IMPLEMENTATION CHALLENGES IN CEMS: INDIAN EXPERIENCE

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OUTLINE OF PRESENTATION

- CEMS IN INDIA
- INDUSTRIAL REGULATION AND CEMS IN SURAT
- CALIBRATION
- VENDOR CERTIFICATION
- DATA ACQUISTION AND HANDLING
- DATA VALIDATION AND ANALYSIS
- SKILLED MANPOWER
- CEMS FOR DECISION MAKING
- WAY AHEAD

CEMS IN INDIA

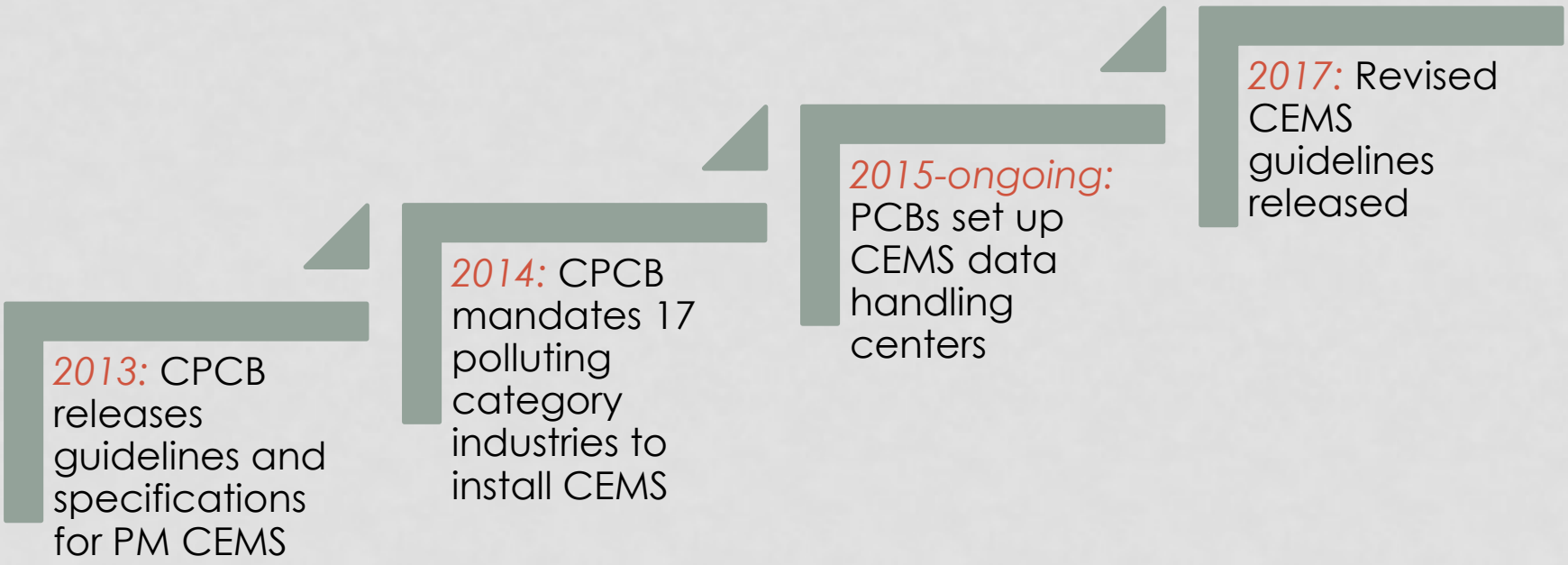


Figure 1. Timeline of key steps taken by regulators towards CEMS integration

INDUSTRIAL REGULATION IN SURAT

- High levels of emissions : More than half of units have been found to exceed the prescribed norms for Particulate Matter (PM)
- Regulator capacity crunch: More than 700 textile units with majority in small and medium scale supervised by decreasing number of officials and ever increasing mandates and number of industrial units
- Other innovations to monitor industrial emissions:
  - Using Close Circuit Television (CCTV) to monitor stack emissions
  - Resolving conflicts of interest in existing audit system

CEMS IN SURAT

- PM CEMS installed in 176 industries, 75% sending data
- Intended rollout to 350+ industries to test pilot emissions market

