

A REVIEW OF  
THE PROCESS FOR  
**SETTING**  
**INDUSTRY-SPECIFIC**  
**EMISSION STANDARDS**  
IN INDIA



PUBLIC  
HEALTH  
FOUNDATION  
OF INDIA



## **ACKNOWLEDGEMENTS**

This report has been prepared by the Ricardo project team (Adarsh Varma, Ashish Kulkarni, Ben Grebot, Robert Stewart, Shaun Brace and Tom Buckland), working closely with our associate, Dr. B. Sengupta (Former Member Secretary for the CPCB) and project partners and members of the steering group, Bhargav Krishna of the Public Health Foundation of India (PHFI), Dr. Hem Dholakia of the Council on Energy, Environment and Water (CEEW), and Kunal Sharma of Shakti Sustainable Energy Foundation.

This study has benefitted from the valuable inputs received from experts involved in the standard setting process in Government, NGOs, research institutions and private sector in India. In particular, we would like to thank the Ministry of Environment, Forest and Climate Change, Central Pollution Control Board, Gujarat Pollution Control Board, Centre for Science and Environment, Federation of Indian Chambers of Commerce & Industry, Quality Council of India and other experts consulted for their valuable inputs as part of the stakeholder consultation for the study. We would also like to thank all of the participants for their feedback on the draft findings presented at the stakeholder workshop held on April 21, 2016 in New Delhi.

Financial support for this study was provided by Shakti Sustainable Energy Foundation.

## **DISCLAIMER**

The views and analyses represented in this document do not necessarily reflect those of Shakti Sustainable Energy Foundation. The Foundation accepts no liability for the content of this document, or for the consequences of any actions taken on the basis of the information provided.

For private circulation only.

## EXECUTIVE SUMMARY

### Context

India has experienced rapid economic development since the end of the 20<sup>th</sup> century, and is now the world's fastest growing major economy<sup>1</sup>. This development has been fuelled by an increase in domestic demand for products and services, and an expansion of the manufacturing sector, resulting in an economic growth rate which has outpaced China in recent years<sup>2</sup>. However, this rate of development has had serious consequences for India's environment, with increasing vehicle numbers and expanding industries resulting in high pollutant emissions across the country.

The industrial sector is a significant contributor of stack emissions in India, from localised sources such as brick kilns and diesel generator sets, to large centralised facilities such as coal-fired thermal power plants and oil refineries. As a result, industry emission standards have an important role to play in reducing emissions and improving air quality.

**The legal provision for the development of Emission Standards for industrial sectors is set out under the Air (Prevention and Control of Pollution) Act, 1981, and further built upon in the Environment (Protection) Act, 1986.** The Government of India sets emission standards as a means to limit the levels of pollution emitted from industrial sources. The responsibility for overseeing the development and implementation of these standards is shared between the Ministry of Environment Forest and Climate Change (MoEFCC), Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs). These are minimum national standards, but the SPCBs have the authority to set tighter standards if required — although there are very few examples where this has happened in practice.

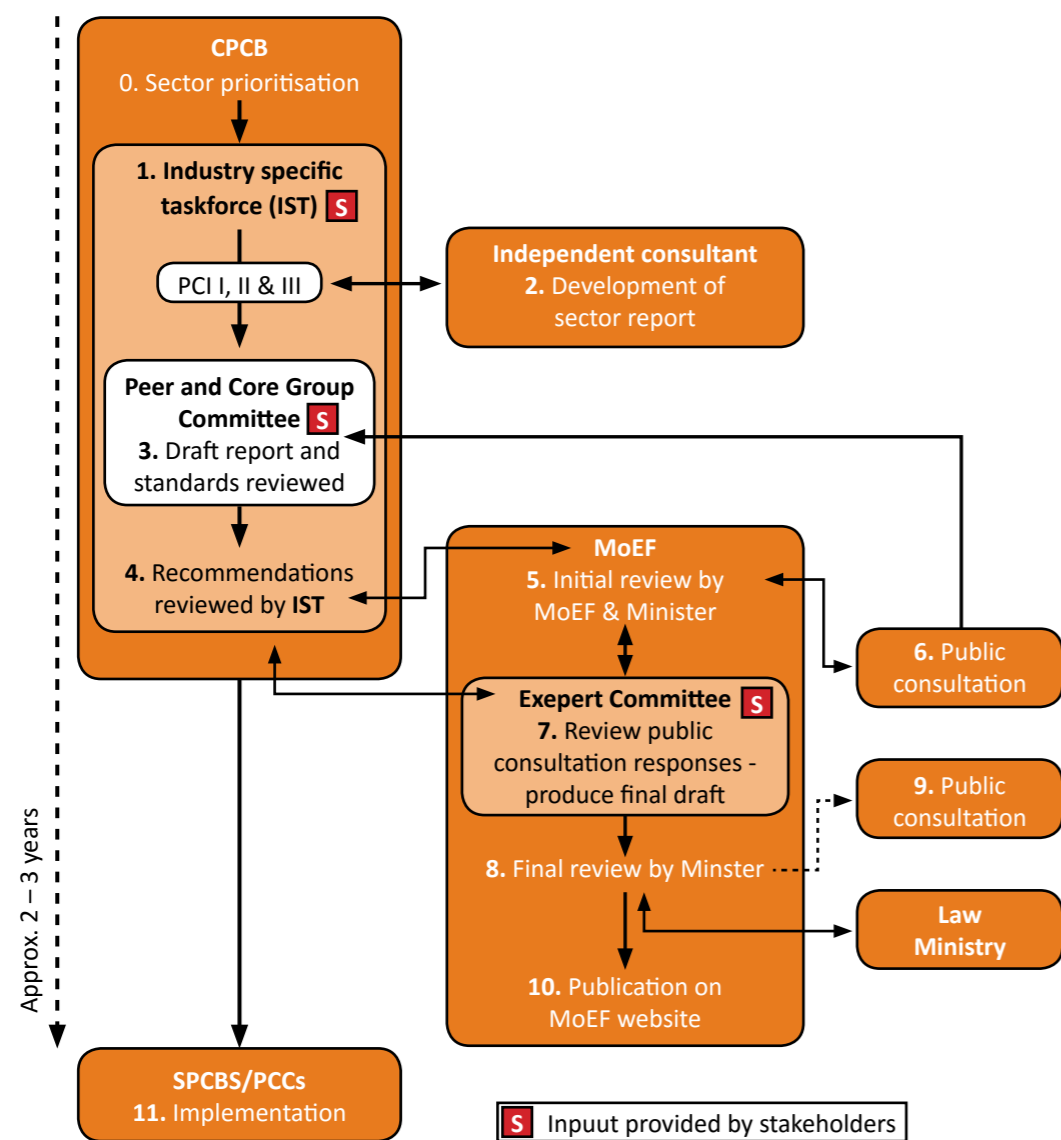
**The MoEFCC provides minimum national standards for emissions to air and water for over 100 industries/activities.** These range from high emitting industries, such as thermal power plants, petroleum oil refineries and integrated iron and steel facilities, to more localised sources such as flour mills, the starch industry and the cashew seed processing industry. In the past year or so, it appears that activity in relation to standards development and revision has significantly increased under the new Government, with a number of standards under development or review, draft standards notified (e.g. iron and steel) and others adopted (e.g. thermal power plants).

The process by which emission standards are developed in India is described in Section 2 of the report. The figure below provides an overview of the process and flow of information between different bodies, based on the consultation and literature reviewed during the study. [There may be some variations in this process between different sectors.]

<sup>1</sup> Telegraph (2016) Growth star India overtakes China as world's fastest growing major economy via <http://www.telegraph.co.uk/finance/economics/12146579/India-overtakes-China-as-worlds-fastest-growing-major-economy.html>

<sup>2</sup> BBC (2015) India's economic growth picks up to 7.4 % via <http://www.bbc.co.uk/news/business-34965165>

**Figure 1: Flow diagram of the process for emission standard development in India**



**Key:** CPCB = Central Pollution Control Board / IST = Industry Specific Taskforce / PCI = Pollution Control Implementation (Division of CPCB) / MoEF = Ministry of Environment, Forest & Climate Change / SPCBs = State Pollution Control Boards / PCCs = Pollution Control Committees.

### Study focus and approach

The main objectives of the study were:

- To characterize the existing process for setting air emission standards in India and to assess the degree to which this process is followed in practice.
- To review how techno-economic, environmental and social impacts are taken into consideration, and to assess the level of communication, engagement and transparency at each stage of the process. As part of this review, three industrial sectors were investigated in greater detail.
- To undertake an assessment of, and comparison against, international practices and processes for emission standard development, including those applied in the European Union, China and USA.

It is important to note that the aim of the study was not to investigate the need for standards or the levels at which they are set; but to focus on the process by which they are developed.

### Main Findings and Recommendations

The review of the process followed in India to develop industry emission standards, along with a comparison of practices adopted in other geographies, has shown that **developing industry emission standards is a challenging process**. India is not alone in facing challenges with developing these types of standards, and there are lessons (both good and bad) that can be learnt from experiences elsewhere. The reasons for this include the following:

- A number of industry sectors are complex, with significant variation in fuels, processes and products — meaning that standards have to be differentiated to try and take into account these differences.
- To develop robust standards requires a strong evidence base on the sector (e.g. current status of implementation of existing standards, current performance), which takes time and resources to gather, review and analyse.
- Standards tend to require industry investment to reduce emissions, so naturally there can be some opposition to setting tighter standards.

Significant progress has been made in developing emission standards, and improvements are visible in a number of sectors. Bodies involved in the process have gained significant experience and knowledge of what works well, or not so well, and there are some good examples of best practices being applied by some SPCBs. However, based on a review of available documentation and discussions with key stakeholders, some potential challenges and areas for strengthening, related to the process for standards development in India, have been identified:

- Resources (skills and manpower)** of some of the key institutions involved in the process are strained, and stakeholders have indicated that this is impacting on the process for development of the standards, and ultimately the standards themselves. Key recommendations include:
  - Expansion of the technical resource pools within CPCB for co-ordination of the process and SPCBs/PCCs to enable development of tighter standards (and enforcement) where necessary.
  - Upskilling of existing staff and knowledge sharing, including enhancing interactions between SPCBs to share knowledge.
- Clarity of the process** could be improved, as it is not clearly laid out in any single document — making it harder for stakeholders to understand the different stages and know how and when they can engage with the process. Furthermore, whilst a lot of information is generated during the process, it is not always made publicly available (e.g. background sectoral documents, meeting minutes etc.). Key recommendations include:
  - A clear process should be transparently documented and followed with all documentation to be made public at the earliest opportunity.
  - Greater diversity of relevant committees, improved evidence base and greater publicity for consultations.

- **Evidence base** for developing the standards appears to be quite variable between sectors, although in many cases it was not possible to access the background documents used to inform the standards being developed, since they were not routinely made publicly available. A strong evidence base ultimately leads to more robust and realistic standards, and should thus reduce the risk of challenges later in the process. Key recommendations include:
  - Clear and consistent structure for sector background documents should be defined, and information generated by other bodies internationally should be utilized where relevant.
  - Specific impact analyses that should be undertaken initially at the start of the process (and during it as the standards evolve), should be clearly set out with appropriate guidance, and applied.
- **Engagement with key stakeholders**, including industry, SPCBs/PCCs, NGOs and the general public has been raised by a number of stakeholders during the study as one area where the process could be strengthened. This should help with improving the overall evidence base and for subsequent implementation of the standards (including the potential development/setting of more stringent standards at a State level if required). Key recommendations include:
  - Key stakeholders (SPCBs/PCCs, in particular) should have a greater role in the development of standards, as well as in open engagement during the process and later in implementation.
  - A range could be developed for each of the standards (lower – upper), reflecting potential variability in what emission reductions the sector could achieve — allowing for tighter standards to be applied in areas where national air quality standards are not being met.
  - Enhancing SPCB/PCC interactions to improve information exchange and support for finding solutions to common, shared challenges.

## CONTENTS

ACKNOWLEDGEMENTS	1
DISCLAIMER	1
EXECUTIVE SUMMARY	3
1. INTRODUCTION	8
1.1 Context	8
1.2 This study	9
1.3 Methodology	10
2. PROCESS FOR THE DEVELOPMENT OF INDUSTRIAL EMISSION STANDARDS	11
2.1 Roles and responsibilities of government bodies	11
2.1.1 Ministry of Environment, Forest and Climate Change (MOEFCC)	11
2.1.2 Central Pollution Control Board (CPCB)	12
2.1.3 State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs)	13
2.2 Analysis of prescribed process	15
2.2.1 Overview	15
2.2.2 Prioritisation	18
2.2.3 Input provided by industry, academia, NGOs or SPCBs/PCCs	19
2.2.4 Environmental and techno-economic considerations	20
2.2.5 International considerations	21
2.2.6 Public consultation	21
2.2.7 Development of more stringent standards	22
2.2.8 Implementation	24
2.3 Detailed sector review	27
2.4 Summary	28
3. COMPARISON WITH INTERNATIONAL PRACTICE	29
3.1 Overview	29
3.2 EU emission controls	30
3.2.1 Legislation	30
3.2.2 Key organisations	31
3.2.3 Development stages	32
3.3 USA emission controls	37
3.3.1 Legislation	37
3.3.2 Development of emission standards	40
3.4 China	43
3.5 Similarities/differences between India and the RoW	46
3.6 Conclusions and Recommendations	50

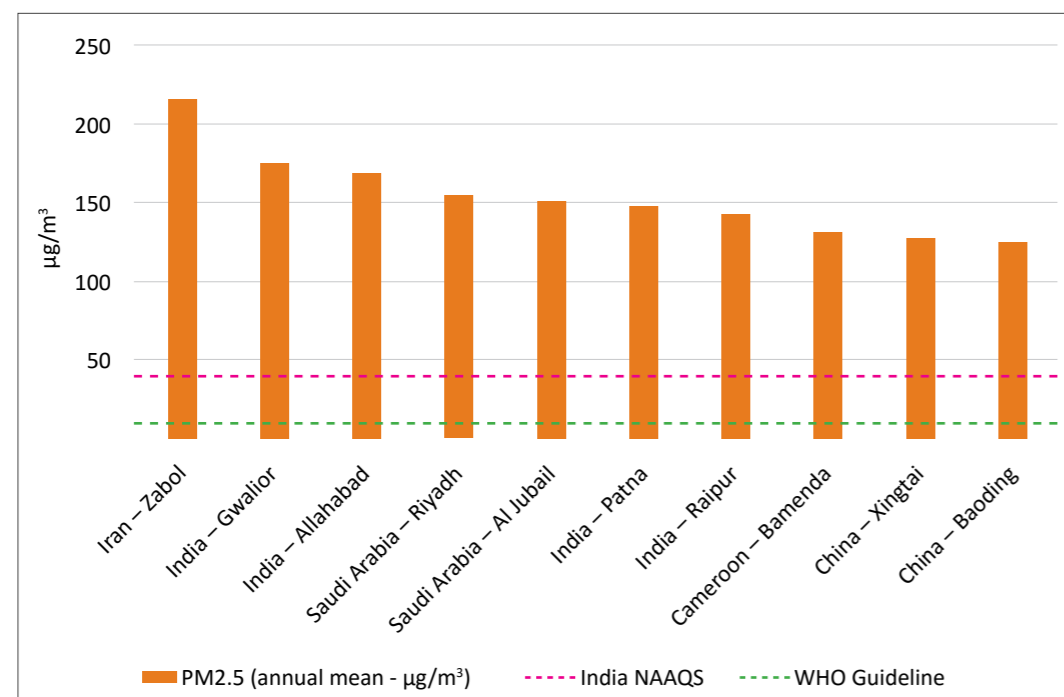
# 1. INTRODUCTION

## 1.1 Context

India has experienced rapid economic development since the end of the 20<sup>th</sup> century, and is now the world's fastest growing major economy<sup>3</sup>. This development has been fuelled by an increase in domestic demand for products and services, and an expansion of the manufacturing sector, resulting in an economic growth rate which has outpaced China in recent years<sup>4</sup>.

However, this rate of development has had serious consequences for India's environment, with increasing vehicle numbers and expanding industries resulting in high pollutant emissions across the country. This was demonstrated by the results of the WHO's 2016 ambient air quality database<sup>5</sup>, which found Indian cities making up four of the world's top 10 for ambient concentrations of PM<sub>2.5</sub>, as shown below.

