

The State of India's Pollution Control Boards

Who is in the field?

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1. INTRODUCTION

The Indo-Gangetic plain (IGP) in India is one of the most polluted regions in the world. A densely populated region, with a large number of sources emitting a range of pollutants, regulating air pollution here is an extremely difficult and complex task. Several measures are afoot to improve air quality in this region, and the State Pollution Control Boards and Pollution Control Committees (SPCBs/PCCs) are playing a key role. However, these frontline agencies in pollution regulation are faced with several institutional constraints and challenges in discharging their mandate effectively.

In *'The State of India's Pollution Control Boards'*, we explore some of the key institutional issues faced by Boards in the IGP through a series of working papers:

- 1) **"Who has a seat at the table?"** – Examines the composition of the Boards and their ability to engage in policymaking and take decisions in furtherance of their statutory goals;
- 2) **"Who is at the helm?"** – Analyses the qualifications of the Board's leadership - the Chairperson and the Member Secretary, the length and stability of their tenure, and whether they are well-placed to guide the Boards' functioning; and
- 3) **"Who is in the field?"** – Evaluates the adequacy of the Boards' capacity – particularly technical capacity – to perform critical functions like consent granting, inspection, monitoring, and enforcement.

In this paper – the third in the series – we focus on the technical capacity of the Boards, specifically the state of technical staff (engineers and scientists) employed by the Boards. The environmental engineers and scientists of an SPCB form the backbone of the institutional structure for pollution regulation. They carry out the fundamental task of the SPCBs, namely the review and grant of approvals under the environmental law regime. They evaluate applications from industries, conduct inspections or inquiries, collect and evaluate air and effluent samples, and issue approvals where applicable. Through their work, they provide the structural underpinnings to the "command and control" approach to pollution management. Several earlier reports have highlighted the significant staff constraints under which SPCBs function, highlighting in particular the high rate of vacancies among technical staff (1–3). In the context of a rapidly industrializing State, and an evolving environmental regulatory regime, there is a need for SPCBs to be appropriately skilled and staffed.

Based on information collected from state governments and pollution control boards through applications filed under the Right to Information Act, 2005 (RTI Act), information from various governments websites and insights shared during interviews with senior Board officials, this paper describes the state of play viz. staffing at SPCBs in the ten SPCBs and PCC across the IGP. It analyses the rate of vacancies for technical positions, the ratio of technical to non-technical positions, the implications of high vacancy rates on workloads, and the role of legal staff in the regulatory regime.

We find that sanctioned positions in many states have not been increased in over two decades, and SPCBs struggle to hire and retain staff for a number of reasons. The rapid industrial growth witnessed meanwhile has resulted in substantially higher workload than initially intended, resulting in a diluted pollution management regime as the staff struggle to meet existing guidelines on regulatory practices. With discourse around air quality management in particular rapidly evolving to encompass new technologies, frameworks for policy, and market-based mechanisms for regulation, there is a greater need than ever to strengthen the staff of flailing SPCBs so that they are able to meet current and future challenges.

2. EXPECTED DUTIES OF THE STAFF

The effectiveness of a SPCB as an environmental regulator is determined to a great degree by the staff employed to support the Board in its duties under the Air Act and other laws. Apart from functions related to planning air pollution abatement programmes and laying down standards for air quality, the duties of the SPCB related to enforcement are predominantly carried out by the SPCB staff. The erstwhile Planning Commission's evaluation of the functioning of SPCBs positions the 'command and control' approach of the Boards as embodied within the Water Act and the Air Act and highlights three main instruments employed by the SPCBs to achieve their objective under the Acts – (i) consent to establish (CTE) (ii) consent to operate (CTO) and (iii) establishing standards for emissions and effluents (3). The SPCB staff – broadly categorised as technical (engineers and scientists), legal and administrative – have a substantial role in all three instruments.

In terms of the command aspect, environmental engineers are entrusted with the duty to review applications for grant of approvals to industries under various environmental laws and rules and impose conditions for pollution control. This includes applications for CTE and CTO under the Air Act¹ and the Water Act,² and prior authorisations under the Hazardous Waste Management Rules, 2016,³ the Bio-medical Waste Management Rules,⁴ Solid Waste Management Rules, 2016, the Construction and Waste Demolition Rules, 2016 and the E-Waste (Management) Rules, 2016⁵ among others. The environmental engineers at the SPCB evaluate the applications, conduct an inquiry or inspection if necessary and thereafter either grant or refuse the application with reasons recorded in writing. Based on the information submitted and the nature of the activities carried out by the industry, the environmental engineers impose general and specific conditions in the approval, such as those for installation of pollution control equipment and emission and effluent standards to be complied with.

Additionally, the technical staff of the SPCB also play a key role in assessing industries in terms of their pollution potential. The Central Pollution Control Board (CPCB) has provided an inclusive list of industries and has categorised them into red, orange, green and white based on their size, use of resources, pollution potential and possible health implications arising from their operation (6). This categorisation is used for surveillance of industries and in streamlining the process for grant of consents or authorisations. Industries with high pollution potential are categorised as 'red' and are subjected to higher application fees, greater frequency of inspection of their premises (every six months), and restrictions on operation in certain areas such as ecologically sensitive zones. In the event that an industry does not fall within the CPCB's current categorisation, SPCBs can decide the categorisation for such an industry. For example, the Punjab PCB decides the category for such an industry via a committee comprising environmental engineers and scientific officers (7).

With regard to control, environmental engineers are tasked with ensuring that the conditions of consents or authorisations and standards for emissions and effluents are duly complied with. Empowered by the Water Act and the Air Act, engineers and scientists carry out inspections of industries and collect emission and effluent samples following standard protocols to assess whether they are in violation of prescribed standards (8). If these industries are found to be in violation, they are required to initiate actions against such violators including coercive actions such as closure or temporary cessation of electricity or water supply (7). In conducting these inspections, it is vital that SPCB staff follow protocols laid out in the law as only then evidence collected during such inspections is admissible in legal proceedings against contravening industries.⁶

Legal proceedings involving the SPCBs include those initiated by persons affected by polluting industries or concerned about the impact of such industries, those initiated by an industry aggrieved by the actions of the SPCB, or those by the SPCB against a non-compliant industry. These proceedings may be in the nature of writ petitions

¹ The Air (Prevention and Control of Pollution) Act, 1981 ('Air Act'), sec 21.

² The Water (Prevention and Control of Pollution) Act, 1974 ('Water Act'), sec 25.

³ The Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016, rule 6.

⁴ The Bio-medical Waste Management Rules, 2016, rule 9.

⁵ The E-Waste (Management) Rules, 2016, rule 13.

⁶ Air Act, sec 26(2).

before the constitutional courts,⁷ appeals before the appellate authorities constituted under the Water Act and the Air Act,⁸ criminal cases before the lower courts⁹ or proceedings before the National Green Tribunal (NGT).¹⁰ Legal officers appointed by the SPCB along with external counsel engaged by it are responsible for pursuing such cases before these courts and also for providing their opinion on aspects of enforcement that could have legal implications (9). The SPCBs do not possess the power to impose fines or levy penalties as such power only lies with the criminal courts. Therefore, in the case of defaulting industries, certain enforcement actions beyond the issue of closure notices are often contingent on the legal officer initiating proceedings before the court.

3. CURRENT STATUS

The environmental regulatory regime has seen significant changes in the last decade. The Ministry of Environment, Forest and Climate Change (MoEF&CC) notified the Construction and Demolition Waste Rules and the Plastic Waste Management Rules in 2016 and amended other regulations concerning solid waste, batteries and e-waste, completely reforming waste management in India. The guidelines on water quality monitoring, enacted in 2017, brought with them the legal mandate to have more frequent sampling and an increase in the number of parameters being evaluated (10). The National Ambient Air Quality Standards (NAAQS) were revised in 2009 to include eight new pollutants, including PM_{2.5}, PM₁₀ and ozone. These standards are fundamental in assessing non-compliance and determining priority areas for pollution control. Directions and orders of the NGT, set-up in 2010 with wide jurisdiction to address various aspects relating to pollution control, also play an important role in present day environmental regulation.