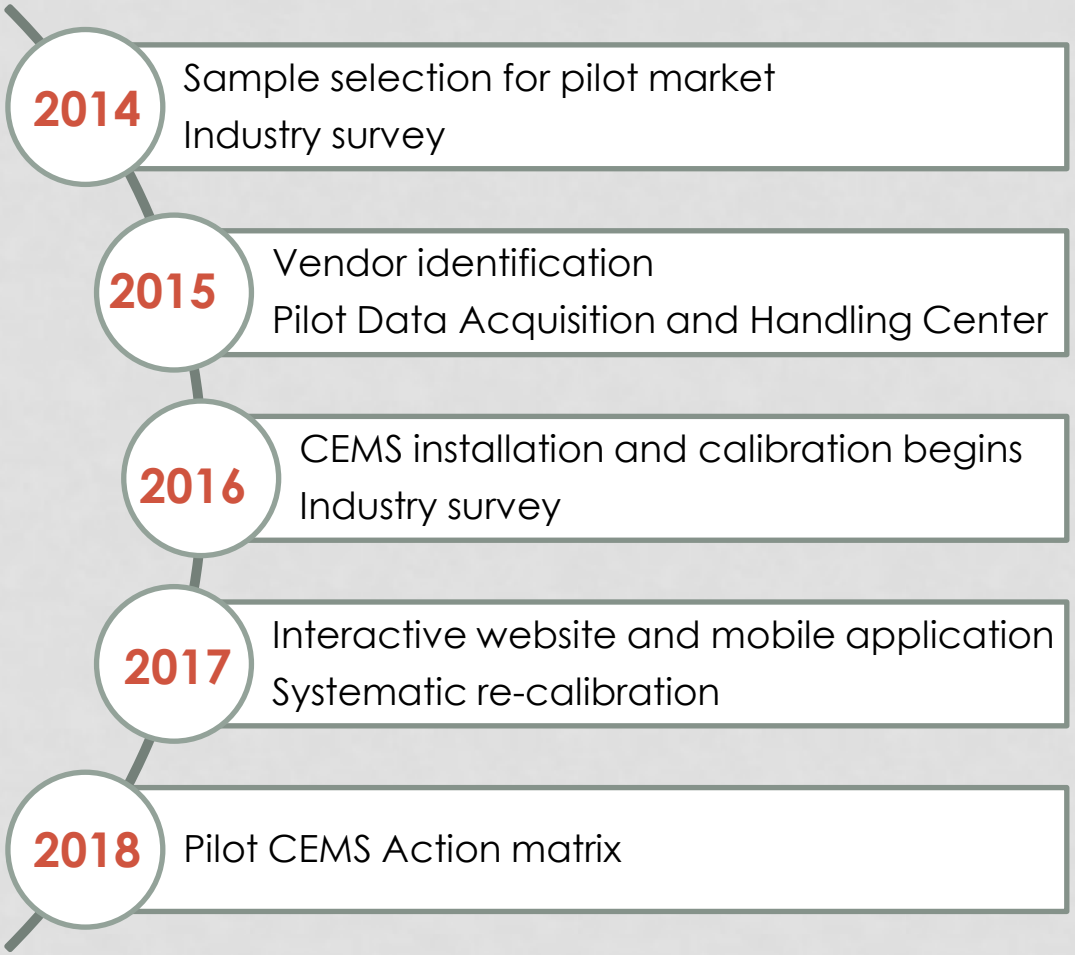


Figure 2. Key milestones towards using CEMS in Surat

STAKEHOLDER MAP

- Power-interest grid (Bryson, 2004) maps stakeholder commitment to high-quality data transfer
- Industries, vendors and labs with high influence lack interest