**Figure 2: Top 10 cities based on ambient PM<sub>2.5</sub> concentrations**



**Note:** Figures based on 2012-14 data.

<sup>3</sup> Telegraph (2016) Growth star India overtakes China as world's fastest growing major economy via <http://www.telegraph.co.uk/finance/economics/12146579/India-overtakes-China-as-worlds-fastest-growing-major-economy.html>

<sup>4</sup> BBC (2015) India's economic growth picks up to 7.4 % via <http://www.bbc.co.uk/news/business-34965165>

<sup>5</sup> WHO (2014) Ambient (outdoor) air pollution in cities database via [http://www.who.int/phe/health\\_topics/outdoorair/databases/cities/en/](http://www.who.int/phe/health_topics/outdoorair/databases/cities/en/)

The industrial sector is a significant contributor to air pollution in India, from localised sources such as brick kilns and diesel generator sets, to large centralised facilities such as coal-fired thermal power plants and oil refineries.

The Government of India sets emission standards as a means to limit the levels of pollution emitted from industrial sources. Standards are legally binding requirements which set quantitative limits for pollutants that may be released from specific sources. The process by which standards are set varies between countries, but will typically involve either primary or secondary research into the quantity of emissions arising from a particular process/activity, and analysis of the potential for pollution control or abatement. In order to provide adequate protection to human health and ecological habitats, these standards must be set at appropriate levels and be supported by justifiable evidence.

The legal provision for the development of Emission Standards for industrial sectors is set out under the Air (Prevention and Control of Pollution) Act, 1981. The responsibility for overseeing the development and implementation of these standards is shared between the Ministry of Environment Forest and Climate Change (MoEFCC), Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs).

The provision of emission standards were further built upon in the Environment (Protection) Act, 1986. Amongst other things, this act gives the Central Government powers to take measures to protect and improve the environment, which, as stated in section 3(2)(iv) includes:

*“Laying down standards for emission or discharge of environmental pollutants from various sources whatsoever. Provided that different standards for emission or discharge may be laid down under this clause from different sources having regard to the quality or composition of the emission or discharge of environmental pollutants from such sources”.*

## 1.2 This study

The main objectives of the study were:

- To characterize the existing process for setting emission standards in India and to assess the degree to which this process is followed in practice.
- To review how techno-economic, environmental and social impacts are taken into consideration and to assess the level of communication, engagement and transparency at each stage of the process.
- To review three industrial sectors in greater detail and undertake an assessment of, and comparison against, international practices and processes for emission standard development, including those applied in the European Union, China and USA.

It is important to note that the aim of the study was not to investigate the need for standards or the levels at which they are set; but to focus on the process by which they are developed.

The findings of the study were presented at a Stakeholder Engagement Workshop held in Delhi on April 21, 2016. This report provides full details on the assessment and sets out recommendations for the potential strengthening of the process for setting industry-specific emission standards.

## 1.3 Methodology

The assessment has aimed to provide a review of the process for setting industry-specific standards, by comparing the ‘prescribed’ process (i.e. based on published guidance documents) with the ‘real-world’ process that is believed to be taking place in practice. This approach relied on the availability of background literature and direct engagement with key stakeholders involved in the process.

The first stage in the assessment involved the preparation of a ‘data needs matrix’, which listed the questions to be addressed by the study. The Matrix was agreed upon by the Project Steering Committee, with questions selected to address the following areas:

- Regulatory framework
- Development process
- Implementation

A literature review of relevant documents, including MoEFCC and CPCB publications, such as Comprehensive Industry Documents (COINDs), notified emission standards and guidance documents, was then completed, in order to piece together a description of the ‘prescribed’ process.

A series of discussions was then arranged with key stakeholders in order to gain an understanding of what takes place in practice and to address some of the uncertainties/gaps that were identified through the review of the ‘prescribed’ process. Stakeholder interviews took place with representatives of the following organisations as well as other experts who are knowledgeable about the process:

- MoEFCC
- CPCB
- Federation of Indian Chambers of Commerce & Industry (FICCI)
- Centre for Science and Environment (CSE)
- Gujarat Pollution Control Board (GPCB)
- Andhra Pradesh Pollution Control Board (APPCB)
- Telangana Pollution Control Board (TPCB)
- Quality Council of India (QCI)

The information sourced during the literature review and stakeholder consultation was used to develop an overview of the process for setting industry-specific emissions standards comparing what is set out in official guidance with how the process appears to be followed in practice. To supplement this review of ‘prescribed’ and ‘real-world’ processes, the study looked in more detail at the standards set for three key polluting industries: thermal power plants, iron and steel and brick kilns. Comparisons with established international practices for the development of standards were then provided to see how the process in India compares with those in other geographies.

Building on the key challenges that were identified, a series of recommendations on potential improvements to the process have been outlined, and a shortlist of industries for future standard development/review compiled.

## 2. PROCESS FOR THE DEVELOPMENT OF INDUSTRIAL EMISSION STANDARDS

Industrial emission standards form an integral part of India’s air quality strategy. Standards are designed to tackle the environmental impacts of harmful emissions from industrial plants by setting legal requirements for acceptable concentrations of pollutants within the exhaust gases emitted by a facility, and also within ambient air at the site. Increasing or decreasing these standards will result in changes to the ambient concentrations of pollutants in the areas surrounding the facilities, and play a key role in the protection of human and ecological health. Therefore, a thorough and effective process for the development of standards must be in place to ensure that standards provide an adequate level of protection for nearby communities and ecosystems.

Section 2.1 describes the key roles and responsibilities of the main government bodies responsible for developing the standards. Section 2.2 presents the prescribed process for setting industry-specific emission standards in India, based primarily on the standards and guidance documents published by the CPCB and MOEFCC (a list of the key guidance documents, which dictate the process for standard development, is provided in Appendix IV). Section 2.2 also includes observations on what appears to happen in practice, based on discussions with key stakeholders and on the findings of independent research bodies and think tanks, including CSE and the World Bank. Section 2.3 provides a summary of the findings of the more detailed review of the process followed for the setting of standards in three of India’s key industrial sectors. A summary of the analysis in this section is provided in Section 2.4.

### 2.1 Roles and responsibilities of government bodies

Various organisations are involved in the development of emission standards. The following provides a brief overview of the Government bodies that contribute to the process. Further details of their specific roles in the process are then provided in the following sections.

#### 2.1.1 Ministry of Environment, Forest and Climate Change (MOEFCC)

The MOEFCC is a government department responsible for planning, promoting, coordinating, and overseeing the implementation of environmental and forestry programmes in the country. The Ministry is responsible for the implementation of policies and programmes related to the conservation of the country’s natural resources, and has five broad objectives:

- To conserve and survey flora, fauna, forests and wildlife;
- The prevention and control of pollution;
- To oversee afforestation and regeneration of degraded areas;
- The protection of the environment; and
- To ensure the welfare of animals.

The MOEFCC is responsible for reviewing draft standards developed by CPCB, undertaking public consultation and adopting and publishing finalised emission standards.

### 2.1.2 Central Pollution Control Board (CPCB)

The CPCB is a statutory organisation that is positioned under the MOEFCC. The CPCB was established in 1974, following the development of the Water (Prevention and Control) Act, 1974. Subsequent national acts have entrusted the CPCB with further functions and powers. These include the Air (Prevention and Control of Pollution) Act, 1981, and the Environment (Protection) Act, 1986.

The role of the Central Board is set out in section 16(2)(b) of the Air (Prevention and Control of Pollution) Act, 1981, and is to:

*“plan and cause to be executed a nation-wide programme for the prevention, control or abatement of air pollution”*

The Central Board consists of 15 members, excluding the Chairman and the Member Secretary. The maximum term of office for each member is three years. The structure of the Central Board is stipulated in sub-clauses (1) and (2) of clause 3 of The Water (Prevention and Control) Act, 1974:

- Chairman - nominated by the Central Government.
- A number of officials, not exceeding five - nominated by the Central Government.
- A number of persons, not exceeding five – nominated by the Central Government, from amongst the members of the State Boards.
- A number of non-officials, not exceeding three – nominated by the Central Government, to represent the interest of:
  - Agriculture;
  - Fishery;
  - Industry;
  - Trade; or
  - Any other interest, which, in the opinion of the Central Government, ought to be represented.
- Two persons to be nominated by the Government, to represent the companies or corporations owned, controlled or managed by the Central Government.
- Member Secretary – appointed by the Central Government.

Overall, the CPCB employs approximately 500 fulltime employees who form a multi-disciplinary team comprising engineers, scientists and environmental specialists.

The CPCB is split into three major groups: technical services, scientific services, and finance and administration. The main divisions and their areas of activities are summarised in the table below:

**Table 1: Divisions of the CPCB**

SI No.	Division	Areas of activity
1	Pollution assessment	Assessment of water and air pollution
2	Infrastructure and R&D	Laboratories and R&D

3	Plan Co-ordination	Plans and programmes of CPCB and co-ordination matters
4	Pollution Control Implementation (PCI-I)	Chemical industries
5	PCI-II	Metallurgical, thermal power plants and other air polluting industries
6	PCI-III	Agro-based industries
7	Urban pollution control	Small scale industry, vehicular pollution, environmental planning, solid waste and plastic wastes and training
8	Hazardous waste Management	Hazardous waste and chemical, bio-medical waste and electronic waste

The CPCB is responsible for developing and maintaining national standards under the many environmental laws. This is done in consultation with organisations at a National, State and local level. As part of the Board’s role in ensuring that standards are maintained, it is responsible for conducting monitoring of water and air quality, and maintaining this data.

The Peer and Core Group Committee is a body of experts that sits within the CPCB, which plays a key role in the setting of emission standards. This is discussed in greater detail in Section 2.2.

### 2.1.3 State Pollution Control Boards (SPCBs)/ Pollution Control Committees (PCCs)

SPCBs are responsible for implementing legislations and issuing rules, regulations and notifications that prescribe the emission standards. The role of the State Board is set out in section 17(1)(g) of the Air (Prevention and Control of Pollution) Act, 1981:

*“To lay down, in consultation with the Central Board and having regard to the standards for the quality of air laid down by the Central Board, standards for emission of air pollutants into the atmosphere from industrial plants and automobiles or for the discharge of any air pollutant into the atmosphere from any other source whatsoever not being a ship or an aircraft: Provided that different standards for emission may be laid down under this clause for different industrial plants having regard to the quantity and composition of emission of air pollutants into the atmosphere from such industrial plants”*

SPCBs are required to plan and execute a programme for the prevention, control and abatement of pollution, and to collaborate with the CPCB in achieving this, and provide advice to the State Government on any matter relating to the prevention, control and abatement of air pollution. SPCBs collect and disseminate information relating to air pollution, undertake inspections of air pollution control areas, provide assessments of air quality and take measures to prevent, control and abate air pollution.



For Union Territories (ruled directly by the federal government) these activities are the responsibility of the Pollution Control Committee (PCC). All industries located in, or planned to be built within any State or UT must coordinate with the respective SPCB or PCC.

The responsibility for the setting of emission standards is vested with SPCBs/PCCs under Section 17(1)(g) of Air Act. SPCBs/PCCs are able to set more stringent standards where the local air quality does not meet ambient air quality standards or where location-specific sensitive uses require additional protection (e.g. monuments & sanctuaries). In many areas this is due to rapid industrialisation/urbanisation and as a result of the cumulative impact of existing facilities. The CPCB provides guidance to SPCBs on the setting of location-specific stringent standards. However, the CPCB develops the national level minimum standards that are generally adopted as they are, by SPCBs/PCCs (this is discussed further in Section 2.2.7).

The composition of SPCBs/PCCs is as follows:

- Chairman – nominated by the State Government.
- A number of officials, not exceeding 5 – nominated by the State Government.
- A number of persons, not exceeding 5 – nominated by the State Government from amongst the members of the local authorities functioning within the State.
- A number of non-officials, not exceeding 3 – nominated by the State Government to represent the interest of certain sectors chosen by the Government (e.g. agriculture, fishery, industry, trade etc.).
- 2 persons to represent the companies/corporations owned, controlled or managed by the State Government – nominated by the State Government.
- Member-secretary – appointed by the State Government.

SPCBs/PCCs may also form Core Technical Committees, comprising between 5 and 7 experts<sup>6</sup> who have the following responsibilities concerning the setting of industrial emission standards:

- Confirm the boundaries for areas of study and agree on the priority pollutants for control.
- Confirm the location and frequency of air quality monitoring undertaken at monitoring stations.
- Review comprehensive environmental audit reports submitted by operators.
- Work with industries to identify potential technological improvements and to set as low as reasonably achievable standards.
- Confirm the required frequency of inspections, based on the individual requirements/risks for each facility.
- Undertake periodic progress reviews and to amend decisions for any desired enforcement.

.....  
<sup>6</sup> Including a professor of a university to act as Chairman; an officer from the Central Pollution Control Board; a CSIR nominee (preferably from NEERI); a maximum of three nominated experts, with relevant professional qualifications and experience; and an officer from the concerned SPCB to act as Member Secretary.

## 2.2 Analysis of prescribed process

The following sections describe the prescribed process for setting industry-specific emission standards in India, supplemented with observations on what has been found to occur in practice, through the stakeholder engagement programme and a review of independent studies. An overview of the process is provided, followed by more detailed descriptions of the following key development issues:

- Prioritisation;
- Input provided by industry, academia, NGOs and SPCBs/PCCs;
- Environmental and techno-economic considerations;
- International considerations;
- Public consultation;
- Development of more stringent standards; and
- Implementation.

### 2.2.1 Overview

The MOEFCC notifies minimum national standards for emissions to air and water (i.e. excluding those set for noise) for over 100 industries/activities. These range from high emitting industries such as thermal power plants, petroleum oil refineries and integrated iron and steel facilities, to more localised sources such as flour mills, the starch industry and the cashew seed processing industry.

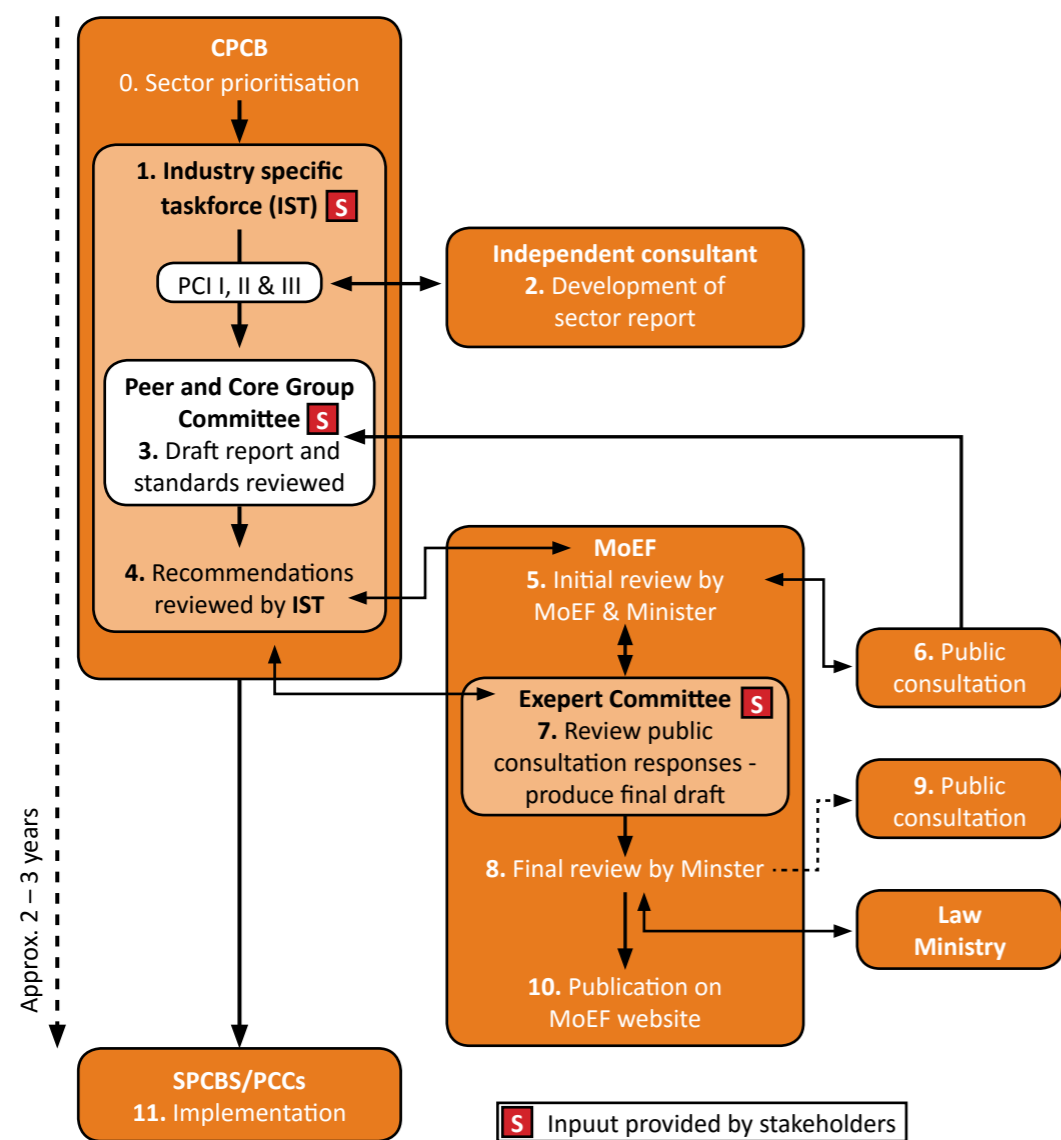
The first set of standards developed following the enactment of the Air Pollution Control Act in 1981, included:

- Thermal power plant;
- Cement plant;
- Integrated iron and steel industry;
- Non-ferrous metallurgical industry;
- Aluminium manufacturing industry;
- Oil refinery; and
- Fertilizer industry.

