

Unclassified

ENV/JM/MONO(2017)12

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

06-Jun-2018

English - Or. English

**ENVIRONMENT DIRECTORATE
JOINT MEETING OF THE CHEMICALS COMMITTEE AND
THE WORKING PARTY ON CHEMICALS, PESTICIDES AND BIOTECHNOLOGY**

Cancels & replaces the same document of 04 May 2017

**REPORT ON OECD PROJECT ON BEST AVAILABLE TECHNIQUES FOR PREVENTING AND
CONTROLLING INDUSTRIAL CHEMICAL POLLUTION**

ACTIVITY I: POLICIES ON BAT OR SIMILAR CONCEPTS ACROSS THE WORLD

**Series on Risk Management
No. 40**

JT03433015

This document, as well as any data and map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.



ENV/JM/MONO(2017)12
Unclassified

English - Or. English

OECD Environment, Health and Safety Publications
Series on Risk Management
No. 40

REPORT ON OECD PROJECT ON BEST AVAILABLE TECHNIQUES FOR PREVENTING
AND CONTROLLING INDUSTRIAL CHEMICAL POLLUTION

ACTIVITY I: POLICIES ON BAT OR SIMILAR CONCEPTS ACROSS THE WORLD

IOMC

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS

A cooperative agreement among **FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD**

Environment Directorate
ORGANISATION FOR ECONOMIC COOPERATION AND DEVELOPMENT
Paris 2017

About the OECD

The Organisation for Economic Co-operation and Development (OECD) is an intergovernmental organisation in which representatives of 34 industrialised countries in North and South America, Europe and the Asia and Pacific region, as well as the European Commission, meet to co-ordinate and harmonise policies, discuss issues of mutual concern, and work together to respond to international problems. Most of the OECD's work is carried out by more than 200 specialised committees and working groups composed of member country delegates. Observers from several countries with special status at the OECD, and from interested international organisations, attend many of the OECD's workshops and other meetings. Committees and working groups are served by the OECD Secretariat, located in Paris, France, which is organised into directorates and divisions.

The Environment, Health and Safety Division publishes free-of-charge documents in eleven different series: **Testing and Assessment; Good Laboratory Practice and Compliance Monitoring; Pesticides; Biocides; Risk Management; Harmonisation of Regulatory Oversight in Biotechnology; Safety of Novel Foods and Feeds; Chemical Accidents; Pollutant Release and Transfer Registers; Emission Scenario Documents;** and **Safety of Manufactured Nanomaterials.** More information about the Environment, Health and Safety Programme and EHS publications is available on the OECD's World Wide Web site (www.oecd.org/chemicalsafety/).

This publication was developed in the IOMC context. The contents do not necessarily reflect the views or stated policies of individual IOMC Participating Organizations.

The Inter-Organisation Programme for the Sound Management of Chemicals (IOMC) was established in 1995 following recommendations made by the 1992 UN Conference on Environment and Development to strengthen co-operation and increase international co-ordination in the field of chemical safety. The Participating Organisations are FAO, ILO, UNDP, UNEP, UNIDO, UNITAR, WHO, World Bank and OECD. The purpose of the IOMC is to promote co-ordination of the policies and activities pursued by the Participating Organisations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.

This publication is available electronically, at no charge.

Also published in the Series on Risk Management: [link](#)

**For this and many other Environment,
Health and Safety publications, consult the OECD's
World Wide Web site (www.oecd.org/chemicalsafety/)**

or contact:

**OECD Environment Directorate,
Environment, Health and Safety Division
2 rue André-Pascal
75775 Paris Cedex 16
France**

Fax: (33-1) 44 30 61 80

E-mail: ehscont@oecd.org

© OECD 2017

Applications for permission to reproduce or translate all or part of this material should be made to: Head of Publications Service, RIGHTS@oecd.org, OECD, 2 rue André-Pascal, 75775 Paris Cedex 16, France

FOREWORD

All over the world, different policies and practices are being implemented to prevent and control industrial emissions in order to ensure a high level of environmental and human health protection. But inherent in many of these policies is the BAT (best available techniques) concept which has evolved as one of the key elements for setting emission limit values and other permit conditions in preventing and controlling the industrial emissions.

The implementation of BAT or similar concepts generally requires a high level of resources. There would thus be an added value in sharing experience and knowledge amongst OECD Member countries and Partner countries on this issue. The OECD Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology at its 54th meeting in February 2016 therefore approved a new project on best available techniques for preventing and controlling industrial chemical pollution.

The overall objective of the project is to assist governments to implement policies and practices that embody BAT or similar concepts to prevent and control industrial emissions, more specifically to prevent and control chemical pollution. The project consists of 3 activities. The objective of Activity I, subject of this report, was to collect information on policies and practices that are based on BAT or similar concepts implemented in a selected number of OECD Member and Partner countries.

The Information was collected through literature research and extensive contacts with national experts on pollution prevention and control, including the members of OECD's designated Expert Group on BAT. Information from experts was gathered via a survey and subsequent information-exchange. The draft report was reviewed by the OECD and the OECD's designated Expert Group on BAT and presented at a workshop held in November 2016. Their expertise contributed to the quality of the information provided in this report.

This report was prepared under the supervision of the designated Expert Group on BAT and published under the responsibility of the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology of the OECD.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	10
1 INTRODUCTION.....	11
1.1 Background.....	11
1.2 Objectives and Scope	11
1.3 Methodology	13
1.4 Structure of the report	13
2 POLICIES & PRACTICES IN THE UNITED STATES	15
2.1 Overview.....	15
2.2 Policies to prevent & control industrial emissions to air	15
2.2.1 Clean Air Act (CAA).....	15
2.3 Policies to prevent & control industrial emissions to water.....	25
2.3.1 Clean Water act (CWA)	25
2.3.2 Safe Drinking Water Act (SDWA).....	32
2.4 Policies to prevent & control industrial emissions to soil.....	33
2.4.1 Pollution prevention act.....	33
2.5 Reference	35
3 POLICIES & PRACTICES IN THE EUROPEAN UNION.....	37
3.1 Overview.....	37
3.2 General policies to prevent & control industrial emissions	37
3.2.1 Industrial Emissions Directive (IED)	37
3.2.2 EMAS Regulation (EMAS III).....	43
3.3 Policies to prevent & control industrial emissions to air	47
3.3.1 The Medium Combustion Plant (MCP) Directive.....	47
3.3.2 Directive on Stage I Petrol Vapour Recovery (PVR).....	49
3.4 Policies to prevent & control industrial emissions to soil.....	50
3.5 Projects & reference documents related to BAT.....	50
3.6 References.....	51
3.7 Case Belgium – Flanders	51
4 POLICIES & PRACTICES IN INDIA	54
4.1 Overview.....	54
4.2 Policies to prevent & control industrial emissions to air	54
4.2.1 Air (Prevention and Control of Pollution) Act	54
4.2.2 Minimal National Standards (MINAS)	56
4.3 Policies to prevent & control industrial emissions to water.....	57
4.3.1 Water (prevention and control of pollution) Act.....	57
4.4 Policies to prevent & control industrial emissions to soil.....	60
4.5 References.....	60

5	POLICIES & PRACTICES IN PEOPLE’S REPUBLIC OF CHINA	62
5.1	Overview	62
5.2	General policies to prevent & control industrial emissions	63
5.2.1	Environmental Protection Law of the People's Republic of China	63
5.3	Policies to prevent & control industrial emissions to air	65
5.3.1	Atmospheric Pollution Prevention and Control Law of the People's Republic of China	65
5.4	Policies to prevent & control industrial emissions to water	70
5.4.1	Law of the People's Republic of China on Prevention and Control of Water Pollution.....	70
5.5	Policies to prevent & control industrial emissions to soil	74
5.6	Projects & reference documents related to BAT.....	74
5.6.1	Scientific article.....	74
5.6.2	BAT/BEP Forum in East and South East Asia (ESEA)	75
5.6.3	Environmentally Sustainable Management (ESM) of medical wastes in China	75
5.7	References	75
6	POLICIES & PRACTICES IN JAPAN	78
6.1	Overview	78
6.2	Policies to prevent & control industrial emissions to air	79
6.2.1	Air Pollution Control Act/Air Pollution Control Law	79
6.3	Policies to prevent & control industrial emissions to water	83
6.3.1	Water Pollution Control Law	83
6.4	Policies to prevent & control industrial emissions to soil	85
6.4.1	Soil Contamination Countermeasures Law (SCCL).....	86
6.5	References	87
7	POLICIES & PRACTICES IN THE RUSSIAN FEDERATION.....	91
7.1	Overview	91
7.2	General policies to prevent & control industrial emissions	92
7.2.1	Federal Law No. 7-FZ on environmental protection	92
7.2.2	Federal Law No. 219-FZ amending Federal Law No. 7-FZ on environmental protection & separate legal acts.....	92
7.3	Policies to prevent & control industrial emissions to air	97
7.3.1	Federal Law No. 96-FZ on the protection of the atmospheric air	97
7.4	Policies to prevent & control industrial emissions to water	99
7.4.1	Water Code (No. 74-FZ)	99
7.5	Policies to prevent & control industrial emissions to soil.....	100
7.5.1	Federal Law No. 89-FZ on industrial and consumer waste.....	100
7.5.2	Description	100
7.5.3	Land Code (No. 136-FZ).....	102
7.6	Projects & reference documents related to BAT.....	103
7.6.1	Scientific article.....	103
7.6.2	Project on Climate friendly economy: Introduction of best available techniques	103
7.6.3	Project on BAT for intensive rearing of pig, poultry and cattle in EECCA countries using the example of Russia	103
7.6.4	Environmental Information Centre for Enterprises in St.-Petersburg	104
7.6.5	BAT/BEP Centre for environmentally safe disposal of potentially hazardous consumer products and industrial wastes in Russia.....	104
8	POLICIES & PRACTICES IN NEW ZEALAND.....	105
8.1	Overview	105
8.2	Policies to prevent & control industrial emissions to air	106

8.2.1	Resource Management Act (RMA)	106
8.2.2	Hazardous Substances and New Organisms Act (HSNO Act)	112
8.3	Policies to prevent & control industrial emissions to water	116
8.3.1	Resource Management Act (RMA)	116
8.3.2	Hazardous Substances and New Organisms Act (HSNO Act)	118
8.3.3	Sustainable Dairying - Water Accord	119
8.4	Policies to prevent & control industrial emissions to soil	121
8.4.1	Resource Management Act (RMA)	121
8.4.2	Hazardous Substances and New Organisms Act (HSNO Act)	124
8.5	References	124
9	CONCLUSIONS	127
	ANNEX I: SURVEY ON POLICIES AND PRACTICES TO PREVENT AND CONTROL INDUSTRIAL EMISSIONS OF POLLUTANTS	145
	APPENDIX: WORLD BANK GROUP ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES	154
	Overview	154
	General Guidelines	154
	Industry Sector Guidelines	155

EXECUTIVE SUMMARY

This report provides an overview of policies and practices that envisage prevention and control of industrial emissions to air, water or soil for 7 OECD Member and Partner Countries, namely: the United States, European Union, India, People's Republic of China, Japan, Russian Federation and New Zealand. The overview includes information on the: type of policy instrument, pollutants to which it apply, sectors/activities to which it applies, date of entry into force and timing for implementation, concept, i.e. technology-based or not, definition of the concept, underlying criteria, requirement linked to use of BAT or similar concept, and the actors involved.

No assessment or comparison of policies and practices was made. And thus no "best concept" was selected. However, some general conclusions on Activity 1 can be drawn:

- Policies to prevent and control industrial emissions often propose a technology-based approach (BAT or similar concept), whether or not combined with an approach based on environmental quality objectives (EQO concept).
- For prevention and control of emissions to air and water, there is often a hierarchy of general legislation supported by specific legislation. For the prevention and control of emissions to soil/land however, there is often no specific legislation, only general legislation.
- The technology-based approach is not always (clearly) defined (if there is already one). Underlying criteria might be referred to in legislation explicitly, however practice might be different. It is not always clear if, and to what extent, the criteria are taken into account when selecting techniques as "advanced techniques" and determining associated emission values.

1 INTRODUCTION

1.1 Background

All over the world, different policies and practices are being implemented to prevent and control industrial emissions in order to ensure a high level of environmental and human health protection. Many of these policies incorporate the concept of the BAT (best available techniques). It is evident that the BAT concept has evolved as one of the key elements for setting Emission limit values and other permit conditions in preventing and controlling industrial emissions.

The definition in the Directive 2010/75/EU (European Commission 2010) provides a good example on how BAT is understood in most countries. ‘Best available techniques’ means the most effective and advanced stage in the development of activities and their methods of operation, which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole.

The concept of BAT is also used in multilateral environmental agreements related to industrial pollution (e.g. Minamata Convention on Mercury, Stockholm Convention on Persistent Organic Pollutants and Ospar Convention for the Protection of the Marine Environment of the North-East Atlantic). Furthermore, similar concepts are being used worldwide, such as:

- Best Available Control Technology (BACT),
- Best Available Techniques/Technology Not Entailing Excessive Cost (BATNEEC),
- Best Conventional Pollutant Control Technology (BCT),
- Best Environmental Management Practice (BEMP),
- Best Environmental Practice (BEP),
- Best Practicable Environmental Option (BPEO),
- Best Practicable Means (BPM),
- Best Practicable Control Technology Currently Available (BPT),
- Reasonably Available Control Technology (RACT).

1.2 Objectives and Scope

The overall objective of the project is to assist governments to implement policies and practices that embody BAT (or similar concepts) to prevent and control industrial emissions, more specifically to prevent and control chemical pollution. In view of the above, knowledge and experiences on how BAT (or similar concepts) are applied, how information on advanced techniques is gathered, how techniques with high

environmental performance are identified, how cost and economic aspects are taken into account, and how such policies and practices are evaluated with respect to their effectiveness will be gathered. The work within the project focusses on;

- exchange of information on policies and practices that embody BAT (or similar concepts),
- exchange of information on how governments gather information on advanced techniques and establish BAT (or similar concepts),
- exchange of information on how governments evaluate the effectiveness of policies and practices that embody BAT (or similar concepts), and
- evaluation of the effectiveness of the use of BAT by using PRTR or monitoring data.

