

REAL TIME MONITORING SYSTEM

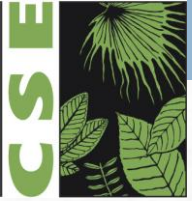
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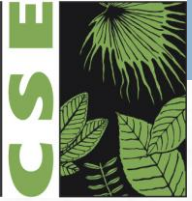
A good ENVIRONMENTAL GOVERNANCE regime paves the path for sustainable growth of a nation. Assures quality environment, equitable growth, health and safety for people while promoting growth.

All that it needs:

- Suitable pollution norms
- Standardised pollution monitoring practices
- Credible Reporting (disclosure)
- Transparency
- Strong regulatory framework
- Self regulation- market oriented pollution control

Emerging economies have incessant problem of: Weak pollution norms and regulatory system, poor monitoring practices, Non-transparency, lack of self regulatory of market based pollution control or monitoring mechanism (like emission trading).

CEMS for Environmental Governance

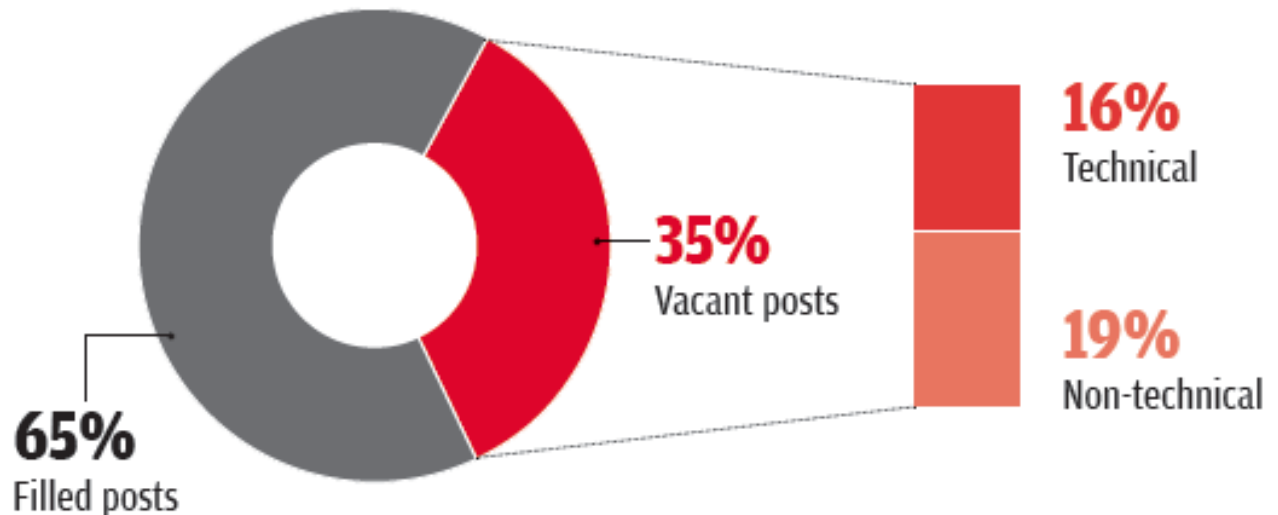


Norms are lenient- while improving, huge push-back is noticed

Regulatory system suffers

- ✓ Shortage of skilled manpower and infrastructure.
- ✓ A regulator gets less than 1 day for inspection of one industry in a year. (including time for travel, inspection, report preparation.)
- ✓ Number of industries are increasing and areas of work are expanding – gap between resource need and availability increasing

Most state pollution control boards are unable to monitor industries due to unfilled sanctioned posts



Source: CSE, based on data provided by state pollution control boards; Note: data is for six states—Maharashtra, Karnataka, Odisha, West Bengal, Tamil Nadu and Gujarat

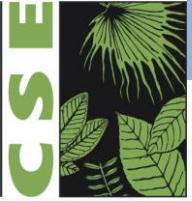
In India

Pollution monitoring and reporting – not credible at all.

- ✓ Regulators have no means and time to verify. It is not feasible to go, monitor and verify regularly.
- ✓ Ease of doing business also pushes for quick clearance.

Scope of action against defaulters are limited.

- ✓ Legal actions may lead to endless man-hours and time which is already scarce.