The standards are notified by the MOEFCC and are made available to the public on the CPCB website. A full list of the industries with standards for emissions to either air or water are provided in Appendix I. In recent years, it appears that activity in relation to standards development and revision has significantly increased under the new Government, with a number of standards under development, draft standards notified (e.g. iron and steel) and others adopted (e.g. thermal power plants).

The following diagram provides a summary of the process for the development of industry-specific standards, identified through both the literature review and stakeholder consultation. Each stage is then discussed in greater detail below.

**Figure 3: Flow diagram of the process for emission standard development in India**



**Key:** CPCB = Central Pollution Control Board / IST = Industry Specific Taskforce / PCI = Pollution Control Implementation (Division of CPCB) / MoEF = Ministry of Environment, Forest & Climate Change / SPCBs = State Pollution Control Boards / PCCs = Pollution Control Committees.

The development of standards is initiated within the Central Government, and is the same for all industry types. Once the CPCB selects an industry sector for the development of standards an industry-specific task force, which consists of representatives of the CPCB, MOEFCC, industry, relevant sectoral Ministries, academics and SPCB representatives (depending on sectoral importance), is established. The Board then instructs the CPCB's Pollution Control Implementation Divisions I, II & III and the Hazardous Waste Management Division to develop draft standards for the selected industry, often with support provided by external experts/research institutes. This typically involves the preparation of a sectoral background document, which should include a review of the status of implementation of any existing standards, existing performance of the sector, review of available techniques/technologies to reduce emissions, consideration of international standards and practices, and some initial proposals for potential standards. These are prepared by a third party for the CPCB.

It was not possible to gain access to an example sectoral background document for the purposes of this assessment. However several COINDs documents (which are publicly available) have been reviewed. These are expected to reflect the main findings of the sectoral background documents, although the exact linkage between the two was not clear from the review undertaken and stakeholders consulted. Based on this sectoral report, the CPCB develops a draft set of standards for discussion with the Peer and Core Group Committee (P&CGC).

The P&CGC is an expert group within the CPCB, consisting of academic personnel and representatives from industry and business, Sectoral Ministries, independent consultants, National Laboratories, NGOs, IIT/IISC and a selection of SPCBs/PCCs (up to 4 in some cases). Members of the Committee are selected on the basis of their relevance to the industry being considered. The Peer Group is specific to the sector under consideration whilst the Core Group has a wider membership and aims to ensure consistency across different sectoral standards. This Core Group may also include a health professional as well as someone focussed on ambient air quality. They will review the draft documents produced by the Pollution Control Implementation Divisions/ Hazardous Waste Management Division, and either provide feedback requesting changes, or they will make a recommendation to take it forward to the CPCB Board.

The standards recommended by the P&CGC are then considered by the industry-specific task force of the CPCB, that will either provide feedback requesting changes, or they will make a recommendation to be passed to the MOEFCC and the Minister. The MOEFCC (co-ordinated by the Control of Pollution Division) will undertake an initial review of the draft standards and return to CPCB for updating if any changes are required. If not, the draft will be placed for a first review by the Minister. If the Minister is content, the standards are placed on the MOEFCC's website for public consultation (30-60 days), after which responses from stakeholders are taken into consideration by the MOEFCC Expert Committee, which comprises representatives of the MOEFCC, Sectoral Ministries, CPCB, the Confederation of Indian Industry (CII), FICCI and the Bureau of Indian Standards (BIS), as well as the CPCB. Any comments raised by the Committee are sent to the CPCB to be actioned. Once the Committee is content that these changes have been made, it is sent to the Minister again. If there are no further comments, the draft standards are approved by the Minister and sent to the Law Ministry for vetting. The standards are then final and come into force (subject to any timetable for compliance set out in the standards themselves) — details of which are published in the Gazette of India.

The timeframe in which the development of a standard takes place varies between industries. However most will require a minimum of 2-3 years, or generally longer, before being notified. On adoption of the standard, it appears that the information provided in the sectoral background documents is used to produce a Comprehensive Industry Document (COINDs) for the relevant industry, which is published on the CPCB website; although as noted earlier, the exact linkage between the two documents is not clear. COINDs vary between sectors, but often provide an introduction to the industry being reviewed, and an assessment of the environmental impacts. They will present any assessments of emissions undertaken in support of the standard development process and provide recommendations on the standards to be set.

Once the minimal national standards have been confirmed, SPCBs/PCCs are responsible for the setting of emission standards within their respective States, as detailed in Section 17(1) (g) of the Air Act (SPCB/PCC processes are discussed further in later sections of the report).

### Observation of 'real-world' practice

The criteria by which the draft standards are reviewed by the industry specific task force, P&CGC and Expert Committee is not publically available and it is not clear who is responsible for the final decision (i.e. whether this is the responsibility of the chairperson, or whether this is agreed by a majority decision).

There was a lack of publically available information to be able to understand the exact process that has been followed and whether it is consistent between sectors.

The P&CGC is the primary route for input from private sector organisations, however the stakeholder interviews indicated that industry (particularly the private sector) are not always fully engaged during the development of the standards i.e. the structure of the development process restricts industry involvement as only a select number of organisations appear to be invited to contribute. This means that the expertise and resources they have are not always being utilised as effectively as they could be. Also equipment manufacturers do not appear to be included on relevant Committees which may mean that the timescales for the procurement and installation of abatement equipment may not be considered fully during the process.

### 2.2.2 Prioritisation

CPCB use their own system of industry-characterisation for prioritising industries for standard development. This system groups industrial activities/processes into categories, including “Red”, “Orange” and “Green”. This system was recently revised to include a new category (“White”), and the selection process was amended to reflect the Pollution Index, “*which is a function of the emissions (air pollutants), effluents (water pollutants), hazardous wastes generated and consumption of resources*”. Industrial sectors are now scored from 0 to 100, with the increasing value reflecting the increasing pollution load from the industry. The updated system also states that no Red Category industry will be permitted to operate within ecologically fragile or protected areas. It is hoped that this new system will encourage operators to adopt cleaner technologies, reducing the level of emissions<sup>7</sup>. The industry categories are now defined on the following basis:

**Table 2: System for industry categorisation**

Category	Description	Number of industries within this category
RED	Industrial sectors having Pollution Index score of 60 and above	60
Orange	Industrial sectors having Pollution Index score of 41 to 59	83

<sup>7</sup> CPCB (2016) Final Document on Revised Classification of Industrial Sectors Under Red, Orange, Green and White Categories via [http://envfor.nic.in/sites/default/files/Latest\\_118\\_Final\\_Directions.pdf](http://envfor.nic.in/sites/default/files/Latest_118_Final_Directions.pdf)

Green	Industrial sectors having Pollution Index score of 21 to 40	63
White	Industrial sectors having Pollution Index score including and up to 20	36

### Observation of 'real-world' practice

Insufficient evidence was available to understand how the process for prioritisation and its application for selecting standards to be developed or reviewed works in practice including potential application of the above industry categorisation or any other criteria. However it is understood that the CPCB has ultimate responsibility for selecting the industries for standard development and SPCBs/PCCs may submit recommendations for consideration. The process for selection is not well documented (publically at least), therefore it is not possible to confirm the determining factors, such as stakeholder input, source apportionment or techno-economic considerations.

In setting more stringent standards SPCBs/PCCs may also be required to prioritize the pollutants or industries addressed by those standards, however again this is not clearly defined.

### 2.2.3 Input provided by industry, academia, NGOs or SPCBs/PCCs

The primary route for input from key stakeholders, including industry, academia, NGOs etc., during the standard development process is via the Peer and Core Group Committee within the CPCB, as described above, as well as other selected Task Forces and Committees. Once an industry sector has been selected for the development of standards, an industry-specific task force, which consists of representatives of the CPCB, MOEFCC, industry, relevant sectoral Ministries, academics and SPCB representatives (depending on sectoral importance), is established.

### Observation of 'real-world' practice

It was not possible to understand, based on the documentation available, exactly how industry representatives within the P&CGC and MOEFCC's Expert Committee are selected for involvement in the process although it may be based on relevance to the sector. A number of stakeholders have raised concerns regarding the potentially limited role that SPCBs/PCCs play in the P&CGC (very few appear to be actively involved), suggesting that all should have the opportunity to contribute to the process at an earlier stage, enabling feedback on any concerns, the sharing of best practice between States and providing adequate time for each SPCBs/PCCs to prepare for new standards.

It is not clear what guidance is provided to the external experts prior to preparing the draft standards, including the sectoral background document (i.e. requirements for sourcing information, cost-benefit analysis or the need to consider the required time for implementation etc.).

Industry commitment is a real concern for both the CPCB and MOEFCC with a number of challenges recently being made against some standards leading to delays in their adoption and subsequent implementation. Challenges have related to both the stringency of standards but also the timescales for their implementation (i.e. industry achieving compliance) and may in part be due to a lack of industry involvement in the P&CGC.

## 2.2.4 Environmental and techno-economic considerations

In setting minimal national standards, the CPCB will consider the potential impact of industrial emissions on the National Ambient Air Quality Standards (NAAQS), which are legislated under Section 16 (2) (h) of the Air (Prevention and Control of Pollution) Act, 1981, and provide standards for air quality necessary to protect public health, vegetation and property<sup>10</sup>. SPCBs are also required to consider ambient air quality conditions when setting standards at a State and individual site level, as described in the CPCB Guidance document ‘Guidelines for Development of Location Specific Stringent Standards’<sup>9</sup>, and are permitted to set more stringent standards to address concerns on local air quality.

The techno-economic factors taken into consideration in the setting of standards are set out in the COINDs or background documents for each industry, including the selection of abatement technologies.

In the guidance document ‘Rationale in Evolution of Standards for Industrial Effluents and Emissions’<sup>8</sup>, the CPCB provides a formula by which the techno-economic feasibility of a proposed standard can be determined. It is assumed that this formula is adopted by the CPCB at the development stage. This is done by calculating the total annualised cost (Annual Burden) of the environmental treatment required to achieve the standard, including capital, operational, maintenance and repair costs, as a percentage of the Annual Turnover for the relevant industry. If the Annual Burden of the treatment technology is found to be 3 % or less of the Annual Turnover, it is deemed to be bearable and termed ‘critical’. However industries for whom the Annual Burden is greater than 3 %, but less than 6 %, are likely to require additional financial support, and are termed ‘supercritical’. Finally if the technology would require an Annual Burden of 6 % or above, it is unlikely to be considered feasible.

### Observation of ‘real-world’ practice

Whilst the CPCB should take into account potential impact of industrial emissions on the NAAQS, the exact way in which this is to be done as part of the development of specific standards does not appear to be documented, at least publically anyway.

<sup>8</sup> CPCB (1996) Rationale in Evolution of Standards for Industrial Effluents and Emissions via [http://www.cpcb.nic.in/upload/Publications/Publication\\_120\\_sec2\\_67.pdf](http://www.cpcb.nic.in/upload/Publications/Publication_120_sec2_67.pdf)

The stakeholder interviews indicated that the sectoral background document bases its analysis of the techno-economic feasibility of pollution control technologies on the calculation detailed above. Given that this formula was prepared 20 years ago, this screening criteria may no longer be appropriate in an industrial sector where environmental impacts may require the same, if not more, consideration as profits. Furthermore, this formula was not presented in any of the COINDs documents reviewed for this assessment. Some COINDs considered in the study included a review of the pollution control equipment available and descriptions of best practice. This was typically broad, lacking real detail on cost implications for the operator and the potential abatement potential of the equipment.

In some cases the scope of the supporting evidence was found to be limited. For example, the COINDs document produced for brick kilns, which appears to include the research put forward in the sectoral background document (although this is not explicitly stated), based its conclusions on a single study of monitored emissions from four facilities, of which just one had been operating commercially. There are certainly similar studies that could have been considered but the document gives no indication that any were taken into account. Basing an emission standard on an assessment of this scale, without verifying the results against reliable data, carries significant risk for the efficacy of the standards.

## 2.2.5 International considerations

It is believed that the sectoral background documents, which include the justification for the draft emission standards, will consider standards set by other countries. However, it has not been possible to confirm this for the purposes of this assessment. COINDs documents are also expected to provide a review of international standards for each industry.

The guidance given to SPCBs in the CPCB publication on the setting of location-specific stringent standards, states that “a review of best technologies available in the world will facilitate the maximum reduction in pollution achievable at the tail end”. However it also states that often the availability and cost of such technologies may be prohibitive.

### Observation of ‘real-world’ practice

Despite the requirement to consider international standards, many of the COINDs documents reviewed did not provide international standards for comparison, although it has not been possible to confirm whether these were considered in the sectoral background document. For the three sectors reviewed in greater detail (see Section 2.3), the standards set in India are generally less stringent and include fewer pollutants than equivalent standards set in the EU, USA and China (with the exception of thermal power plants where equivalent standards to those set in China have been adopted for new installations). Therefore, it is not clear, at least for these sectors, if international standards were considered; at least they do not appear to have been used as a benchmark for best practice in most instances.

## 2.2.6 Public consultation

Draft notifications of new or amended emission standards are made public by the Central Government for a period of 30-60 days on the MOEFCC website, prior to being reviewed by the

Expert Committee. Members of the public may submit comments via email to a representative of the Central Pollution Control Board. The draft notifications set out the standards and any requirements for operators. However they do not detail the reason for the change or the methods and background documentation used to develop new standards. Following the 30-60 day period, stakeholder responses to the draft are taken into consideration before final notification.

Whilst standards are being finalised/notified, stakeholders are able to challenge what has been set out in the draft via the Appellate Authority constituted under the law, or through the National Green Tribunal (NGT).

### Observation of 'real-world' practice

This is a relatively recent change to the process whereby consultation used to take place at the end of the MOEFCC review process and in advance of the publication of the final standards. Feedback from the public consultation is collated and reviewed by both the MOEFCC and CPCB and a response to the comments is agreed. The draft documents are then updated. The CPCB and MOEFCC do prepare a summary of stakeholder comments received and how they have been responded, however these are not shared in the public domain.

The stakeholder interviews confirmed that very few responses are being received and generally these are coming from industry who should already have had earlier opportunities to contribute to and comment on the standards being developed. These recent changes do not appear to be documented publically and the consultations themselves are not well publicised.

Furthermore, it should be noted that the consultations for all recent standards have been 30 days only. Additionally, in several instances, the draft notification posted on the MOEFCC website did not explicitly state the date on which the 30 day comment period commenced or the date by which comments have to be submitted.

## 2.2.7 Development of more stringent standards

Upon notification, the agreed standards will be communicated to all SPCBs/PCCs by the CPCB. Section 17(1) (g) of the Air Act confirms that it is the responsibility of the SPCBs/PCCs to set emissions standards, including the setting of standards more stringent than those recommended by the CPCB. The minimum national standards will be reviewed and decisions made as to whether to adopt them as written, or apply tighter standards to address specific environmental concerns. At a State level, there will generally be a Task Force (focussed on implementation), Industry Specific Committee, Vigilance Committee (enforcement and compliance) and Zero Liquid Discharge (ZLD) Committee, amongst others.

A key document used by SPCBs for the setting of emission standards which vary from those proposed by the Central Government, is the CPCB's 'Guidelines for Development of Location Specific Stringent Standards' (2009)<sup>9</sup>. This document helps SPCBs to identify areas that are likely to require

more stringent standards, to understand in more detail the sources of pollution within those areas and the means for controlling them, and to develop standards based on the specific capacity of that environment.