Within the air quality space, pollution control strategies have witnessed a shift from being primarily focused on vehicular and industrial pollution to including action on other sources such as emissions from firecrackers, crop residue burning and dust. At the same time, the country has witnessed increased urbanisation and industrialisation. Since 1981 – the year that the Air Act was enacted – India's Gross Domestic Product has increased almost tenfold, and its urban population has tripled (11,12). In response to industrial pollution, the CPCB and the Ministry of Environment and Forests had in 2010 devised the Comprehensive Environmental Pollution Index (CEPI) to assess environmental pollution levels in industrial clusters and assess the effectiveness of pollution control plans in these areas (13). The introduction of new rules and standards coupled with the rapid growth in industrialisation have placed a greater burden on environmental regulators - the SPCBs/PCCs, who have not strengthened their ranks adequately to be able to meet these demands.

Information on the Board staff of the 10 chosen Indo-Gangetic Plain (IGP) states and union territory were obtained through RTI Act applications filed in August-September 2021. The applications requested information regarding the current sanctioned strength and vacancies across technical positions, attempts to fill vacancies, and the number of consents issued.

To understand the functioning of the SPCBs/PCC and their perception of their capacities and constraints, we conducted a series of semi-structured, key informant interviews. We spoke to 18 current and former senior leadership of the CPCB and SPCBs (Chairpersons, Member Secretaries, Environmental Engineers, and Legal Officers) across the IGP states. Interviewee responses were anonymised, and States were coded to ensure participant confidentiality. These data were supplemented by a review of previously published reports on SPCB functioning, and data that are available on various government websites.

⁷ Constitution of India, Article 32 and 226.

⁸ Air Act, sec 31; Water Act, sec 28.

⁹ Air Act, sec 37; Water Act, sec 41 and Code of Criminal Procedure, 1973, sec 133; The Indian Penal Code, 1860, sec 268.

¹⁰ Air Act, sec 31B; The National Green Tribunal Act, 2010 ('NGT Act'), sec 14, 15 and 16.

In the following sections, we discuss in depth the change in the number of positions within these SPCBs/PCC over time, the proportion of those positions that are technical or legal in nature, and the rate of vacancies and associated workload implications for technical staff.

3.1. Have the number of sanctioned posts and occupied posts increased over time?

Our assessment of whether staff strength has grown to match the growing workload will be limited to the SPCBs/PCC of Punjab, Haryana, Delhi and Rajasthan as the historical and current data on the number of sanctioned posts and consents issued are only available for these four states in the IGP.

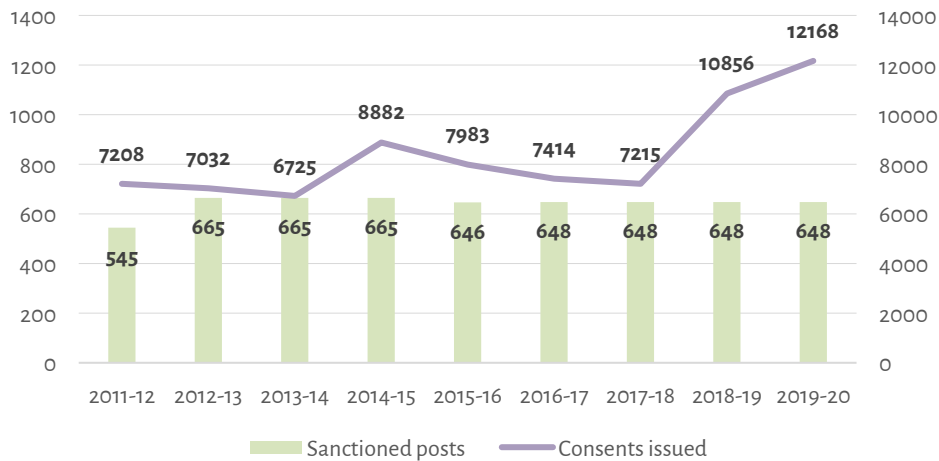


Figure 1. Snapshot of Punjab PCB - posts and consents issued¹¹

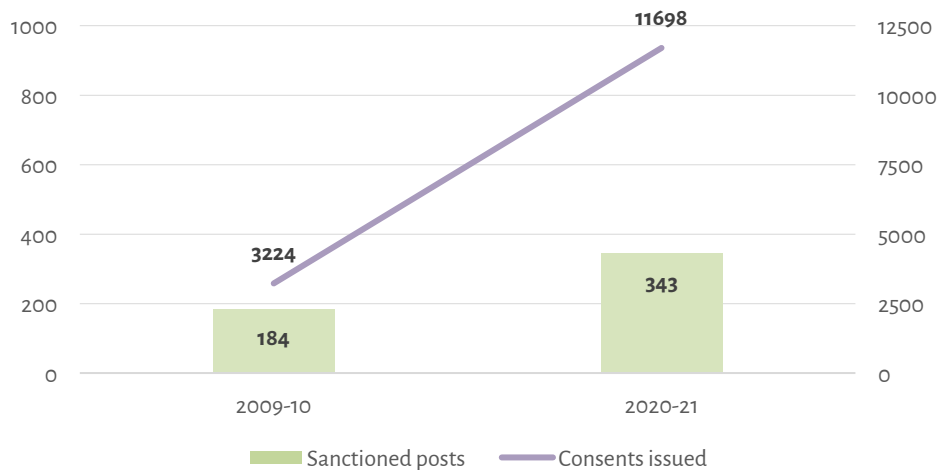


Figure 2. Snapshot of Delhi PCC - posts and consents issued¹²

¹¹ Sourced from the Annual Reports of the Punjab PCB (14). Sanctioned posts value for 2017-18 was not present in the corresponding Annual Report, so has been assumed to be the same as in 2016-17 and 2018-19.

¹² For 2009-10, the data has been taken from the Delhi PCC Annual Report (15). Please note that the report only includes consents issued in the green and orange categories, and not in the red category. For 2020-21, staff sanctioned strength data has been taken from the RTI response provided by DPCC (which refers to post creation order no. DPCC/Admn-DPCC/(3)(2)(29)/Admn-16/Vol.11/72-77 dated 28/06/2019), and data on consents issued has been taken from the OCMMS portal (16).

Over the last decade, Punjab issued nearly double the number of consents (Figure 1). In 2019-20, prior to the economic slowdown caused by COVID-19, the number of consents issued had increased by more than 70% compared to 2011-12. However, the number of sanctioned posts only increased by 19% during this period – not increasing since 2012-13. Between 2009-10 and 2020-21, the number of consents issued by Delhi increased by 263%, with the number of sanctioned posts increasing only by 86% in that time (Figure 2). The consent process under the Water Act and the Air Act includes reviewing the consent application, visiting the premises prior to final decision if required, and later monitoring the industry's compliance with the consent conditions through periodic inspections. These inspections are required to be undertaken every 3 months in case of the 17 highly polluting category industries, 6 months in case of red category industries and once a year in case of orange category industries. A two-fold increase in the number of industries being granted consents would expand the number of inspections manifold. It is clear from Figure 1 and Figure 2 that both Punjab and Delhi have been unable to augment their staff strength to keep up with the rapid industrialisation experienced in both regions.

During the same time period, Haryana (Figure 3) and Rajasthan (Figure 4) show a steady increase in the number of sanctioned posts. This is however not indicative of the true capacity of the Boards given that the number of posts occupied have been decreasing over the years.