The project consists of 3 activities, linked to the different objectives:

- Activity I on Policies and practices that use BAT (or similar concepts) across world,
- Activity II on Experiences with developing BAT (or similar concepts),
- Activity III on Evaluation of policies and practices that use BAT (or similar concepts).

The objective of Activity I is to collect information on policies and practices that are based on BAT (or similar concepts) implemented in a selected number of OECD Member and Partner countries. Activity I does not include an assessment, nor comparison of these policies and practices.

The report provides an overview of policies and practices that envisage prevention and control of industrial emissions to air, water or soil. Emissions are defined as direct or indirect release of substances. Indirect emissions are emissions that are a consequence of the activities of the entity (installation), but occur at sources owned or controlled by another entity. The release of vibrations, heat or noise and prevention and recovery of waste is beyond the scope.

The policies and practices of seven OECD Member and Partner Countries were studied: United States, European Union, India, People's Republic of China, Japan, Russian Federation, and New Zealand. The focus is on national (or supra-national), rather than regional policies and practices.

The information on policies, addresses the following questions:

- What is the type of policy instrument?
- To which pollutants does it apply?
- To which sectors/activities does it apply?
- When did it enter into force? What is the timing for implementation?
- How is BAT (or other, similar concept) defined? (Examples of similar concepts included in the survey are listed in Annex II)
- Which are the criteria that underlie the derivation of BAT?

- Which are the requirements linked to the use of BAT (or similar concept)?
- Which are the responsible bodies for developing the BAT policy?
- By whom was the policy initiated and adopted?
- Which actors are involved in the information gathering on candidate BAT and identification of BAT?
- Is it technology-based?

On the last point, policies to prevent and control industrial emissions may propose a technology-based approach (BAT or similar concept), or an environmental quality objective based approach (EQO concept). Literature (de Jonge 1996) provides a clear picture of both approaches: The all-EQO approach to environmental protection is based on the ideal situation where actual environmental quality (at all levels) can be linked to discharge measures and thus lead to cost-minimisation. It is the fundamental philosophy for those who consider the environment as a usable and renewable resource (the “economist’s approach”). By contrast, the all-BAT approach is based on the precautionary principle and allows no consideration for scientific uncertainties on the risks associated with pollutants. It is the fundamental philosophy for those who consider the environment as a limited and non-renewable resource (the “environmentalist’s approach”). The concept of BAT has however evolved over time to cover, amongst others, also economic considerations. In practice, during permitting, most often both approaches are used in a sequential way. If the policy is indeed technology-based, additional questions are addressed:

The information gathering on candidate BAT and the identification of BAT is the subject of Activity II, and will be described in a subsequent report. However, readily available information on methods and methodologies used is already included in the report at hand.

1.3 Methodology

The Information was collected through literature research and extensive contacts with national experts on pollution prevention and control, including the members of OECD’s designated Expert Group on BAT. Information from experts was gathered via a survey (template is included in Annex I) and subsequent information-exchange (via mail, telephone and face-to-face meetings).

A considerable amount of information was gathered on policies and practices to prevent and control industrial emissions. This report provides an overview of this information by examining the key questions introduced above.

1.4 Structure of the report

The information on the different OECD Member and Partner Countries under study is structured in separate chapters. Insofar as it involves different policies (or policy requirements), the policies to prevent and control emissions to air, water and soil are described in separate paragraphs.

- Chapter 2: United States,
- Chapter 3: European Union,
- Chapter 4: India,

- Chapter 5: People's Republic of China,
- Chapter 6: Japan,
- Chapter 7: Russian Federation,
- Chapter 8: New-Zealand.

The main findings of the project are presented in Chapter 9.

2 POLICIES & PRACTICES IN THE UNITED STATES

2.1 Overview

Some requirements for preventing and controlling emissions (in particular to air and to water) in the US are technology-based. The controlling standards (in particular to air) are defined according to the location and the source (e.g. stationary vs. mobile, new vs. existing), and, in some cases, include economic factors.

The Pollution Prevention Act is focusing on industry, government, and public attention to reduce the amount of pollution via cost-effective changes in production, operation, and raw materials use. Pollution prevention includes practices that increase efficiency in the use of energy, water, or other natural resources, and protect our resource base through conservation. Source reduction refers to practices reducing hazardous substances from being released into the environment prior to recycling, treatment or disposal. It includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

Concerning air emissions, the Clean Air Act (CAA) is a federal law designed to protect public health and welfare from different types of air pollution caused by a diverse array of pollution sources. It provides the principal framework for national, state, tribal and local efforts to protect air quality (including National ambient air quality standards, NAAQS).

The Clean Water Act (CWA) is a similar policy for water. The objective of this Act is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintaining the integrity of wetlands, streams, lakes and coastal waters (including water quality standards for point sources). The CWA also seeks to attain water quality which provides for the protection and propagation of fish, shellfish and wildlife. Besides the CWA, the Safe Drinking Water Act is aimed to protect the quality of drinking water in the USA including drinking water treatment and standards. It focuses on all waters actually or potentially designed for drinking use, above ground as well as underground sources (including secondary (states) standards that are water quality-based). The Safe Drinking Water Act (SDWA) also establishes requirements and provisions for the Underground Injection Control (UIC) Program that ensures safeguards to protect public health by preventing injection wells from contaminating underground sources of drinking water (USDWs).

2.2 Policies to prevent & control industrial emissions to air

2.2.1 Clean Air Act (CAA)

2.2.1.1 Description

The CAA is a federal law designed to protect public health and welfare from different types of air pollution caused by a diverse array of pollution sources. It provides the principal framework to protect air quality at national, state and local level. The objective of the Clean Air Act is to protect human health,

welfare, and the environment by maintaining and improving the quality of the air through the development of standards.

The Act to improve, strengthens, and accelerates programs for the prevention and control of air pollution was enacted in 1963. Major amendments to the law, requiring regulatory controls to prevent air pollution, were made in 1970, 1977 and 1990.

Besides the stationary sources (including factories and chemical plants), the CAA is also directed to mobile sources (e.g. motor vehicle engines and off-road vehicles and engines). These mobile sources must also meet CAA emissions standards. These standards apply to cars, trucks, buses, recreational vehicles and engines, generators, farm and construction machines, lawn and garden equipment, marine engines and locomotives. In addition, the composition of fuels used to operate mobile sources, including gasoline, diesel, ethanol, biodiesel and blends of these fuels are also regulated under the CAA.

2.2.1.2 Type of policy / Driving force for implementation

The driving force for implementation of the CAA is in general *command and control*. However, the various programs under the CAA have different ways they are implemented. The states are required to adopt enforceable plans to achieve and maintain air quality meeting the air quality standards. EPA's Clean Air Markets Programs, such as the Acid Rain Program are market-based emission trading programs.

2.2.1.3 Pollutants to which the policy applies

- Persistent Organic Pollutants (POPs)
- Heavy metals (Lead)
- Inorganic substances (Sulphur dioxide, Nitrogen dioxide, Carbon monoxide)
- Chlorinated and brominated organic substances
- Ozone depleting substances (Ozone)
- Greenhouse gases (GHGs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants (Dust/Particulate matter)

The criteria pollutants covered by the Clean Air Act are: ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead and particulate matter.

2.2.1.4 Sector / activities to which the policy applies

- Energy (Power plants and factories)
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

2.2.1.5 *Timing for implementation*

The CAA entered into force in 1963 (amendments in 1970, 1977 and 1990).

2.2.1.6 *Technology-based approach*

2.2.1.6.1 Standards

2.2.1.6.1.1 National ambient air quality standards (NAAQS)

Under the CAA, the EPA establishes national ambient air quality standards (NAAQS). NAAQS are standards that apply for outdoor air throughout the USA for commonly found air pollutants (also known as "criteria pollutants"): particle pollution (often referred to as particulate matter) and ground-level ozone, carbon monoxide, sulphur dioxide, nitrogen dioxide and lead.

The CAA requires periodic review (every five years) of the science upon which the standards are based and the standards themselves.

The Clean Air Act identifies two types of NAAQS:

- Primary standards are designed to protect human health, with an adequate margin of safety, including sensitive populations such as children, the elderly, and individuals suffering from respiratory diseases.
- Secondary standards are designed to protect public welfare and the environment from any known or anticipated adverse effects of a pollutant.

The NAAQS have no technology basis. However, elements of control strategies to implement the NAAQS can be technology-based. When EPA establishes a new NAAQS or revises an existing NAAQS, it sets in motion a series of actions aimed at ensuring that air quality throughout the country meets those standards. EPA must designate areas as meeting or not meeting the standard (attainment/nonattainment). A district meeting a given standard is known as an "attainment area" for that standard and otherwise a "non-attainment area". If no data are available, an area may be assigned the same classification as an adjacent area, or be called "unclassifiable".

States are required to develop a general plan to attain and maintain the NAAQS in areas under their jurisdiction, and a specific plan to attain the standards for each area designated nonattainment for a NAAQS. These plans, known as State Implementation Plans or SIPs, are developed by state and local air quality management agencies and submitted to EPA for approval. Tribal governments may also choose to develop implementation plans for nonattainment areas under their jurisdiction, or have the EPA act on their behalf. When these plans are approved by EPA, they become enforceable by EPA. If a state fails to submit an approvable plan, EPA can develop an enforceable federal implementation plan (FIP) in its place.

The SIPs serve two main purposes:

- Demonstrate that the state has the basic air quality management program components in place to implement a new or revised NAAQS.
- Identify the emissions control requirements the state will rely upon to attain and/or maintain the primary and secondary NAAQS.

The EPA is authorized to develop technology-based standards (e.g. to control emissions of NO_x, SO₂, and particulate matter) which apply to specific categories of stationary sources. These standards are referred to as New Source Performance Standards (NSPS) and reflect the degree of emission limitation achievable through the application of the best system of emission reduction which has been determined to be adequately demonstrated, considering costs. The NSPS apply nationally to new, modified and reconstructed facilities in specific source categories.

However, findings apply to the categories as a whole. Subcategories have been established for the purpose of creating standards that differ among sizes, types, and classes of sources. EPA is required to review these technology-based standards at least every eight years, and to update them where appropriate.

The EPA has developed NSPS for more than 70 source categories and subcategories. Some examples are manufacturers of glass, cement, rubber tires and wool fiberglass. The NSPS are codified in the Code of Federal Regulations, under Title 40 Part 60. Emissions standards for sources are based on information on available technologies.

2.2.1.6.1.2 National Emission Standards for Hazardous Air Pollutants (NESHAP)

NESHAP are national emissions standards for hazardous air pollutants (HAP). The 1990 Amendments to the Clean Air Act specify a list of HAPs and a schedule for which EPA is to adopt standards. The listed pollutants are known or suspected to cause cancer or other serious health and environmental effects. Since 1990, EPA has modified the list through rulemaking to currently include 187 HAPs.

The NESHAP are technology standards based on Maximum Achievable Control Technology (MACT). These standards apply to both new and existing major and area sources, as defined in the CAA. The CAA defines how MACT levels of controls are to be determined.

2.2.1.6.2 Permits

2.2.1.6.2.1 New Source Review (NSR)

New Source Review (NSR) permitting protects air quality when factories, industrial boilers and power plants are newly built or modified. NSR also assures that new or modified industries are as clean as possible. In addition, the program assures that advances in pollution control occur concurrently with industrial expansion.

If a company is planning to build a major new plant or make a major modification to an existing major source then the company must obtain an NSR permit. The NSR permit is a preconstruction permit which requires the company to minimize air pollution emissions by changing the process to prevent air pollution and/or installing air pollution control equipment.

Operators of these installations have to install state-of-the-art air pollution controls when they build new facilities or make modifications to existing facilities.

The emission thresholds for a major source that trigger NSR requirements are based on a source's potential to emit (PTE). In areas that are attaining the NAAQS, new sources with PTE over 100 tons per year (for 28 defined categories) or 250 tons per year (for the others) are required to undergo NSR. In areas that are not attaining the NAAQS, the thresholds are lower, generally 100 tons per year for all source categories or lower depending on the severity of air quality. The PTE thresholds that would trigger NSR for the proposed modification of an existing source vary by pollutant but are generally lower than for new sources (e.g., 40 tons per year (NO_x, and SO₂) or 100 tons per year of CO).

There are three types of New Source Review (NSR) permitting requirements: Prevention of Significant Deterioration; Nonattainment NSR; and Minor source permits. A source may have to meet one or more of these permitting requirements.

2.2.1.6.2.2 Prevention of Significant Deterioration (PSD)

These permits are required for new major sources or a major source making a major modification in areas that meet the National Ambient Air Quality Standards. The emission thresholds that trigger the PSD program are noted in paragraph 40 above.

Examples of major sources: large industrial facilities, e.g. coal-fired power plants, plants that manufacture sulfuric and nitric acid, which are used in fertilizer, chemical and explosive production, glass manufacturing plants and cement manufacturing plants.

Prevention of Significant Deterioration (PSD) applies to new major sources or major modifications at existing sources for pollutants where the source is located in an area that meets or attains the National Ambient Air Quality Standards (NAAQS). It requires the following:

- Installation of the "Best Available Control Technology" (BACT),
- An air quality analysis,
- An additional impacts analysis, and
- Public involvement.

2.2.1.6.2.3 Nonattainment NSR permits

These permits are required for new major sources or major sources making a major modification in areas that do not meet one or more of the National Ambient Air Quality Standards. The emission thresholds that trigger the NSR program for sources in nonattainment areas are noted in paragraph 40 above. Under this more stringent program, states are required to ensure that new and modified major stationary sources do not further degrade air quality. This includes a requirement that these sources install controls at least as effective as the best performing source of that same category anywhere in the country. The emissions limit is established in each individual permit and is called the "lowest achievable emission rate" or LAER. These sources must also offset projected emissions through reductions in pollution from existing facilities in the area. Nonattainment NSR programs also have to require the opportunity for public involvement.