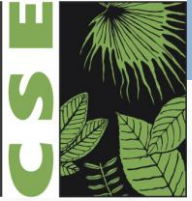


- Credible pollution monitoring- less manual intervention
- Transparency
- Better regulatory hand- continuous vigil
- Immediate corrective measures
- Process optimization
- Basic framework for market based pollution control
- Paves path for Self- monitoring regime

Helps in better compliance enforcement. Real time monitoring can be instrumental in bringing new era of environmental regulation.

US, Europe etc. have well established CEMS framework. Between 2005 and 2015, US has achieved huge emission reduction from power plants- NO_x emissions declined by 62% (from 3.4 to 1.3 MnMT), SO₂emissions declined by 78% (from 9.3 to 2.0 MnMT)

Real time monitoring brings

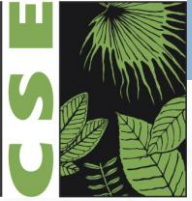


Two types of continuous or real time monitoring systems:

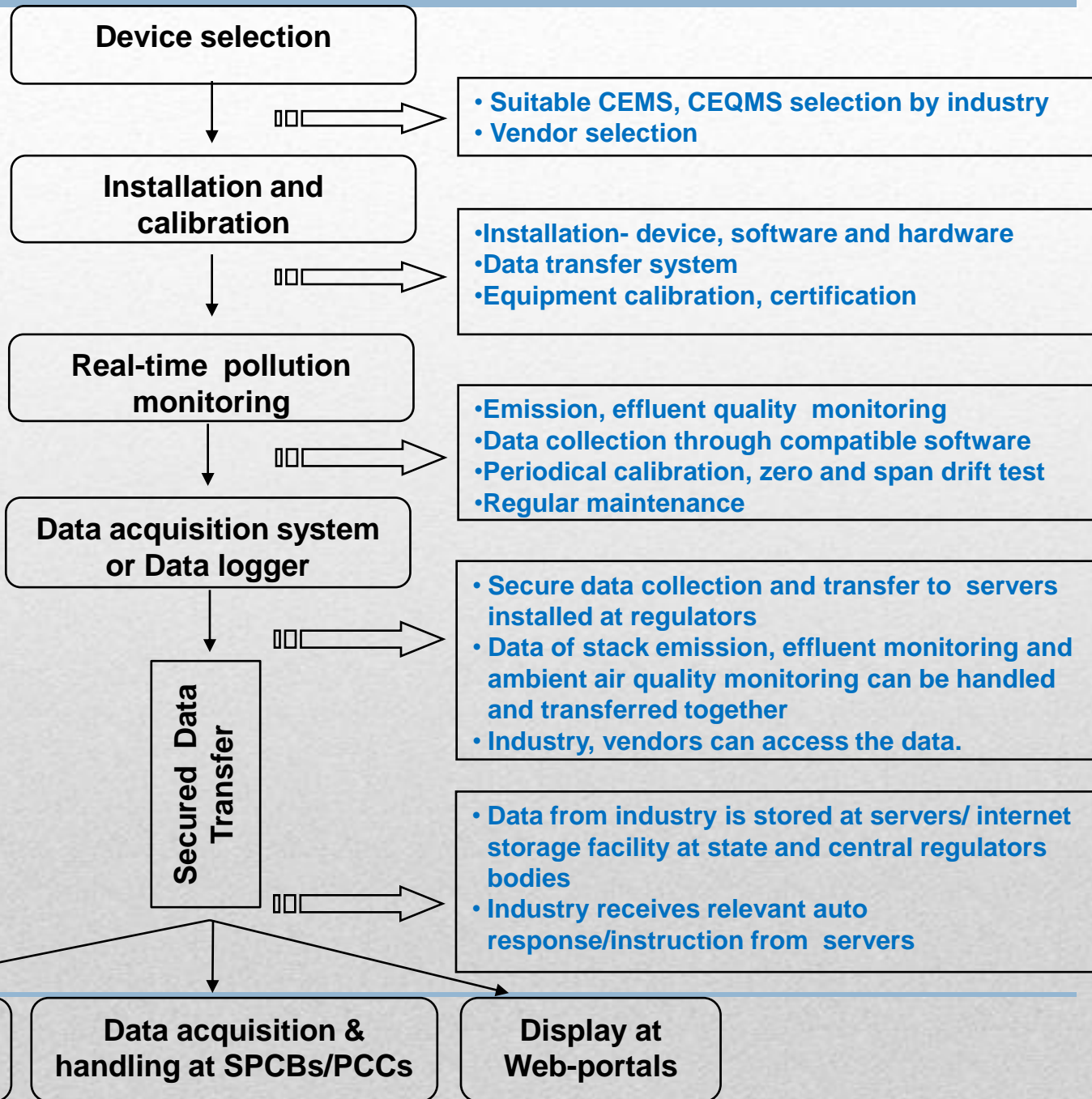
- ✓ **For air pollution: Continuous emission monitoring system (CEMS), CAAQMS**
- ✓ **For water pollution: Continuous effluent quality monitoring system (CEQMS)**