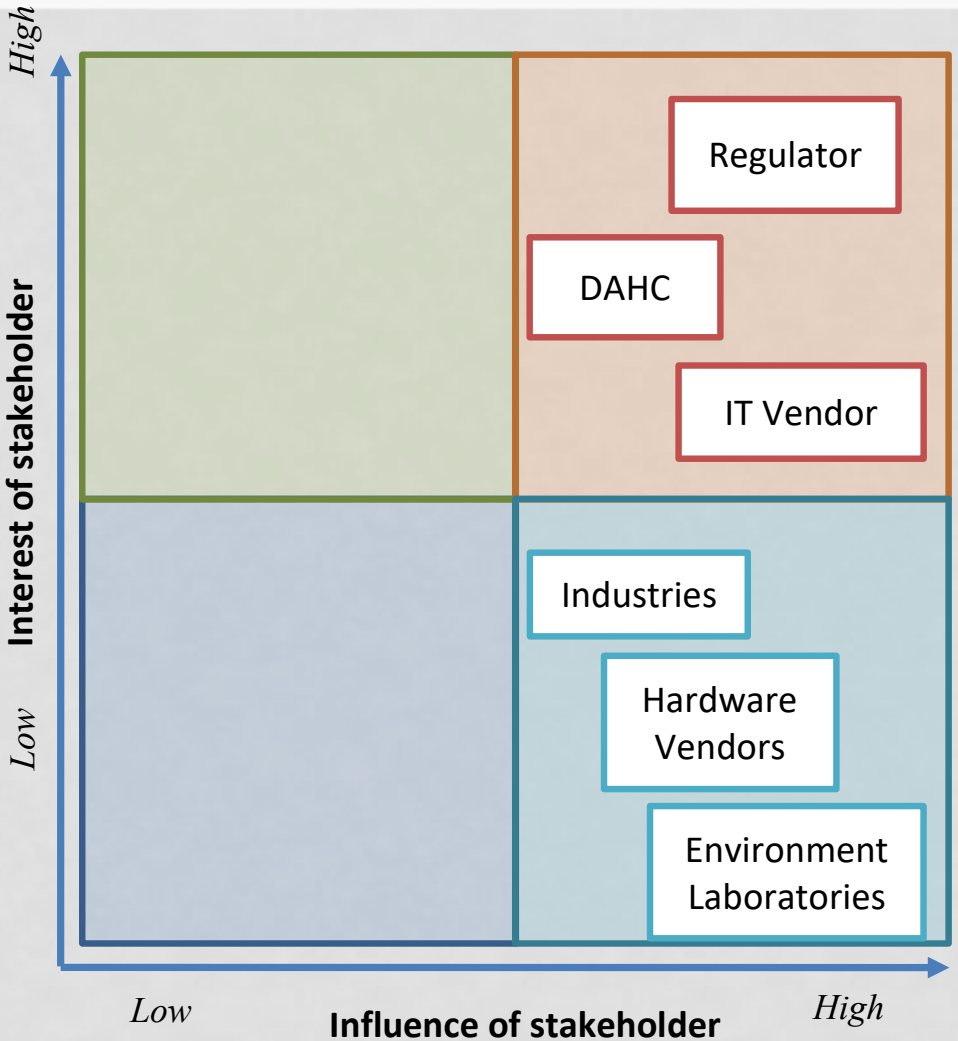


Figure 3. Gauging stakeholder interest and influence over data transfer

CALIBRATION

- Collusion between industries, vendors and labs to under calibrate
- Systematic calibration by third party calibration through auditor to resolve this issue
- True calibration factors almost twice the original