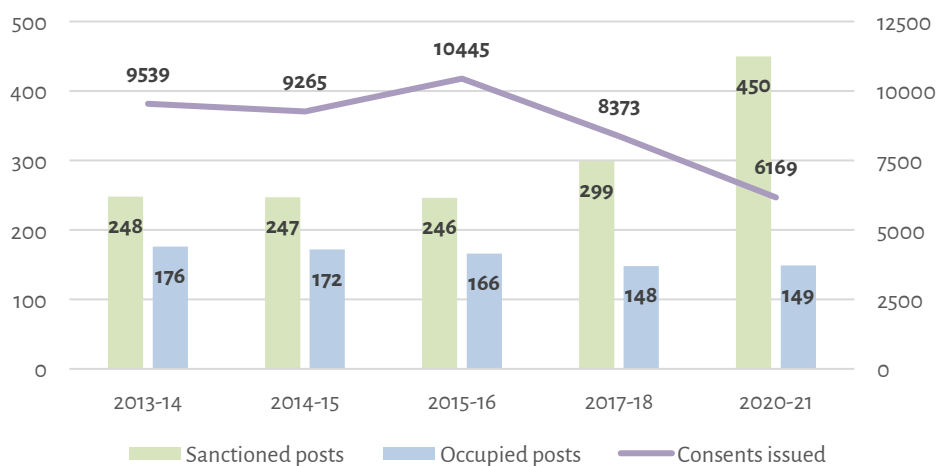


Figure 3. Snapshot of Haryana PCB - posts and consents issued¹³

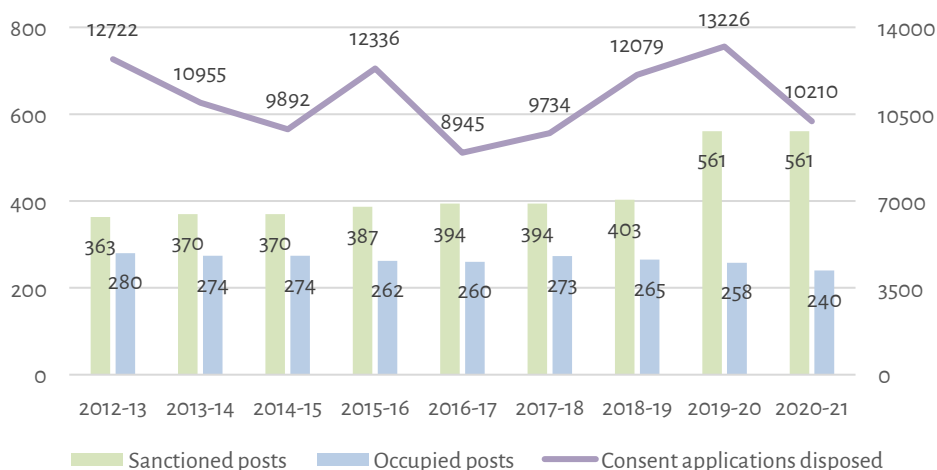


Figure 4. Snapshot of Rajasthan PCB - posts and consents issued¹⁴

¹³ Data taken from Haryana SPCB Annual Reports (17).

¹⁴ Data taken from Rajasthan SPCB Annual Reports (18).

Interviews with senior leadership across these Boards echoed the situation reflected in the numbers, with the Member Secretary of State 6 noting that sanctioned strength at his SPCB had not been expanded in over 20 years. He also noted that with a number of technical staff retiring by 2023, they would hit a wall with their ability to regulate effectively - “*char log se Board kaise chalega?*” (*how will the Board run with four people?*). The Member Secretary of State 3 termed the staff situation “*pathetic*”. The Member Secretary of State 1 highlighted the dire staff situation at his Board by signalling to the piles of documents lying on his desk and around the room that were to be managed by him and three other technical officers. A Regional Office-in-Charge at State 1 noted that the lack of manpower meant that routine tasks involved with consent applications often could not be completed, stating that he “*barely goes to the field*” and that “*inspections are done by others, I only inspect large industries, sometimes*”.

3.2. What is the current level of vacancies at the SPCBs?

Increasing sanctioned posts over time alone does not determine the capacity of the SPCBs to perform their duties. This is because most Boards across the country have failed in hiring staff to fill these sanctioned posts. Chairperson of State 2 noted that SPCB jobs are seen as “*thankless*”. In his words, “*There are always vacancies. In comparison, a job as a sub-engineer at the PWD is considered better than a job at the SPCB because it is an autonomous body*” (with none of the benefits associated with a government job).

In Figure 5, staff strength data for the 10 SPCBs/PCC has been compiled. The median vacancy rate across both years for all 10 SPCBs/PCC was 51%. Jharkhand in particular seems to have a very high level of vacancy with over 84% of the sanctioned posts remaining unoccupied. The RTI responses indicated that all 9 SPCBs/PCC had at least 40% vacancy in 2021. Interviews also revealed that challenges in hiring full-time employees resulted in SPCBs bringing on board contractual staff. This results in operational challenges as consent applications and renewals typically require review and sign-off by a permanent staff engineer. The Member Secretary of State 4 highlighted this as a challenge, noting that “*[they] need permanent staff to keep the system running on in a smooth way*”.

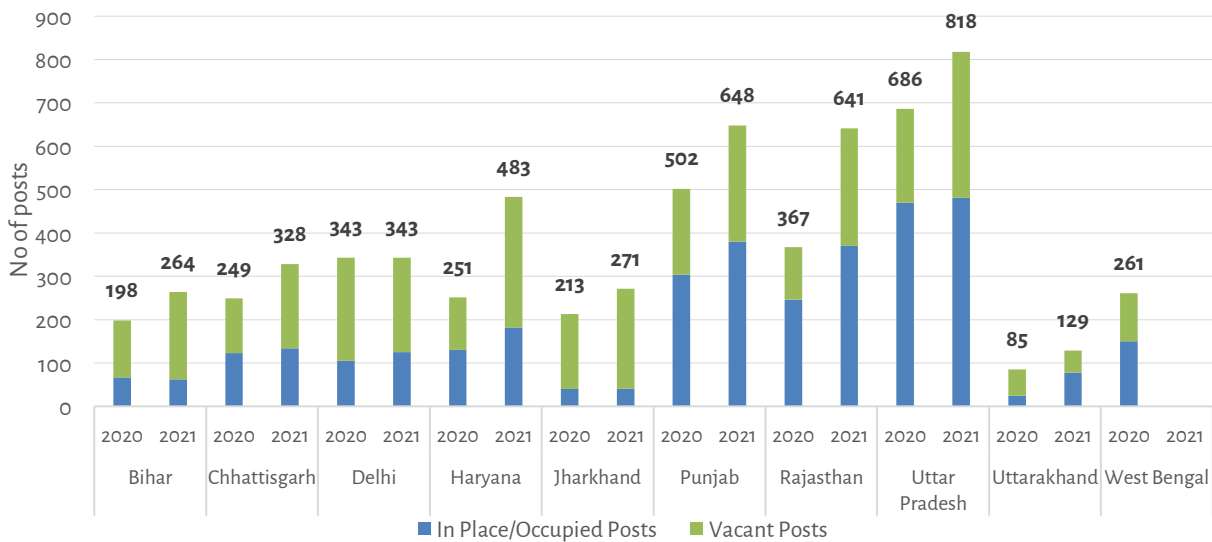


Figure 5. Snapshot of occupied and vacant posts across all 10 SPCBs/PCC¹⁵

¹⁵ Figure has been compiled based on the responses received to the RTI queries for 8 SPCBs/PCC for 2021. Data for 2020 has been taken from a performance audit of SPCBs/PCCs undertaken by the CPCB pursuant to a direction by the National Green Tribunal (1). West Bengal did not provide a response to the RTI query. Bihar only provided data for its total sanctioned posts, along with the number of vacancies it has advertised for. However, the status of vacancies in Bihar were obtained during the interviews conducted by us, and have been used to populate this figure.

3.3. What is the nature of sanctioned posts?

The SPCB staff can broadly be classified into two categories: technical and non-technical. The technical staff includes environmental engineers and scientists, with the non-technical including all other roles. In this analysis, we focus on the proportions between technical and non-technical staff within the sanctioned positions at each of the SPCBs/PCC.

