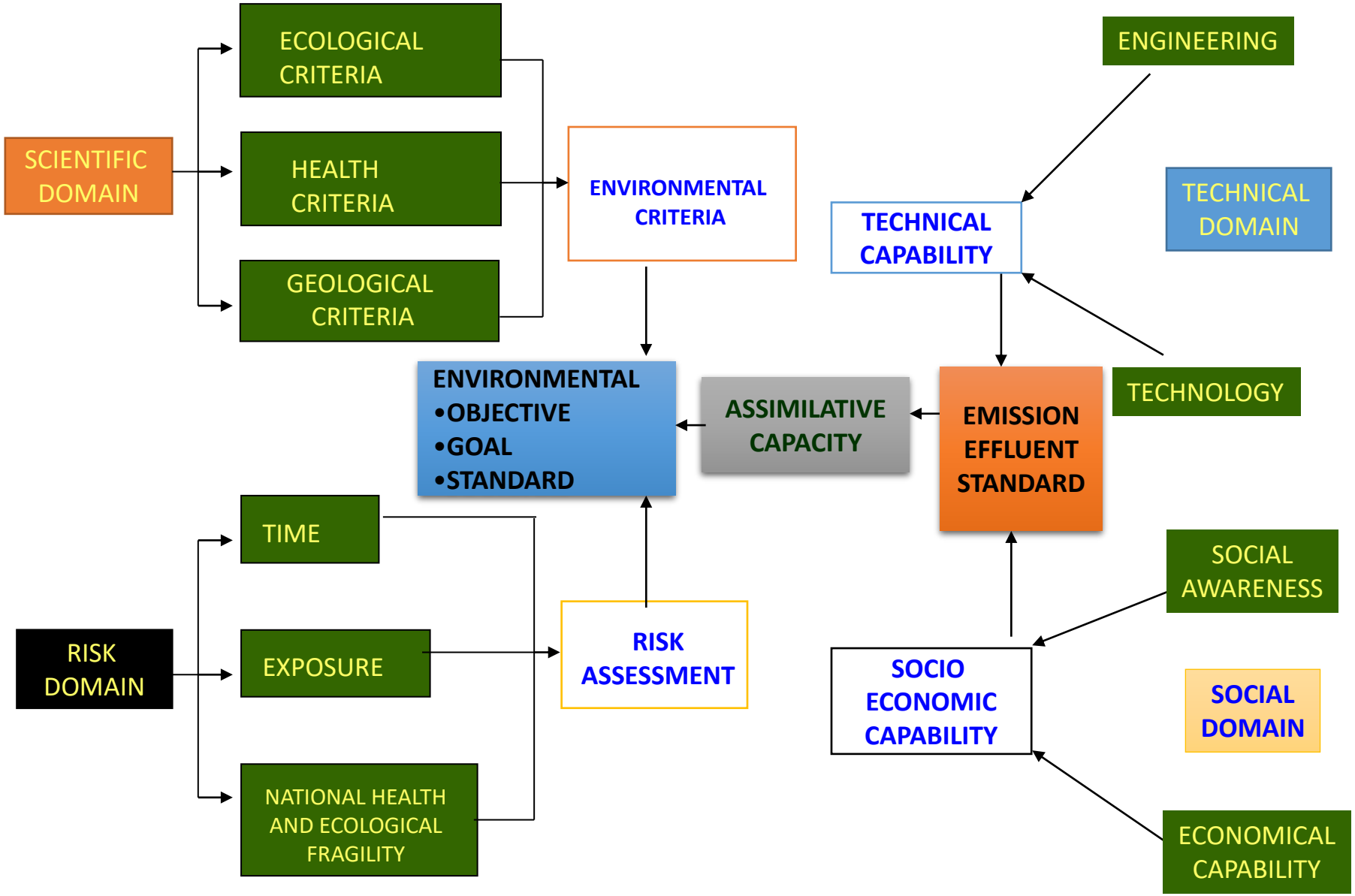
- The procedure to determine the standards consider all emission prevention and control and is based on a consensual information exchange process in the TWG.
- Affordability of standards are assessed based on technical and cost-benefit analyses.
- Standards for any industrial process / operation recommended by Central Pollution Control Board (CPCB) are subjected to stakeholder consultation including general public.
- Comments received are technically examined by CPCB and changes, if any, incorporated.
- The revised draft standards are placed before the “Expert Committee (EC)” of MoEF&CC for approval.