2.2.1.6.2.4 Minor source permits

The purpose of these permits is to prevent the construction of sources that would interfere with attainment or maintenance of a National Ambient Air Quality Standard (NAAQS) or violate the control strategy in nonattainment areas. Also, minor NSR permits often contain permit conditions to limit the sources emissions to avoid PSD or nonattainment NSR.

2.2.1.6.3 Sources

2.2.1.6.3.1 New sources (new, modified and reconstructed)

EPA establishes national sector-specific emission standards for new (and modified and reconstructed) sources. These are called New Source Performance Standards (NSPS). They reflect the degree of emission limitation achievable through the application of the best system of emission reduction which has been determined to be adequately demonstrated, considering costs. NSPS are applicable across all 50 states.

Under the NSR permitting program, the emission limits that reflect BACT and LAER are determined on a case-by-case basis for each new or modified source subject to the programme. The permitting authority is usually the state. In no way can the case-by-case BACT/LAER be less stringent than the particular NSPS.

The stringency of emissions standards applied to new and modified pollution sources under the NSR preconstruction permitting program is distinguished by the classification of the air quality management area. Enterprises located in areas that attain the ambient air quality standards are required to install BACT. Enterprises located in areas that exceed ambient air quality standards are required to install LAER technologies and must also offset any projected pollution increases with pollution decreases from existing facilities in the area. A company can obtain offsets several ways, including by reducing emissions from other facilities it owns, purchasing offsetting tons of emissions from another company that reduces emissions, or closing down an old plant.

2.2.1.6.3.2 Existing Sources

EPA does not issue uniform standards for existing sources of criteria pollutants or their precursors. Rather, state implementation plans for areas that are not meeting the NAAQS must include reasonably available control measures, including reasonably available control technology for existing stationary sources.

Reasonably available control technology (RACT) is determined by the State for existing sources as part of the process to implement the NAAQS. Typically, RACT is determined for a category of sources.

2.2.1.7 Definition of BAT or similar concept & criteria that underlie

2.2.1.7.1 National Ambient Air Quality Standards

2.2.1.7.1.1 New sources (new, modified and reconstructed)

Best Available Control Technology (BACT) and Lowest Achievable Emission Rate (LAER) are acronyms for different program requirements under the NSR program for new and modified sources.

A company that wishes to construct a new major source or major modification to an existing source located in an area that meets the applicable NAAQS is required to undergo a Prevention of Significant Deterioration review and to use BACT.

BACT is an emission limitation based on the maximum degree of reduction achievable, considering energy, environmental and economic factors. BACT is determined by the permitting authority on a case by case basis for major, new or modified emission sources in attainment/clean areas, taking into account energy, environmental, and economic impacts through application of a broad range of pollution reduction approaches. These can include add-on equipment or changes in production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques. Sources are required to complete modelling analyses to ensure that the proposed emissions increase will not cause or contribute to a violation of any applicable NAAQS or increase air pollution concentrations more than specific increments. In areas that are in attainment with the NAAQS, air quality increments represent a maximum allowable increase in a particular pollution concentration above baseline levels. Pristine areas, such as national parks and wilderness area have strict requirements for the permissible increase in ambient pollutant concentrations.

BACT must be at least as strict as NSPS. BACT does not permit pollution in excess of those allowed under the provisions of the USA Clean Air Act (CAA).

New sources in non-attainment areas are required to adhere to the lowest achievable emissions rate (LAER) for those pollutants that exceed applicable NAAQS. E.g., if an area is non-attainment for ozone, the major new or modified source must meet LAER for VOC and NO_x. The source would have to meet BACT for SO₂ and PM. LAER is the lowest emissions rate achieved by a similar source or the lowest rate for a similar source in a permit anywhere. In addition to meeting LAER, the source must also offset any emissions increase by a ratio of at least 1:1 (and in extremely polluted areas, the ratio is as high as 1.5:1), in order to achieve a net air quality benefit. Examples of how the offsetting emission credits can be obtained are: installing extra controls at the affected source, paying to install controls at another source in the same airshed, or by purchasing emission credits from a broker (these credits also must come from the same airshed).

LAER means for any source, that rate of emissions which reflects the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source, or the most stringent emission limitation achieved in practice by such class or category of source.

However, the application of this term will not permit the emission of any pollutant in excess of the amount allowable under applicable new source performance standards.

LAER is required on major new or modified sources in non-attainment areas and need to be at least as strict as NSPS.

2.2.1.7.1.2 Existing sources

Reasonably available control technology (RACT) is for existing sources. RACT is applied to existing pollutant sources that are located in a region that exceeds an applicable NAAQS. As ozone has been the most pervasive pollution problem in the USA, RACT is largely applied to sources that emit VOC. EPA issued dozens of control technique guidelines (CTG), which are sector-based guidelines that provide information about control techniques and include a model rule that could be adopted by a State. RACT emission limits are designed to be technology forcing, but they also consider cost and feasibility of implementing such technologies.

The RACT standard is less stringent than BACT.

2.2.1.7.2 National Emission Standards for Hazardous Air Pollutants

Maximum Achievable Control Technology (MACT) standards apply to major new and existing sources of hazardous air pollutants (HAPs), and in some cases, to area (or non-major) sources. They typically are in the form of specific emissions limits. The standards are set by EPA and apply nationally. Major sources of HAP are those that emit or have the potential to emit 10 tons per year of any of the listed HAP or 25 tons per year of a combination of HAPs. The term "control technology" not only refers to emission control devices, such as scrubbers, thermal oxidizers and bio-filters, but can also mean measures, processes, methods, systems or techniques that are used to limit the emissions of hazardous air pollutants.

The MACT standards are technology-based and represent the maximum degree of reduction in emission taking into consideration the costs of achieving such emission reduction and any non-air health and environmental impacts and energy requirements. For new (and substantially reconstructed) sources, these MACT standards must be at least as stringent as is achieved by the best-controlled similar source. For existing sources, MACT standards are to be at least as stringent as the average level of emission reduction already achieved by the best performing 12% of sources in the same category.

EPA is also required to complete a risk assessment for each MACT standard to assess whether residual health and environmental risks remain after imposition of a MACT standard. And, EPA is required

to review MACT standards periodically, and, based on science and public health data, to assess whether the existing standard is amply protective, and to revise such standard where data so indicate.

2.2.1.8 Requirements linked to the use of BAT.

Installations should be operated in accordance to the applicable legal provisions of the CAA to prevent and control air emissions. Depending on the source (stationary or mobile), the type of installation (new, modified, reconstructed or existing), the type of pollutants (criteria pollutants or HAP) and the location (attainment, non-attainment or unclassifiable area), installations should comply with applicable specific technology-based standards.

Under the CAA, there are two different types of permitting programs:

- New source review permitting; These are permits that are issued before construction (or modification) starts.
- Operating permits; These don't apply new requirements to facilities, but improve compliance by clarifying what facilities must do control air pollution.

Operating permits are required for all major sources and a limited number of smaller sources (called area sources, minor sources, or non-major sources). Under various programs, the applicability level for determining major enterprises is emitting or having the potential to emit 100 tons per year of any air pollutant, except as expressly provided otherwise. As noted above under descriptions of various programs above, there can be different thresholds linked to the severity of pollution or to the pollutant itself.

Many states adopt what is referred to as “permit by rule” or “general permits” for smaller enterprises subject to operating permits. A regulation or general permit is developed for a sector, e.g., restaurants, dry cleaners, automotive body shops, which include requirements for emissions limits, specific parameters for which records must be kept, and the frequency for when such records must be transmitted to the state agency. These permits by rule or general permits allow states to effectively focus their resources on individual, case-by-case permits for large enterprises, and ensure that small enterprises can locate and operate new businesses without severe administrative burden but also meet the best emissions standards.

The EPA often sets performance standards in the form of numerical emission limits. This approach gives companies flexibility to decide the best way to achieve that emission limit, considering costs and other factors. Depending on the program, additional flexibility may be provided through emissions averaging (e.g. among multiple emission points within a facility), alternative standards, or other mechanisms (e.g. market-based regulatory approaches for acid rain, ozone layer protection, and vehicle emissions).

Under the CAA, states (and local agencies) may adopt requirements that are more stringent than those of EPA. Among the examples:

- The north eastern states and California have more stringent standards, and lower applicability thresholds, for VOC sources (due to long standing and unhealthy ozone concentrations).
- California and Connecticut have established ambient standards for dioxin/furans.
- California has a one-hour ozone standard that is more stringent than that of EPA.

- Massachusetts has environmental performance standards for power plants (pounds per MWh of NO_x, SO₂, CO₂, and PM).

2.2.1.9 *Responsible bodies*

The CAA delegates states (and respective local agencies where applicable) to be the lead parties responsible for implementing air quality management programs. The Environmental Protection Agency (EPA) oversees state programs, reviews and approves state plans, and has the authority to operate a federal program in a state, should it be found to be deficient. EPA can also take independent action to enforce the CAA against affected sources. EPA conducts periodic audits of state programs, and inspections of industrial facilities.

The Act requires EPA to develop primary and secondary ambient air quality standards. The Act also requires EPA to form a scientific advisory committee, comprised of members from public and private sectors, to review the science and to make recommendations to EPA.

Furthermore, the Act requires EPA to review the criteria associated with ambient air quality standards. Every five years, EPA is to assess the basis of such standards, take into consideration the recommendations of an independent scientific review committee, and determine whether or not the existing ambient standards are adequate to protect public health and the environment. EPA then has the discretion to recommend that existing ambient standards be revised, that a standard for a new pollutant be adopted, or that no changes be made. A revision does not always result in making a standard more stringent.

The CAA specifies the list of hazardous air pollutants which EPA must regulate. The CAA also provides for a process by which pollutants may be added or subtracted from the list. The CAA also requires EPA to publish a list of the categories that it intends to regulate. EPA is authorized to revise this list based on the contribution of various sectors on air quality. Sector-based emission standards (for a particular industrial category, e.g., steel plants, pulp and paper, petroleum refineries, electricity generating units, power plants) are required to be reviewed every eight years, and revised if necessary.

EPA is also authorized to set national New Source Performance Standards (NSPS) that apply to from many industrial sectors. NSPS often limit criteria pollutants or precursors, but also can apply to other pollutants, including greenhouse gas emissions. (States do not need to develop and submit plans to implement these standards.)

Related to implementation of the NAAQS, EPA is responsible for designating areas of the country as meeting or not meeting the NAAQS. EPA also provides guidance and technical assistance to assist states, who are responsible for developing enforceable state implementation plans (SIPs) to meet the NAAQS. The states need to submit a plan containing, among other elements, emissions performance standards for existing sources of such emissions. EPA reviews state plans to ensure that they comply with the CAA and is authorized to prescribe a plan for a state if the state fails to submit or enforce a satisfactory plan.

Besides the above mentioned tasks, EPA is also required to establish, among others, a national research program to investigate the causes of pollution and how it can be prevented and controlled, to develop air quality training materials to help states and the regulated enterprises to prepare air quality plans, and to help comply with air quality regulations and standards, and to take civil or criminal enforcement action against violators of environmental laws when warranted. EPA is authorized to inspect any enterprise for the purposes of determining compliance with air quality requirements. An enterprise must grant entry to an EPA representative.

States are required to develop, implement and enforce air quality plans to achieve and maintain the NAAQS. The CAA sets minimum required elements of each air quality plan are clearly specified.

- Regulations developed under the authority of the CAA typically include requirements for affected enterprises to record various operating parameters and to report such data periodically to the state and EPA. In general, enterprises self-report and self-disclose compliance status, violations and corrective actions. Emissions and pollution data are transparent and publicly available.

Some enterprises are required to continuously record pollutant values and to establish an alternative method of recording data if the continuous monitor is not operating or while it is offline for repair or maintenance. One example is enterprises subject to the acid rain requirements (power sector). Some regulations for specific categories of sources (such as for large industrial sources) also require continuous monitoring of emissions.

2.2.1.10 Additional information

2.2.1.10.1 How information on advanced techniques gathered

EPA maintains the RACT/BACT/LAER Clearinghouse (RBLC). This is a searchable database by pollutant or sector that contains case-specific information on the "Best Available" air pollution technologies that have been required to reduce the emission of air pollutants from stationary sources (e.g., power plants, steel mills, chemical plants). This information has been provided by State and local permitting agencies.

2.2.1.10.2 Identification of BAT and BAT-AELs

For NSPS, EPA's Office of Air Quality Planning and Standards (OAQPS) conducts extensive technology evaluations for each sector for which a standard is intended to be adopted. These evaluations can include: On-site inspections of facilities, Emissions testing, Review of what processes and technologies exist to control emissions (this review can include facilities outside of the USA), Questionnaires to industry about their operations, and Review and assessment of data in the RBLC.

EPA establishes a NSPS emission limit based on its assessment of the degree of emission limitation achievable through the application of the best system of emission reduction which it determines to be adequately demonstrated, taking into account the cost of such reduction and any non-air quality health and environmental impact and energy requirements. The limit is intended to be technology forcing, but also a limit that all affected sources would be capable of meeting. NSPS is applicable nationally, and as explained above, a NSPS standard serves as the floor in any case-by-case BACT determination. So, NSPS is by definition, less stringent than many BACT emission limits in state permits. In most programs, emission limits are set using scientific data on the emissions performance and costs of available technologies.

For NAAQS, EPA sets standards based on periodic review of the latest peer-reviewed studies of each pollutant's health and environmental effects. The Clean Air Scientific Advisory Committee (CASAC) provides advice and recommendations. This is not the case for setting emissions limits for industrial sources.