In Figure 6, the share of sanctioned technical and non-technical posts has been shown based on the responses to the RTI queries. All sanctioned posts belonging to the environmental engineer and scientist category have been grouped under the 'technical' posts category, whereas every other sanctioned post has been grouped under the 'non-technical' category.

Two insights can be drawn from Figure 6. First, there is a wide variation in the ratio of the number of technical staff to the number of non-technical staff – an observation also noted in the CPCB 2020 report. Second, the only clear pattern that emerges across the 9 SPCBs/PCC is that the number of sanctioned posts for non-technical staff generally exceeds the number of sanctioned posts for technical staff. This observation is at variance with the CPCB 2020 report, as according to the report 9 SPCBs/PCC (not including Punjab) had a greater share of scientific and technical posts as compared to administrative posts (1).

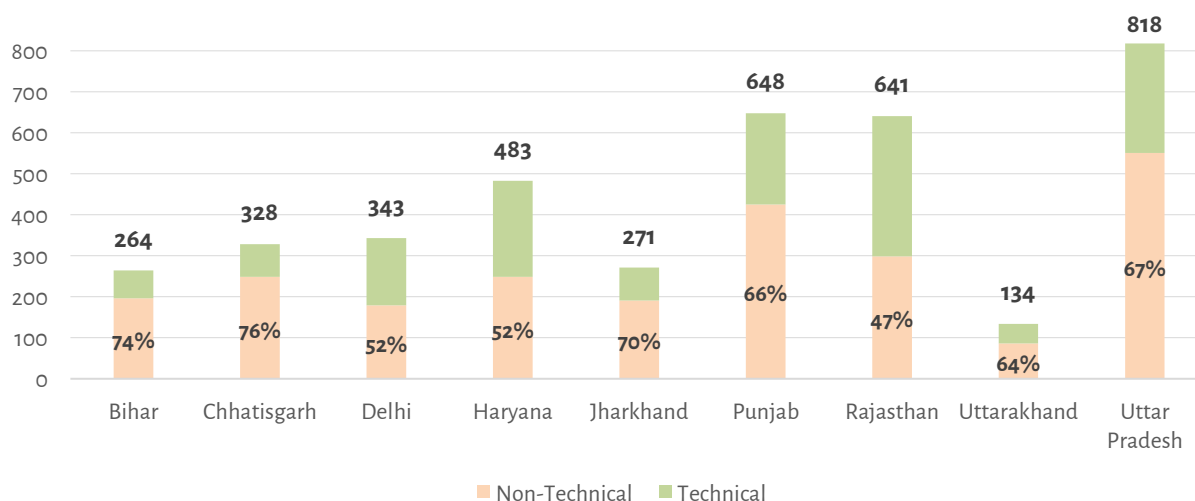


Figure 6. Share of sanctioned non-technical and technical staff posts in 9 SPCBs/PCC

3.4. How do vacancies affect the workload of technical staff?

“We are grappling with the shortage of staff, we’re only 100 people, and we have so many statutory obligations now, with around 10000 industries. Every officer is working 12-14 hours. As per my study, we need three times the current capacity in terms of man hours to deal with the situations.” - Member Secretary, State 6

As mentioned previously, the technical staff of the SPCBs comprises scientists and environmental engineers employed to carry out the functions of the Board. Among the SPCBs for which data was made available, five of the eight have over 60% vacancies in scientist positions with Haryana and Jharkhand having over 80% of such scientists’ positions left vacant. In terms of vacancies amongst environmental engineers, it was observed that four of the eight states had over 50% vacancies. Once again, Jharkhand stands out with nearly 80% vacancies in the number of environmental engineer positions.

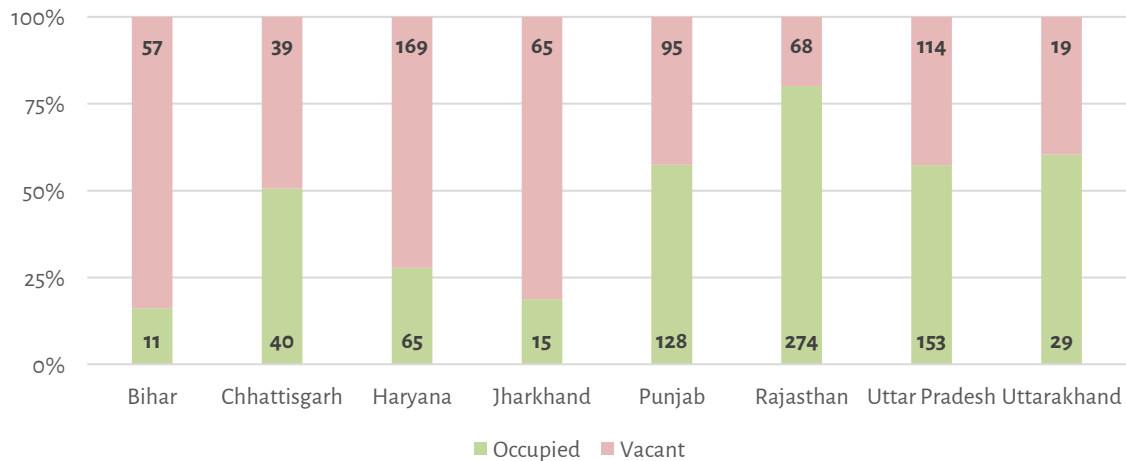


Figure 7. Snapshot of technical posts (environmental engineers + scientists) across 8 SPCBs¹⁶

Figure 7 details the number of sanctioned posts and vacancies within technical staff in 8 SPCBs. Overall, 4 of the 8 SPCBs have approximately half or more of their environmental engineer and scientist posts vacant. Occupancy is less than 25% in Bihar and Jharkhand.

Vacancies in technical staff have a significant bearing on the ability of the Board to monitor industrial compliance as indicated to us by the Chairperson of State 1 –

“It is practically impossible to undertake monitoring duties when there is a high staff crunch. We are working at ~30% of our sanctioned strength. If you expect [State 1’s] pollution to be controlled with [such a small number of staff], then I will frankly tell you it is impossible”.

In order to gain a better understanding of the need to fill these vacancies, we have reviewed the number of current engineers as against one of their duties - to review applications for CTE/CTO under the Water Act and the Air Act. The Online Consent Management and Monitoring System (OCMMS) dashboard provides information regarding the application for consents and the granting of consents in almost every state in the country (16). We estimate the average amount of time available per environmental engineer post for processing consent applications, by considering the consent applications received by the 7 SPCBs in the years 2019, 2020 and 2021.¹⁷ Combining this with the information on sanctioned posts and occupied posts provided in the responses to RTI queries, along with the information available on the OCMMS portal, we estimate the amount of time being spent in processing each application as shown in Figure 8.

¹⁶ West Bengal did not respond to our RTI queries with data on staff strength, hence West Bengal has not been included in the figure. Delhi is also excluded as it did not provide information regarding the vacancies in technical staff, but based on our interview notes, DPCC has added 70-80 new environmental engineers in 2021. Bihar did not share information regarding vacancies in its response to our RTI query, therefore data collected through interviews has been used.

¹⁷ Delhi, Rajasthan and West Bengal were excluded due to a lack of data. For Uttarakhand, data on applications from 2020 and 2021 only were considered. Bihar data regarding occupied posts is taken from our interview notes.