It comprises components for sampling, conditioning, and analysis. Hardwares and softwares are integrated to collect data, interpret into digital and readable format and transfer to server installed at regulators.

What is CEMS?



How does it work?



Emissions/ Effluent



Analyzer



Analog (4-20mA)



Analog to Digital Converter

(Broadband/LAN/GPRS/Wifi)

Digital (RS232/RS485 TCP/Modbus)



PC or Data Logger

REST based Open API Communication with Encrypted Data over HTTP



Central Server Software

Central Server



High Speed Internet With Static IP



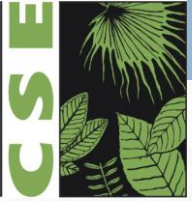
Browser based Access

Industry Representative

District Engineer



Conceptual view of online monitoring

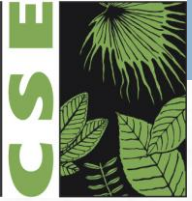


- ✓ CEMS started with CPCB's direction in Feb 2014.
- ✓ Real time effluent quality monitoring started in March 2014.
- ✓ A pilot scale PM ETS (2011) - Gujarat, Maharashtra and Tamil Nadu.
- ✓ After installing, every industry has to register CEMS at CPCB's industry registration portal (<http://assetlogiciq.com/>) with basic information about their instrumentation and processes etc.
- ✓ Industries monitor the mandatory parameters through CEMS and send data to the CPCB and SPCB's servers. Servers installed at SPCB and CPCB send alerts to the industries in case of exceedance or non-compliance.