2.2.1.10.3 Reference documents on BAT reports

EPA publishes proposed NSPS with all supporting documentation for each sector that it intends to regulate. Each NSPS proposed has a public comment period, typically 60-90 days, and in-person

opportunities to provide comment can also be provided (within this same 60-90 day timeframe). All documents are on the web site for the particular NSPS rulemaking.

Following the close of the public comment period, EPA considers and evaluates comments received. Generally, EPA then revises the regulation accordingly and issues a final NSPS. Once the NSPS is issued, it applies to all affected sources going forward from the effective date of the NSPS. Note that the effective date can be the date that the NSPS was proposed, which may be a year or more between proposed and final.

2.2.1.10.4 Monitoring

The EPA works with its federal, state and tribal regulatory partners through a comprehensive CAA compliance monitoring program. Compliance monitoring is one of the key components EPA uses to ensure that the regulated community complies with environmental laws/regulations. Elements include through on-site and off-site inspections, record reviews and investigations that can lead to enforcement when necessary.

The CAA compliance assistance program provides businesses, federal facilities, local governments and tribes with tools to help meet environmental regulatory requirements.

The Clean Air Act Stationary Source Compliance Monitoring Strategy (CAA CMS) is a guidance implemented through the annual National Program Managers Guidance which defines program priorities, implementation strategies and regional performance measures. The Clean Air Act Stationary Source Compliance Monitoring Strategy:

- Provides national consistency in developing stationary source air compliance monitoring programs, while at the same time provides states/locals with flexibility to address local air pollution and compliance concerns.
- Improves communication between states/locals and regions on stationary source air compliance monitoring programs, and enhance the EPA oversight of these programs.
- Provides a framework for developing stationary source air compliance monitoring programs that focuses on achieving measurable environmental results.
- Provides a mechanism for recognizing and utilizing the wide range of tools available for evaluating and determining compliance, and
- Establishes a consistent level of evaluation coverage and environmental and public health protection by all delegated agencies, including EPA where EPA has direct implementation authority.

2.3 Policies to prevent & control industrial emissions to water

2.3.1 *Clean Water act (CWA)*

2.3.1.1 *Description*

The Clean Water Act (CWA) is the primary federal law in the United States governing water pollution. Its objective is to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintaining the integrity of wetlands, streams, lakes and coastal waters. The CWA also seeks to attain water quality which provides for the

protection and propagation of fish, shellfish and wildlife. The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972. Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry. EPA has also set water quality standards for all contaminants in surface waters.

The CWA is limited to "waters of the USA, including the territorial seas". It does not directly address groundwater contamination. Groundwater protection provisions are included in the Safe Drinking Water Act, the Resource Conservation and Recovery Act and the Superfund act (see below).

2.3.1.2 Type of policy / Driving force for implementation

As the case for CAA, driving force for implementation of CWA in general is command and control. States are required to adopt enforceable plans to achieve and maintain water quality standards.

2.3.1.3 Pollutants to which the policy applies

The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. EPA's National Pollutant Discharge Elimination System (NPDES) permit program controls discharges. Point sources are discrete conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. It also includes vessels or other floating craft from which pollutants are or may be discharged. By law, the term "point source" also includes concentrated animal feeding operations, which are places where animals are confined and fed.

Created in 1972 by the Clean Water Act, the NPDES permit program is authorized to state governments by EPA to perform many permitting, administrative, and enforcement aspects of the program.

The NPDES contains both numeric technology-based effluent limitations defined in the CWA as restrictions on quantities, rates, and concentrations of constituents which are discharged, and non-numeric water quality-based effluent limitations in the permit. The permittee must control its discharge as necessary to meet applicable water quality standards for specific pollutants (e.g. nutrients such as nitrogen): maximum pollutant load or concentration.

2.3.1.4 Sector / activities to which the policy applies

An NPDES permit is typically a license for a facility to discharge a specified amount of a pollutant into receiving water under certain conditions. Permits may also authorize facilities to process, incinerate, landfill, or beneficially use sewage sludge. The two basic types of NPDES permits issued are individual and general permits.

An individual permit is a permit specifically tailored to an individual facility. Once a facility submits the appropriate application(s), the permitting authority develops a permit for that particular facility based on the information contained in the permit application (e.g., type of activity, nature of discharge, receiving water quality). The authority issues the permit to the facility for a specific time period (not to exceed five years) with a requirement that the facility reapply prior to the expiration date.

A general permit covers a group of dischargers with similar qualities within a given geographical location. General permits may offer a cost-effective option for permitting agencies because of the large number of facilities that can be covered under a single permit.

Discharges from direct dischargers (i.e. facilities that discharge wastewaters directly into waters of the U.S.) are regulated in permits that specify limits using Best Practicable Control Technology Currently Available (BPT), Best Available Technology Economically Achievable (BAT), Best Conventional Pollutant Control Technology (BCT), and New Source Performance Standards (NSPS).

2.3.1.5 Timing for implementation

The CWA entered into force in 1948 (rewritten version 1972, and major amendments 1977 and 1987).

2.3.1.6 Technology-based approach

2.3.1.6.1 National Pollutant Discharge Elimination System (NPDES)

The NPDES, which is a permit system for regulating point sources of pollution from (1) industrial facilities (including manufacturing, mining, oil and gas extraction, and service industries), (2) municipal governments and other government facilities (such as military bases) and (3) some agricultural facilities, such as animal feedlots.

NPDES permits must be reissued every five years. They also include conditions concerning periodically monitoring and discharge monitoring reports.

2.3.1.6.2 Technology-based standards for point sources (TBELs)

The 1972 CWA created a new requirement for *technology-based standards* for point source discharges. The EPA develops these standards for categories of dischargers, based on the performance of pollution control technologies without regard to the conditions of a particular receiving water body. Technology-based standards are set up for specific pollutants at several levels of control (existing or new sources, direct or indirect discharge, and priority, conventional or nonconventional pollutants) as shown in Table 1.

Table 1. Technology-based standards are set up for specific pollutants at several levels of control

Technology - based standards	Existing Direct Dischargers	New Direct Dischargers	Existing Indirect Dischargers	New Indirect Dischargers	Priority pollutants	Conventional Pollutants	Nonconventional Pollutants
Best Practicable Control Technology Currently Available (BPT)	x				x	x	x
Best Conventional Pollutant Control Technology	x					x	

Technology - based standards	Existing Direct Dischargers	New Direct Dischargers	Existing Indirect Dischargers	New Indirect Dischargers	Priority pollutants	Conventional Pollutants	Nonconventional I Pollutants
(BCT)							
Best Available Technology (Economically Achievable) (BAT(EA))	x				x		x
New Source Performance Standards (NSPS)		x			x	x	x
Categorical Pre-treatment Standards for Existing Sources (PSES)			x		x		x
Categorical Pre-treatment Standards for Existing Sources (PSNS)				x	x		x

TBELs require a minimum level of treatment of pollutants for point source discharges based on available treatment technologies, while allowing the discharger to use any available control technique to meet the limits. For industrial (and other non-municipal) facilities, technology-based effluent limits are derived by using national effluent limitations guidelines and standards established by the EPA, and/or using Best Professional Judgement (BPJ) on a case-by-case basis in the absence of national guidelines and standards.

2.3.1.6.3 Water quality standards for point sources

The 1972 act authorized continued use of the water quality-based approach, but in coordination with the technology-based standards. After application of technology-based standards to a permit, if water quality is still impaired for the particular water body, then the permit agency (state or EPA) may add water quality-based limitations to that permit. The additional limitations (Total Maximum Daily Loads (TMDLs), Water Quality-based Effluent Limitations (WQBELs) and Whole Effluent Toxicity (WET)) are to be more stringent than the technology-based limitations and would require the permittee to install additional controls. Water quality standards consist of four basic elements: (1) designated uses, (2) water quality criteria, (3) antidegradation policy and (4) general policies.

2.3.1.6.4 Storm water Pollution Prevention Plan

Storm water discharges are also covered by the permit program. The Storm water Pollution Prevention Plan (amendments to the Act in 1986) contains best management practices, but does not specify numeric effluent limits and may not include regular monitoring requirements.

2.3.1.7 Definition of BAT and criteria that underlie

The technology-based standards as mentioned in Table 1. are categorized and defined as follows:

2.3.1.7.1 Existing sources

2.3.1.7.1.1 Direct Dischargers

- Best Practicable Control Technology Currently Available (BPT)

Factors relating to the assessment of best practical control technology currently available to comply with subsection (b)(1) of section 301 of this Act shall include consideration of the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application, and shall also take into account the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate.

- Best Conventional Pollutant Control Technology (BCT)

Factors relating to the assessment of best conventional pollutant control technology (including measures and practices) shall include consideration of the reasonableness of the relationship between the costs of attaining a reduction in effluents and the effluent reduction benefits derived, and the comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources, and shall take into account the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate.

- Best Available Technology (Economically Achievable) (BAT(EA))

This level of control is generally described as the best technology currently in use and includes controls on toxic pollutants.

2.3.1.7.1.2 Indirect Dischargers

Categorical Pretreatment Standards (CPS) is issued to industrial users (also called "indirect dischargers") contributing wastes to municipal waste water treatment plants. These standards are developed in conjunction with the effluent guidelines program. Categorical Pretreatment Standards for Existing Sources (PSES) applied for priority as well as nonconventional pollutants.

2.3.1.7.1.3 Direct Dischargers

- New Source Performance Standards (NSPS)

Uniform national EPA water effluent standards which limit the amount of pollution allowed from new sources or from modified existing sources. Applied for priority, conventional as well as nonconventional pollutants.

2.3.1.7.1.4 Indirect Dischargers

- Categorical Pretreatment Standards for Existing Sources (PSNS)

CPS for New Sources, applied for priority as well as nonconventional pollutants.

The additional water quality-based limitations as described in the previous paragraph are defined as follows:

- Total Maximum Daily Loads (TMDLs)

Section 303(d) of the Clean Water Act (CWA) establishes a process for states to identify waters within their boundaries where implementing technology-based controls is inadequate to achieve water quality standards. States establish a priority ranking of these waters and, for the priority waters, develop total maximum daily loads (TMDLs). A TMDL identifies the amount of a specific pollutant or property of a pollutant, from point, nonpoint, and natural background sources, including a margin of safety, that may be discharged to water body and still ensure that the water body attains water quality standards. The allocations of pollutant loadings to point sources are called wasteload allocations.

Effluent limits in NPDES permits must be consistent with the assumptions used to derive the wasteload allocations. Also, in the absence of a TMDL, permitting authorities still must assess the need for effluent limits based on water quality standards and, where necessary, develop appropriate wasteload allocations and effluent limits. This analysis could be done for an entire watershed or separately for each individual discharge.

- Water Quality-based Effluent Limitations (WQBELs)

Effluent limits in NPDES permits must be consistent with the assumptions used to derive the waste load allocations. Also, in absence of TMDLs, permitting authorities still must assess the need for effluent limits based on water quality standards and, where necessary, develop appropriate waste load allocations and effluent limits. This analysis could be done (1) for an entire watershed or (2) separately for each individual discharge. WQBELs are more stringent than TMDLs.

Watershed-based Permitting is a process that emphasizes addressing all stressors within a hydrologically defined drainage basin, rather than individual pollutant sources on a discharge-by-discharge basis.

Watershed Central is a website that described programs to combat nonpoint source pollution and grants to aid the public in improving their local water quality.

- Whole Effluent Toxicity (WET)

WET are risk-based requirements which set site-specific allowable pollutant levels for individual water bodies, such as rivers, lakes, streams and wetlands.

WETs describes the aggregate toxic effect of an aqueous sample (e.g., whole effluent wastewater discharge) as measured by an organism's response upon exposure to the sample (e.g., lethality, impaired growth, or reproduction).

WET tests (developed by the EPA) replicate the total effect of environmental exposure of aquatic life to toxic pollutants in an effluent without requiring the identification of the specific pollutants. The EPA

also developed a WET training tool for regional and state NPDES permit writers and laboratories in the contact of their program implementation.

2.3.1.8 Requirements linked to the use of BAT

Similar to the CAA, installations should be operated in accordance to the legal provisions of the CWA to prevent and control water emissions. Depending on the type of source (new, modified, reconstructed or existing), the discharge situation (direct or indirect) and the type of pollutants (priority, conventional or nonconventional), installations should comply with specific technology-based standards.

Concerning flexibility, if water quality is still impaired for the particular water body, after application of technology-based standards, more stringent water quality-based limitations must be complied with.

2.3.1.9 Responsible bodies

The CWA is administered by the USA Environmental Protection Agency, in coordination with state governments. Under the CWA, the EPA has implemented pollution control programs such as wastewater standards for industry and water quality standards for all contaminants in surface waters.

The EPA is responsible for screening and selecting the techniques on which TBELs (technique-based standards) are based.

Point sources may not discharge pollutants to surface waters without a permit from the National Pollutant Discharge Elimination System (NPDES). The NPDES permit program is authorized to state governments by the EPA to perform many permitting, administrative, and enforcement aspects of the program.

2.3.1.10 Additional information

2.3.1.10.1 BAT and BAT-AELs

The way information on advanced techniques is gathered, “BAT” are identified, and the methodology that is used and how BAT-AELs are determined under CWA is comparable to the CAA.

2.3.1.10.2 Monitoring and reports

Compliance monitoring under the NPDES Program takes place largely at the state level. The EPA has authorized most of the states to implement their own NPDES programs to control water pollution. The EPA oversees authorized state programs and has direct implementation responsibilities for the unauthorized states (ID, NM, MA and NH) as well as federal facilities and in Indian Country.

Compliance monitoring under the NPDES Program encompasses a range of techniques (from Discharge Monitoring Report reviews to on-site compliance evaluation) as well as providing assistance to enhance compliance with NPDES permits.

The NPDES Compliance Inspection Manual provides information on how compliance inspections are conducted.

The NPDES Permit Writers' Manual has purpose to provide a general reference for permitting authorities that outlines and explains the core elements of the NPDES permit program¹.

Additional information concerning drinking water and systems, water quality research, water monitoring and water tools and technology².