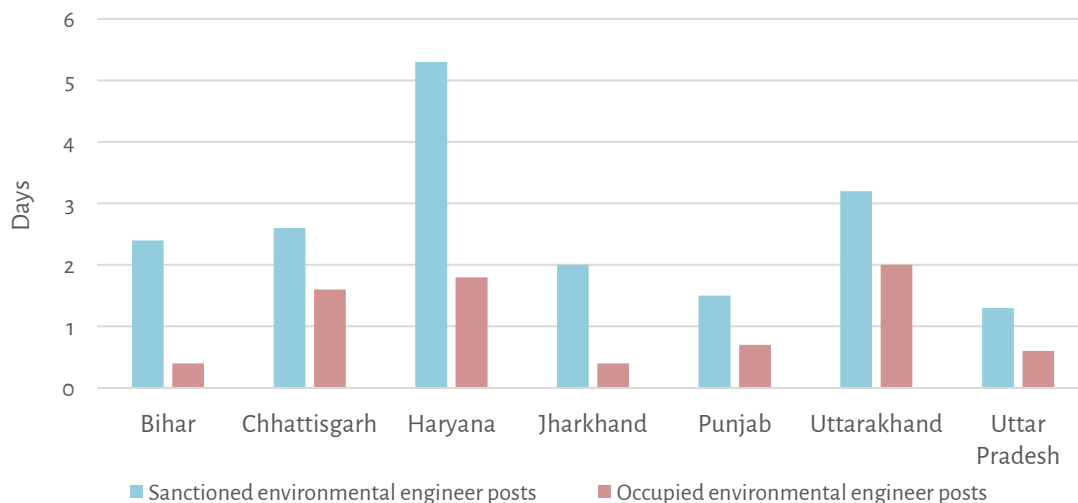


Figure 8. Number of days available per environmental engineer post to process one application)¹⁸

Assuming that a year has 240 working days, we estimate the average time available per post of environmental engineer to process an application for CTE/CTO, across three years between 2019 and 2021. In the figure, the time available is estimated based on both the total occupied environmental engineer posts (in red), as well as the total sanctioned environmental engineer posts (in blue) - the theoretical full strength. Four of the seven states have less than a day available to them to process each application per occupied post. None of the states have more than 2 days available per occupied post. Even when considering sanctioned posts, the situation is not significantly improved, as only Haryana and Uttarakhand can spend more than 3 days per application per environmental engineer post.

It is important to note that while these numbers are indicative of high workload, they do not segregate the applications on the basis of CPCB's industry categorisation, or on any other basis. This means that while different types of applications would require varying processing time, the data available can only provide aggregated time estimates. Further, issuing consents is just one aspect of the job of environmental engineers, and thus does not fully capture their workload. For example, another key aspect of their job is inspecting industrial units, and in 2019, the NGT mandated more frequent inspections than before.¹⁹

Given this workload, it is likely that many of the responsibilities of the technical staff members are often either neglected or being performed by non-technical staff members or third-party contractors. In the words of a former Member Secretary of the CPCB, "most of the engineers and scientists in these ten SPCBs are doing only paperwork now", with much of the work related to inspection and monitoring dependent on third-party laboratories.

In this context, it is worth considering how closely inspections especially for highly polluting industries follow established protocol, and whether the appropriate amount of time is accorded by SPCB staff to conduct these inspections, analyse the sample data, and issue reports. A legal officer with State 3 informed us that "50% of columns in inspection reports are blank", likely due to the time constraints on technical staff.

¹⁸ Processed application data from OCMMS dashboard was estimated by subtracting the number of pending applications from the number of total applications received (16). Data from previous years gets updated on the dashboard from time to time. The data regarding consent applications processed was obtained in April 2022.

¹⁹ *Shailesh Singh v State of Haryana*, 2019 SCC OnLine NGT 1352.

Table 1. Status of Regional Offices (ROs) - environmental engineers posted and consents issued

State	No. of ROs in the state	No. of ROs for which data is available	No. of Environmental Engineers per RO	Average consents issued in 20-21	Consents issued per Environmental Engineer
Bihar	5	2	1	761	761
Chhattisgarh	7	7	2.1	210	98
Haryana	17	16	2.6	361	141
Rajasthan ²⁰	15	15	4.5	667	170
Uttarakhand	4	4	1.3	483	387

A more disaggregated view of workloads can be found by analysing the information on staff postings and consents issued for regional offices (ROs) provided by the SPCBs in response to our RTI applications (Table 1). 5 states included both of these sets of information in their responses. The challenges in manpower are more acute when viewed through the lens of the regional offices. In Bihar, just one environmental engineer is posted in each of the ROs in Barauni and Muzaffarpur. The Barauni RO issued 659 consents in 2020-21, while Muzaffarpur issued 863. Similarly, lone environmental engineers posted in ROs were likely responsible for issuing 507 consents in Roorkee and 838 consents in Dehradun, both in Uttarakhand. However, in most other states the ROs typically issued less than 200 consents per engineer.

Taking a closer look at the process of conducting inspections further highlights the heavy workloads of the technical staff. Specifically, we take a closer look at West Bengal PCB and its inspection process in Box 1.

Box 1:

West Bengal PCB Staff Workload

As per the website of the WBPCB, there are currently 51 environmental engineers working at the Board (19). To understand if the number of engineers is sufficient, we take a look at the number of consents and authorizations issued, along with the inspections of industries conducted in FY '19-20 – the most recent year for which an Annual Report is available online (20).

A total of 10,140 consents and authorizations were issued by the Board during this period. This amounts to approximately 200 consents and authorizations issued per environmental engineer. Assuming 240 working days in a year, we can estimate that each engineer can spend only as little as 1.2 days on average per consent or biomedical waste authorization issued, and only 1.4 days per consent issued. This is comparable to the amount of time available per occupied environmental engineer post for processing consents, as estimated based on the OCMMS platform data in Figure 8.

A similar estimation of workload can be made for the inspections conducted in FY '19-20. A total of 3375 inspections were conducted that year, which amounts to 66 inspections per engineer, and about 3.6 days available on average for the completion of the inspection process for each engineer. The WBPCB allows for the use of selected third-party agencies for carrying out inspections of orange category industries (8). Although a signature of an environmental engineer is required as per the WBPCB guidelines for Inspection Reports, for the sake of this estimation we can discount the inspections of orange category industries (21).

²⁰ Details of the staff posted in ROs in Rajasthan were obtained from the Rajasthan State Pollution Control Board website in February 2022, and were accurate at the time (37).

This leaves 2722 inspections conducted in FY '19-20, with 53 inspections on average being carried out per environmental engineer. This does not leave them with significantly more time – each engineer can typically take only about 4.5 days to complete an inspection. The Board Policy, however, dictates that the Inspection Report must be submitted online within 48 hours (8).

The Inspection Report itself requires the engineer to make at least 15 sets of observations regarding the industrial unit, including estimations of air, water and noise pollution, and also hazardous waste emissions (21). It is also important to note here once again that issuing consents and authorizations, and conducting inspections are just two of the many responsibilities entrusted to them.

The inspection procedures across other SPCBs are also similar, at least in terms of the process that an inspector needs to follow (22–25). Chhattisgarh, Haryana and Jharkhand also have a 48-hour report submission policy, but Delhi, as per its 2016 inspection procedure, requires the inspectors to submit their report within 24 hours. After the increase in the required industrial inspection frequency as mandated by the NGT, it is likely that the workload for the technical staff members has increased even further. For example, as shown in the Table 2, Haryana increased its periodicity of inspections between May 2019 and February 2020. During the same period, the Haryana PCB was also severely understaffed, as highlighted in earlier sections.

Table 2. Change in the frequency of inspections for Haryana PCB (24)

Industrial Category	Before May 2019	After February 2020
Highly polluting category (17 identified industries)	3 years	3 months
Other Red category	5 years	6 months
Orange category	7 years	1 year
Green category	7 years	2 years

3.5. What is the role of legal staff?

Each SPCB and PCC has an in-house legal cell or department to provide legal assistance and advice to the Boards. The number of legal officers and their designations vary across the Boards. The primary functions of the legal cell include working with other officers in the Board to execute the Board's enforcement policy; dealing with court cases in which the Board is a party; dealing with statutory appeals before the Appellate Authorities constituted under the Water Act and the Air Act; and advising the Board and its functionaries on their statutory mandate. The extent of involvement of the legal cells in enforcement varies across Boards. Certain legal cells are tasked with drafting and sending all notices, and closure directions, while others are not involved in this enforcement at all. Yet, in certain Boards, the legal cells are tasked with vetting the enforcement measures before they are undertaken. While working on court cases, the Boards often engage outside counsel, who are then briefed and assisted by the legal cell.