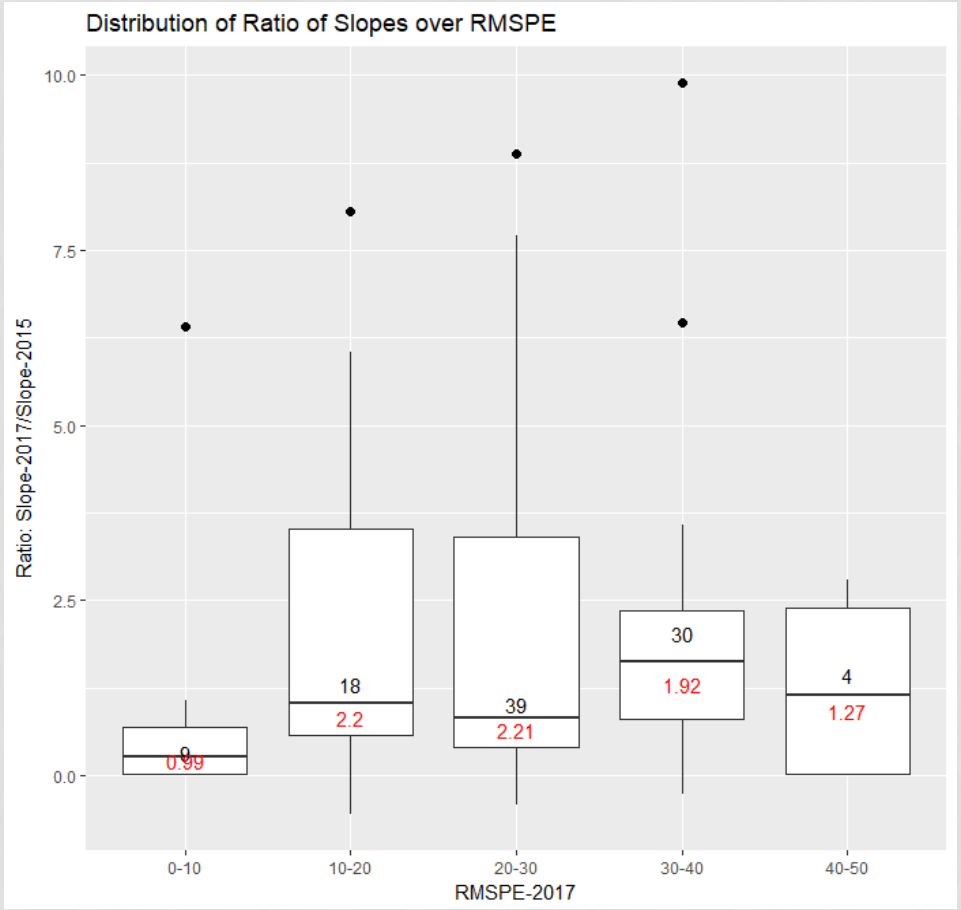


Figure 4. Comparison of calibration factors from 2015 and 2017

VENDOR CERTIFICATION

- Absence of quality standards
- Inconsistency in device performance
- 60% of industries met CPCB post-calibration requirements
- Low accountability