The guidance states that the general approach established by the CPCB requires standards for emissions to air to be made more stringent where "the ambient air quality is not meeting as per the requirement (standards)" or where "location-specific sensitive uses (as notified by the concerned authority) requires additional parameters to be controlled for example in case of monuments, sanctuaries etc." Where these conditions do not apply, the minimal national standards can be set by the SPCB. The guidance confirms that standards should be based on:

- The potential benefits to human health, ecology and potential impacts on man-made assets;
- The techno-economic feasibility of the standards and the availability of required abatement technologies;
- Ambient air and water quality standards applicable to the location of the facilities; and
- The use of both concentration and mass-based metrics.

The suggested steps provided by the CPCB to determine the potential pollutant loadings of a given industry are provided below:

1. Create a list of all relevant industries for each pollutant
2. Categorise the air shed
3. Use a decision matrix to prioritise industries
4. Use atmospheric dispersion modelling to identify areas where air quality standards are likely to be exceeded
5. Locate air quality monitoring stations in applicable locations
6. Carry out monitoring of relevant pollutants
7. Establish relationship between monitored and predicted pollutant values
8. Determine source apportionment of the relevant pollutant for applicable sources in the area
9. Review potential pollutant control systems, providing an assessment of their efficiency and reliability
10. Request a comprehensive environmental audit by the operators
11. Confirm best practicable technology for further control

The guidance stresses the importance of using dispersion models to determine the discharge/emission reduction required to meet ambient air quality levels, and recommends the use of various United States Environmental Protection Agency (USEPA) models for different processes, pollutant types and locations. It also recommends ways of selecting the most appropriate models for Indian conditions.

SPCBs/PCCs are also recommended to undertake an assessment of the cumulative pollution loading of industrial agglomerations on the receiving environment. The pollution loading is then compared with the assimilative capacity of the receiving environment, which is defined as the maximum pollution loading that the environmental medium is capable of withstanding without affecting its 'designated-best-use'.

The situation is considered 'normal' if the pollution load after treatment (PLAT) is less than the allowable level of pollution load (ALPL), based on the assimilative potential. Therefore, the agreed standards and associated technologies can be formulated into a legal agreement and

<sup>9</sup> CPCB (2009) Guidelines for Development of Location Specific Stringent Standards via [http://www.cpcb.nic.in/divisionsofheadoffice/pci1/Location%20Specific%20Standard-Report\\_08.10.08.pdf](http://www.cpcb.nic.in/divisionsofheadoffice/pci1/Location%20Specific%20Standard-Report_08.10.08.pdf)

the consent conditions implemented. However if PLAT is higher than ALPL, it is considered a ‘severe pollution condition’, and further restrictions (i.e. additional or alternative pollution control equipment or more stringent emission standards) will be required.

### Observation of ‘real-world’ practice

The guidance document provided to SPCBs is thorough and should, in theory, provide SPCBs with the necessary tools to set more stringent limits to address existing air quality issues. The guidance states *“there are many areas where it is just not possible to meet the ambient air or water quality standards by simply adopting the national standards notified under the Environment (Protection) Act, 1986 for emission/discharges from various sources.”* Therefore this is a key stage of the process and is vital to ensure the standards are effective.

However the stakeholder interviews indicated SPCBs/PCCs are typically not setting tighter standards, despite the fact that there are real air quality and water concerns in several cities, regions and States. A major argument for not setting tighter standards is that SPCBs/PCCs feel that it is much harder to justify (i.e. it is easier to justify the application of the national standards) and they do not have the resources (financial and technical) to investigate tighter standards. The process for developing standards at a national level is unclear and SPCBs/PCCs are not all actively involved in that process which may add to the challenge of setting tighter standards.

Furthermore, whilst the guidance states that the standards should be based on the potential benefits to human health, this is not reflected in the steps provided by the CPCB in identifying the pollutant load of industries. The potential health impacts do not appear to be considered anywhere in the process.

In setting more stringent standards, SPCBs/PCCs are urged to consider international approaches, stating that *“a review of best technologies available in the world will facilitate the maximum reduction in pollution achievable at the tail end”*. However, the guidance also states that often the availability and cost of such technologies may be prohibitive, and if this is found to be the case, BAT may be interpreted as *“the best demonstrated technology elsewhere and practicable”*. This indicates that SPCBs are unlikely to apply BAT if the costs of the required technology are considered to be disproportionately high. In discussions with the GPCB, it was confirmed that international standards were taken into consideration in the setting of more stringent standards. However, as the GPCB is one of only a small number of Boards to set more stringent standards it is therefore likely that SPCBs will only consider international standards if they are under pressure to set more stringent standards.

## 2.2.8 Implementation

The CPCB has constituted a number of sector-specific National Task Forces, designated to work with SPCBs/PCCs to implement emission standards and to introduce a time-bound programme for achieving this. The main function of each National Task Force is to offer technical solutions to any specific problems regarding the implementation of standards.

SPCBs/PCCs have to fulfil a number of roles to implement the standards. They have to: ensure greater compliance using charges, grants and other incentives; undertake regular inspections, audits and monitoring activities; and enforce standards through fines and imprisonment.

**Encouraging compliance** – SPCBs/PCCs have a number of ways in which they can encourage operators to reduce their impact on the environment, including:

- Charges for residual environmental pollution.
- Incentives for operators that adopt BAT, including concessions on import duties.
- Emissions trading schemes, provided the minimal national standards have been achieved and technologies meeting the ALARA (“as low as reasonably achievable” technologies) criteria have been installed.
- Grants for common treatment facilities, common disposal facilities and common hazardous waste incinerators.

**Undertaking inspections** – SPCBs/PCCs are required to undertake regular inspections of industrial facilities<sup>10</sup>, with the frequency of inspections determined by the category of the industry, as illustrated below.

**Table 3: CPCB guidance on requirements for the minimum frequency of inspections**

Size of industry	Category of pollution potential	Inspection frequency
Large and medium-sized	Red	Once per 3 months
	Orange	Once per year
	Green	Once per 2 years
Small scale (capital investment below 10,000 rupees)	Red	Once per year
	Orange	Once per 3 years
	Green	Once per 5 years

NB: This guidance was published prior to the publication of the new system of categorisation, therefore does not provide inspection frequencies for ‘White’ category industries.

If facilities are found to be failing in their environmental obligations, including emission standards, under the Water Act, the Air Act and the Environmental Protection Act, SPCBs/PCCs have the authority to carry out the following actions:

- Issue and revoke consents to operate
- Require self-monitoring and reporting
- Conduct sampling
- Require corrective action
- Prescribe compliance schedules

<sup>10</sup> Parliament of India – Department Related Parliamentary Standing Committee on Science and Technology, Environment and Forests. One Hundred and Ninety Second Report on Functioning of Central Pollution Control Board via <http://www.fenvis.nic.in/files/Environment,%20Forest%20and%20Climate%20Change/192.pdf>

**Auditing and monitoring practices** – SPCBs/PCCs are also required to conduct an audit of polluting facilities at least once per year, although more frequent audits can also be agreed by the Board. The National Environmental (Protection) Rules of 1986 also require each polluting facility to submit an environmental statement for each financial year.

The requirements for the monitoring of pollutants arising from industrial installations are laid down in CPCB document “Emission Regulation – Part III”, with further guidance provided in “Guidelines on Methodologies for Source Emission Monitoring”.

The Regulation requires industrial units to monitor both ambient air quality and stack emissions within their premises, with the exact location of monitoring stations and sampling ports to be approved by the SPCB/PCC. The SPCB/PCC may also request more rigorous monitoring requirements, depending on the nature of the industry and the sensitivity of the surrounding area. Monitoring equipment must be of a standard design approved by the CPCB, or by a delegated power (e.g. SPCB/PCC). Further, any authorisation undertaking emissions or ambient air quality testing must be approved by the SPCB/PCC.

The frequency with which stack monitoring is undertaken varies, depending on the industry. Each operator is required to report the results of the assessment to the SPCB/PCC. The regulations set monitoring requirements for the thermal power, cement, integrated iron and steel, fertilizer, nitric acid, sulphuric acid, primary aluminium, carbon black, calcium carbide and oil refinery industries.

**Enforcing standards** - Where required, SPCBs/PCCs may enforce standards through emergency measures like disconnecting water or power supply; and/or facility closure. According to the Hazardous Wastes (Management and Handling) Rules of 1989, with the approval of the CPCB, a SPCB/PCCs can impose administrative fines for any violation of rules. All other sanctions, such as fines and imprisonment, must be pursued under the criminal authority of the courts. It is unclear what time frames are provided to industries to comply before action is taken, although it would be expected to be determined on a case-by-case basis, depending on the specific circumstances. Frequency of inspections may increase in cases of non-compliance and/or complaints for individual sites.

Previous assessments<sup>11</sup> have shown the enforcement process to follow the general sequence of:

1. Gather information on non-compliance through site visits and monitoring.
2. Analyse samples at a certified laboratory.
3. Issue a “show cause” notice and if the violation continues, a legal notice of the violation.
4. A review hearing at the SPCB/PCC, with evidence provided by the non-complier in its defence.
5. Issue a notice of proposed directive detailing enforcement response (which may include cut-off or closure of utilities) and/or corrective action and compliance schedules.
6. After review of possible objection by the violator, issue a final directive.
7. In case of non-compliance with the directive, initiate prosecution in criminal court.

<sup>11</sup> OECD (2006) Environmental Compliance and Enforcement in India: Rapid Assessment via <https://www.oecd.org/env/outreach/37838061.pdf>

### Observation of real-world practice

Concerns were raised during the stakeholder interviews regarding the adequacy of enforcement of standards by SPCBs, including the suitability of the monitoring being undertaken and the quality assurance / quality control procedures in place. There are also concerns that small, localised facilities, such as sponge iron plants, are failing to comply with their obligations for environmental monitoring<sup>35</sup>.

The cause of incidences of non-compliance may include a lack of enforcement by SPCBs/PCCs, a lack of understanding regarding the risks associated with exceeding ambient air quality standards, a lack of suitable expertise or monitoring equipment, and/or operator negligence<sup>12</sup>. Criminal cases brought by SPCBs against facilities for non-compliance are difficult to prosecute and have a low conviction rate, which is thought to discourage SPCBs from taking legal action against companies<sup>10</sup>.

A report published by the World Bank<sup>13</sup> on regulatory compliance in India indicated that regulatory authorities often focus on large and visible polluters, despite the fact that 70% of the total industrial pollution load is accounted for by small-medium enterprises. Therefore smaller polluters are more likely to continue to discharge illegally and form clusters resulting in cumulative impacts on air quality. As reported by CSE, in certain industries, such as brick kilns and sponge iron plants, smaller facilities have been found to operate without a CTO and/or bypass the pollution control systems, by releasing emissions directly to the environment (e.g. via emergency caps or roof vents), resulting in the monitored stack emissions falling below the standard<sup>14</sup>.

Some industry sectors have expressed concerns that it is not clear exactly what techniques/ technologies they should be applying to meet particular standards and where they can acquire them from. These are often detailed in the COINDs documents for each industry, however some COINDs documents provide more detail than others, and a number are several years out of date.

## 2.3 Detailed sector review

As part of the study, the emission standard development process was reviewed in greater detail for three key industrial sectors in India (thermal power, iron and steel and brick kiln industries), in order to assess the degree to which the process, detailed above, has been followed in practice.

The findings of the sector reviews are provided in Appendix II. For TPP and iron and steel, there was insufficient evidence available publicly, as well as from consultation, to be able to review and comment on the process in any detail. Therefore, the reviews primarily focussed on a comparison of the levels at which the standards have been set, relative to those applied in other geographies.

<sup>12</sup> Dr. B. Sengupta (2011) Emission Standard, Ambient Air Quality Standard and Emission Measurement for Air Pollution Control [Presentation]

<sup>13</sup> World Bank – India: Enabling Compliance in the Regulatory Environment via <http://web.worldbank.org/archive/website01291/WEB/IMAGES/CH4.PDF>

<sup>14</sup> CSE (2011) Sponge Iron Industry: The Regulatory Challenge via [http://cseindia.org/userfiles/sponge\\_iron\\_layout.pdf](http://cseindia.org/userfiles/sponge_iron_layout.pdf)

## 2.4 Summary

The Government of India sets legally binding standards for emissions to air from a range of industries. The legal provision for the development of these standards is set out under the Air (Prevention and Control of Pollution) Act, 1981, which requires the CPCB to execute “*a nationwide programme for the prevention, control or abatement of air pollution*”. The Act also requires SPCBs/PCCs to have “*regard to the standard for the quality of air laid down by the Central Board*” and that standards must address “*different industrial plants having regard to the quantity and composition of emissions of air pollutants into the atmosphere*”.

The provision of emission standards were further built upon in the Environment (Protection) Act, 1986. Amongst others, this act gives the Central Government powers to take measures to protect and improve the environment, which as stated in section 3(2)(iv), includes: “*Laying down standards for emission or discharge of environmental pollutants from various sources whatsoever. Provided that different standards for emission or discharge may be laid down under this clause from different sources having regard to the quality or composition of the emission or discharge of environmental pollutants from such sources*”

The responsibility for overseeing the development and implementation of these standards is shared between the Ministry of Environment Forest and Climate Change (MoEFCC), Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs). These are minimum national standards but the SPCBs can set tighter standards if required, although it appears that this very rarely happens in practice.

The review of the process followed in India to develop industry emission standards, along with a comparison of practices adopted in other geographies, has shown that **developing industry emission standards is a challenging process**. India is not alone in facing challenges with developing these types of standards. The reasons for this include the following:

- A number of industry sectors are complex, with significant variation in fuels, processes and products — meaning that standards have to be differentiated to try and take into account these differences.
- To develop robust standards requires a strong evidence base on the sector (e.g. current status of implementation of existing standards, current performance), which takes time and resources to gather, review and analyse.
- Standards tend to require industry investment to reduce emissions, so naturally there can be some opposition to setting tighter standards.

Significant progress has been made since the first emission standards were developed more than 10 years ago, and the **MoEFCC currently provides minimum national standards for emissions to air and water for over 100 industries/ activities**. These range from high emitting industries such as thermal power plants, petroleum oil refineries and integrated iron and steel facilities, to more localised sources such as flour mills, the starch industry and the cashew seed processing industry. In the past year or so, it appears that activity relating to standards development and revision has significantly increased under the new Government, with a number of standards under development or review, draft standards notified (e.g. iron and steel) and others adopted (e.g. thermal power plants).

Based on a review of available documentation and discussions with key stakeholders, some potential challenges and areas for strengthening related to the process for standards development in India have been identified. These relate to the following themes:

- **Resources** (skills and manpower) of some of the key institutions involved in the process are strained, and stakeholders have indicated that this is impacting on the process for development of the standards, and ultimately the standards themselves.
- **Clarity of the process** could be improved, as it is not clearly laid out in any single document — making it harder for stakeholders to understand the different stages and know how and when they can engage with the process. Further, whilst significant information is generated during the process, it is not always made publicly available (e.g. background sectoral documents, meeting minutes etc.).
- **Evidence base** for developing the standards appears to be quite variable between sectors, although in many cases it was not possible to access the background documents used to inform the standards being developed, since they are not routinely made publicly available. A strong evidence base ultimately leads to more robust and realistic standards, and should thus reduce the risk of challenges later in the process.
- **Engagement with key stakeholders** including industry, SPCBs/PCCs, NGOs and the general public that has been raised by a number of stakeholders during the study, is one area where the process could be strengthened. This should help in improving the overall evidence base and for subsequent implementation of the standards (including the potential development/setting of more stringent standards at a State level if required).

As stated in Section 2.1, the standards set by SPCBs/PCCs should have “*regard to the standard for the quality of air*” provided by the CPCB, which can be assumed to be the NAAQS. However, in the CPCB’s guidance on the setting of more stringent standards it states that, due to the variability of the conditions across the country, the national minimal standards are unlikely to prevent NAAQS from being exceeded. Despite this, the vast majority of SPCBs/PCCs have not set standards at more stringent levels than the national minimal standards, despite some having an air quality need to do so. Various reasons have been raised by stakeholders for SPCBs/PCCs not setting tighter standards (described in Section 2.2) related to a lack of technical resources as well as not feeling they can justify tighter standards to industry.

The following section looks at the process for standard development adopted in other regions around the world, and aims to provide some comparison with the process followed in India. Recommendations on how the process could be strengthened are presented in Section 4.

## 3. COMPARISON WITH INTERNATIONAL PRACTICE

### 3.1 Overview

A high level review of international approaches to the setting of emission standards focussing on the EU (Section 3.2), USA (Section 3.3) and China (Section 3.4) has been undertaken. This information has subsequently been used as a basis for comparison against the methods in use in India (Section 3.4). The aim of this review was to understand how standards are developed in other parts of the world, and how this compares to the process followed in India. Lessons learnt in other geographies (both good and bad) and the findings from this comparison have subsequently helped in forming some of the study recommendations set out in Section 4.