In one of the RTI Applications filed by CPR, the Boards were asked to provide the following information:

- Total number of staff sanctioned posts along with breakup of designations/posts
- Number of vacancies as of 1 August 2021

Table 3 provides the sanctioned posts of legal officers/ legal assistants in each SPCB based on the information shared by the SPCBs with us. It also provides the vacancies against these sanctioned posts as of 1 August 2021:

Table 3. Snapshot of legal staff strength at the 10 SPCBs/PCC

State/UT	Legal staff	
	Sanctioned	Vacant
Bihar	3	NA
Chhattisgarh	4	2
Delhi	11	8
Haryana	5	1
Jharkhand	2	2
Punjab	9	5
Rajasthan	4	4
Uttar Pradesh	15	11
Uttarakhand	1	NA
West Bengal ²¹	2	0

From Table 3, it is evident that 1) legal cells in most Boards have sanctioned strength of five or less, and 2) vacancies are very high in most Boards. This is a cause for major concern as legal cells can play a crucial role in improving the enforcement of various environmental laws that fall within the mandate of the SPCBs. In the absence of capable and trained legal officers, who understand the procedural and substantive requirements as prescribed in the law and judicial precedent, the efficacious implementation of these laws would undoubtedly remain challenging. Indeed, in the opinion of a Legal Officer from State 3, “90% of field officers don't know the true extent of their powers [under the law]. Either they don't take legal advice, or they don't put it to use”, often leading to situations that are unwelcome both to industry and the SPCB such as all-too-short notice periods before closures. Below, we provide three arguments that speak to the need for strengthened legal capacity at SPCBs.

First, the Boards enforce the law (for instance, consent conditions or compliance with statutory directions) through actions of varying levels of severity. These include sending warning letters or show cause notices, issuing directions for closure or disconnection of electricity or water, revocation of consents, payment of environmental compensation, forfeiture of bank guarantees deposited by the regulated entity, and initiating legal action in courts (26). Each of these actions must be undertaken by following the due process of law, and the legal cells play an important role in ensuring that. As indicated to us by legal officers in different States, many technical staff are unaware of the escalating enforcement mechanism, and sometimes do not follow appropriate protocol or collect the appropriate data to ensure that these measures are implemented in accordance with the law. The absence of adequate legal capacity within SPCBs means that often in practice, many of these documents are prepared and sent directly by technical officers, with little to no legal vetting.

Second, and linked to the previous argument, several enforcement actions initiated by the Boards have been struck down by the courts when affected parties challenge their validity.²² The Boards, as statutory authorities, are bound

²¹ Based on information on employees available on the official website of the West Bengal PCB, as no information was received in response to the RTI Application filed with the Board.

²² *Gupta Enterprises v Delhi Pollution Control Committee*, 2007 SCC Online Del 1380: Action initiated by the DPCC was not preceded by an opportunity to be heard. The Delhi High Court struck down the directions since the principles of natural justice were violated.

to 'reach their decisions fairly and objectively.'²³ Hence, the recurring failure of the Boards to grant an opportunity to regulated parties is a matter of concern.²⁴ In August 2022, the Karnataka High Court came down upon the Karnataka SPCB for issuing directions for the closure of the business, without taking the aggrieved industry's response to the show cause notice into consideration. Accordingly, it held that the coercive orders passed by the Board shall be treated as show cause notices and granted the aggrieved industry one more week to file its response.²⁵ In 2020, the High Court of Bombay criticized the Maharashtra Pollution Control Board for 'mechanically' issuing identical show cause notices against 62 textile industries.²⁶ The Board issued notices to industries alleging that they were carrying out operations within the non-conforming zone. However, the Board had not verified whether these industries were actually located in those zones. The Court held that the Board's actions were 'without jurisdiction and that too, hastily'.

If Boards are guided by sound legal advice and their legal cells are well-equipped to implement the Board's enforcement decisions, it will ensure that Boards take the appropriate action commensurate with the offence and lower the likelihood of these actions being struck down in appeal before courts, allowing the Boards to function more effectively.

Third, although the Water Act and the Air Act give the Boards the power to initiate criminal prosecution for offences committed under the two laws, Boards hardly ever resort to such legal action. Statistics published by the National Crime Records Bureau show that 6 of the 10 SPCBs/PCC in the IGP (Bihar, Chhattisgarh, Jharkhand, Punjab, Uttarakhand, and West Bengal) did not report a single offence under the Water Act or the Air Act in 2020. Delhi follows closely, having reported only one offence under the Water Act and the Air Act (27). Punjab is an exception, however, with several hundred cases being filed and criminal prosecutions being initiated in the last few years, largely to tackle the issue of crop stubble burning. Criminal prosecution has not been a preferred route because it is a resource-intensive, lengthy process, and the outcome may not address the root-cause of the pollution in a timely and effective manner (36).

However, in some instances, criminal prosecution – along with other regulatory actions – is necessary to deter future pollution or non-compliance. The failure of the SPCBs to effectively enforce the law can lead to grave environmental injustices. For instance, the Comptroller and Auditor General's 2017 Audit Report on Rajasthan revealed that the Rajasthan PCB had failed to take any concrete action against thirty brick kilns in Jaipur alone that were operating without a valid CTE or CTO. Apart from these, three more were operating without a CTE/CTO despite having been issued directions for closure over six years ago (28). In such cases of serious and repeat violations, criminal prosecution ought to be initiated by the SPCB for effective deterrence. However, in the absence of adequate legal staff and resources this becomes unfeasible, paving the way for continued non-compliance.

3.6. Why are there so many vacancies?

Several reports have studied vacancies at SPCBs. The Centre for Science and Environment (CSE) both in 2009 as well as in 2014 found that the number of vacant posts was high across several SPCBs, with very few exceptions (2,29). Some states, such as Kerala and Andhra Pradesh, had more than half their posts vacant. The 2009 report states that despite several posts getting sanctioned, hiring did not occur primarily due to "the cumbersome process that requires approvals from the state government", along with financial and budgetary constraints, on occasion. Inability to attract talent was also a source of concern then, due to the lack of a competitive pay scale and the absence of promising career growth prospects. In a report published by the Centre for Chronic Disease Control

²³ *Bhagwan v Ram Chand*, (1965) 3 SCR 218.

²⁴ *M/s Cox India Ltd v M P Pollution Control Board*, Original Application No. 10 of 2013, Order dated 09.05.2013 (National Green Tribunal) para 20; *Laxmi Suiting v State of Rajasthan*, 2014 SCC Online NGT 1419, para 42, 61; *M/S Leela Tex. Exports v State of Rajasthan*, Original Application No. 358 (THC)/2013, Order dated 01.01.2014 (National Green Tribunal), para 55; *M/s Ramco Industries Ltd. v Bihar State Pollution Control Board*, Civil Writ Jurisdiction Case No. 421 of 2017, Order dated 30.03.2017 (Patna High Court).

²⁵ *Ujjal Fish Meal and Oil Company v Karnataka State Pollution Control Board*, Writ Petition No. 16165 of 2022, Order dated 18.08.2022 (Karnataka High Court). A similar order was passed in *Blueline Foods Pvt Ltd v Karnataka State Pollution Control Board*, Writ Petition No.16310 of 2022, Order dated 18.08.2022 (Karnataka High Court).

²⁶ *Reliable Sizing Works v State of Maharashtra*, Writ Petition (ST) No. 3327 of 2020, Order dated 07.07. 2020 (Bombay High Court).

(CCDC) in 2020, the authors noted that during their fieldwork, they found vacancies to be as high as 50% in some of the SPCBs (30). Finally, the CPCB 2020 report provides the most comprehensive and damning indictment of all by concluding that about 46% posts are vacant across all boards, and that these posts “need to be filled up urgently”.