- Need and variability in pollution control technologies is obvious.
- Pollution control technologies in the industrial sector include:
  - Modification in processes, plant practices,
  - in-plant control measures and
  - end-on systems to remove pollutants (including recovery and reuse).

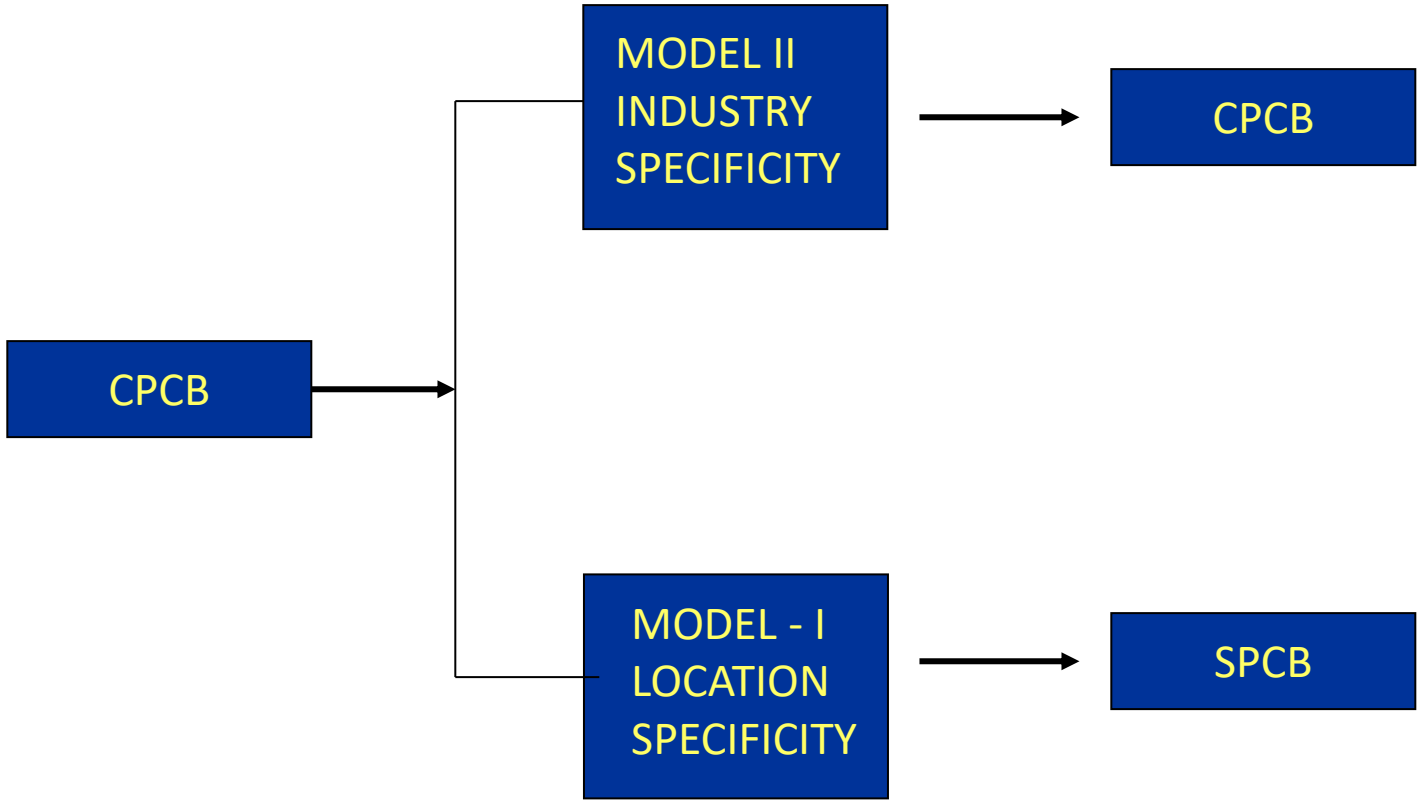
Approaches for adoption of BAT

- COINDS
- MINAS
- Voluntary approach: India has adopted a voluntary approach (for ex: phasing out mercury from chlor-alkali industries).
  - Phasing out of mercury involved change into Best Available Technology, mindset of the industries and policy makers.
- Corporate Responsibility for Environmental Protection (CREP):)
  - Adopted in March 2003 with the purpose to go beyond the compliance of regulatory norms for prevention & control of pollution through various measures including waste minimization, in-plant process control & adoption of clean technologies.
  - Targets of the Charter include:
    - conservation of water, energy, recovery of chemicals,
    - reduction in pollution, elimination of toxic pollutants,
    - process & management of residues that are required to be disposed off in an environmentally sound manner.
    - The Charter enlists the action points for pollution control for 17 categories of highly polluting industries.