## 3.2 EU emission controls

### 3.2.1 Legislation

In the European Union (EU), the overarching legislation targeted at air quality is the Air Quality Directive (Directive 2008/50/EC of the European Parliament, and of the Council of May 21, 2008, on ambient air quality and cleaner air for Europe) which sets the overall framework for improving air quality, including monitoring and reporting, and ambient air quality standards for a broad range of pollutants<sup>15</sup>. Alongside this is the National Emission Ceilings Directive (Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants) which sets overall national level caps on emissions of selected air pollutants (initially for 2010, but proposals under negotiation for 2020-2030)<sup>16</sup>. Together, these two pieces of legislation provide the overall framework for limiting emissions and improving air quality across Europe. However, they do not provide any specific mechanisms or measures for making improvements. Instead, a range of “tools” are provided to do this in the form of a number of sectoral regulations including those targeted at the industrial sectors.

The current system for industrial emission regulation within the EU is governed by the Industrial Emissions Directive (IED). This sets the overall framework for the permitting and control of emissions to all environmental media — from the most polluting industrial activities ranging from power plants, to food and drink production. Most industry sectors not covered by the IED are left to each individual EU country to decide how to control. The IED aims to achieve a high level of protection of human health and the environment by avoiding or minimising pollution from industrial installations, primarily through application of Best Available Techniques (BAT), which are legally defined through development and adoption of ‘BAT Conclusions’ for each sector. This removes the potential for BAT to be applied differently for the same activity in different countries in the EU.

BAT conclusions adopted by the Commission are the reference for setting the permit conditions, and provide emission standards for different activities within a sector. The Directive defines maximum periods for review of permits and achieving compliance following publication of BAT Conclusions (4 years). Emission limit values in permits must be set at a level that ensures pollutant emissions do not exceed the levels associated with the use of BAT and must not result in exceedance of environmental quality standards (for example ambient air quality standards). If it is proven that emission limits would result in disproportionate costs compared to environmental benefits, relaxation of the limits can be approved on a case-by-case basis.

BAT is defined through the development of a BAT Reference (BREF) document for a particular sector. BREFs are developed through committee procedures on the basis of sound techno-economic information, and aim to set out BAT and emerging techniques in a transparent manner. They are subsequently used by regulators to understand what may be technically and economically available to industry, with the aim of improving their environmental performance. The development of BREFs at an EU level is considered to be an efficient exercise because it eliminates the requirement for individual Member States to undertake similar studies. Each

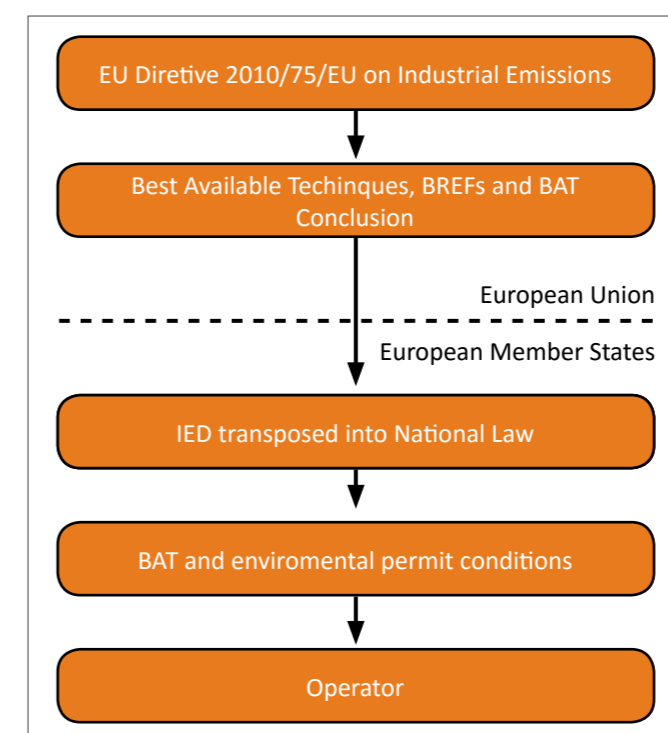
<sup>15</sup> Further details available from: [http://ec.europa.eu/environment/air/quality/legislation/existing\\_leg.htm](http://ec.europa.eu/environment/air/quality/legislation/existing_leg.htm)

<sup>16</sup> Further details available from: <http://ec.europa.eu/environment/air/pollutants/ceilings.htm>

BREF is the outcome of a two to three year process (often longer) involving up to 100 experts. The first series of 33 BREFs were completed by the European IPPC Bureau in 2006. Besides sector-specific BREFs, a series of ‘horizontal’ BREFs have also been developed for a range of topics including economics, energy efficiency, cross-media effects and monitoring of emissions. The current plan is for BREF notes to be reviewed every 8 years.

The ‘process flow diagram’ below illustrates the process for the development of BREFs in the EU, and shows how they are transposed into law by individual Member States.

**Figure 4: Process flow diagram for the EU**



### 3.2.2 Key organisations

The following table lists the key organisations within the EU involved in the determination and implementation of BAT for industrial sectors and provides a brief description of their roles.

**Table 4: Key organisations within the EU involved in the determination and implementation of BAT**

Organisation	Role
<b>Directorate General for Environment within the European Commission</b>	DG ENV is responsible for the implementation of the IED at EU-level. The Commission organises and coordinates the exchange of information through the involvement of the European IPPC Bureau (EIPPCB, see below) (within DG Joint Research Centre) and DG Environment.

Organisation	Role
<b>European IPPC Bureau</b>	The European IPPC Bureau organises the work of the Technical Working Group (TWG), fosters the exchange of information, makes a scientific and technical analysis of the vast amount of information exchanged, proposes compromise solutions on issues when views of TWG members differ, and writes the BREF. The European IPPC Bureau acts as a neutral, technically competent and permanent body to all TWGs.
<b>Technical Working Groups</b>	<p>For the drawing up or reviewing of a BREF document, a TWG is set up (or reactivated) by the Commission. Each TWG consists of technical experts representing Member States, industries, non-governmental organisations (NGOs) promoting environmental protection and the Commission (normally between 40-100 experts).</p> <p>TWG members are nominated to participate in the information exchange primarily based on their technical, economic, environmental or regulatory expertise (especially in permitting or inspecting industrial installations) as well as on their ability to bring into the information exchange process the BREF end-user perspective. TWG members are either nominated by their Member State, by a European industrial trade association or by the environmental NGO EEB. Nomination is the only way of becoming a member of a TWG.</p>
<b>IED Art. 13 Forum</b>	Formal expert group established by legislation to generally oversee the information exchange process on BAT. The Forum is composed of representatives from Member States, industry and environmental NGOs. The Forum has a crucial role in delivering opinion on the ongoing work programme for the elaboration and review of BREFs and on the proposed content of each final draft BREF. This last opinion has to be made publicly available by the Commission and has to be taken into account for the purposes of adopting decisions on the BAT conclusions through the IED Article 75 Committee.
<b>IED Art. 75 Committee</b>	Body established by Article 75(1) of the IED, assisting the Commission in elaboration of implementing acts. The Committee is composed of the Member States and is chaired by the Commission. <b>The Committee adopts decisions on BAT conclusions.</b>

### 3.2.3 Development stages

The Commission's guidance on the practical arrangements for the exchange of information under the Industrial Emissions Directive (IED, 2010/75/EU), including the collection of data, the drawing up of BAT reference documents (BREFs) and their quality assurance as required by Article 13(3)(c) and (d) of the Directive, can be found in the Official Journal of

the European Union<sup>17</sup>. This guidance sets out clearly the main steps for developing a BREF and BAT Conclusions including the content and scope of each, and the steps to be undertaken including data collection and quality assurance, as well as associated timescales. A summary of these steps is set out below:

**Table 5: EU steps for developing a BREF and BAT Conclusions**

Step	BREF review step	Expected step time (months)	Accumulated time (months)
0	<b>Preparation for the review</b>	-	-
1	<b>TWG (re)activation and call for wishes</b>	2	2
2	<b>Kick-off meeting</b>	3	5
3	<b>New information (deadline)</b>	6	11

After finalising a BREF, the EIPPCB maintains the BATIS forum for this BREF, in particular as regards follow up actions to the recommendations for future work made in the BREF and in view of the future review of the BREF. BATIS should serve as a forum for discussion and exchange of information in support of the next review process.

EIPPCB (re)activates the TWG (calling for confirmation of membership and contact details). In the case of a BREF review, the EIPPCB asks TWG members to submit their wishes regarding information they would like to be considered during the review process or modifications/corrections they wish to see introduced into the existing text.

In the case of a BREF review, the EIPPCB structures and establishes a consolidated list of wishes and, if necessary, develops standard templates for each issue on the wish list, for the TWG to provide information in a structured, efficient and directly usable way. The EIPPCB calls a meeting of the TWG in order to clarify the process, to discuss the wish list (in the case of a BREF review), to agree on the scope of the review and to agree on the data to be collected and its format, based on the guidance on data collection provided for in Chapter 5 of the official guidance. The TWG agrees on a procedure based on general guidance of the EIPPCB to deal with issues like confidential business information, sensitive information under competition law, conflict of interests and other related matters.

The TWG collects and submits the information promised or identified in the conclusions of the kick-off meeting. Information readily available is submitted to the EIPPCB without delay so that drafting can start as soon as possible after the kick-off meeting. During this period, the EIPPCB can:

- participate in site visits, which might be agreed at or after the kick-off meeting;
- research information; and
- start drafting using the available information submitted early.

For those techniques that are to be considered in the determination of BAT, the TWG aims to gather information on, and document in the BREF, the following:

<sup>17</sup> <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012D0119&from=EN>

Step	BREF review step	Expected step time (months)	Accumulated time (months)
------	------------------	-----------------------------	---------------------------

- Description
- Technical description
- Achieved environmental benefits
- Environmental performance and operational data
- Cross-media effects
- Technical considerations relevant to applicability
- Economics
- Driving force for implementation
- Example plants
- Reference literature

The information submitted by members of the TWG and collected by the EIPPCB is shared with the TWG members in 'real time' via BATIS. The TWG members can comment on the submitted information and share the comments through BATIS.

<b>4</b>	<b>Elaboration of the first formal draft</b>	<b>4-6</b>	<b>15-17</b>
----------	--	------------	--------------

The EIPPCB produces a first formal draft of the BREF (or of the revised parts of the BREF in the case of a BREF review) for formal consultation of the TWG. All BREFs should follow the general structure outlined below, as set out in the official guidance. However, there is some flexibility to change the overall order and structure of certain chapters to suit the sectors concerned:

1. Scope
2. Chapter: General information about the sector concerned
3. Chapter: Applied processes and techniques
4. Chapter: Current emission and consumption levels
5. Chapter: Techniques to consider in the determination of BAT
6. Chapter: Best available techniques (BAT) conclusions
7. Chapter: Emerging techniques
8. Concluding remarks and recommendations for future work
9. References
10. Glossary of terms and abbreviations
11. Annexes (dependent upon relevance to the sector and availability of information)

It is expected that the information submitted during the consultation period will normally provide the background needed to achieve a high degree of consensus on the chapters of the BREF entitled 'Current emission and consumption levels' and 'Techniques to consider in the determination of BAT', whereby the chapter of the BREF entitled 'Best available techniques (BAT) conclusions' will be included in the first formal draft of a BREF review.

<b>5</b>	<b>TWG comments</b>	<b>2-3</b>	<b>17-20</b>
----------	---------------------	------------	--------------

The TWG comments on the draft are to be received within two to three months. It should be noted that often members of the TWG will also undertake their own consultation e.g. industry trade bodies on the TWG will consult with their members, country officials will consult within their own country. Therefore, the comments received from the TWG members tend to be informed by a much larger group of stakeholders.

Step	BREF review step	Expected step time (months)	Accumulated time (months)
------	------------------	-----------------------------	---------------------------

<b>6</b>	<b>Elaboration of the second formal draft (optional)</b>	<b>3-7</b>	<b>[20-27]</b>
----------	--	------------	----------------

The EIPPCB takes into account all the comments and the submitted information. The EIPPCB drafts a background document including an assessment of the major comments received and produces a second formal draft containing at least an updated version of the chapter of the BREF entitled 'Best available techniques (BAT) conclusions and the latest version of the chapters of the BREF entitled 'Current emission and consumption levels' and 'Techniques to consider in the determination of BAT'.

<b>7</b>	<b>TWG comments (optional)</b>	<b>2-3</b>	<b>[22-30]</b>
----------	--------------------------------	------------	----------------

The second formal draft is issued for formal consultation for TWG comments to be received within two months. When consultation is foreseen over the summer or year-end holidays, the period of consultation may be extended to three months maximum.

<b>8</b>	<b>Final meeting</b>	<b>3-5</b>	<b>20-25 [25-35 if second draft developed]</b>
----------	----------------------	------------	--

The EIPPCB analyses all the comments and prepares for a final TWG meeting. The EIPPCB drafts a background paper including at least an assessment of the major comments received, and provides at least the latest version of the chapters of the BREF entitled 'Current emission and consumption levels', 'Techniques to consider in the determination of BAT' and 'Best available techniques (BAT) conclusions'. This final TWG meeting seeks consensus for a final draft.

<b>9</b>	<b>Final draft</b>	<b>4</b>	<b>24-29 [29-39 if second draft developed]</b>
----------	--------------------	----------	--

The final draft is produced for a short commenting period to the TWG that should focus on the changes made as a result of the final meeting's conclusions. The EIPPCB ensures that feedback is given to the TWG on how these comments have been taken into account. The updated final draft and the assessment of the final comments received are made available to the Forum at least eight weeks before the Forum meeting.

<b>10</b>	<b>Presentation at a Forum meeting</b>		
-----------	--	--	--

The updated final draft is presented to the Forum, which is asked to provide its opinion on the document. The Commission makes the opinion of the Forum publicly available.

Step	BREF review step	Expected step time (months)	Accumulated time (months)
11	<b>Adoption of the BAT conclusions and publication of the BREF</b>		

The draft decision on the BAT conclusions will be submitted by the Commission to the Article 75 Committee to deliver its opinion in accordance with the procedure set out in the IED. After the adoption of the decision on the 'BAT conclusions', the EIPPCB will modify, if necessary, the BREF according to the adopted decision on the BAT conclusions and, without delay, will make the English version of the final BREF publicly available. The decisions on the BAT conclusions will be published in the Official Journal of the European Union in the official languages of the Union.

It should be noted that whilst the costs of specific techniques are considered during the process along with the emission reductions they may bring, no detailed cost-benefit analysis is currently undertaken during the development of any standards. However this has been identified as a potential gap in the process and a framework is being developed (by Ricardo for the European Commission) to try and address this.

The box below provides an example of the development of the BREF note for large combustion plants (i.e. power plants) in Europe.

**EXAMPLE: Development of BREF note for Large Combustion Plants**

More than 60 experts, including representatives from Member States, industry and environmental NGOs, participated in the development of the BREF for Large Combustion Plants, published in 2006.

Information was sourced from a range of reports and documents provided by Member States, industry, operators, authorities, equipment suppliers and environmental NGOs as well as for individual sites across Europe. Further information was gathered during site visits to different European Member States.

The BREF document outlines the extent to which Member States and industries agreed with the outcomes of the report and provides details on any objections. The document also requests that any further research relevant to the scope of work be shared with the EC, to enable continued development of the BAT conclusions.

The document recommends BAT associated emission levels which must be taken into account for the setting of permit conditions. However, it does state that setting of permit conditions for individual sites should *“involve taking account of local, site-specific factors such as the technical characteristics of the installation concerned, its geographical location and the local environmental conditions”*.

A review and revision of this BREF and the development of new emission standards was launched in 2011 and is still ongoing and expected to be concluded later in 2016. The initial data collection phase took an extended period of time and more recent delays have been due to lengthy discussions on the levels at which standards should be set trying to reflect the variability in plant and fuel types across Europe.