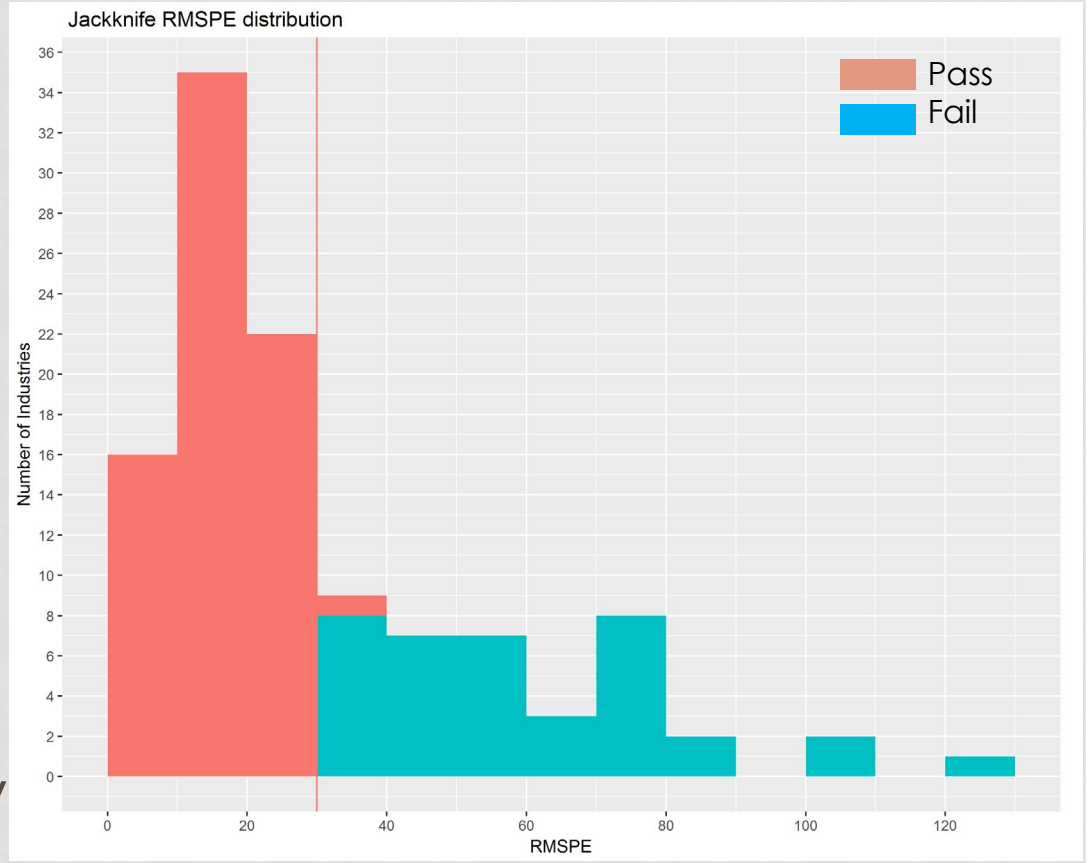


Figure 5. Distribution of Root Mean Squared Percent Error across devices in 2017

DATA ACQUISITION AND HANDLING

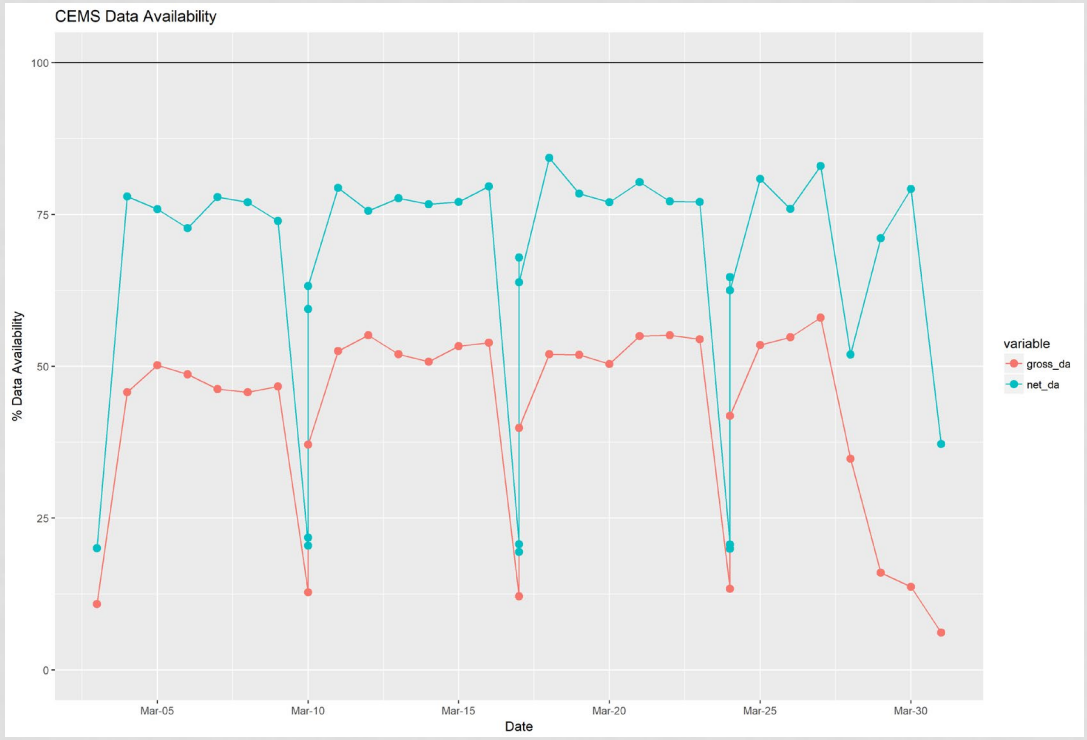


Figure 6. Data availability from March 1 to March 21, 2018

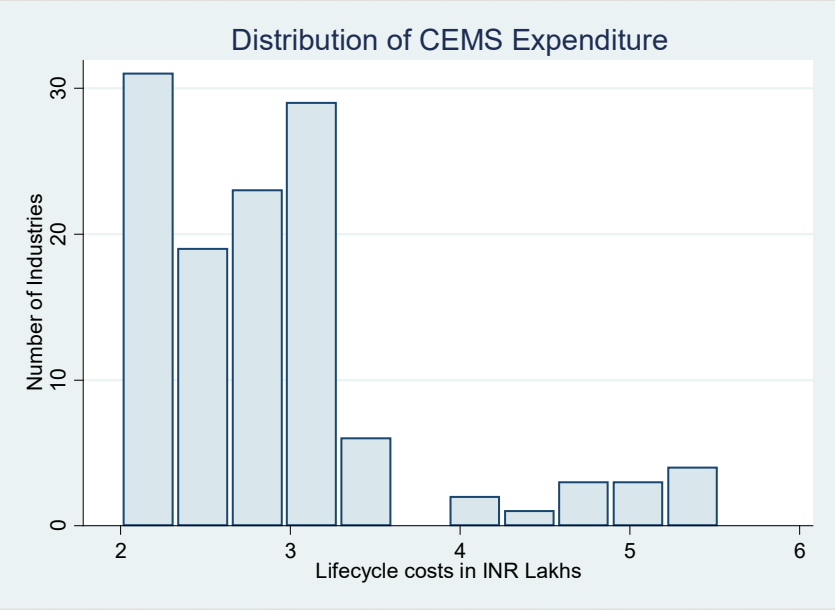
- Data generally available 60-65% of the time
- Multiple reasons for data unavailability – multi-dimensional problem
- Need for robust accountability structures

CAUSES OF DATA UNAVAILABILITY

Data unavailable at	Technological problems	Frequency of occurrence	Behavioural problems	Frequency of occurrence	Organizational problems	Frequency of occurrence
Site	Device software malfunction	Rare	Disconne-cting device	Very common	Poorly structured maintenance contract	Common
	IT Vendor software malfunction	Occasio-nal	Switching off PC	Rare	Unavailability of skilled labour	Rare
	Hardware problems	Very common				
Server	Server malfunction	Very rare				
	Data retrieval issues	Common				

CONTRACT STRUCTURES

Distribution of aggregated costs on CEMS till date



Desired characteristics of maintenance contract

- Provide preventive and breakdown maintenance
- Maintain spare parts locally for quick repairs
- Unlimited software maintenance
- Review device performance monthly
- Replace spares at minimal cost
- Troubleshoot issues within a limited timeframe