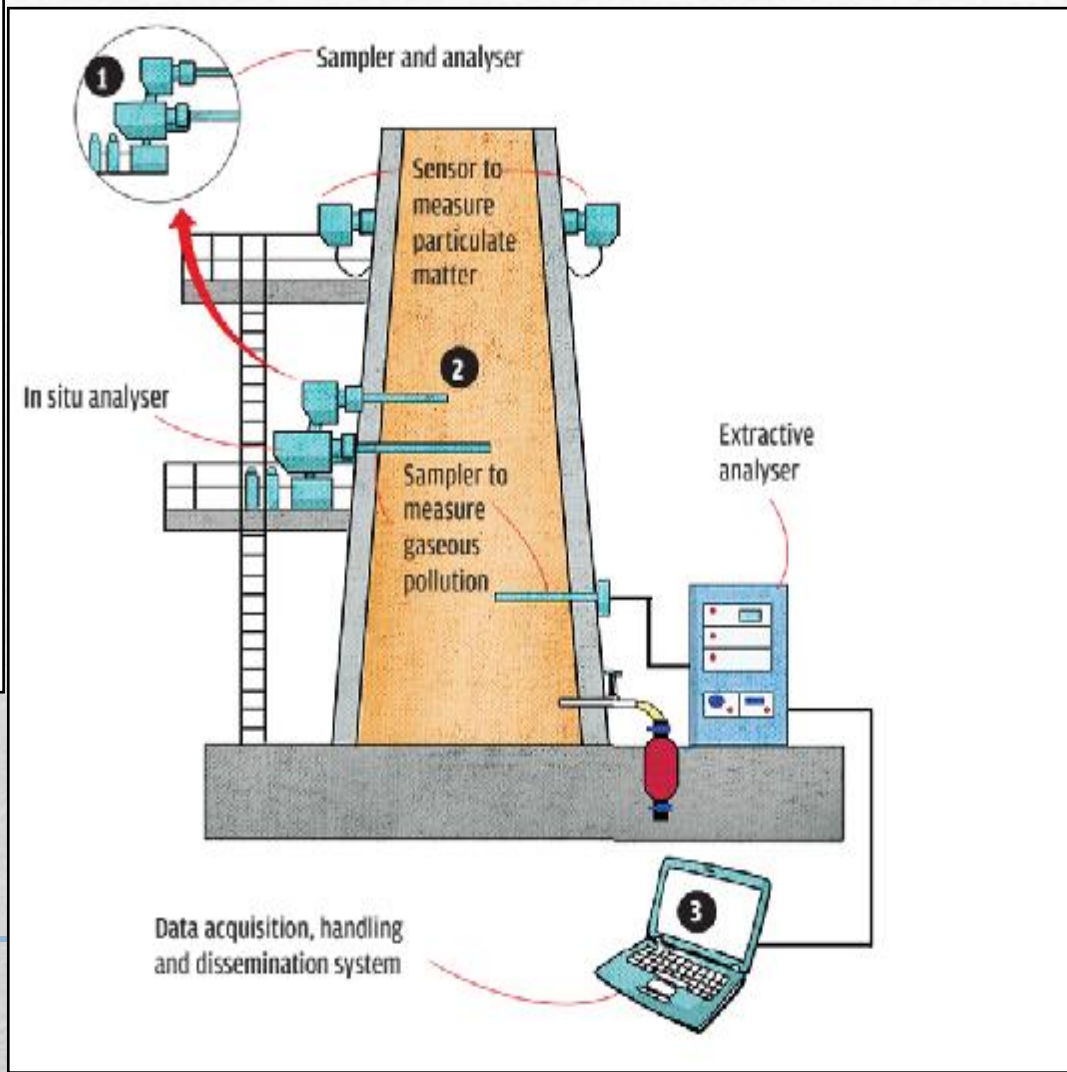
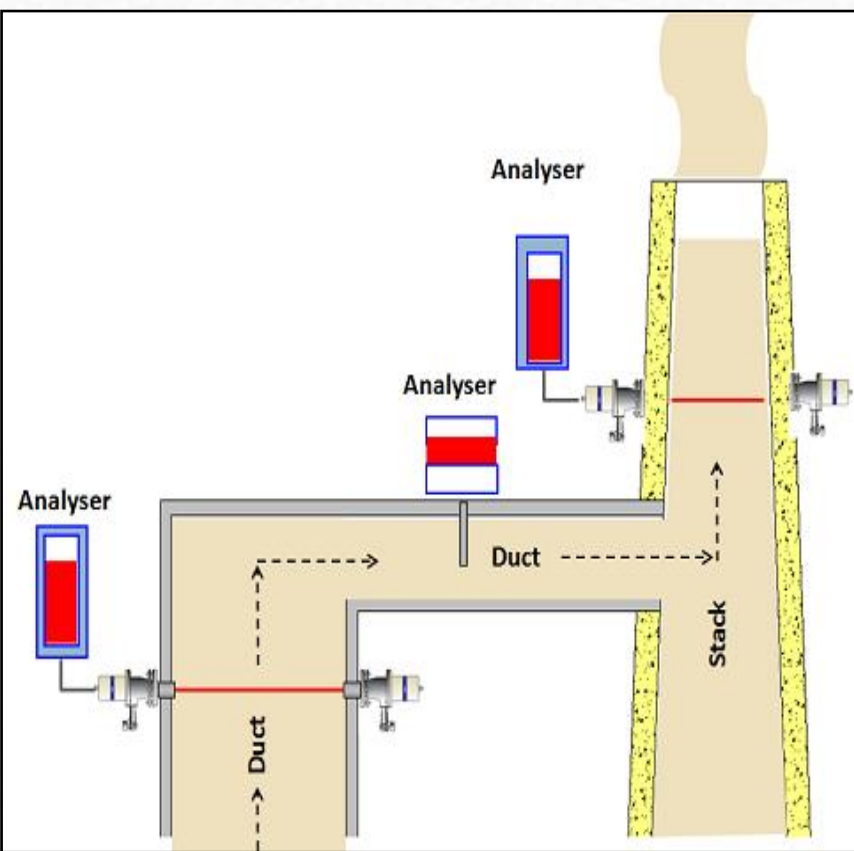
Regulation for CEMS in India