2.3.2 Safe Drinking Water Act (SDWA)

2.3.2.1 Description

The Safe Drinking Water Act is aimed to protect the quality of drinking water in the USA. It focuses on all waters actually or potentially designed for drinking use, above ground as well as underground sources.

2.3.2.2 Type of policy / Driving force for implementation

Driving force for implementation of SDWA is command and control. States are required to adopt programs to achieve and maintain standards to protect drinking water sources.

2.3.2.3 Timing for implementation

The SDWA entered into force in 1974.

2.3.2.4 Technology-based approach

The National Primary Drinking Water Regulations (NPDWR) are legally enforceable primary standards and treatment techniques that apply to public water systems aimed to protect public health by limiting the levels of contaminants in drinking water.

As the case under CWA, under SDWA these minimum standards (=primary standards) are developed by the EPA based on best available peer-reviewed science and a detailed risk and cost assessment. Additional more stringent nuisance-related standards (secondary standards) can be set up by the States.

2.3.2.5 Definition of BAT or similar concept & criteria that underlie

Primary standards and treatment techniques are technology-based, also taking into account a detailed risk and cost assessment. Primary standards are available for the following parameters:

- Microorganisms,
- Disinfectants,
- Disinfection byproducts,
- Inorganic chemicals,
- Organic chemicals,
- Radionuclides.

Secondary (States) standards are nuisance-related (water quality-based).

¹ <https://www.epa.gov/npdes/npdes-permit-writers-manual>

² <https://www.epa.gov/science-and-technology/water-science>

2.3.2.6 Requirements linked to the use of BAT

Similar to the CWA, drinking water installations should be operated in accordance to the legal provisions of the SDWA. Besides the primary (EPA) technology-based primary standards, more stringent secondary (Stated) water quality-based limitations must be complied with.

2.3.2.7 Responsible bodies

The Office of Ground Water and Drinking Water (OGWDW) is responsible for the implementation of the Safe Drinking Water Act. This office protects public health by ensuring safe drinking water and protecting ground water, together with states, tribes, and many other partners (e.g. public water systems and their operators, certified laboratories that conduct required analyses of drinking water samples).

EPA is authorised to establish minimum standards to protect tap water and requires all owners or operators of public water systems to comply with these primary (health-related) standards. So, the EPA is responsible for screening and selecting of the primary technology-based standards. The States are responsible for the secondary (more stringent) quality-based standards related to nuisance.

2.3.2.8 Additional information

2.3.2.8.1 Monitoring

EPA, states, and the tribes monitor compliance under the Safe Drinking Water Act regulatory programs. Additional information concerning drinking water and systems, water quality research, water monitoring and water tools and technology:

2.4 Policies to prevent & control industrial emissions to soil

2.4.1 Pollution prevention act

2.4.1.1 Description

The Pollution Prevention Act focusses on industry, government, and public attention to reduce the amount of pollution via cost-effective changes in production, operation, and raw materials use. Pollution prevention includes practices that increase efficiency in the use of energy, water, or other natural resources, and protect our resource base through conservation.

Source reduction refers to practices reducing hazardous substances from being released into the environment prior to recycling, treatment or disposal. It includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

2.4.1.2 Type of policy / Driving force for implementation

Driving force for implementation of the above described soil-related policy is *command and control*.

2.4.1.3 Pollutants to which the policy applies

Any hazardous substance, pollutant, or contaminant would be applied.

2.4.1.4 Sector / activities to which the policy applies

Any activity that release any hazardous substance, pollutant, or contaminants into the environment prior to recycling, treatment or disposal would be applied.

2.4.1.5 Timing for implementation

The Pollution Prevention Act entered into force in 1990.

2.4.1.6 Technology-based approach

Under this Act, the amount of pollution has to be reduced via technology-based principles and cost-effective changes in production, operation and raw materials use. This approach includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.

2.4.1.7 Definition of BAT & criteria that underlie

Although technology-based principles and cost-effectiveness are taken into account to reduce emissions, no BAT or similar concept and criteria that underlie are directly defined in this Act. In general, the criteria that underlie:

Best demonstrated available technology (BDAT) is defined by EPA as the most effective commercially available means of treating specific types of hazardous waste. BDATs may change with advances in treatment technologies.

2.4.1.8 Requirements linked to the use of BAT

Under this Act, any activity that releases any hazardous substance, pollutant, or contaminants into the environment prior to recycling, treatment or disposal should be operated in accordance to the legal provisions of the PPA.

2.4.1.9 Responsible bodies

The EPA is the responsible body for this policy.

2.4.1.10 Additional information

The EPA conducts and supervises investigation and clean-up actions at a variety of sites where oil or hazardous chemicals have been released into the environment or when there is a threat of the release of these substances. Clean-up activities also may take place at active and abandoned waste sites, federal facilities and properties, and where above or underground storage tanks have leaked.

The Office of Pollution Prevention and Toxics (OPPT) manages programs under the Pollution Prevention Act.

Regulatory Information concerning Land and Clean-up are:

- Aboveground Storage Tanks (ASTs): ASTs that store petroleum or hazardous substances are subject to both federal regulations and state/local regulations. Most ASTs need to meet Spill, Prevention, Control, and Countermeasure (SPCC) requirements.

- **Underground Storage Tanks (USTs):** The UST Program is primarily implemented by states and territories.
- **Resource Conservation and Recovery Act (RCRA) Corrective Action:** The RCRA Corrective Action program monitors and regulates the clean-up (via Best Demonstrated Available Treatment – BDAT) of the contamination at RCRA-regulated facilities when solid or hazardous waste is not properly managed.
- **Superfund:** The Superfund is the Comprehensive Environmental Response, Compensation and Liability Act was set up in 1980 (CERCLA). The Superfund was enacted to address abandoned hazardous waste sites in the USA.
- **Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986:** Section 313 of EPCRA established the Toxics Release Inventory (TRI). The TRI is the United States' pollutant release and transfer register (PRTR). When the TRI was originally implemented the only quantities of toxic chemicals facilities had to report annually to the U.S. Environmental Protection Agency's Toxics Release Inventory Program were those released directly to the environment or transferred to offsite locations for treatment or disposal. The PPA expanded the information required to be reported by facilities under EPCRA Section 313 to include information specific to source reduction and preferred waste management techniques. As described under Section 6607 of the PPA, for a given chemical this additional information includes the quantities of the chemical that were recycled, used for energy recovery, or treated at the facility or elsewhere. The PPA also requires reporting of any source reduction practices (e.g., process modifications, substitution of raw materials) implemented at a facility during the reporting year.

The main additions or changes are: the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the Small Business Liability Relief and Brownfields Revitalization Act of 2002.

2.5 Reference

- U.S. House of Representatives (1990). Pollution Prevention Act.
- U.S. House of Representatives (2002). Federal Water Pollution Control Act
- U.S. House of Representatives (2002). Title XIV of the Public Health Service Act - Safety of Public Water Systems (Safe Drinking Water Act).
- U.S. House of Representatives (2004). The Clean Air Act
- US EPA. Building Flexibility with Accountability into Clean Air Programs. <https://www.epa.gov/clean-air-act-overview/building-flexibility-accountability-clean-air-programs>.
- US EPA. Implementing Clean Water Act Section 303(d): Impaired Waters and Total Maximum Daily Loads (TMDLs) <https://www.epa.gov/tmdl>.
- US EPA. Land, Waste and Cleanup Science. <https://www.epa.gov/science-and-technology/land-waste-and-cleanup-science>.

- US EPA. Learn About Effluent Guidelines. <https://www.epa.gov/eg/learn-about-effluent-guidelines>.
- US EPA. National Pollutant Discharge Elimination System (NPDES). <https://www.epa.gov/npdes>.
- US EPA. Table of Regulated Drinking Water Contaminants. <https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants>.
- US EPA. Technology Transfer Network - Clean Air Technology Center - RACT/BACT/LAER Clearinghouse <https://www3.epa.gov/ttnecat1/rblc/htm/welcome.html>.
- US EPA. Terminology Services (TS). https://ofmpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do?details=&glossaryName=Environmental%20Issues%20Glossary.
- US EPA (1990). Summary of the Pollution Prevention Act. <https://www.epa.gov/laws-regulations/summary-pollution-prevention-act>.
- US EPA (2002). Summary of the Clean Water Act. <https://www.epa.gov/laws-regulations/summary-clean-water-act>.
- US EPA (2002). Summary of the Safe Drinking Water Act. <https://www.epa.gov/laws-regulations/summary-safe-drinking-water-act>.
- US EPA (2004). Clean Air Act Overview. <https://www.epa.gov/clean-air-act-overview/clean-air-act-text>.
- US International Risk Management Institute IRMI Online.
- US Legal. Definitions. <http://definitions.uslegal.com/b/best-available-control-technology/>.

3 POLICIES & PRACTICES IN THE EUROPEAN UNION

3.1 Overview

Emissions from industrial installations have been subject to EU-wide legislation for some time. The Directive 2010/75/EU on industrial emissions (IED) is a recast of seven earlier pieces of legislation on industrial emissions, including Directive 1996/61/EC on integrated pollution prevention and control (IPPC) and Directive 2001/80/EC on large combustion plants (LCP). The IED sets out the main principles for the permitting and the control of installations based on an integrated approach. Permit conditions, including emission limit values (ELVs), must be based on the best available techniques. However the IED creates a very important relationship between the permit conditions based and BAT.

Other policies that must definitely be mentioned are: the EU Eco-Management and Audit Scheme (EMAS) regulation, the Directive on Stage I Petrol Vapour Recovery (PVR) and the Medium Combustion Plant (MCP) Directive. The EMAS Regulation establishes the voluntary participation by organisations in the Community's eco-management and audit scheme. It promotes best environmental management practice (BEMP), via the development of Sectoral Reference Documents (SRDs) which are to be taken into account by EMAS registered organisations when assessing their environmental performance.

The Directive 1994/63/EC on petrol storage & distribution aims to reduce emissions from volatile organic compounds due to the evaporation of petrol at all stages of the fuel storage and distribution chain. In its annexes, this directive includes technical requirements that are synonymous with the use of BAT; although now somewhat outdated in the 23 years that have passed since they were recorded.

The Directive 2015/2193/EU on medium combustion plants (MCP) lays down rules to control air emissions of sulphur dioxide (SO₂), nitrogen oxides (NO_x) and dust from medium combustion plants, as well as rules to monitor carbon monoxide (CO) emissions from these plants. The Directive aims to reduce the potential harm to human health and the environment from plants with a rated thermal input equal to or greater than 1 MWth and less than 50 MWth. Article 6 (10) of the directive requires the Commission to organise an exchange of information with Member States and stakeholders on the emission levels achievable with best available and emerging technologies and the related costs.

All these policies represent a technology-based approach to prevention and control of industrial emission, whether or not combined with an environmental quality-based approach.

3.2 General policies to prevent & control industrial emissions

3.2.1 Industrial Emissions Directive (IED)

3.2.1.1 Description

To prevent and control industrial emissions, the EU has developed a general framework based on integrated permitting. This means that the permits must take account of a plant's complete environmental performance to avoid pollution being shifted from one environmental medium to another. Priority should be given to pollution prevention by intervening at source.

The Industrial Emissions Directive (IED) is a recast of seven earlier pieces of legislation on industrial emissions. It lays down rules to prevent and control pollution into the air, water and land (soil) and to avoid generating waste from large industrial installations as well as to use resources efficiently.

Some key elements of the IED:

- All installations covered by the IED must prevent and control industrial emission by applying the *best available techniques* (BATs), and also take measures to ensure efficient energy use and other resources including water, waste prevention and management and the prevention of accidents and the limiting of their consequences.
- The installations may only operate if they are in possession of an (*integrated*) *permit*. The installations must comply with the permit conditions set by the competent authority.
- The BAT conclusions adopted by the Commission are the reference for setting these permit conditions. Emission limit values must be set at a level that ensures pollutant emissions do not exceed the levels associated with the BATs. Under strict and justified conditions, the IED allows competent authorities some *flexibility* to set less strict emission limit values.
- The competent authorities must perform regular environmental inspections of the installations.
- The public has the right to participate in the permitting process.

For certain activities (e.g. large combustion plants, waste incineration and co-incineration plants, solvent using activities and titanium dioxide production), the IED also sets EU wide emission limit values for selected pollutants.

In order to define BAT and the BAT-associated environmental performance levels at EU level, the European Commission organises an exchange of information with experts from Member States, industry and environmental NGOs and services of the Commission. Collectively these create a so-called Technical Working Group (TWG). This work is coordinated by the Commission Joint Research Centre's (JRC) European IPPC Bureau located in Seville (Spain). The European IPPC Bureau is part of the Circular Economy and Industrial Leadership Unit of the JRC's Directorate B - Growth and Innovation. Growth and Innovation is one of the six scientific directorates of the European Commission's Joint Research Centre (JRC). This process results in BAT reference documents (BREFs). The BAT conclusions contained in BREFs are adopted by the Commission as Implementing Decisions and have a value of EU law.

3.2.1.2 Type of policy / Driving force for implementation

The IED represents a *command and control* instrument by requiring emission limit values based on BAT to be set in national permits for so-called IPPC-installations.

Different approaches to controlling emissions into air, water or soil separately may encourage the shifting of pollution from one environmental medium to another rather than protecting the environment as a whole. Therefore the IED provides for an integrated approach to the prevention and control of emissions into air, water and soil, to waste management, to energy and resource efficiency and to accident prevention. This approach will also contribute to the achievement of a level playing field in the European Union by aligning environmental performance requirements for industrial installations.