DATA VALIDATION AND ANALYSIS

- Need for an efficient data validation system
- Current validation methods include iso-kinetic sampling and Ringelmann surveys

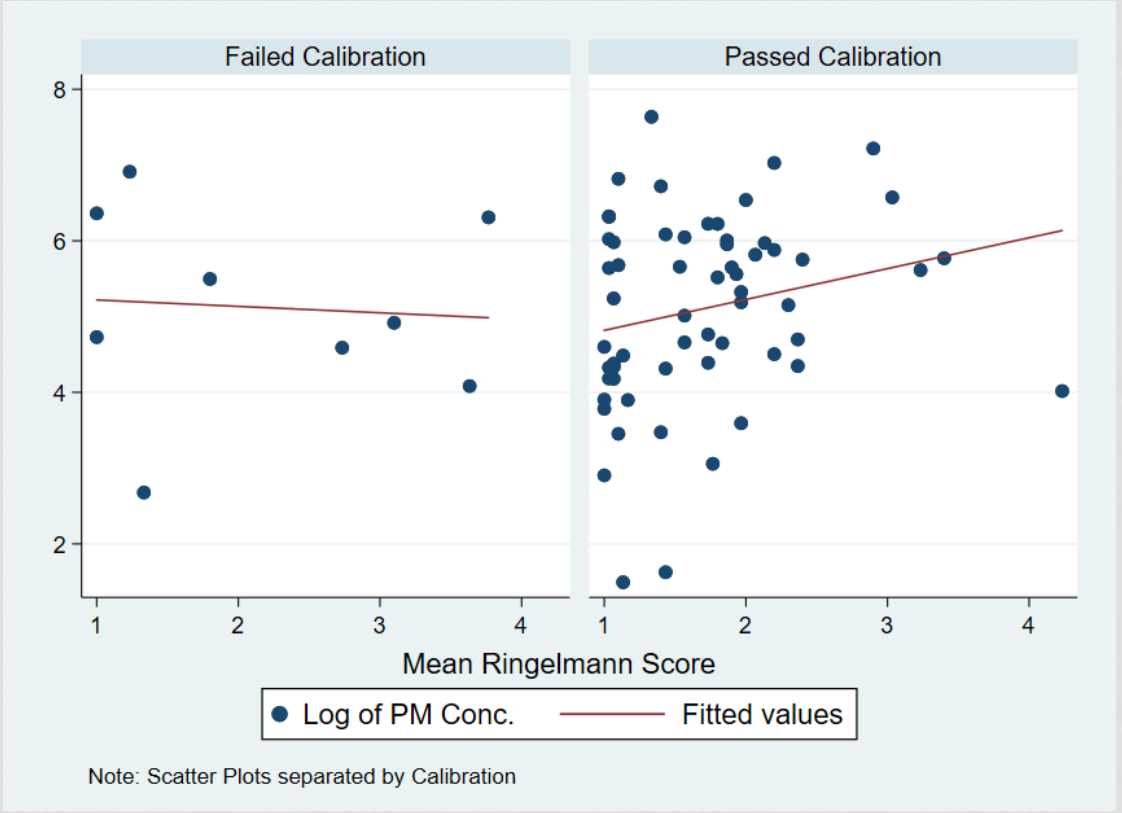


Figure 7. Plot of CEMS data against Ringelmann readings across calibration status

SKILLED MANPOWER

- State-owned Data Acquisition and Handling Centres set up
- Insufficient data specialists, CEMS experts
- Dedicated manpower unavailable, most officers handle multiple departments
- Introduction of multiple tools to enable effective utilization of limited capacity