ENVIRONMENTAL QUALITY OBJECTIVE, CRITERIA, STANDARD RELATIONSHIP



MINAS – Minimum National Standards



At National level, Industry Specific Standard is evolved with minimal requirement with due regard to economic feasibility termed as MINIMAL NATIONAL STANDARD (MINAS)

Challenges

- **Technologies:**
  - Sustainable ambient air purification ,
  - Low maintenance,
  - Energy efficient,
  - Address fine particulate pollution,
  - Relevant to local environment,
  - Low cost, contextualized and user-friendly.
  - Safe for human and ecosystem health.
- ***Operational Models***:
  - Cradle to grave approach,
  - Safe removal, and
  - Disposal of any waste generated by ensuring health and hygiene aspects of operation and maintenance workers as well as public at large.
- ***Capacity building***
  - Sectoral and cross-sectoral training

Example: Thermal power plant standards 1986

S. No.	Industry	Parameter	Standards
1	2	3	4
5.	**Thermal Power Plants**		Maximum limiting concentration, milligrams per litre (except for pH and temperature)
	Condenser Cooling waters (once through cooling system)	pH	6.5-8.5
		Temperature	Not more than 5 ^{0}C higher than the intake water temperature
		Free available chlorine	0.5
	Boiler blow down	Suspended Solids	100
		Oil and Grease	20
		Copper (total)	1.0
		Iron (total)	1.0
	Cooling tower blow down	Free available chlorine	0.5
		Zinc	1.0
		Chromium (total)	0.2
		Phosphate	5.0
		Other corrosion inhibiting material	Limit to be established on case by case basis by Central Board in case of Union territories and State Board in case of States.
	Ash pond effluent	pH	6.5-8.5
		Suspended solids	100
		Oil and Grease	20
[1][5A.	**Thermal Power Plant (Water Consumption Limit)**	**Water consumption**	I. All Plants with Once Through Cooling (OTC) shall install Cooling Tower (CT) and achieve specific water consumption upto maximum of 3.5m^3/MWh within a period of two years from the date of publication of this notification. II. All existing CT-based plants reduce specific water consumption upto maximum of 3.5m^3/MWh within a period of two years from date of publication of this notification. [2]{III. Specific water consumption shall not exceed maximum of 3.0 m^3/MWh for new plants installed after the 1st January, 2017 and these plants shall also achieve zero waste water discharged}.

Thermal power standards notification 07 Dec 2015

Sr. No.	Industry	Parameter	Standards
1	2	3	4
"5A.	Thermal Power Plant (Water consumption limit)	Water consumption	I. All plants with Once Through Cooling (OTC) shall install Cooling Tower (CT) and achieve specific water consumption upto maximum of 3.5m^3/MWh within a period

			of two years from the date of publication of this notification. II. All existing CT-based plants reduce specific water consumption upto maximum of 3.5m^3/MWh within a period of two years from the date of publication of this notification. III. New plants to be installed after 1st January, 2017 shall have to meet specific water consumption upto maximum of 2.5 m^3/MWh and achieve zero waste water discharged";

Sr. No.	Industry	Parameter	Standards
1	2	3	4
"25.	Thermal Power Plant	**TPPs (units) installed before 31st December, 2003***	
		Particulate Matter	100 mg/Nm^3
		Sulphur Dioxide (SO_2)	600 mg/Nm^3 (Units Smaller than 500MW capacity units) 200 mg/Nm^3 (for units having capacity of 500MW and above)
		Oxides of Nitrogen (NOx)	600 mg/Nm^3
		Mercury (Hg)	0.03 mg/Nm^3(for units having capacity of 500MW and above)
		TPPs (units) installed after 1st January,2003, upto 31st December, 2016*	
		Particulate Matter	50 mg/Nm^3
		Sulphur Dioxide (SO_2)	600 mg/Nm^3 (Units Smaller than 500MW capacity units) 200 mg/Nm^3 (for units having capacity of 500MW and above)
		Oxides of Nitrogen (NOx)	300 mg/Nm^3
		Mercury (Hg)	0.03 mg/Nm^3
		TPPs (units) to be installed from 1st January, 2017**	
		Particulate Matter	30 mg/Nm^3
		Sulphur Dioxide (SO_2)	100 mg/Nm^3
		Oxides of Nitrogen (NOx)	100 mg/Nm^3
		Mercury (Hg)	0.03 mg/Nm^3