### 3.3 USA emission controls

#### 3.3.1 Legislation

The US Clean Air Act (CAA) sets out National Ambient Air Quality Standards (NAAQS) for six “criteria” pollutants and the associated powers needed for management of air quality to achieve the NAAQS. The CAA also provides the legal basis for regulation of industrial emissions, including powers to set minimum emission standards for criteria and hazardous air pollutants for industrial and related activities. These include New Source Performance Standards and Air Toxics rules which are reviewed and updated at intervals to address changes in control technology and priorities in air quality and public health. The development of standards is based on a range of inputs including review of emission data, recent control development, costs, impacts, regulatory priorities, industry and other inputs. The information used to develop standards is provided during consultations with public, operators and other stakeholders (and continues to be available after the process is completed). Legal challenge to decisions is common. Note that, in addition to the standards, environmental impacts of new developments (and substantial changes to existing plant), including impacts on air quality, are also considered prior to construction with the objective of preventing significant deterioration of air quality where NAAQS are met and to avoid further deterioration in non-attainment areas.

The US Clean Air Act (CAA), a federal law established in 1970, sets air quality standards and regulates air emissions from stationary and mobile sources. The law authorizes the US Environmental Protection Agency (USEPA) to establish National Ambient Air Quality Standards (NAAQS) for “criteria pollutants”<sup>18</sup> to protect public health and to regulate emissions of hazardous air pollutants<sup>19</sup>. Other provisions relate to reduction of acid rain, transport emissions and control of ozone-depleting substances. The powers provided in the CAA allow the USEPA to develop Regulations to set out emission standards for certain types of (industrial) emission sources.

In order to achieve NAAQS, States are required to develop pollutant-specific state implementation plans (SIPs), incorporating a range of measures including regulation of industrial emissions. The SIPs developed for each criteria pollutant, are subject to public consultation and submitted to the USEPA for approval. SIPs are revised when a NAAQS is changed. In “non-attainment” areas, the CAA requires adoption of additional regulatory measures to achieve and maintain compliance with the relevant NAAQS (which again include measures on industrial emissions). Note that a SIP is also required where the State is compliant with a NAAQS, but includes emission sources which contribute to non-attainment in a neighbouring State.

Since 1990, the CAA has required all States to develop and implement operating permit programmes for both existing and new installations. The USEPA develops regulations to specify required emission standards for criteria pollutants from major sources and details the minimum elements to be included in all state and local operating permit programmes, and provides support in developing these programmes. State and local governments can implement separate

<sup>18</sup> Particulate matter, ozone, sulphur dioxide, nitrogen dioxide, carbon monoxide and lead.

<sup>19</sup> Currently (March 2016) 187 Hazardous Air Pollutants are listed [here](#); these do not have associated air quality standards but emissions are regulated because of health or other environmental threats.

requirements that are appropriate for their unique local conditions (including setting more stringent emission limits). Regulators must periodically renew operating permits, generally every 5 years. The permit programmes cover major sources of air pollution, defined as stationary facilities, that emit 100 tons or more per year of a regulated air pollutant, with smaller sources considered “major” in non-attainment areas that do not meet NAAQS. Other significant operations are also covered. A summary of those facilities included in the programmes is provided in the table below:

**Table 6: Facilities covered under the CAA operating permit programmes**

Stationary facilities which emit $\geq$ 100 tons per annum of a regulated air pollutant (e.g. particulates, volatile organics, sulphur dioxide, and nitrogen oxides).
Stationary facilities which emit $<$ 100 tons per annum of a regulated air pollutant in an area that exceeds an applicable national air quality standard (emission thresholds may be dependent on designation of non-attainment area).
Large coal-burning utility boilers and industrial boilers subject to control requirements under the acid rain provisions of the Clean Air Act.
Sources that are subject to requirements under New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP).
Sources of toxic air pollutants.
Sources required to have pre-construction or new source permits. Such facilities can be very large, with a wide variety of process operations and many emission sources such as chemical plants, petroleum refineries, and large manufacturing facilities.

“Title V” Permits are required for operating plants. Note that criteria pollutant emission thresholds for permitting depend on classification of the non-attainment area (an area with poorer air quality will have a lower emission threshold; similarly an area designated as an Ozone Transport Region has a lower threshold for VOC emissions). Permit emission limit values reflect preconstruction permit requirements (see New Source Review permits below), NSPS and emission guidelines for existing plant and, NESHAP. However, more stringent emission limits may be applied to reflect local circumstances (including air quality).

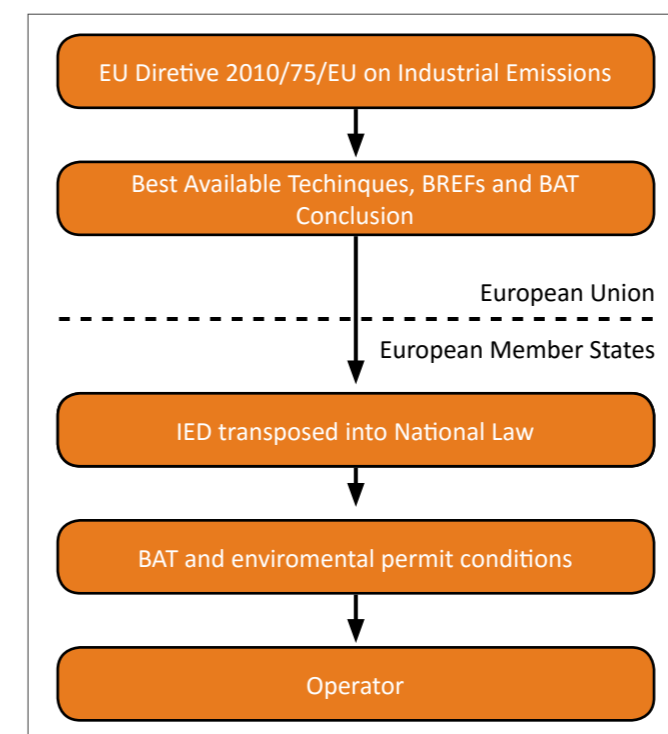
New Source Review (NSR) permitting is needed for construction of new sources (or substantial modifications to existing sources). It aims to ensure consideration of air quality impacts (and other impacts), and application of modern emission controls and emission limits. There are three types of NSR permitting:

- i. In areas where the NAAQS are being met, the Prevention of Significant Deterioration (PSD) permit programme also applies to new major sources or substantial modifications on existing sources. A PSD permit decision includes public consultation and requires use of “Best Available Control Technology” (BACT) for criteria pollutants coupled with an air quality analysis, other environmental impacts analysis (impacts of air, ground and water pollution on soils, vegetation, and visibility caused by any increase in emissions of pollutants from the plant under review and, from associated growth).

- ii. Non-attainment NSR permits are required where new major sources are proposed or, substantial modifications on existing sources are proposed, in a non-attainment area. These require Lowest Achievable Emission Rate (LAER) as opposed to the permitting requirements for existing plant in non-attainment areas, with reference to “Reasonably Available Control Technology” (RACT).
- iii. Minor source permits – to control release of criteria pollutants which may interfere with attainment of a NAAQS or are potentially in conflict with control strategies in a non-attainment area.

BACT and LAER are determined on a site-specific basis, but are based on general guidance and information provided by USEPA in a database of permit data<sup>20</sup>. For example in the South Coast Air Quality District<sup>21</sup>, new sources are reviewed prior to construction, and activities that will result in an increase in emissions are required to offset emissions through emission reduction credits. These local permitting arrangements are used alongside national and state processes for new sources. Besides permit controls, there is certification (type approval) of certain equipment (for example process heaters and emergency generators).

**Figure 5: Process flow diagram for the USA**



<sup>20</sup> Available here: <https://cfpub.epa.gov/RBLC/index.cfm?action=Home.Home&lang=en>

<sup>21</sup> <http://www.aqmd.gov/home>

### 3.3.2 Development of emission standards

The two main types of industrial emission standards under the CAA are New Source Performance Standards (NSPS, controls on criteria pollutants) and National Emission Standards for Hazardous Air Pollutants (NESHAP) or Air Toxics Rules. NESHAP standards are produced for new and existing plants. The CAA also includes provision for review of criteria pollutant standards for existing plants, and USEPA provides such standards as emission guidelines for the State permitting authorities.

NSPS are developed under Section 111 of CAA and represent a level of control described as Best Demonstrated Technology (BDT). The NESHAP are developed under Section 112 of CAA and are based on Maximum Achievable Control Technology (MACT). Both NSPS and NESHAP are reviewed on an eight-yearly basis and revised if further reduction is required (for example if indicated by health impact studies). The USEPA may also establish more stringent standards in order to further protect the environment, public health or the economy<sup>22</sup>.

MACT is developed based on emission data from the best-performing existing facilities. Under NESHAP, standards for new sources are based on the emissions levels achieved by the top-performing similar source. For existing sources, USEPA sets standards that represent the level of performance already achieved by the average of the top 12 percent of similar sources (the MACT 'floor').

Development of standards can take a number of years. USEPA publishes the regulatory actions in the development of standards for regulated activities and, for example, the timeline for development of recent NSPS and NESHAP rules on Portland Cement Kilns<sup>23</sup> are shown in the table below:

**Table 7: Standards development for Portland Cement kilns**

Date	Action	Comment
11/9/15	Correction notice	Correction of typographical/editorial errors following representation from industry.
27/7/15	Final rule	
19/11/14	Proposed amended rule	
12/2/13	Final rule	Revised rule following court action, petitions to reconsider and new technical information

<sup>22</sup> Ohio Environmental Protection Agency via [www.epa.ohio.gov](http://www.epa.ohio.gov)

<sup>23</sup> <https://www3.epa.gov/airquality/cement/actions.html>

3/8/12	Public hearing	
18/7/12	Proposed rule	Revised rule following court action and petitions to reconsider
11/5/11	Response to petitions for reconsideration	Sets out basis of decisions on comments
11/1/11	Final rule and parallel proposal	Amendments
9/8/10	Final NSPS and Air toxics standard	
9/6/09	Comment period extended and additional public hearings	Response to petition from NGO
6/5/09	Proposed amendments to air toxics standard	
30/5/08	Proposed amendment to NSPS	

The supporting documentation for the development of both NSPS and NESHAP standards<sup>24</sup> includes a technology review, emission controls and effectiveness, secondary air benefits/disadvantages, other impacts (for example, waste generated and energy use) and costs. The NESHAP additionally requires a statistical consideration of emission data to determine the best performing emission level and the average of the top 12% of sources (the MACT floor report).

For criteria pollutant emission guidelines for existing plants, other factors such as retrofit cost, facility life, location and design are also considered. For example, the Portland cement kiln NSPS and NESHAP standards are accompanied by:

- Administrative information
- A non-technical fact sheet to explain the basis and purpose of the rule, who it affects, what it does and basic summary of impacts and benefits.
- An impact assessment including:
  - estimates of expected emission reductions (nationally and by state)
  - estimates of impacts on energy use, resource use and waste generation
  - secondary impacts (for example emissions avoided from energy reduction)
  - water quality impacts
  - solid waste impacts
  - cost impacts for new and existing plant for defined pollutants and their associated

<sup>24</sup> Available here <https://www3.epa.gov/ttn/atw/nsps/pcemnsps/pcemnspspg.html>

- emission reduction technologies or groups of technologies
  - monitoring costs (where the new standard requires additional monitoring such as continuous emissions monitoring, CEMS)
- Technical report(s) - for example:
  - Regulatory impact analysis: This provides a summary of the proposed rule or standard, the approach to regulation, and sets out a description of the affected sector and projected development of the sector (baseline assumptions), the proposed controls, potential impact of controls on market, sensitivities and costs and benefits (including emission reductions, compliance costs, health benefits, employment impacts, impacts on small businesses, other impacts (energy, GHG emissions), regulatory costs).
  - The determination of the MACT floor (for NESHAP standards);
  - Summary of environmental and cost impacts of NESHAP/NSPS proposal; and
  - Responses to comments on proposals.

The process involves gathering of data (for example from regulatory compliance emission tests and operators) to establish the baseline and development of a proposed rule for the emission requirements. The proposed rule and supporting documentation are published for public comment and (if required) a public hearing to gather regulator, industry, NGO and public feedback. Consultation responses are recorded and responses developed, and the rule finalised (with potential for a further limited consultation if there are significant changes from the original proposal). The finalised rule is then published in the Code of Federal Regulations. The process, including impact assessments, baseline data (inventories and costs and benefits for example), proposal, consultation responses and determination of the responses, is publicly available through the EPA website and (for documentation relating to the consultation and final rule) the US Regulations website<sup>25</sup>

The CAA also allows the USEPA to develop standards or requirements that allow for the application of Generally Available Control Technology (GACT) Standards for certain area sources, as an optional alternative approach to MACT. However, these are unlikely to be applicable to industrial plants (except small sources in aggregate).

The box below provides an example of the development of standards for power plants in the US.

**EXAMPLE:**

**Development of US Mercury and Air Toxics rules for power station boilers**

Standards for power station boilers were in place prior to the 1990 amendment of CAA, but several steps had to be fulfilled before new emission standards could be put in place for power stations.

The first stage was submission of a “Utility Air Toxics Study” to Congress to set out and determine whether it would be necessary to regulate power plants under Clean Air Act, section 112. However, this was substantially delayed (until 1998) until the EPA had gathered additional information on emissions from power plants and to demonstrate that it used the information in determining whether the Clean Air Act was the “appropriate and necessary” mechanism for control of power plant emissions. In parallel, the USEPA reviewed mercury emissions from power plants and other industrial sources, and the health and environmental impacts of those emissions, and available control technologies. These findings were issued as the “Mercury Study Report to Congress” in 1997.

After publication of the Utility Air Toxics study, the USEPA was given two years to determine whether regulation of power plant emissions under section 112 of the Clean Air Act was the appropriate legislative mechanism, and also had to agree to issue proposed and final power plant mercury emission standards by December 2003 and December 2004, respectively.

In 2000, the US EPA determined that control of coal and oil-fired power station boilers was appropriate, which meant that regulations would be required and proposed regulations were developed and published in 2003. These provided for emission limits or a non-regulatory ‘cap and trade’ scheme (for mercury) under a different section of the Clean Air Act. However, these were challenged by a range of organisations (including NGOs, State governments and Industry). Following a reversal by the USEPA of the determination that section 112 was appropriate for regulation of power stations, further court action (and appeals) allowed development of the final Mercury and Air Toxic Standards for Power Plant proposal, which was finalised in 2011. New Standards were proposed for new power plants in 2012, which had an extended period for public comment before being finalised in 2013. However, there have been further iterations of the rules on reporting (2014), startup and shutdown (2015), E-reporting (2015) and technical corrections (2016)<sup>26</sup>. In addition, further legal challenges led to review of the consideration of costs and publication of supplementary findings in 2015. This led to the 2016 technical corrections and clarifying changes to the final rule, but these did not make substantive changes to the regulation.

### 3.4 China

China’s rapid rate of economic development and urbanisation since the turn of the 21<sup>st</sup> century has resulted in pollutant emissions on an unprecedented scale. As a result, the country now has the highest emissions of oxides of nitrogen (NOx) and sulphur dioxide (SO<sub>2</sub>) in the world. The primary sources of pollutant emissions include heavy industry, energy consumption and motor vehicles.

<sup>25</sup> US Federal consultations are currently published through <https://www.regulations.gov/#!home>

<sup>26</sup> Information here <https://www3.epa.gov/mats/actions.html> and here <https://www3.epa.gov/mats/actions.html#content>

Environmental policies in China are determined by the national legislative system, which consists of several tiers, ranging from national laws issued by the National People’s Congress, to local policies and regulations set by provincial and local governments. The four national laws that direct air pollution control in China are as follows:

- The Environmental Protection Law
- The Air Pollution Prevention and Control Law
- The Environmental Impact Assessment (EIA) Law
- The Law on Promoting Clean Production

China’s first Air Pollution Prevention and Control Law was issued in 1987. This has been amended several times, most recently in 2015. The Chinese Government has set goals to reduce pollutant concentrations in both the 11<sup>th</sup> and 12th Five Year Plans. The 13<sup>th</sup> FYP, which will be announced shortly, is expected to focus on environmental quality.

The two primary cabinet-level government bodies responsible for air quality issues are the National Development and Reform Commission (NDRC), which is responsible for formulating economic development strategies, plans and policies, that have significant implications on pollution prevention, and the Ministry of Environmental Protection (MEP), which takes responsibility for pollution prevention and control. Several other Ministries are also involved in the development of environmental policies, including, but not limited to, the Ministry of Water Resources, the Ministry of Housing and Urban Development, and the Ministry of Agriculture. Major environmental policies are determined by the Environment and Resource Committee (E&RC), which sits beneath the National People’s Congress.