In our interviews, respondents indicated a number of factors that have affected their ability to hire and retain technical talent including pay and benefits, options for career growth, political pressure, and the lack of defined service rules. Both the Chairperson and the Member Secretary of State 1 indicated the lack of defined service rules being a key stumbling block to hiring. Coupled with significant political pressure to hire preferred candidates for what are seen as “government jobs” (cited as a constraint almost unanimously), many SPCBs indicated that they either prefer to onboard consultants to do the job or outsource hiring to the State or Union Public Service Commission (PSC). These PSCs are seen as apolitical and professional bodies that have the capability to handle the thousands of applications that come through for each position.

It is unlikely that financial or budgetary constraints are restricting the hiring process. This is because – as the CPCB 2020 report notes – many boards have “stacked huge sums of money in banks in the form of fixed deposits” (1). We filed RTI applications to investigate the financial status of the 10 SPCBs/PCC under consideration in March 2022. The responses received (which will be examined in greater detail in an upcoming working paper) corroborate the findings of the CPCB report. Annually, the receipts of nearly all the boards greatly exceeded their expenditure, with some states earning as much as double the amount that they were spending. A large portion of their receipts was from the interest earned from bank-deposited funds. The reasons for continued understaffing are thus perhaps attributable to other factors cited earlier.

3.7. What efforts have been made to fulfil hiring needs?

To get a more complete picture regarding vacancies, we must also consider the attempts being made by the SPCBs to fill their posts. In the RTI applications filed by CPR, one query requested the Boards to provide any recent recruitment announcements or advertisements. Despite the staffing crisis across the Boards, half of them either did not provide any response to the query, or perhaps more worryingly, stated that no advertisements had been posted recently. Five states, namely Bihar, Haryana, Jharkhand, Rajasthan and Uttar Pradesh responded to this query. Only Bihar’s response included any significant hiring intent, with an advertisement for hiring in 36 positions published in a local daily. Uttar Pradesh’s response simply stated that their hiring is done in accordance with a service manual, and through the PSC. Haryana, Jharkhand and Rajasthan advertised for only one post each (for the post of Chairperson in the case of Rajasthan).

In terms of measuring the results of the hiring process, little information is available. One example available is from Delhi. While Delhi did not provide a response to the RTI query, news reports indicate that in December 2021 it hired as many as 50 environmental engineers (31). It is unclear however, if this alone would completely address the Committee’s staffing issues.

4. EVOLVING REGULATORY REGIME AND IMPLICATIONS FOR SPCBs

The implications of inadequate technical and legal staff for the routine functions of the SPCBs/PCC have been explained in detail in the preceding sections. Briefly, these include challenges with monitoring industrial compliance and initiating action against polluting industries. However, beyond these difficulties, issues with staffing in SPCBs/PCC have led to more fundamental shifts within the regulatory structure in recent years.

The *first* of these is the increasing use of third-party auditors to monitor and assess environmental compliance (32). Pioneered by Gujarat in an attempt to ameliorate manpower shortages in its SPCB, the use of third-party auditors has now extended to other states including West Bengal, Odisha, Telangana and Punjab. The rationale for such a regime is that there exists an untapped technical pool within the private sector that could be effectively utilized to conduct monitoring and inspection at industrial units and provide the under-staffed SPCBs with the requisite data for enforcement. However, such a regime is not without its deficiencies, with studies finding that the hiring of these auditors by industry themselves creates an inherent conflict of interest viz. reporting. Indeed, a study found that randomly assigning auditors to industries in Gujarat substantially increased compliance (33).

The *second* is the emergence of technological tools to enhance air pollution emissions monitoring. The standardization and wide availability of Continuous Emissions Monitoring Systems (CEMS) has in theory enabled SPCBs to reduce their workload as these stack monitors report data via the internet direct to the SPCBs at regular intervals. This hypothetically reduces the need for more frequent 'in-person' inspections of polluting industry. However, in discussion with us, several senior SPCB officials admitted that data quality and availability from these monitors is variable across industry and state. Indeed, the Member Secretary of State 6 noted that while his state had mandated the installation of CEMS across several categories of industries, many had not even installed the monitors, and those that had, reported infrequent and poor-quality data. A former Member Secretary of the CPCB noted that there is often a significant mismatch in data reported by CEMS and that measured manually at the stack *"because the industry is not calibrating the equipment, they are not operating instruments properly and there [is] a lot of manipulation, so data are not reliable"*.

The *third* is growing public discourse around the need for market-based mechanisms to regulate pollution. Following the completion of Surat's pilot emissions trading scheme (ETS) for PM_{2.5} in 2020 (launched originally in 2010), several states have signalled their intent to launch or have already launched ETS for air pollution and carbon emissions (34,35). While still in their nascency in India, ETS programs have a long history of implementation in more developed economies such as the United States where they were effectively employed in reducing sulphur emissions.

The Surat pilot, while successful in its own narrow definition, covered the relatively niche textile sector, and only a small part of it. Questions around whether such a scheme could be implemented across highly polluting industries, where the political economy of environmental regulation is far more complex, remain unanswered at this stage. Additionally, in our interviews, Member Secretaries of SPCBs where such new schemes have been launched revealed that much of the work is only on paper at this stage given the challenges in capacity that they face on an ongoing basis. If there is to be some market-based framework for pollution control, moving away from the command-and-control model, it will still require significant in-house staff and skill augmentation at SPCBs to undergird a flailing regulatory structure.

Overall, it is clear that whatever path for air quality regulation India chooses going forward, the SPCBs will be leading the way, but in their current state viz. staffing, they are struggling to execute their existing mandate, let alone one that may be broadened substantially.

REFERENCES

1. Central Pollution Control Board. Report of the Performance Audit of State Pollution Control Boards/ Pollution Control Committees. Central Pollution Control Board; 2020 Sep 18. Available from: REPORT OF THE PERFORMANCE AUDIT OF SPCBs-PCCs BY CPCB IN OA NO. 95 of 2018 (Aryavart Foundation Vs. Vapi Green Enviro Ltd. & Ors.).pdf (greentribunal.gov.in)
2. Centre for Science and Environment. Turnaround: Reform Agenda for India's Environmental Regulators. Centre for Science and Environment; 2009 Nov 15. Available from: <https://www.cseindia.org/turnaround-reform-agenda-for-indias-environmental-regulators-479>
3. Planning Commission. Programme Evaluation Organization's Evaluation Study on the functioning of State Pollution Control Boards. 2001. Available from: <http://www.indiaenvironmentportal.org.in/files/spcb-final.pdf>
4. The Air (Prevention and Control of Pollution) Act 1981. Available from: <https://legislative.gov.in/sites/default/files/A1981-14.pdf>
5. The Water (Prevention and Control of Pollution) Act 1974. Available from: <https://cpcb.nic.in/upload/home/water-pollution/WaterAct-1974.pdf>
6. Central Pollution Control Board. Modified Directions under Section 18(1)(b) of the Water (Prevention & Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981 regarding Harmonization of Classification of Industrial Sectors under Red/Orange/Green/White Categories. 2016 Mar 07. Available from: <https://cpcb.nic.in/openpdf.php?id=TGFoZXNoRmlsZS9MYXRlc3RfMTE4XoZpbmFsXoRpcmVjdGlvbnMucGRm>
7. Punjab Pollution Control Board. Regarding Policy of Punjab Pollution Control Board regarding Consent management/Authorization. 2013. Available from: <https://ppcb.punjab.gov.in/sites/default/files/documents/complete%20New%20Policy%20of%20the%20Board%202013.pdf>
8. West Bengal Pollution Control Board. Comprehensive Inspection Policy. 2019. Available from: <https://www.wbpcb.gov.in/writereaddata/files/INSPECTION%20POLICY%20OF%20WBPCB%20MAY%202019.pdf>
9. Karnataka State Pollution Control Board. Legal Action. [cited 2022 Sep 23]. Available from: <https://kspcb.karnataka.gov.in/node/89>
10. Central Pollution Control Board. Guidelines on Water Quality Monitoring, 2017. 2017. Available from: https://cpcb.nic.in/wqm/Guidelines_Water_Quality_Monitoring_2017.pdf
11. The World Bank. GDP (constant 2015 US\$) - India | Data. 2022. [cited 2022 Sep 23]. Available from: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?locations=IN>
12. The World Bank. World Bank Open Data – Urban Population. 2022. [cited 2022 Oct 6]. Available from: <https://data.worldbank.org/indicator/SP.URB.TOTL?locations=IN>
13. Central Pollution Control Board. Directions under Section 18(1)(b) of the Water (Prevention & Control of Pollution) Act, 1974 and the Air (Prevention & Control of Pollution) Act, 1981 to undertake Environmental Quality Monitoring and for Installation of Continuous Ambient Air Quality Monitoring Stations and Real-Time Water Quality Monitoring Stations in Critically Polluted Areas. 2016 Apr 26. Available from: <https://erc.mp.gov.in/Documents/doc/Directions/Critical.pdf>