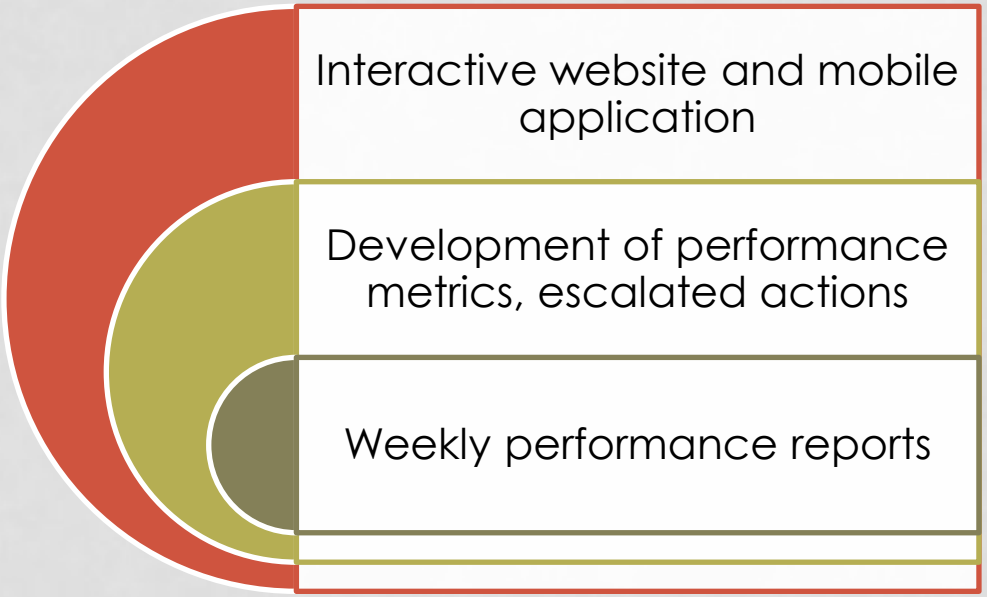
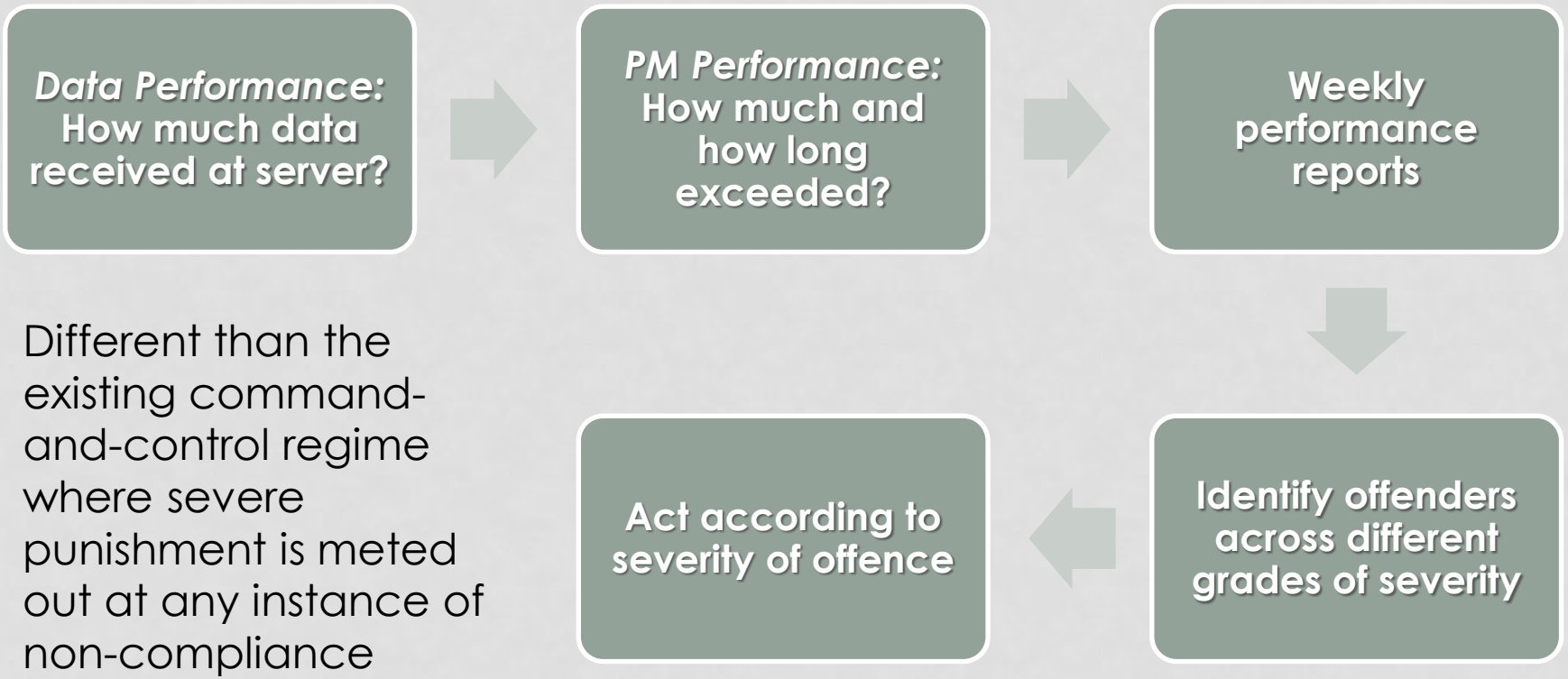