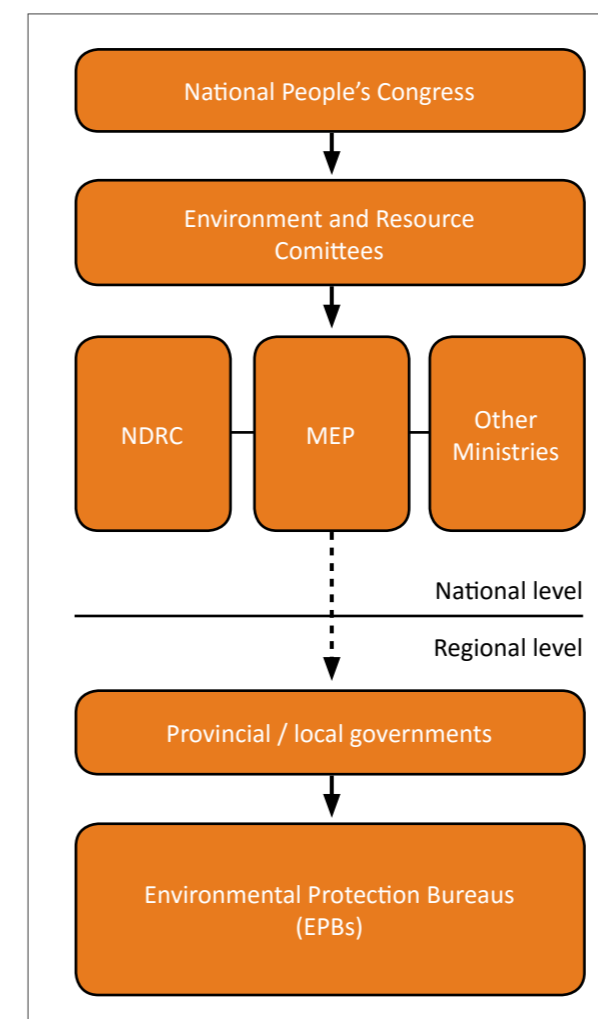
The MEP coordinates between the E&RC and the local Environmental Protection Bureaus (EPB) at the provincial, municipal and county level. EPBs at or above the county level are responsible for undertaking the supervision and management of environmental protection activities in areas under their jurisdiction, including the enforcement of emission standards in accordance with the Environmental Protection Law<sup>27</sup>.

The MEP sets emissions standards for a range of pollutant/industry types, which provide emission limits for air pollutants and set out the requirements for monitoring and supervision. The MEP sets standards for both new and existing facilities. Where either new or existing facilities are sited within ‘special’ areas, defined as “*scenic spots or places of historical interest, natural reserves, areas close to historical or cultural sites under protection and other places that need special protection, as designated by the State Council or the people’s government of provinces, autonomous regions and municipalities directly under the Central Government*”, under the Law of the People’s Republic of China on the Prevention and Control of Atmospheric Pollution<sup>28</sup>, tighter emission limits are applied. In the past, public consultation has not formed a part of this process. However, the requirement for public consultation in environmental management has been raised in draft amendments to the Air Pollution Prevention and Control Law.

The standards are used to implement environmental legislation as detailed above, and are enforced by local EPBs. The EPBs are able to enforce emission standards through the use of pollution levies, which involve the charging of air pollution fees based on the quantity/concentration of pollutant emitted, and daily fines with no upper limit, which came into effect in January 2015.

Each provincial government sets out an annual implementation plan on how air quality objectives will be achieved. These work plans are submitted to the MEP and made publicly available. Targets and tasks are then filtered down to city and county level. Self-inspection reports of the previous year, detailing information on tasks and improvements are also submitted to the MEP and forwarded to the National Development and Reform Commission, Ministry of Industry and Information Technology, Ministry of Finance, Ministry of Housing and Urban-Rural Development and National Energy Administration — who assess and report the outcomes to the State Council.

**Figure 6: Process flow diagram for the development of emission standards in China**



<sup>27</sup> Institute for Global Environmental Strategies (2014) Major Developments in China’s National Air Pollution Policies in the Early 12th Five-Year Plan via <http://pub.iges.or.jp/>

<sup>28</sup> Law of the People’s Republic of China on the Prevention and Control of Atmospheric Pollution via <http://www.china.org.cn/english/environment/34422.htm>



There is a direct link between the approval of heavy polluting industries and the completion of EIAs, which provide specific emission limits for each facility. Under the 12<sup>th</sup> FYP, EIAs must demonstrate that new projects have been developed with an emission control methodology that is capable of achieving the emission limits set by the MEP. Where new projects in key control areas are forecast to emit SO<sub>2</sub>, NO<sub>x</sub>, industrial PM and/or VOCs, the developer must form an emission reduction strategy which achieves a pollutant offset of 1:2 in key control areas, or 1:1.5 in general control areas. These facilities may also be subject to the 'special' emission limits discussed above.

### 3.5 Similarities/differences between India and the RoW

The following table provides a summary of how India, USA, the EU and China approach key stages of the development process. Consideration is then given to some of the similarities/differences between these regions.

**Table 8: Comparison of approaches to key stages of the development process**

REGION	CRITERIA
<b>Prioritisation and evidence base</b>	
<b>India</b>	<ul style="list-style-type: none"> <li>▪ Prioritisation is based on the polluting potential of the industry and on whether industries are located within a sensitive region.</li> <li>▪ The evidence base is prepared by the Pollution Control Implementation Divisions (usually via a third party such as a research institute), and presented in the form of COINDs documents, or more recently, sectoral background documents. In some cases (e.g. brick kilns) this evidence base may consist of a single study of facilities located in India, without adequate consideration of standards set elsewhere in the world. This is then reviewed and discussed by the Peer and Core Group Committee. Sectoral background documents for more recent standards have not been made public.</li> </ul>
<b>USA</b>	<ul style="list-style-type: none"> <li>▪ Prioritisation of standards is determined by air quality criteria pollutants and emissions of hazardous air pollutants. Application of standards to facilities is determined by the CAA operating permit programme, on the basis of the scale of annual emissions and the location of the facility.</li> <li>▪ The evidence for NSPS and NESHAP standards is based on an EPA review of the emission controls possible and in use for each industry. The review involves the gathering of baseline data, including from regulatory compliance emission tests and impact assessments.</li> </ul>
<b>EU</b>	<ul style="list-style-type: none"> <li>▪ The selection of industries for the development of BAT is dictated by the Industrial Emissions Directive.</li> <li>▪ The evidence base is developed through the BREF committee process and extensive data collection related to site and technology performance across the EU. Each BREF represents the outcome of a 2 – 3 year process (minimum), drawing on the expertise of up to 100 stakeholders.</li> </ul>

<b>China</b>	<ul style="list-style-type: none"> <li>▪ The MEP develops draft standards for consideration by the two state committees. The process for prioritising industries and developing an evidence base is unclear. However, it is evident from the list of industries for which standards have been set, that the focus has been on large polluting industries, such as metallurgical processes, cement and coal.</li> </ul>
<b>Social, environmental and techno-economic considerations</b>	
<b>India</b>	<p>The CPCB considers the potential impact of standards on the NAAQS. The potential impacts on human health and ecological habitats are also discussed in the COINDs documents for each sector.</p> <p>The feasibility of standards is determined by calculating the Annual Burden (costs of technologies) as a percentage of the Annual Turnover of the industry.</p>
<b>USA</b>	<p>Emission standards and rules consider control technologies available as well as other impacts. Regulatory impact assessments consider future market for the sector, co-benefits and impacts on (for example) compliance costs, market, employment and small businesses at a national level. Application of standards for individual facilities is dependent on whether the plant is situated within areas which meet national air quality standards. The USEPA can also establish more stringent standards in order to further protect the environment, public health or the economy.</p> <p>State and local authorities also have the authority to set more stringent requirements on stationary sources in areas that do not meet Clean Air Act air quality standards (non-attainment areas).</p>
<b>EU</b>	<p>TWGs gather information on pollution control technologies applicable to the relevant industries, including the environmental benefits, environmental performance and operational data, cross-media effects, technical considerations and the driving force for implementation. These are documented in the BREF notes. Industry sectors and individual countries may use third party experts (consultancies, research institutes) for data gathering and analysis to help with their inputs to the process (i.e. to provide evidence to support their position).</p> <p>Throughout the process information is shared, reviewed and discussed by the relevant committees, ensuring that all social, environmental and techno-economic considerations have been addressed.</p> <p>A framework for evaluating the costs and benefits of emission standards is currently being developed for the European Commission by Ricardo as no detailed analysis has been undertaken for previous standards.</p>
<b>China</b>	<p>The FYP provide a series of social, economic and environmental initiatives for national development, which are endorsed by the National People's Congress. These include a series of subsequent FYPs relevant to the control of air pollution, which outline some of the environmental, social and economic considerations factored into the setting of standards. However the process for doing this is unclear.</p> <p>In setting standards, China will typically include standards for existing, new and "special" facilities. Special facilities are those located in areas with poor existing air quality or those close to sensitive ecological or cultural sites.</p>

Stakeholder and public consultation	
<b>India</b>	<ul style="list-style-type: none"> <li>▪ The main route for input from industry and NGOs is via the Peer and Core Group Committee. However, these organisations must be invited / accepted onto the Committee in order to contribute.</li> <li>▪ Draft standards are made public, for a period of 30 – 60 days, on the MoEFCC website. The public can submit comments on these standards via email within the designated timeframe. These responses are taken into consideration by the MoEFCC Expert Committee before final notification, although it is unclear exactly how.</li> <li>▪ The CPCB/MoEFCC also prepare a summary of stakeholder comments and confirm how these have been responded to, but this is not made public.</li> </ul>
<b>USA</b>	<ul style="list-style-type: none"> <li>▪ NSPS and NESHAP standards for emission requirements, and supporting documentation, are published for public comment by the USEPA. If required, a public hearing may also be held in order to gather regulator, industry, NGO and public feedback.</li> <li>▪ All comments received are recorded and responses developed. The rule is then finalised, with further consultations arranged if there are significant changes from the original.</li> <li>▪ All documents relating to this process (including consultation responses) are made available to the public via the USEPA website.</li> <li>▪ Proposals include a non-technical fact sheet to explain proposals in simple language.</li> </ul>
<b>EU</b>	<ul style="list-style-type: none"> <li>▪ Stakeholder input is provided via both the IED Art. 13 Forum and the TWG for each sector.</li> <li>▪ The IED Art. 13 Forum comprises Member State representatives and industry, and environmental NGOs — with all opinions put forward made publicly available.</li> <li>▪ The TWG for each standard consists of between 40 – 100 experts, appointed by nomination only, representing Member States, industries, NGOs and the Commission. TWG members are selected on the basis of their technical, economic, environmental or regulatory expertise, as well as their ability to provide a BREF end-user perspective.</li> <li>▪ Stakeholder consultations are carried out by the TWG, and by individual TWG members, throughout the process.</li> </ul>
<b>China</b>	<ul style="list-style-type: none"> <li>▪ The MEP is believed to involve industry stakeholders in the development of emission standards, and under the 13<sup>th</sup> FYP there has been a focus on the importance of public engagement in such processes. However the extent to which this occurs is unclear.</li> </ul>

The summaries provided in the table above highlight some key similarities and differences between the processes for setting industry-specific standards adopted around the world.

All regions appear to prioritise industries on the basis of the quantity of emissions, with all initially focussing on heavy industries, such as thermal power plants, before covering smaller, localised sectors. However the strength of the evidence base used to support these standards does appear to vary. The EU adopts a rigorous process, often involving the review of hundreds of research papers and supporting documentation plus individual site data, in order to develop sector BREF notes. This process is governed by European legislation, ensuring consistency and transparency. A similar process is also adopted in the US for the preparation of MACT standards, whilst in India, in some cases the conclusions presented in COINDs documents are based on just a handful of studies. This indicates that the data used to justify emission standards in India could be strengthened, and that where possible, new data should be verified against existing research, including international comparisons. In some geographies such as the EU, the process to be followed for defining emission standards, including the content of sectoral reference documents, is clearly defined in a single document.

The consideration for social and environmental impacts forms a key part of the committee process for developing BREF notes in the EU, with environmental bodies contributing throughout. However, no detailed sector cost-benefit analysis is currently undertaken, although a framework is under development for future standards. In the US, minimum standards are set for new and (for hazardous air pollutants) existing plants, which consider social, economic and environmental impacts. In India, although the CPCB takes the NAAQS into consideration when developing National Minimal Standards, this is unlikely to result in compliance in heavily polluted areas. As SPCBs appear reluctant to set more stringent standards, despite local air quality requiring this, it may be advisable to introduce standards for “special” facilities, as has been adopted in China, which would ensure an additional level of protection for sensitive areas. In India, the method for determining the annual cost burden of pollution control technologies (as a proportion of turnover) is limited, as it does not reflect the reduction in environmental impact resulting from the use of the technologies being considered, and it is unclear if it is being routinely calculated for all standards, since relevant documentation is not publicly available.

India, the US and the EU have all faced challenges in relation to the time it can take to develop and adopt emission standards (more than 5 years in some cases) reflecting the complexity of the issues, challenges on resources to develop the evidence base and manage the process, and competing interests in relation to the levels at which standards should be set. Improving the evidence base and involving more stakeholders to develop standards does increase the time and resources required, although equally, a poor evidence base and/or engagement with stakeholders can lead to problems later on in the process e.g. industry challenges, implementation problems. There is clearly a balance that needs to be found.

Stakeholder involvement, including industry experts and environmental NGOs, is an integral part of the process for developing EU BREF notes. These stakeholders provide inputs throughout the process and use their own contacts to undertake a targeted stakeholder engagement programme. In the US, stakeholders can provide input via consultations or through public hearings. In India, the Peer and Core Group Committee and MoEFCC Expert Committee provide an opportunity for a restricted number of industry stakeholders to be involved in the development process. The selective nature of the Committee may be restricting access to a wide pool of industry and NGO expertise.

Although recent changes have allowed further public participation in the development process in India, the CPCB typically receives a small number of comments. As is the case in the EU and the USA, this process could be more transparent and well publicised, offering several routes for public comment, such as announcements in national publications and public hearings.

Potential recommendations to address some of the differences identified are described in the following section.

### 3.6 Conclusions and Recommendations

The following provides a summary of the key challenges or issues identified from the review of the process for setting industry-specific emission standards, and from the detailed review of the thermal power plant, iron and steel and brick kilns industries. A number of recommendations have been provided to try to address the issues raised.

#### CHALLENGE #1 – LACK OF RESOURCES

Resources (skills and manpower) of some of the key institutions involved in the process are strained and stakeholders have indicated that this is impacting on the process for development of the standards and ultimately the standards themselves.

#### Recommendation #1 – Resources

It is recognised that resources are particularly tight and due to budgetary constraints there may not be scope to increase them. This should however be considered where possible along with the upskilling of existing staff. Having the right skills and manpower is critical for ensuring that the standards developed are based on the best evidence available and that they are developed in a reasonable timescale. Increased permit fees could be one option for increasing resources. At a SPCB/PCC level, improving knowledge sharing and collaborative working between bodies – as described above – could help to share the challenges being faced and potentially find solutions quicker than if working in isolation e.g. there may be opportunities for joint working to address common issues for a particular sector.

If possible, the PCI divisions of CPCB should be strengthened by providing more experienced scientists and engineers in each division (PCI-I, PCI-II, PCI-III, PCI-SSI, HWMD). Whilst there is strong expertise within the division, there are constraints on the time they have available due to the limited number of experts. There should be a nodal group with representatives from each division to coordinate the activities of standard development and periodic updating / revision of standards.

#### CHALLENGE #2 – CLARITY OF THE PROCESS

The process followed to develop industry standards is not clearly laid out in any single document making it harder for stakeholders to understand the different stages and know how and when they can engage with the process. Furthermore, whilst a lot of information is generated during the process it is not always made publicly available (e.g. background sectoral documents, meeting minutes etc.).

#### Recommendation #2 – Improved transparency

A clear process should be transparently documented and adhered to, as applied in other geographies (e.g. EU). This ensures that all stakeholders, whether they are involved in the process or not, have a clear understanding of the steps to be undertaken for standard development as well as the criteria by which standards are developed and reviewed by the relevant bodies. Recommendations on how this process could be improved are set out below in Table 9. Alongside the individual stages, timings (in months) for each step should also be defined to ensure that the process is completed within an appropriate timescale in line with the process in other geographies (proposed to be a maximum of 2-3 years depending on the complexity of the sector). All background documentation, meeting minutes of each group/committee and responses to comments should be made available online at the earliest opportunity within the process.