14. Punjab Pollution Control Board. Annual Reports (2011-12 to 2019-20). 2022. [cited 2022 Oct 6]. Available from: <https://ppcb.punjab.gov.in/en/about-us/miscellaneous/annual-reports>
15. Delhi Pollution Control Committee. Annual Report 2009-10. 2010. Available from: <https://www.dpcc.delhigovt.nic.in/uploads/annual/9ab695b0c84233840f3c7eaaco83a1fepdf-1dff7db3e759561069507e8b3bd86a4a.pdf>
16. Ministry of Environment, Forest and Climate Change, Government of India. Pollution Control Board Dashboard. Online Consent Management & Monitoring System. 2016 [cited 2022 Sep 23]. Available from: https://ocmms.nic.in/OCMMS_NEW/deshboard.jsp
17. Haryana State Pollution Control Board. Annual Reports. 2019-2020. [cited 2022 Oct 7]. Available from: https://hspcb.gov.in/annual_report
18. Rajasthan State Pollution Control Board. Annual Reports.[updated 2022 Sep 22, cited 2022 Oct 7]. Available from: <https://environment.rajasthan.gov.in/content/environment/en/rajasthan-state-pollution-control-board/information/AnnualReports.html>
19. West Bengal Pollution Control Board. Employees of West Bengal Pollution Control Board. 2019. [cited 2022 Sep 23]. Available from: <https://www.wbpcb.gov.in/employees-of-the-board>
20. West Bengal Pollution Control Board. Annual Report: Pollution Board 2019-20. 2020. Available from: https://www.wbpcb.gov.in/files/Mo-06-2021-06-21-18Annual%20Report%20Polution%20Board_19_20.pdf
21. West Bengal Pollution Control Board. Memo No. 1669-4A-6/2015. 2015 Dec 06. Available from: https://www.wbpcb.gov.in/writereaddata/files/Order4_standard_protocol_for_inspection_of_industries.pdf
22. Bihar State Pollution Control Board. Guidebook on Application and Inspection Procedure under Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention & Control of Pollution) Act, 1982, Environment (Protection) Act, 1986, Hazardous Waste (Management, Handling and Trans-Boundary Movement) Rules, 2008 & Rules Made there under. 2017. Available from: http://udyog.bihar.gov.in/All_in_one_doc_file/Guidebook%20on%20application%20and%20inspection%20procedure-BSPCB20160305021232392.pdf
23. Chhattisgarh Environment Conservation Board. Inspection Manual- Complete Guide for Inspection of Units. No date. Available from: <https://cglabour.nic.in/Factory/CentralInspection/pdf/CGPCBInspection.pdf>
24. Haryana State Pollution Control Board. Inspection Policy. 2020. Available from: https://hspcb.gov.in/content/Consent_Policy_Procedure/Inspection_Policy.pdf
25. Jharkhand Pollution Control Board. Inspection Procedure. 2016. Available from: https://jhkocmms.nic.in/OCMMS/SPCB_DOCUMENTS/sop/Inspection_Procedure.pdf
26. Maharashtra Pollution Control Board. Implementation of Enforcement Policy, Circular No. MPCB/AS(T)/TB/B-894. 2016 Mar 01. Available from: https://mpcb.gov.in/sites/default/files/standing_orders/Circular_Enforcement_Policy04102019.pdf
27. Pandey K. Air, Water Pollution Offences More Than Triple In 2020: NCRB. 2021 Sep 16 [cited 2022 Oct 3]. Available from: <https://www.downtoearth.org.in/news/environment/air-water-pollution-offences-more-than-triple-in-2020-ncrb-79046>
28. Comptroller and Auditor General. Report of the Comptroller and Auditor General of India on Economic Sector for the year ended 31 March 2017, Government of Rajasthan, Report 5 of 2017. 2017. p. 11–48. Available from:

https://cag.gov.in/webroot/uploads/download_audit_report/2017/Report_No5_of_2017_-_Economic_Sector_Government_of_Rajasthan.pdf

29. Centre for Science and Environment. Filling the Blanks: A Discussion Paper on Strengthening Environmental Governance. Centre for Science and Environment; 2014. Available from: <http://cdn.cseindia.org/userfiles/Filling%20The%20Blanks%20Report.pdf>
30. Bahuguna V, Krishna B. Strengthening Pollution Control Boards to achieve the National Ambient Air Quality Standards in India. 2020 Nov. Available from: https://www.ceh.org.in/wp-content/uploads/2020/11/NAAQS-report_final_revised_22-10-20.pdf
31. India Today Web Desk. Delhi Air Pollution: Newly-Recruited Fifty Environmental Engineers to Undergo Three-Week Training Module'. [updated 2021 Dec 23, cited 2022 Oct 3]. Available from: <https://www.indiatoday.in/cities/delhi/story/delhi-air-pollution-newly-recruited-fifty-environmental-engineers-dpcc-undergo-three-week-training-module-1891320-2021-12-23>
32. Menon M, Kohli K. Regulatory Reforms to Address Environmental Non-Compliance | Centre for Policy Research. Policy Challenges 2019-2024: The Key Policy Questions for the New Government and Possible Pathways. 2019 Jul 6;44–8. Available from: <https://web.archive.org/web/20210319215340/https://www.cprindia.org/sites/default/files/Policy%20Challenges%202019-2024.pdf>
33. Duflo E, Greenstone M, Pande R, Ryan N. The Value of Regulatory Discretion: Estimates from Environmental Inspections in India. *Econometrica*. 2018 Dec 12;86(6):2123–60. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.3982/ECTA12876>
34. Sekar A. Can Emission-Trading Markets Help India Tackle Its Industrial Pollution Crisis? – The Wire Science. 2022 July 8. [cited 2022 Oct 3]. Available from: <https://science.thewire.in/environment/india-emissions-trading-pollution-crisis/>
35. Greenstone M, Pande R, Sudarshan A, Ryan N. The Benefits and Costs of Emissions Trading: Experimental Evidence from a New Market for Industrial Particulate Emissions. 2022 Jul 15. p. 57. Available from: https://www.anantsudarshan.com/uploads/1/0/2/6/10267789/greenstone_pande_ryan_sudarshan_emissions_trading_20220323.pdf
36. Ghosh S. The Environment. In: Regulation in India Design, Capacity, Performance. Hart Publishing; 2019. p. 203–28. (Hart Series in Comparative Public Law; vol. 24). Available from: <https://www.bloomsbury.com/uk/regulation-in-india-design-capacity-performance-9781509927562/>
37. Rajasthan State Pollution Control Board. Regional Officer's Detail. Available from: <https://environment.rajasthan.gov.in/content/environment/en/rajasthan-state-pollution-control-board/contact-Us/regional-office.html>

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