Figure 8. Tools to monitor industrial emissions through CEMS

CEMS DATA FOR DECISION-MAKING



Different than the existing command-and-control regime where severe punishment is meted out at any instance of non-compliance

CEMS DATA FOR DECISION-MAKING

- Two important metrics:
  - Data Performance: Indicates the percentage of data transmitted by the CEMS device to GPCB server.
  - PM Performance: Measured by PM Score, which indicates the duration and extent for which reported PM emissions exceeded prescribed norms of 150mg/Nm3.
- Use weekly performance reports to identify offenders across different grades of severity
- Act according to severity of offence
- Totally different approach than the existing command-and-control regime where severe punishment is meted out at any instance of non-compliance

WAY AHEAD

- Key threats to well-functioning CEMS:
  - Collusion between environmental laboratories and industries to misreport data
  - Weak contracting practices furthering disinterest or complacence among device vendors
  - Absence of a structured methodology for regulators to use and act upon CEMS data
- There is need for strong accountability structures
- Newly introduced action framework promises to improve plant accountability, should have a cascading effect onto the device vendors and environmental laboratories

THANK YOU

QUESTIONS?

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REFERENCE: RINGELMANN

- Low-cost, visual emissions testing
- Compares the colour of smokestack emissions against a calibrated grey scale
- High frequency means of testing pollution without directly sampling plants

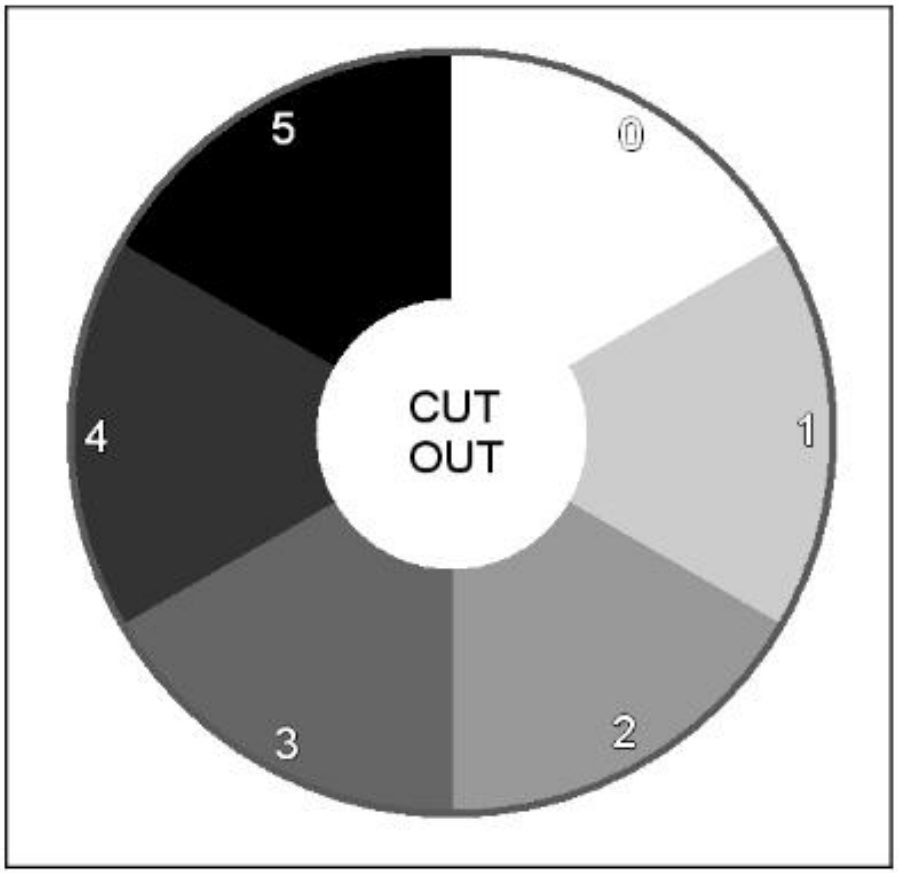

Figure 9. Rngelmann grey scale

REFERENCE: ACTION MATRIX

Action	*Period of Observation (No of week = X)*	*Criteria based on Data Performance*	*Criteria based on PM Performance*
Regional Office sends auto-generated SMS and email to industry	1 week	Industry is one of 5 with lowest positive data availability and mean data availability is <85% (OR) Industry has zero data availability for at-least X weeks in the past 4 weeks	Industry is one of 5 with worst PM Performance and exceedance duration > 0 hours
Regional Office sends auto-generated email and letter to industry	2 weeks		
Regional Office meets with industry and CEMS vendor	3 weeks		
Regional Offices conducts site visit and collects stack sample	4 weeks		