Thermal Power compliance NOTIFICATION 5th September 2022

Table-I

Sl. No.	Category	Location/area	Timelines for compliance (Non-retiring units)		Last date for retirement of units for exemption from compliance	
			parameters other than SO_2 emissions	SO_2 emissions	parameters other than SO_2 emissions	SO_2 emissions
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Category A	With 10 km radius of National Capital Region or cities having million plus population[1].	Up to 31st December 2022	Up to 31st December 2024	Up to 31st December 2022	Up to 31st December 2027
2	Category B	With 10 km radius of Critically Polluted Areas[2] or Non-attainment cities[2]	Up to 31st December 2023	Up to 31st December 2025	Up to 31st December 2025	
3	Category C	Other than those included in category A and B	Up to 31st December 2024	Up to 31st December 2026	Up to 31st December 2025	

[1] As per 2011 census of India.

[2] as defined by CPCB.

Specific water consumption shall not exceed maximum of 3.0 m_3/MWh for new plants installed after the 1st January, 2017 and these plants shall also achieve zero waste water discharge.”;

Advantages..

- The technology employed for the control of the proposed limit of SO2 & NOx so also control of mercury emission (at about 70-90%) as a co-benefit.
- The new standards are aimed at reducing emission of PM10 (0.98 kg/MWh), Sulphur dioxide(7.3 Kg/MWh) and Oxide of nitrogen (4.8 kg/MWh), which will in turn help in bringing about an improvement in the Ambient Air Quality (AAQ) in and around thermal power plants.
- Limiting the use of water in thermal power plant will lead to water conservation (about 1.5 M3/MWh) as thermal power plant is a water-intensive industry.
- This will also lead to a reduction in energy requirement for drawl of water.

Successful take-aways

Voluntary approach

Corporate Responsibility for Environmental Protection (CREP)

CREP

- "Corporate Responsibility for Environmental Protection (CREP)" with the purpose to go beyond the compliance of regulatory norms for prevention & control of pollution through various measures including waste minimization, in-plant process control & adoption of clean technologies.
- The Charter has set targets concerning conservation of water, energy, recovery of chemicals, reduction in pollution, elimination of toxic pollutants, process & management of residues that are required to be disposed off in an environmentally sound manner.
- The Charter enlists the action points for pollution control for various categories of highly polluting industries

Various other initiatives.....(of BAT)

- Use of compressed natural gas (CNG) as an alternative fuel.
- Introduction of Bharat Stage VI vehicle and fuel standards.
- Zig-zag technology for the stack emissions from brick kilns.
- Online monitoring of discharges through the Online Continuous Emission Monitoring Systems (OCEMS).
- introduction of hybrid vehicles or fuel cell vehicles or fuel modifications, such as ultra-low sulphur fuels, or alternative fuels.
- Waste-to-energy technologies, such as incineration or anaerobic digestion, allow for the recovery of energy from waste while minimizing its volume and environmental impact.

We may consider……

- **Integration of technologies:**
  - As of date, for environmental remediation, combination of electrochemical, physical, biological and other processes successfully implemented.
  - Future optimization and integration need to be based on techno-economic effectiveness vis-a-vis environmental impact.
- **Practical applications of functional materials/chemicals:**
  - Transformation of functional materials would release nanoparticles, metal ions, and organics into the environment. These may lead to secondary pollution. Such issues need consideration.
- **Circular economy: (Waste from one is resource for other)**
  - In conventional environmental management, solid, liquid, and gaseous wastes are generally seen as "WASTE" for society. (due to hazardous nature).
  - Recent developments in converting solid, organic, and gaseous wastes into value-added materials and energy fuels would lead to develop ***circular economy.***

Thank you