Table 9: Recommended process improvements

Development Stage	Recommendation
<b>0. Sector prioritisation for standard development or revision</b>	<p>The process for the prioritisation of sectors should be clearly documented and based on an established screening criteria. The new methodology for the characterisation of industries, published in 2016, should provide a suitable basis for this, although it is too soon to tell, since it has just been published. The timescales for review of standards should be defined based on this characterisation e.g. every 5 years for red, 8 for orange, 10 for green and 14 for white categorised sectors. As a comparison, EU standards – which are generally only set for the most polluting industries and not smaller sectors – are meant to be reviewed every 8 years. Setting out a clear roadmap for which sectors will be reviewed and when, should give industry the requisite confidence for making investment decisions and also help them and others to prepare for the process.</p> <p>As part of this study, in an effort to identify industrial emission sources that could potentially be prioritised for future emission standard development/review, a review of the full list of standards provided on the CPCB website was undertaken, in order to confirm the most recently published standards. This information was then combined with the industry categorisations provided by the CPCB along with expert judgement, to identify those which potentially pose the greatest risk to the environment (further details provided in Appendix V). On the basis of this review, it may be appropriate to undertake a detailed assessment of emission standards for all forms of waste combustion, including hazardous, residual, commercial and industrial waste incineration facilities. Other sectors that could be considered for standards development/revision include the following: Sponge iron plants; Coke oven; Aluminium manufacturing units; Non-ferrous metallurgical industry; Asbestos manufacturing units; Pesticide manufacturing; Pharmaceutical industry; Mining industry; Integrated paint industry.</p>

CPCB	
<b>1. Task Force to be established</b>	The selection of industry representatives, NGOs and representatives of academic institutions should be open to a broad range of organisations, and should be expanded to reflect the wealth of expertise available in India. In light of the interlinkages outlined in the Sustainable Development Goals, the inclusion of health as a stakeholder (Government & NGOs) is a must. Experts should be nominated by relevant bodies including SPCBs.
<b>2. Sector report to be developed</b>	<p>All primary research undertaken in support of the standard development process should be peer-reviewed by a non-industry research organization or think tank.</p> <p>The background document should give consideration to standards set in other geographies (e.g. the EU, USA and any other region with established standards applicable to the industry) and explain how this has been taken into account.</p> <p>A clear and consistent structure for the background document, which is common for all sectors (proposed structure described below this table), should be followed. The specific impact analysis that needs to be undertaken should be clearly set out and defined (discussed further below).</p>
<b>3. Peer and Core Group Committee</b>	<p>Greater consideration should be given to the composition of relevant committees, in particular, membership of the Peer &amp; Core Group Committee that makes the recommendation for standards that are subsequently placed before the CPCB Board and eventually the MoEFCC, should be expanded. SPCBs should all be officially notified that the process has begun and be given the opportunity to provide a representative if desired and/or submit written comments so that State level concerns are also taken into account in the process.</p> <p>Committees should include more subject matter specialists (e.g. pollution control equipment manufacturers, environmental/engineering consultants etc.), NGOs (where relevant to their expertise), and representatives of the private sector, coupled with greater involvement of SPCBs/PCCs. The tenure of the committee should be a minimum of five years and adequate compensation for their time should be given.</p> <p>If it is not possible to increase the number of representatives on the Committee, a stakeholder engagement stage in the development process, which draws on the Committees' government, industry and academic contacts, in line with the process adopted by the EU's Technical Working Groups, should be introduced. This could be set to a maximum 3 month period for the collation of responses, and should significantly increase the level of expert inputs.</p> <p>For transparency, it could be valuable to publish a working draft of the standards at this stage so that stakeholders can see the direction in which the standards are heading, and provide any feedback (directly or via a relevant SPCB, industry association, NGO etc.).</p>

<b>4. CPCB Board</b>	The criteria by which the CPCB reviews proposed standards should be clearly documented (published) and consistent across all industries. If the standard is deemed acceptable and no further input is required from the Peer and Core Committee, the comments of the CPCB Board should be made public.
MoEFCC	
<b>5. Initial review and placing before Minister</b>	The criteria by which the MoEFCC and the Minister assess the draft standard should be clearly documented (published) and justifiable. The key criteria should include the extent to which the standards may contribute towards achieving the NAAQS and subsequent health impacts.
<b>6. Public consultation</b>	<p>In addition to placing the draft standards on the MoEFCC website for a period of 30 – 60 days, the MoEFCC should also hold a press conference/public hearing to announce the change in emission standards, inviting feedback from members of the public and stakeholders. The draft standards should be accompanied by all supporting documentation, so that stakeholders can understand the decision-making process and the social, environmental and economic factors that have been taken into consideration. This will also prevent any delays in feedback resulting from members of the public having to request for supporting information.</p> <p>All public comments received and responses to these comments by the CPCB/MoEFCC should be documented and made publicly available.</p>
<b>7. Expert Committee</b>	The criteria by which the expert committee assesses the draft standard should be clearly documented and justifiable.
<b>8. Minister approval</b>	No change.
<b>9. Public consultation</b>	Once approved by the Minister, the draft standards should be open to a final public consultation, as above, to include details of how and why the standards have been changed following the initial consultation. This provides stakeholders with a final opportunity to consider if their feedback has been taken into account on the earlier draft. If significant feedback is provided at this stage and the standards are revised, then the Expert Committee may need to reassess.
<b>10. Publication in the Gazette of India</b>	The standards should include any additional requirements for monitoring and suggestions on where to find additional guidance documents.

### CHALLENGE #3 – EVIDENCE BASE

Evidence base for developing the standards appears to be quite variable between sectors although in many cases it was not possible to access the background documents used to inform the standards being developed as they are not routinely made publicly available. A strong evidence base ultimately leads to more robust and realistic standards and should thus reduce the risk of challenges later in the process.

### Recommendation #3 – Improved evidence base

Consistency and enhancements in the content of the supporting documentation is required. This should provide a clear and concise summary of potential standards, what technologies are available, the impacts they can have, and cost and feasibility considerations. Any external organisations employed to support the development of the evidence base should not have any vested interests in the sector. There is already a lot of information generated by other bodies internationally (e.g. BREF documents in Europe); this type of information should be utilised where relevant to ensure efficiencies (i.e. not gathering data that is already available e.g. costs of particular techniques) and adopt best practices from other countries. Information gathered for other geographies should be assessed to check its appropriateness for the situation in India e.g. costs of installation of some techniques may differ in India.

As proposed in Table 9 above, there may also be merit in undertaking an independent peer review of the background document prepared for each set of standards to ensure that it is robust before it informs the process. Alternatively, or in addition, this review could take place as part of the consultation on the draft standards (ideally on an early draft so feedback can still influence the process) as long as all of the supporting evidence is made available at the same time.

The sectoral background documents prepared by CPCB should include the following:

- a) General information about the sector
- b) Manufacturing process and pollution generating potential
- c) Fuel consumption and process emission
- d) Techniques considered in the determination of best available technology for pollution prevention and control
- e) Conclusion on best available technology (BAT)
- f) Emerging technologies, including clean technologies
- g) Techno-economic viability of suggested standards
- h) Emission monitoring protocol to be followed for suggested standards
- i) Protocol for implementation of standards
- j) Concluding remarks and recommendations
- k) Glossary of terms and abbreviation
- l) References

Specific impact analyses that should be undertaken initially at the start of the process and during it as the standards evolve should be clearly set out in appropriate guidance and it should be ensured that they are undertaken. As a minimum the annual cost burden as a proportion of sector turnover should be undertaken and the inputs and assumptions for this clearly documented.

As this only considers costs there should also be consideration of the benefits that could be realized – as a minimum this should consider the likely emission reductions that could be realized and contribution towards achieving the NAAQS recognizing the added complexity and resources to detail health and environmental benefits. In the US a detailed impact analysis is undertaken for each standard considering the overall costs and benefits and potential market

impacts. In the EU no such analysis is currently undertaken but a framework for doing so is under development. Undertaking analysis of the overall costs and benefits will help to ensure that any proposed standards are cost effective and the benefits outweigh the costs.

Furthermore, as described in the previous recommendation, all COINDs and other supporting documents should be made available on the CPCB website and existing COINDS documents should be updated with the latest technical information and data. Linked to this, the sector background documents should be made available to Committee members well in advance of meetings and if gaps are identified then further data collection should be undertaken. SPCBs/PCCs should be invited to contribute data on sites operating in their regions to better understand what is feasible and what the impacts might be (greater involvement of SPCBs/PCCs in the process would also help to capture this type of information).

### Recommendation #4 – Monitoring

The monitoring protocol for recommended standards should be part of all published emission standards. The calibration protocol for instruments used for monitoring should also be included in the monitoring protocol. Whilst outside of the scope of this study, SPCBs/PCCs are facing real challenges with implementation and in particular with monitoring of emissions for compliance. There are concerns across a number of bodies as well as industry regarding the quality of the data being generated and its consistency between sites. Getting this right is critical to ensure broad confidence in the standards themselves as well as making sure the environmental benefits are truly realised. It is recommended that a National Level Task Force be established to focus solely on this issue and a roadmap with a set of actions be developed that will ensure that this issue is addressed in a defined period of time.

### Recommendation #5 – Information portal

Strengthen the ENVIS portal for information gathering and sharing for standard development (or develop an alternative). In Europe, the system is used for storing all background documentation (e.g. sector reports), data collected during the process (e.g. individual site and technology performance data), draft outputs from the process, all feedback received on draft outputs (stakeholders submit comments direct to the portal in a structured manner e.g. specifying exactly which part of the draft document the comment refers to) and how this feedback has been taken into account or not (with justification). Access to the information held within the system could be limited to the key stakeholders involved in the development process. The benefits of such a system would include (a) improved transparency of the process and documentation of the evidence base for standards that have been developed (b) ease of access to information during the process as well as at a later date if/when the standards are to be reviewed (c) improved sharing of information between the experts involved in the development process, but also with SPCBs/PCCs, who may not be directly involved in the process but want to understand more about potential techniques / technologies, etc. to support their negotiations with industry.

#### CHALLENGE #4 – ENGAGEMENT

Engagement with key stakeholders including industry, SPCBs/PCCs, NGOs and the general public has been raised by a number of stakeholders during the study as one area where the process could be strengthened. This should help with improving the overall evidence base and for subsequent implementation of the standards (including the potential development/setting of more stringent standards at a State level if required).

#### Recommendation #6 – Improve engagement with the SPCBs/PCCs and the support they receive

This could be enhanced by the following actions:

- Giving them a **greater role in the development of the standards** with more representation on relevant Committees/Task Forces as well as open engagement/consultation during the process. For example, in Europe, to be a member of the Technical Working Group (main body developing the standards) you must be nominated, which could be by one of the Member States. In the Indian process the composition of the Peer and Core Group Committee tends to be determined by the CPCB. Publicity of ongoing development and revision of standards could be enhanced to ensure all SPCBs/PCCs are aware of any potential changes and have an opportunity to contribute. There are a number of existing forums in India for CPCB / SPCB interactions including the Chairman and Member Secretary's conference which could be utilised for enhancing engagement. However, it appears that the frequency of these forums has been reduced in recent years so may need to be increased in number and/or length (time for discussion).
- To **encourage them to set tighter standards**, where needed, a range for each of the standards (lower – upper) could be developed reflecting potential variability in what emission reductions the sector could achieve taking into account technology availability, performance and costs. A similar process is applied within Europe. The upper end of the range would act as the minimum emission standards that would have to be applied by all States and sites. The lower value or somewhere in between lower and upper could be used by the SPCBs/PCCs in cases where they have specific concerns and want to set tighter standards and/or could apply in a similar way to the US approach where tighter limits apply in areas not achieving national air quality standards (e.g. critically polluted areas and/or industrial clusters). This range would make it easier for them to justify tighter standards. Similarly, China have introduced emission standards for “special” facilities, which are those located in polluted areas or close to cultural/ecological sites, which are set lower emission standards.
- As industry emission standards have an important role to play in improving air quality, SPCBs (specifically Gujarat, Maharashtra, Telangana, Andhra Pradesh, Karnataka, Tamil Nadu, West Bengal and others where large a number of air polluting industries are located), should have a specific expert group in their Board to formulate location specific stringent emission standards to meet **national ambient air quality standards**. This group should have expertise in air quality modelling, air pollution control, emission inventory, vehicular pollution control, fuel quality, etc. There may be merit in developing these standards jointly for efficiencies and sharing of knowledge. Leveraging expertise already available at local or national institutions in conducting air quality modelling and developing emissions inventories such as at the IITs, NEERI, and others should be considered where in-house expertise is unavailable.

- **Enhancing SPCB/PCC interactions** to improve information exchange and support for finding solutions to common, shared challenges. India has multiple states with large climatic and geographical variations as well as variation in the technical capacity and capabilities of bodies. Many of them will face similar challenges and there will be some that have already overcome them. In the EU the European Commission has established the IMPEL network (European Union Network for the Implementation and Enforcement of Environmental Law) which includes representatives of the environmental regulators from each of the 28 Member States. This brings together the regulators on a regular basis (meetings, workshops and conferences) and enables them to procure and manage a number of projects concerning awareness raising, capacity building, peer review, exchange of information and experiences on implementation, international enforcement collaboration as well as promoting and supporting the practicability and enforceability of European environmental legislation. India does already hold some workshops between CPCB and SPCBs so the framework is in place but the frequency of such meetings has reduced in recent years. Reinvigorating this set-up in India (e.g. increasing the frequency of such meetings and having particular focus on standards) and/or providing an alternative/additional forum could greatly enhance both the development of the standards (e.g. improved feedback into the process based on experiences of implementation) and their subsequent implementation (e.g. finding solutions to ongoing monitoring and enforcement challenges).

#### Recommendation #7 – Improve engagement with industry and their commitment to the process

To do this will require a range of actions including a **stronger evidence base** informing the development process (clear and robust evidence is harder to challenge), **more proactive involvement of industry in the development process** (including private sector, multinationals with access to international expertise and experience, equipment manufacturers) and ensure **access to and publicity of pilot plants and/or case study examples** of particular technologies (the latter is particularly important for industries which have a large number of smaller sites including SMEs). It is critical that they engage during the process rather than challenge the standards after notification. This engagement will help to ensure that the standards are based on robust evidence and any potential technical constraints including timelines for implementation are taken into account. Of course, final decisions on which standards are developed and the levels at which they are set are still down to the CPCB and ultimately MoEFCC.

Ensure SPCBs/PCCs work closely with industry to facilitate information exchange and identification of solutions to environmental challenges. This has worked successfully in selected States such as Gujarat, for example, where the SPCB host a series of ‘Environmental Surgeries’ for industry to discuss the challenges they are facing and share experiences on possible solutions. Gujarat has also sought to simplify some of the processes for industry (e.g. applications for consents). These actions have been undertaken in an integrated manner alongside the setting of more stringent State level emission standards for some sectors.

**Recommendation #8 – Improve engagement with other stakeholders such as NGOs, academics, experts and general public**

Engagement with other stakeholders is mixed at present with generally only selected NGOs and experts appearing to engage with the process as they are often invited on to relevant Committees and/or to review certain standards. So far very limited feedback is received as part of the public consultation. Publicity of the consultation could be enhanced utilising relevant fora such as environmental networks, local, regional and national press, advance warning of upcoming consultation etc. Supporting documentation that has been used to inform the development process should also be published at the same time as the consultation, if not earlier, so that interested parties can fully understand the basis for the standards. This may include the sectoral background document(s) as well as relevant meeting minutes. Following the consultation all comments should be reviewed and responses to these documented (already done as part of the existing process) but then this document should also be published. This helps to close the feedback loop and give confidence to stakeholders that their inputs are being considered.

**RICARDO**

Ricardo is a global engineering, strategic and environmental consultancy focused on solving future challenges in transportation, energy, scarce resources and waste. Our Scarce Resource and Waste services deliver environmental consulting focused on industrial pollution control, air quality, chemical risk, climate change, resource efficiency, water and waste management.

**PHFI**

PHFI is a not-for-profit public private initiative working towards a healthier India. It is helping to build broadband public health capacity through education, research and training, with the purpose of enabling a sustained and holistic response to the significant public health challenges faced by India.

**COUNCIL ON ENERGY, ENVIRONMENT AND WATER (CEEW)**

The Council on Energy, Environment and Water (CEEW) is one of South Asia's leading policy research institutions. CEEW promotes dialogue and common understanding on energy, environment and water issues in India and globally through high quality research, partnerships with public and private institutions, and engagement with and outreach to the wider public.

**SHAKTI SUSTAINABLE ENERGY FOUNDATION**

Shakti Sustainable Energy Foundation works to strengthen the energy security of India by aiding the design and implementation of policies that encourage energy efficiency, renewable energy and the rapid adoption of sustainable transport solutions.

SEPTEMBER 2016



PUBLIC  
HEALTH  
FOUNDATION  
OF INDIA