3.2.1.3 Pollutants to which the policy applies

3.2.1.3.1 For emissions to air

- ☒ Persistent Organic Pollutants (POPs)
 - Substances and mixtures which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction via the air
 - Polychlorinated dibenzodioxins and polychlorinated dibenzofurans
- ☒ Heavy metals
 - Metals and their compounds
 - Arsenic and its compounds
- ☒ Inorganic substances
 - Sulphur dioxide and other sulphur compounds
 - Oxides of nitrogen and other nitrogen compounds
 - Carbon monoxide
 - Cyanides
- ☒ Chlorinated and brominated organic substances
 - Chlorine and its compounds
- ☒ Ozone depleting substances
 - Chlorine and its compounds
 - Fluorine and its compounds
- ☒ Other organic substances
- ☒ Other pollutants
 - Volatile organic compounds
 - Dust including fine particulate matter
 - Asbestos (suspended particulates, fibers)

3.2.1.3.2 For emissions to water

- ☒ Persistent Organic Pollutants (POPs)
 - Substances and mixtures which have been proved to possess carcinogenic or mutagenic properties or properties which may affect reproduction in or via the aquatic environment
 - Persistent hydrocarbons and persistent and bioaccumulable organic toxic substances
- ☒ Heavy metals
 - Metals and their compounds
 - Arsenic and its compounds
 - Organotin compounds

- Inorganic substances
 - Cyanides
- Chlorinated and brominated organic substances
 - Organohalogen compounds and substances which may form such compounds in the aquatic environment
- Polycyclic aromatic hydrocarbons (PAHs)
 - Substances listed in Annex X to Directive 2000/60/EC
- Active substances of plant protection products or biocidal products
 - Biocides and plant protection products
 - Substances listed in Annex X to Directive 2000/60/EC
- Other pollutants
 - Materials in suspension
 - Substances which contribute to eutrophication (in particular, nitrates and phosphates)
 - Substances which have an unfavourable influence on the oxygen balance (and can be measured using parameters such as BOD, COD, etc.)
 - Organophosphorus compounds

For air and water pollutants, substances are listed in Annex II of the IED. For soil, substances are not explicitly defined in the Directive but Articles 22 and 3(18) link to definitions under separate legislation on the classification, labelling and packaging of substances and mixtures.

Some boxes are not checked as the pollutants are not explicitly mentioned in Annex II of the IED. However they may fall under the application of the IED, because of their characteristics (e.g. carcinogenic) or components (e.g. chlorine), or if they are emitted in significant quantities, having regard to their nature and potential to transfer between environmental media.

According to the BREF guidance, TWG members identify key environmental issues for deriving (or updating) BAT conclusions, i.e. for each sector. Key environmental issues are defined as “issues for which BAT conclusions have the highest likelihood of resulting in noteworthy additional environmental benefits.”

3.2.1.4 Sector / activities to which the policy applies

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

The IED aims to prevent and control pollution from various industrial sources, with a major pollution potential. More than 50,000 EU installations are covered by the IED.

Industrial installations operating one or more activities listed in Annex I of the IED and, where applicable, reaching the capacity thresholds set out in that Annex are required to obtain an integrated permit from their competent authority. The permit conditions should be set on the basis of best available techniques.

3.2.1.5 Timing for implementation

The IED was adopted on 24 November 2010 and entered into force on 6 January 2011.

To ensure effective implementation, the Directive had to be transposed into national law by Member States by 7 January 2013.

The Directive is based on a Commission proposal recasting 7 previously existing directives, including the Integrated Pollution Prevention and Control (IPPC) Directive, the Large Combustion Plants (LCP) Directive, the Waste Incineration (WI) Directive, the Solvents Emissions Directive and 3 Directives on Titanium Dioxide., following an extensive review of the policy.

The original IPPC Directive entered into force on 30 October 1996.

Within 4 years of the publication of the BAT Conclusions, Member States competent authorities have to reconsider and update existing permit conditions and use those BAT conclusions as the reference for setting permit conditions. Within that 4-year window, installations also have to comply with those permit conditions.

In order to facilitate the granting of permits, Member States have the option to set requirements for certain categories of installations in general binding rules. General binding rules shall also be based on BAT, without prescribing the use of any specific technique. However, the general binding rules have to be updated to take into account developments in BAT.

3.2.1.6 Technology-based approach

The IED represents a technology-based approach to the prevention and control of industrial emissions.

“Best available techniques” (BAT) play a key role in the IED. It should be emphasized that ‘techniques’ includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned. The BAT conclusions, including BAT and BAT associated performance levels, adopted by the European Commission, are the reference for setting permit conditions. However the IED creates a very important relationship between permit conditions based on the best available technique (technology-based), emission limit values, and environmental quality standards. Article 18 on “Environmental quality standards” states: “Where an environmental quality standard requires stricter conditions than those achievable by the use of the best available techniques, additional measures shall be included in the permit, without prejudice to other measures which may be taken to comply with environmental quality standards.” The IED thus imposes a compulsory use.

Environmental quality standards are set in a number of EC Directives. These include for air the Directive 2008/50/EC³ and for (surface) water the Directive 2008/105/EC, and the amending Directive 2013/39/EU⁴.

3.2.1.7 Definition of BAT & criteria that underlie

Article 3 “Definitions” defines best available techniques (BAT) as "the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:

- (a) ‘techniques’ includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;
- (b) ‘available techniques’ means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;
- (c) ‘best’ means most effective in achieving a high general level of protection of the environment as a whole.”

For the determination of BAT, special consideration must be given to the criteria listed in Annex III of the IED e.g.,:

- The use of low-waste technology,
- The use of less hazardous substances,
- The furthering of recovery and recycling of substances generated and used in the process and of waste, where appropriate,
- Comparable processes, facilities or methods of operation which have been tried with success on an industrial scale,
- Technological advances and changes in scientific knowledge and understanding,
- The nature, effects and volume of the emissions concerned,
- The commissioning dates for new or existing installations,
- The length of time needed to introduce the best available technique,
- The consumption and nature of raw materials (including water) used in the process and energy efficiency,

³ <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=cellar:c9520199-e5aa-4a5b-a410-10d0474433e0>

⁴ <http://eur-lex.europa.eu/legal-content/NL/TXT/?uri=URISERV%3A128180>

- The need to prevent or reduce to a minimum the overall impact of the emissions on the environment and the risks to it,
- The need to prevent accidents and to minimize the consequences for the environment,
- Information published by public international organisations.

3.2.1.8 *Responsible bodies*

The IED was proposed by the European Commission, and adopted through a process involving the European Parliament, which represents EU citizens and is directly elected by them, and the Council of the European Union, which represents the individual Member States.

In order to define BAT and the BAT-associated environmental performance at EU level, the Commission organizes an exchange of information with experts from Member States, industry and environmental organisations.

3.2.1.9 *Additional information*

The European Commission adopted a guidance document for the exchange of information under IED (Commission Implementing Decision 2012/119/EU). This guidance lays down rules on the collection of data and on the drawing up of BAT reference documents and on their quality assurance. This guidance can be found in the Official Journal of the European Union⁵.

3.2.2 *EMAS Regulation (EMAS III)*

3.2.2.1 *Description*

The EMAS Regulation establishes the voluntary participation by organisations in EMAS, the Community's eco-management and audit scheme. The objective of EMAS is to promote continuous improvements in the environmental performance of organisations by the establishment and implementation of environmental management systems by organisations, the systematic, objective and periodic evaluation of the performance of such systems, the provision of information on environmental performance, an open dialogue with the public and other interested parties and the active involvement of employees in organisations and appropriate training.

To receive EMAS registration, an organisation must:

- Carry out an environmental review of all environmental aspects of the organisation, and identify those which are significant,
- In the light of the results of the environmental review, develop and implement an environmental management system taking into account the best environmental management practice for the relevant sector,
- Carry out an internal audit,
- Prepare an environmental statement (reporting).

⁵ <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012D0119&from=EN>

The environmental review, management system, audit procedure and statement must be approved by an accredited environmental verifier. The validated statement is registered and made publicly available. An organisation successfully completing all stages may use the EMAS logo to demonstrate its commitment to improving its environmental performance.

The EMAS Regulation promotes adoption of best environmental management practice (BEMP). For this purpose, Sectoral Reference Documents (SRDs) are elaborated. These SRDs contain detailed technical information describing best environmental management practice to improve environmental performance, as well as sector-specific environmental performance indicators and benchmarks of excellence or rating systems identifying environmental performance levels. An EMAS registered organisation must take into account the relevant SRDs when assessing its own environmental performance.

3.2.2.2 Type of policy / Driving force for implementation

The EMAS Regulation introduces EMAS, a *voluntary* instrument for organisations to evaluate, report and improve their environmental performance. EMAS is a management, planning and reporting tool.

3.2.2.3 Pollutants to which the policy applies

According to the EMAS Regulation an organisation's reporting on environmental performance should be on the basis of generic and sector-specific performance indicators, focusing on key environmental areas at production level, and allowing comparison with appropriate benchmarks. This is to ensure that the organisation can compare its environmental performance both over different reporting periods and with sectorial, national or regional benchmarks.

Environmental aspects that should be considered include, amongst others,

- Emissions to air,
- Releases to water,
- Production, recycling, reuse, transportation and disposal of solid and other wastes, particularly hazardous wastes,
- Use and contamination of land,
- Use of natural resources and raw materials (including energy),
- Use of additives and auxiliaries as well as semi-manufactured goods,
- Local issues (noise, vibration, odour, dust, visual appearance, etc.),
- Transport issues (both for goods and services),
- Risks of environmental accidents and impacts arising, or likely to arise, as consequences of incidents, accidents and potential emergency situations,
- Effects on biodiversity.

Generic indicators, e.g., indicators that apply to all types of organisations, are Energy efficiency, Material efficiency, Water, Waste, Land use with regards to biodiversity and Emissions.

Emissions concerns emissions of greenhouse gases (including CO₂, CH₄, N₂O, HFCs, PFCs and SF₆), SO₂, NO_x and PM to air. Water concerns water consumption. Only if an organisation concludes that the indicator is not relevant in its specific case, and an appropriate justification is provided, reporting is not required.

3.2.2.4 Sector / activities to which the policy applies

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

EMAS has been available for participation by organisations since 1995, and was originally restricted to organisations in industrial sectors. Since 2001, EMAS has been open to all organisations regardless of size, type or sector.

SRDs have been developed or are currently in development for:

- Retail trade (officially adopted by the EC)
- Tourism (officially adopted by the EC)
- Construction (SRD finalised – in adoption process)
- Agriculture - Crop and animal production (SRD finalised – in adoption process)
- Food and beverage manufacturing (SRD finalised – in adoption process)
- Public administration (SRD finalised – in adoption process)
- Car manufacturing
- Electrical and electronic equipment manufacturing (SRD drafting ongoing)
- Fabricated metal products manufacturing (Technical work ongoing)
- Telecommunication and ICT Services (Technical work ongoing)
- Waste management (Technical work ongoing)

3.2.2.5 Timing for implementation

The Regulation (EC) No 1221/2009, so-called EMAS III, that introduced the reference to SRD's, was published in 2009 and entered into force on 11 January 2010. However, the EMAS Regulation was first

introduced in 1993 (Regulation (EC) No 1836/93 or so-called EMAS I) and revised in 2001 (Regulation (EC) No 761/2001 or so-called EMAS II).

In 2011 the European Commission published a European Commission Communication that established an indicative list of priority sectors for which Sectoral Reference Documents would be elaborated.

3.2.2.6 *Technology-based approach*

The EMAS regulation is considered a *technology-based* policy to manage and control industrial emissions. “Best environmental management practices” (BEMPs) are referenced in the EMAS Regulation at every critical step of EMAS implementation. An EMAS registered organisation must take into account the relevant SRD, and BEMP, when developing its environmental management system, when assessing its own environmental performance (article 4) and when reporting on these (Annex IV). The same applies to the environmental verifiers during verification and validation of the environmental management system (article 18).

The European Commission's Joint Research Centre (JRC) identifies, evaluates and documents these BEMP for different sectors in close co-operation with the stakeholders concerned. To do so, the JRC follows the so-called frontrunner approach. Frontrunners are those organisations implementing, at full scale, innovative solutions that allow best environmental performance to be achieved and which do so ahead of their peers. The JRC studies those techniques, measures or actions that are implemented by the frontrunner organisations within each sector addressed to identify those practices that are most advanced in terms of environmental performance. The results are Sectoral Reference Documents (SRDs) on best environmental management practice. The essence of the SRDs is thus learning from frontrunners.

3.2.2.7 *Definition of BAT & criteria that underlie*

Best environmental management practice (BEMP) are those techniques, measures and actions that result in best environmental performance with proven technical feasibility and economic viability. BEMPs can be of a technical or technological nature as well as soft actions and management choices.

BEMPs are identified both within the physical site boundaries of the organisations of the sector concerned and across the whole value chain of their products and services, and thus considering environmental impacts over the whole life cycle.

The concept of BEMP is linked to two key criteria:

- The best practice is already fully implemented by a number of organisations in the sector or at least by one organisation if replicable/applicable by others; and
- the best practice is technically and economically viable.

3.2.2.8 *Responsible bodies*

The EMAS Regulation was initiated by the European Commission, and adopted by the European Parliament and the Council of the European Union. In order to define best environmental management practices (BEMPs), environmental performance indicators and benchmarks of excellence at EU level, the Commission organizes an exchange of information with experts. Any actor with relevant experience in the sector concerned is invited to contribute.

This work is coordinated by the Circular Economy and Industrial Leadership Unit of the European Commission's Joint Research Centre (JRC). The process results in SRDs; adopted by the Commission as Decisions.

3.2.2.9 Additional information

The development of the SRDs, including the frontrunner approach, is described in detail in the report⁶.

3.3 Policies to prevent & control industrial emissions to air

3.3.1 The Medium Combustion Plant (MCP) Directive

3.3.1.1 Description

The Medium Combustion Plant (MCP) Directive lays down rules to control air emissions of sulphur dioxide (SO₂), nitrogen oxides (NO_x) and dust from medium combustion plants, as well as rules to monitor carbon monoxide (CO) emissions from these plants. The aim is to reduce emissions to air and the potential harm to human health and the environment from these plants. Emission limits values are set out in Annex II.