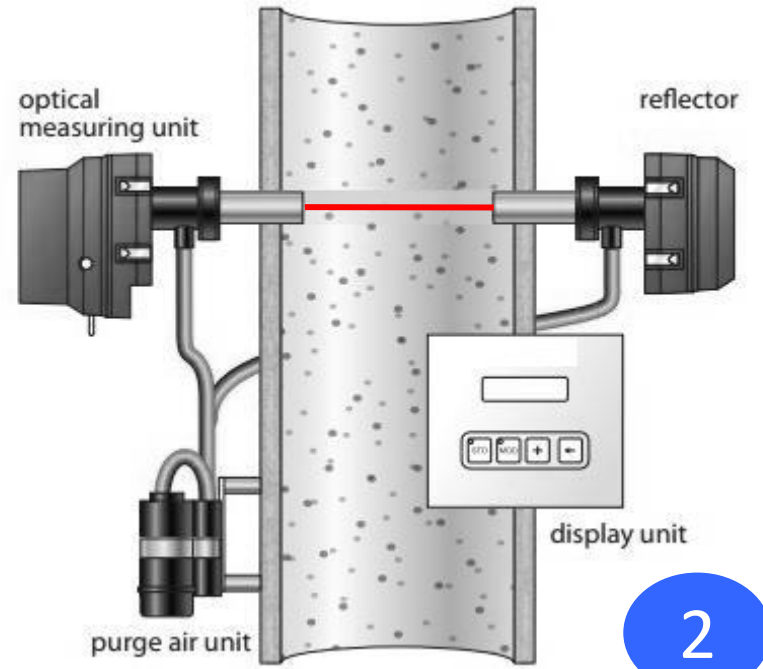
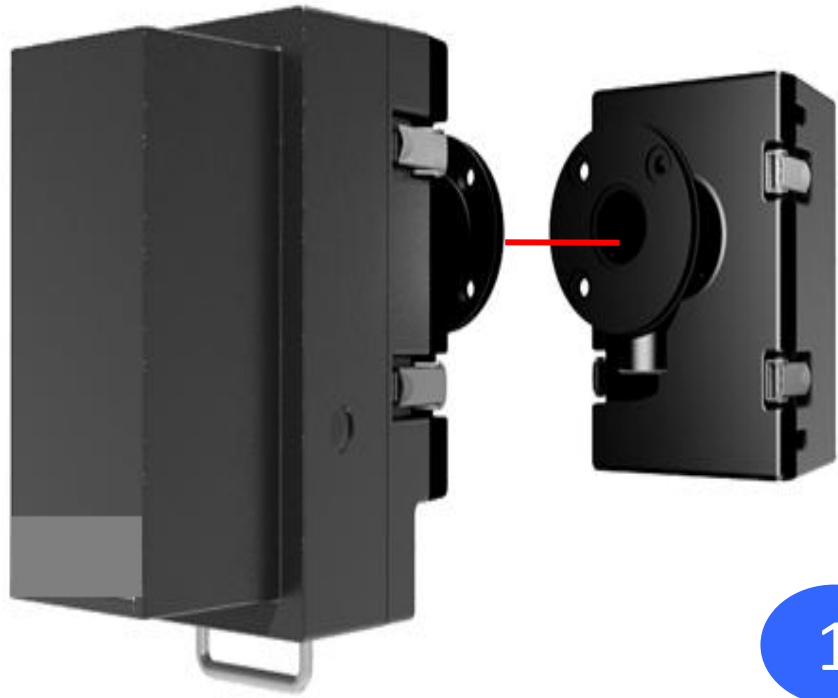
Industry and parameter to be monitored using CEMS

Category	Effluent Parameters(13)	Emission Parameters(7)
Aluminium	pH, BOD, COD, TSS, Flow	PM, Fluoride
Cement	-	PM,NOx,SO ₂
Distillery	pH, BOD,COD,TSS, Flow	PM
Dye and dye	pH, BOD,COD, TSS, Cr, Flow	-
Chlor Alkali	pH, TSS, Flow	Cl ₂ ,HCl
Fertilizers	pH, flow, Ammonical Nitrogen, F	PM, Fluoride, NH ₃
Iron & steel	pH, Phenol, cyanide, flow	PM,SO ₂
Oil refinery	pH, BOD,COD,TSS, flow	PM,CO,NOx,SO ₂
Petrochemical	pH, BOD,COD,TSS, flow	PM,CO,NOx,SO ₂ ,
Pesticides	pH, BOD, COD, TSS, Cr, As , flow	-
Pharmaceutical	pH, BOD, COD, TSS ,Cr ,As, flow	-
Power Plants	pH, TSS, Temperature	PM,NOx,SO ₂
Pulp & paper	pH, BOD, COD, TSS ,AOx, flow	-
Sugar	pH, BOD,COD,TSS, flow	-
Tannery	pH, BOD, COD, TSS, Cr, flow	-
Zinc	pH, TSS, flow	PM SO ₂
Copper	pH, TSS, flow	PM SO ₂