3.3.1.2 Type of policy / Driving force for implementation

The MCP Directive represents a *command and control* instrument by demanding emission limit values to be set in national permits for so-called MCP-installations.

3.3.1.3 Pollutants to which policy applies

- Inorganic substances
 - Sulphur dioxide
 - Oxides of nitrogen
 - Carbon monoxide
- Other pollutants
 - Dust

3.3.1.4 Sector / activities to which the policy applies

The MCP Directive regulates pollutant emissions from the combustion of fuels in plants with a rated thermal input equal to or greater than 1 megawatt (MWth) and less than 50 MWth. Medium combustion plants are used for a wide variety of applications (electricity generation, domestic/residential heating and cooling, providing heat/steam for industrial processes, etc.).

3.3.1.5 Timing for implementation

The MCP Directive entered into force on 18 December 2015. To ensure effective implementation, the Directive has to be transposed into national law by Member States and this by 19 December 2017.

⁶ <http://susproc.jrc.ec.europa.eu/activities/emas/documents/DevelopmentSRD.pdf>

3.3.1.6 Technology-based approach

Measures allowing a cost-effective emission reduction for MCPs were identified via the impact assessment that was elaborated in the light of EU's former strategy on air pollution.

Different measures to comply with the air quality objectives were compared. The comparison was based on qualitative or quantitative criteria related to the effectiveness, the efficiency and coherence in achieving the specific objectives:

- Effectiveness: Emission reduction,
- Efficiency: Pollutant abatement cost,
- Coherence: EU compliance with international obligations, administrative costs and impacts on SMEs.

Technical possibilities are taken into consideration. Full report⁷ is available.

According to the MPC Directive MCP < 5MW must comply with the emission limit values for SO₂, NO_x and PM that are set out in Annex II of the MCP Directive by 2030. Whereas larger installations, MCP > 5MW, must comply with these emission limit values by 2025.

For installations which are located in areas (zones) that do not comply with EU air quality standards, stricter emission limit values may be applied. (also article 6) The Directive states that Member States should assess the need to apply stricter emission limit values than the requirements set out, as part of the development of air quality plans pursuant to Directive 2008/50/EC of the European Parliament and of the Council. Such assessments should take account of the outcome of an exchange of information on the best emission-reduction performance that can be achieved with *best available and emerging technologies*. The European Commission should organize such exchange of information with Member States, the industries concerned, including operators and technology providers, and non-governmental organisations, including those promoting environmental protection.

The European Commission should assess the need to amend the emission limit values set out in Annex II for new combustion plants, on the basis of *state-of-the-art technologies*. In this context, the European Commission should also consider the need to set specific emission limit values for other pollutants, such as carbon monoxide, and possible minimum energy efficiency standards. (article 12)

3.3.1.7 Definition of BAT & criteria that underlie

Remark: Reference is made to best available and emerging techniques (BAT) and state-of-the-art technologies in assessing the need to apply stricter emission standards to comply with air quality standards, to amend emission standards for new combustion plants and to set emission standards for other pollutants and minimum energy efficiency standards.

3.3.1.8 Requirements linked to the use of BAT

The MCP Directive provides a number of (temporary) derogations and exemptions which Member States can introduce with respect to compliance with the emission limit values, both for new and existing installations.

⁷ http://ec.europa.eu/environment/archives/air/pdf/Impact_assessment_en.pdf

- (temporary) Derogations in cases where there is;
 - Interruption in supply of low-sulphur fuel resulting from a serious shortage
 - Interruption in supply of gas
- Exemptions
 - MCPs used in cases of emergency and operated during limited time periods

3.3.1.9 *Responsible bodies*

The MCP Directive was proposed by the European Commission, and adopted by the European Parliament and the Council of the European Union.

3.3.2 *Directive on Stage I Petrol Vapour Recovery (PVR)*

3.3.2.1 *Description*

The Directive on Stage I PVR aims to control volatile organic compound (VOC) emissions during the storage of petrol at terminals and its subsequent distribution to service stations. The Directive contains requirements for storage installations at terminals to reduce evaporative losses. In addition, when petrol is loaded onto tankers and transported to service stations the Directive ensures vapours are recovered and returned to the tanker or terminal.

3.3.2.2 *Type of policy / Driving force for implementation*

The Directive on Stage I PVR represents a *command-and-control* instrument.

3.3.2.3 *Pollutants to which the policy applies*

- Volatile organic compounds

3.3.2.4 *Sector / activities to which the policy applies*

- Storage of petrol at terminals and distribution to service stations (refineries, combustion plants, etc.)

3.3.2.5 *Timing for implementation*

The Directive on Stage I PVR entered into force on 20 January 1995. To ensure effective implementation, the Directive had to be transposed into national law by Member States and this by 31 December 1995.

3.3.2.6 *Technology-based approach*

The Directive lays down harmonized technical provisions (design and use) for storage installations at terminals, loading and unloading installations at terminals, mobile containers, loading installations at service stations, and is thus considered *technology-based*.

The Member States may however impose more stringent measures than those laid down in the Directive throughout their territory or in geographical areas where it is established that such measures are necessary for the protection of human health or the environment because of special conditions. (Article 3, 4 and 6)

3.3.2.7 Definition of BAT & criteria that underlie

No reference is made to BAT or similar concept, although the recitals acknowledge the importance of "available technologies".

3.3.2.8 Requirements linked to the use of BAT

The Directive provides a number of derogations and exemptions in certain cases (depending on throughput, location, age of installation)

3.3.2.9 Responsible bodies

The Directive on Stage I PVR was initiated by the European Commission, and adopted by the European Parliament and the Council of the European Union.

3.3.2.10 Additional information

The European Commission recently carried out an extensive evaluation of the effectiveness, efficiency, coherence, relevance and the EU added value of the Directive on Stage I PVR⁸:

3.4 Policies to prevent & control industrial emissions to soil

There is no comprehensive, coherent set of rules on prevention and control of soil pollution in Europe. Policies in other areas (agriculture, water, waste, chemicals, and prevention of industrial pollution) do indirectly contribute to the protection of soil. All these policies do however have other primary aims and scope of action.

3.5 Projects & reference documents related to BAT

'BAT information exchange as the heart and driver of the IED' - Workshop organised by DG Environment and the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

In October 2014, a workshop was held in Berlin (Germany) to take stock of 17 years' experience of BAT information exchanges under the IPPC Directive and IED. The aim was to share stakeholder (Member States, NGOs, industry and the European Commission) experiences and explore suggestions to further improve the process and its products, i.e. BREFs and BAT conclusions. A report with conclusions from this workshop is available⁹.

In April 2016, a workshop was held in Copenhagen (Denmark). The participants (Member States, Norway, Turkey, the European Environment Agency and the European Commission,) shared experiences of implementing the IED and the BAT Conclusions and the first lessons learnt, noting both the challenges encountered and the successes achieved. The workshop documents are available¹⁰.

⁸ <http://publications.europa.eu/en/publication-detail/-/publication/2fce37c3-d154-11e5-a4b5-01aa75ed71a1/language-en>

⁹ https://circabc.europa.eu/d/a/workspace/SpacesStore/f3c05ebb-710a-44e9-b30c-4b30fa660f75/Berlin%20report_final.docx.

¹⁰ <https://circabc.europa.eu/w/browse/17812ed5-a85e-4a54-8332-cd9f8ebbc929>

3.6 References

- Dijkmans, R. (2000) Methodology for selection of best available techniques (BAT) at the sector level. *Journal of Cleaner Production* 8, 11-21.
- European Commission (2015). Criteria for identifying key environmental issues for the review of BREFs. IED Article 13 forum, European Commission.
- European Commission (2016). Best Environmental Management Practice. 2016, <http://susproc.jrc.ec.europa.eu/activities/emas/>.
- European Commission (2016). Eco-Management and Audit Scheme. 2016, http://ec.europa.eu/environment/emas/index_en.htm.
- European Commission (2016). Industrial Emissions - Prevention and control of industrial emissions. 2016, <http://ec.europa.eu/environment/industry/stationary/index.htm>.
- European IPPC Bureau (EIPPCB) (2016). European IPPC Bureau (EIPPCB) 2016, <http://eippcb.jrc.ec.europa.eu/index.html>.
- Polders, C., et al. (2012) Methodology for determining emission levels associated with the best available techniques for industrial waste water. *Journal of Cleaner Production* 29-30, 113-121.
- Schoenberger, H., Canfora, P., Dri, M., Galvez-Martos, J.L., Styles, D., Antonopoulos, I.S. (2014). Development of the EMAS Sectoral Reference Documents on Best Environmental Management Practice. Brussels, Belgium, European Commission.

3.7 Case Belgium – Flanders

Protecting the environment is a regional competence in Belgium. The legal basis for the fight against environmental pollution from industrial installations in Flanders is regulated in title I, II and III of VLAREM. VLAREM I, the Order of the Flemish Government of 6 February 1991 concerning Environmental Licenses, and VLAREM II, the Order of the Flemish Government of 1 June 1995 concerning General and Sectoral provisions relating to Environmental Safety, are both implementing orders of Decree of the Flemish Council of 28 June 1985 concerning Environmental Licenses. For IPPC installations the BAT conclusions adopted by the European Commission are imposed via VLAREM III, the Order of the Flemish Government of 16 May 2014 concerning additional general and sectoral environmental conditions for IPPC installations. The Flemish regulation can be consulted via: <https://navigator.emis.vito.be/mijn-navigator>.

In Flanders, BAT are the reference for determining the general, sectoral and specific permit conditions. For IPPC installations, in addition, the BAT conclusions adopted by the European Commission are the reference for setting permit conditions. (VLAREM I, art. 30bis, § 6). VLAREM obliges that the operator, being a normal, careful person, uses the BAT at any time in order to protect man and environment. This is both for the choice of emission control measures, as for the choice of prevention measures. This condition is met upon compliance with the conditions of VLAREM and/or of the environmental permit.

VLAREM also determines that the emission limit values, the parameters and the equivalent technical measures should be based on the BAT, without imposing a certain technique or technology. Technical characteristics, the geographical situation and the local environmental circumstances of the concerned installation should be taken into account (VLAREM I, art. 30bis, § 4). If, in order to reach environmental

quality objectives, more severe conditions are needed than those achievable with BAT, additional conditions may be imposed (VLAREM I, art. 30bis, § 5).

Derogations are possible from the general principle that BAT is the ultimate reference when determining the permit conditions. For example, on the basis of art. 30bis, §10 of VLAREM I, the permitting authorities may grant emission limit values that differ from the ones stated in the BAT conclusions adopted by the European Commission in terms of level, periods, as well as reference situations. The permitting authorities may also grant a temporary exemption from the aforementioned principle for the testing or use of emerging techniques. This is also stated in the IED.

VLAREM I, art. 1 defines BAT as: "the most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole:

- (a) ‘techniques’ includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;
- (b) ‘available techniques’ means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator;
- (c) ‘best’ means most effective in achieving a high general level of protection of the environment as a whole.”

This is the same definition as the one in the IED. In the determination of the BAT, the same criteria as the one mentioned in Annex III of the IED should be taken into account, i.e.:

- the use of low-waste technology,
- the use of less hazardous substances,
- the furthering of recovery and recycling of substances generated and used in the process and of waste, where appropriate,

The Environment, Nature and Energy Department (LNE) of the Flemish Government is in charge of preparing, following up and evaluating the Flemish environmental policy.

Under the auspices of the Flemish Government, the Flemish Knowledge Centre for Best Available Techniques (BAT Centre) was founded in 1995. The BAT Centre provides the permitting authorities and industry with information on environmentally- and energy friendly techniques in industrial processes and selects BAT. The BAT Centre’s BAT advice is used by the authorities when issuing environmental permits for industrial installations and when updating environmental regulation (including VLAREM). It is also at the basis of the Flemish eco-investment support policy. On a European level, the BAT Centre¹¹ participates in the information exchange on BAT under the IED.

The BAT selection on a Flemish level is the result of a technical, environmental and economic assessment of different pollution prevention and control techniques (called “candidate BAT”). This is performed in a

¹¹ <https://emis.vito.be/en/flemish-knowledge-centre-best-available-techniques>.

participatory process, involving both authorities and industry and results in Flemish BAT-studies. <https://emis.vito.be/en/bat-studies> gives an overview of the finished Flemish BAT-studies, those who are currently in preparation or those who are being revised.

The BAT Centre's methodology for the selection of BAT at the sector level was published in the Journal on Cleaner Production in 2000 (Dijkmans 2000). A four-step procedure is followed to decide whether a candidate BAT can be considered as BAT. The candidate BAT are evaluated with respect to their technical viability (step 1), environmental benefit (step 2) and economic viability (step 3). Finally, different candidate BAT are compared and/or grouped (step 4) leading to the proposal of BAT.