Equipments & Installation





PM (dust) CEMS

1



2



3



Gaseous CEMS

1



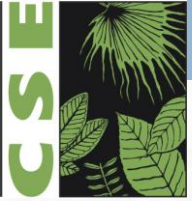
2



3



CEQMS

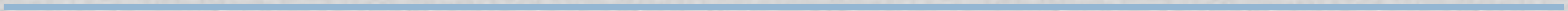


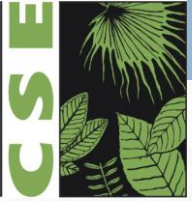
Success demands?

Roadmap

Strategy

Time-bound action plan





Self-regulation regime



Compliance check system



Regular operation & maintenance



Tamperproof data transfer system



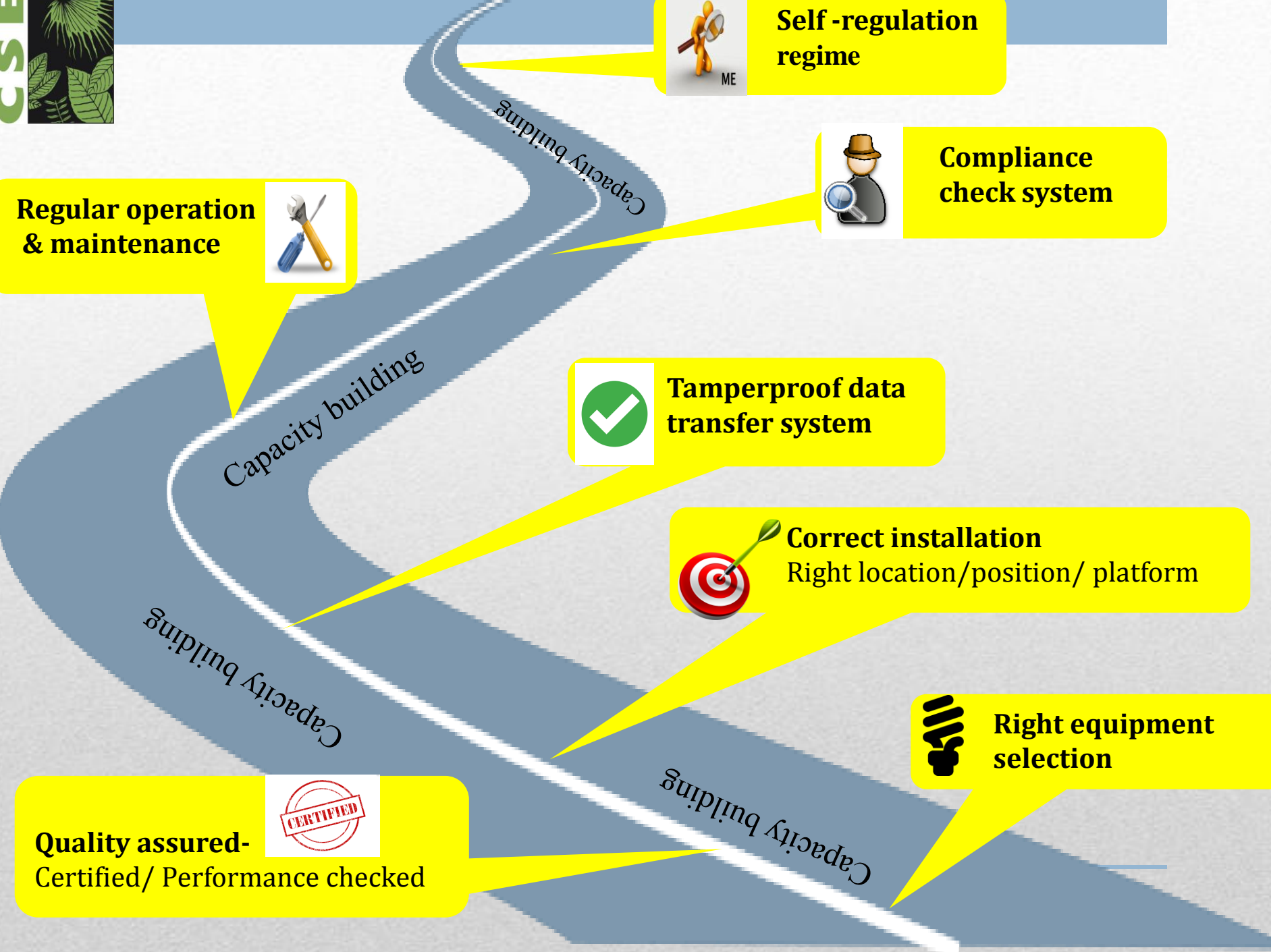
Correct installation
Right location/position/ platform



Right equipment selection



Quality assured-
Certified/ Performance checked



If missing ?

Around 80% industries have installed. Including GPI, common treatment facilities nearly 4000. Monitoring & reporting is yet to improve

Installation is still incomplete.

- ✓ Nearly 20% installation- one or other equipment such as camera, dust monitors etc. were missing.
- ✓ 15% of installation- not working/equipment failure.
- ✓ Another 15% claimed installation- no installation at site.

Many installations are wrong. No clear idea on where to install CEMS- which stack ? Which location ?

No clarity on suitable technology selection. Industries comply the direction; prefer cheaper devices irrespective to their suitability



Disturbance: Duct joining the stack

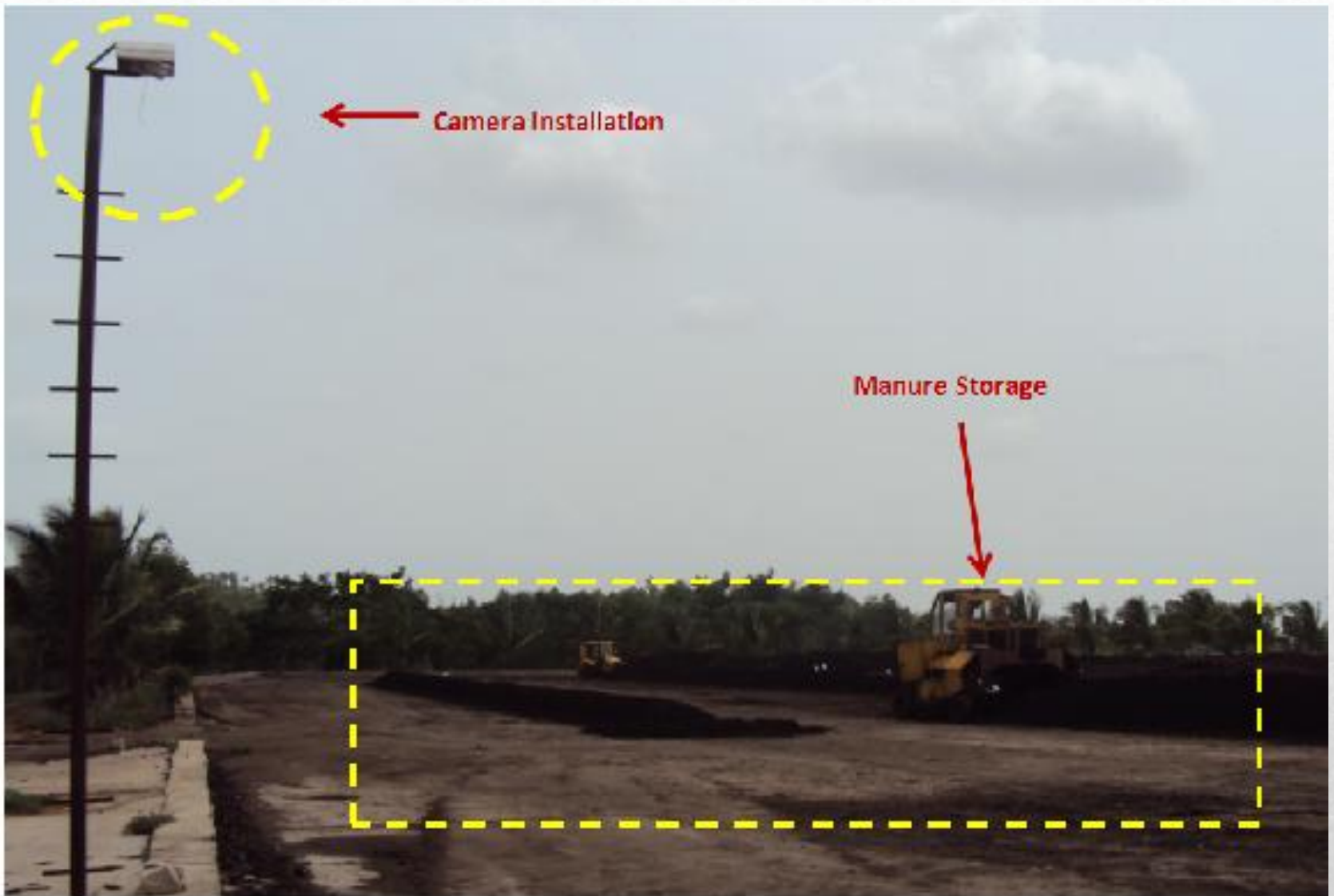
Real time monitoring device

Disturbance: Bent and joining of two ducts

CSE's survey: installation of CEMS

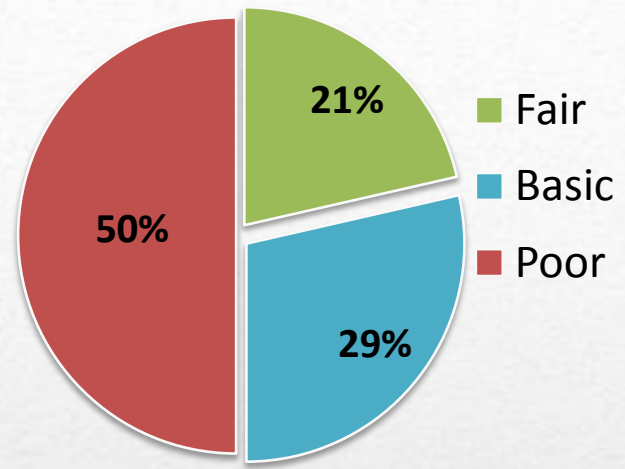


CSE's survey: installation of CEMS



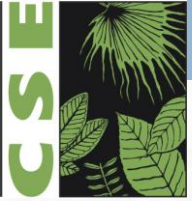
CSE's survey: installation of CEMS

- **Lack of adequate knowledge and skills** even with the larger industries. **Insufficient knowledge base** in stakeholders is one of the biggest issues.



- **No tool for quality assurance of CEMS.** Neither Device certification system exists nor the system for performance check during installation.
- **No lab accreditation/ empanelment system.** calibration, performance check and verification of CEMS which ideally should be done by empanelled labs don't exist.
- **Tamperproof data reporting, transfer and validation system is missing.**

Challenges: Summary



No generalized approach for technology selection.
It is based on the type of industry, process and flue gas characterization.

The data acquisition and handling software is provided with the device as a package.

Sector-specific directives and clear standards/regulations is a necessity.

Roles and responsibilities are clearly defined.

- ✓ Quality of the product and certification - Manufacturer
- ✓ Installation, O&M - Supplier and Industry
- ✓ Compliance - industry
- ✓ Compliance check - Regional environmental agency.

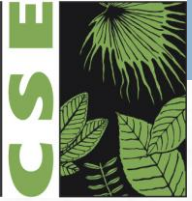
Best practices- Learnings from Germany

Certification and quality assurance of a CEMS device by a competent agency is mandatory.



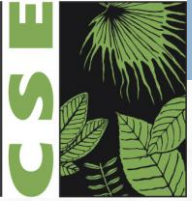
Industries install CEMS devices before and after pollution control equipments. Installing before treatment checks for any malfunction and level of treatment required





Environment, health and safety are prime concerns for German industries.





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CEMS data is seen in conjugation with plant's key operational data.
German industries consider CEMS data complementary to a plant's operational data as it helps in optimization of the process.



This is an opportunity. Collective, time-bound and strategic efforts are required to make it successful.

- ✓ A set of guidelines and protocols
- ✓ Quality assurance system
- ✓ Self-sustainable lab empanelment/accreditation system
- ✓ A tamperproof –uniform data transfer and validation process
- ✓ Clear Roles & responsibilities for Stakeholder.
- ✓ Skill and capacity building
- ✓ Inspection and verification of installations

Success must be assured