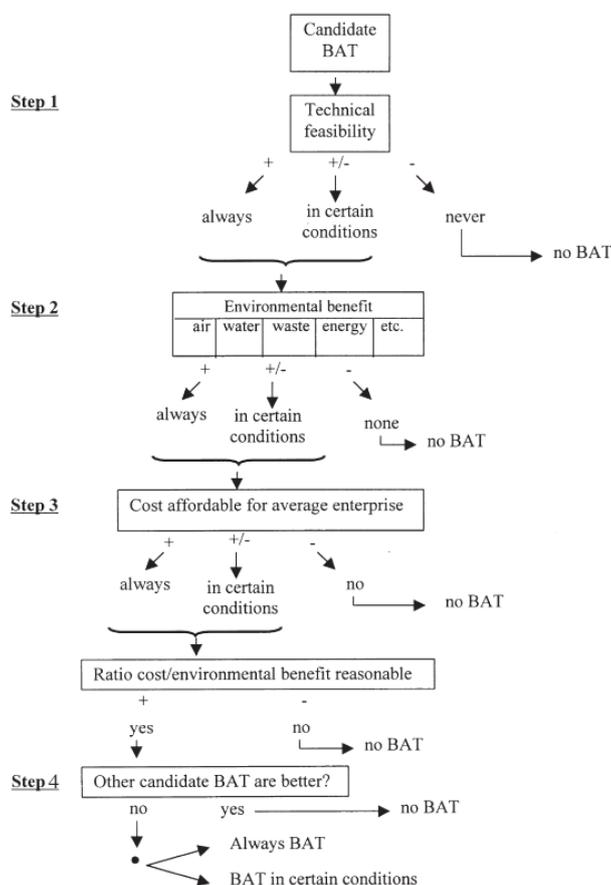


Figure 1: Multistep procedure for the selection of sectoral BAT

Source: (Dijkmans 2000)

BAT Centre has also developed a practicable, objective and transparent methodology for determining BAT-AELs for industrial waste water. The methodology was published in the Journal on Cleaner Production in 2012 (Polders, Van den Abeele et al. 2012). The methodology is based on a detailed analysis of emission data for the industrial sector under consideration and includes five steps: 1) Selection and grouping of industrial installations, 2) Collection of emission data, 3) Selection of parameters (pollutants), 4) Analysis of available emission data in relation to BAT and 5) Determination of (differentiated) BAT-AELs.

4 POLICIES & PRACTICES IN INDIA

4.1 Overview

To prevent and control industrial emissions, industry, government and households must comply with various Acts. These Federal Laws provide the principal framework for environmental permits. The requirements for preventing and controlling emissions (in particular to air and to water) in India are technology-based.

The Environmental Protection Act give the general powers of the central government to take measures to protect and improve the environment, including water, air and land and the inter- relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property. Besides standards for emission or discharge of environmental pollutants from the industries, processes or operations and general standards for discharge of effluents, the Act includes provisions on ambient air quality standards in respect of noise and standards for emission of smoke, vapour etc. from motor vehicles.

Concerning air emissions, the Air Act is a federal law for the prevention, control and abatement of air pollution. It provides the principal framework for the Central and State Governments and the Central and State Boards of India to protect air quality.

The Water Act is a similar policy for water. The objective of this Act is to prevent the pollution of water by industrial, agricultural and household wastewater that can contaminate water sources. Besides this “command and control” regulatory mechanism, there are also economic instruments and incentives for pollution abatement, E.g. the Water Cess Act. This Act aimed to provide for the levy and collection of a cess on water consumed by certain industries and by local authorities.

There is no specific legislation which deals in regulation of land pollution or which gives a definite scope and meaning. Unlike water and air pollution, land pollution is in general being touched upon by the Environment Protection Act, which deals with all aspects of environmental problems.

4.2 Policies to prevent & control industrial emissions to air

4.2.1 *Air (Prevention and Control of Pollution) Act*

4.2.1.1 *Description*

The United Nations Conference on the Human and Environment (Stockholm, June 1972), in which India participated, sparked the first steps towards the preservation of the natural resources of the earth, including air-quality and control of air pollution. In order to meet the decisions taken at this Conference, the Central and State Governments and the Central and State Boards of India implemented the Air Act.

Provisions deal with the prevention, control and abatement of air pollutants (solid, gas or liquid and noise) as by-products of industrial or domestic activities.

Long and short term planning shall be devised in order to set air quality standards, create community awareness on the air pollution, prepare technical training and dossiers to carry out aforesaid measures of pollution prevention and control.

4.2.1.2 Type of policy / Driving force for implementation

Driving force for implementation of Air Act is *command and control*. The Air Act states that different industries and sectors (sources of pollution) should keep certain emissions (nitrogen oxide, sulphur oxide, carbon monoxide, VOCs, particulate matter, toxic substances, etc.) beyond a prescribed level (standards). Therefore, the Government set up Pollution Control Boards (PCBs) which are responsible for the measurement and testing of both the atmosphere and different sources of air pollution. These boards identify polluters exceeding standards and give advice to the Indian Government in order to determine these standards.

4.2.1.3 Pollutants to which policy applies

- Heavy metals
 - Lead
- Inorganic substances
 - Sulphur dioxide
 - Nitrogen dioxide
 - Carbon monoxide
- Polycyclic aromatic hydrocarbons (PAHs)
- Other pollutants)Dust/Particulate matter)

4.2.1.4 Sector / activities to which the policy applies

The Central Pollution Control Board (CPCB) has set a list of Environmental Industry-specific Standards¹²:

- Energy (Thermal power plants and factories)
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

Schedule I of the Act contains 104 sectors / activities for which standards for emission or discharge of Environmental pollutants are set up.

4.2.1.5 Timing for implementation

The Air Act entered into force in 1981.

¹² http://cpcb.nic.in/Industry_Specific_Standards.php

4.2.1.6 *Technology-based approach*

Under the Act, National Ambient Air Quality Standards (NAAQS) are set up by the Central Pollution Control Board. These standards can vary depending on the locations (industrial, residential, rural and other area versus ecologically sensitive area notified by the Central Government). A list of pollutants for which NAAQS are available can be found via http://cpcb.nic.in/National_Ambient_Air_Quality_Standards.php

A similar concept to BAT is the use of so called “Comprehensive Industry Documents” or “COINDS”. These documents, designed for each specific industry in India, discuss a wide range of relevant environmental parameters (e.g. pollution potential). In these COINDS, the Minimal National Standards (MINAS) for a particular industry is determined, based on the “best available techniques not entailing excessive cost” (BATNEEC). These standards, taking into account technological and economic feasibility, are developed by the Central Pollution Control Board (CPCB) in such a manner not to impose any risk to safety, health or welfare to the people (at work) in India.

Depending on the gravity of the pollution and techno-economic assessment of the requisite pollution control measures the MINAS may be attained in one stroke or in phases. The evolution of MINAS thus remaining independent of the characteristics of the recipient environment: The Central and State Boards for Pollution Control have come to an agreement that under no circumstances MINAS would be relaxed as because the same is techno-economically acceptable to the industry.

If warranted by local conditions (e.g. Where the recipient environment demands stricter quality of the effluent of the industry), the State Pollution Control Boards (SPCBs) are required to prescribe standards stricter than MINAS.

According to ED, the Indian Minas documents are quite old (seventies) and as far as known, there is no intention to revise these. The COINDS for specific sectors can be found via http://cpcb.nic.in/Publications_Dtls.php?msgid=3

4.2.1.7 *Definition of BAT & criteria that underlie*

The technology-based National Environmental Standards are defined as follows:

4.2.2 *Minimal National Standards (MINAS)*

MINAS for a particular industry is the effluent standard achievable by the industry by installing pollution control measures which are within the techno-economic capability of the industry.

4.2.2.1 *Requirements linked to the use of BAT*

Installations should be operated in accordance to the legal provisions of the Act to prevent and control air emissions. Depending on the sector/activities, installations should comply with specific technology-based standards.

4.2.2.2 *Responsible bodies*

The Ministry of Environment and Forests (MOEF, 1985) is the central governmental agency for coordination, planning, promotion and enforcement of all environmental activities (policy, standards, regulations, etc.). Under the MOEF, the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) are lumbered with the collection and examination of scientific information/data. These institutions are responsible for the information being used in the “COINDS”.

In order to enlighten the task of the Central Pollution Control Board, different State Pollution Control Boards (SPCBs) were established. They advise the State Governments on pollution related issues, plan a comprehensive state-level pollution control/prevention/abatement program, implement and enforce national standards and grant consents to establish and to operate under the Air Act.

Under the Act State Air Laboratories are instituted, where samples of air shall be tested to investigate polluting agents. Audits shall be conducted on regular basis and financial aid to the State Boards shall be granted to fund their activities.

4.2.2.3 Additional information

4.2.2.3.1 National Air Quality Monitoring Programme (N.A.M.P)

N.A.M.P. is a national programme of (ambient) air quality monitoring. Under N.A.M.P., three air pollutants (sulphur dioxide, nitrogen dioxides and respirable suspended particulate matter) have been identified for regular monitoring at all the locations. It comprises 573 operating stations in 240 cities/towns in 26 states and 5 Union Territories of the country. The main objectives of the NAMP:

- Identifying cities/regions violating the prescribed standards,
- Collecting knowledge and information to develop preventive and corrective measures,
- Understanding the natural cleansing processes in the environment (of pollutants) through dilution, dispersion, wind-based movement, dry deposition, precipitation and chemical transformation
- Determining status and trends regarding air quality.

4.2.2.3.2 Environmental Information System (ENVIS)

ENVIS, under The Ministry of Environment & Forests (MoEF), provides scientific, technical and semi-technical information on different environmental issues. Therefore it helps the Ministry in fields of innovation, modernization of technologies, retrieving information and promoting research.

4.2.2.3.3 Comprehensive Environmental Pollution Index (CEPI)

CEPI is an index that gives a rational number between 0 and 100 to characterize the environmental quality of an industry. It is based on the effect that an industry has on air, water, land, health and ecology. 88 industrial clusters have been selected by the Pollution Control Boards (CPCB), in consultation with the Ministry of Environment & Forests Government (MOEF) of India. A new classification uses colour codes for the environmental impact. Scores (or industries) between 60 and 100 are classified “red”, scores between 30 and 59 are classified “orange”, scores between 21 and 40 are classified “green” and scores under 21 are classified “white”.

4.3 Policies to prevent & control industrial emissions to water

4.3.1 *Water (prevention and control of pollution) Act*

4.3.1.1 Description

The Act aimed to secure the health and safety of people (as well as flora and fauna) in India by preventing the pollution of water by industrial, agricultural and household wastewater that can contaminate water sources. The Act applies in first instance to ten listed States and the Union Territories and to other

States that adopt the Act under article 252 of the Constitution. Next, the Act establishes the Central Board for the Prevention and Control of Water Pollution, describing its legal status, membership, functions and powers. The Act also provides for the setting up of Joint Boards (i.e. Boards based on an interstate-agreement between two or more Governments of contiguous States), with a similar structure and functions. Further, the Act describes procedures for the taking of samples and powers of entry and inspection.

4.3.1.2 *Type of policy / Driving force for implementation*

Driving force for implementation of Water Act of 1974 is mainly *command and control* (similar to “Air Pollution”). The government introduced, besides this “command and control” regulatory mechanism, major incentives for pollution abatement: The Water (Prevention and Control of Pollution) Cess Act, 1977, an *economic instrument*. This is an Act to provide for the levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution constituted under the Water (Prevention and Control of Pollution) Act, 1974. The Act was last amended in 2003.

4.3.1.3 *Pollutants to which the policy applies*

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances
- Chlorinated and brominated organic substances
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Other pollutants

Drinking Water Standards are set up for organoleptic and physical parameters (e.g. Color, odour, pH, taste), undesirable substances in excessive amounts (e.g. Heavy metals, salts, mineral oil), toxic substances (e.g. As, Cd, Pb, trihalomethane), radioactive substances, pesticide residues and bacteriological parameters.

Limits and test methods for the Drinking Water Standards can be found via Indian Central Government 2012¹³.

4.3.1.4 *Sector / activities to which the policy applies*

Similar to “Policies to prevent & control industrial emissions to air” for specific industries.

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector

¹³ <http://cgwb.gov.in/Documents/WQ-standards.pdf>

☒ Other activities

4.3.1.5 *Timing for implementation*

The Water Act entered into force in 1974. The Act was amended in 1988.

4.3.1.6 *Technology-based approach*

Similar to “Policies to prevent & control industrial emissions to air” for specific industries. To make sure that water quality is being maintained or restored at preferable level, it is important that the boards regularly monitor the water quality. These measurements are being used in the “COINDS”, in order to determine the Minimum National Standards (MINAS) for effluents in different industries.

4.3.1.7 *Definition of BAT & criteria that underlie*

Similar to “Policies to prevent & control industrial emissions to air” for specific industries. Minimal National Standards (MINAS): effluent standards achievable by the industry by installing pollution control measures which are within the techno-economic capability of the industry.

4.3.1.8 *Requirements linked to the use of BAT*

Similar to “Policies to prevent & control industrial emissions to air” for specific industries. Installations should be operated in accordance to the legal provisions of the Act to prevent and control water emissions. Depending on the sector/activities, installations should comply with specific technology-based standards.

4.3.1.9 *Responsible bodies*

The States are to establish State Boards for the Prevention and Control of Water Pollution, with a constitution set forth in the Act. The main function of the Central and State Boards is to promote cleanliness of streams and wells in different areas of the State, plan and implement comprehensive policies, collect, analyse and disseminate data, lay down effluent and sewage standards and effluent and sewage treatment standards.

The State Boards may restrict the application of the Act, by declaring water pollution prevention and control area or areas, and thereupon the provisions of this Act shall apply only to such area or areas (sect. 19). New outlets for discharges of sewage and/or effluent and new discharges of waste water need consent from the State Board.

4.3.1.10 *Additional information*

4.3.1.10.1 *Monitoring*

The Central Pollution Control Board (CPCB) is monitoring water quality of national aquatic resources in collaboration with concerned State Pollution Control Boards at different locations, operated under a three-tier programme:

- National Water Quality Monitoring Programme (NWQMP) (i.e. Global Environment Monitoring System (GEMS))

The GEMS programme (1978) is a primary source for global water quality data. As a water science centre, it focuses on a growing knowledge on water quality issues worldwide and is the only global water

quality monitoring system. The main goal is therefore improving the water quality monitoring and assessment capacity (in countries worldwide) and determining state and trend of regional and global water quality.

- Monitoring of Indian National Aquatic Resources System (MINARS)

On account of various discharge of wastewater in river, the quality is likely to be adversely affected. It is therefore, necessary to monitor the quality of the various river waters. This is a continuous project of previous years as approved by the CPCB. The water quality from 70 sampling station located on various rivers in the State is monitored under MINARS.

- Yamuna Action Plan (YAP)

Based on the findings of a study to assess the status of pollution of Yamuna River (1977-1978), the Indian Government decided to take up water quality restoration measures named as Yamuna Action Plan (YAP).

4.3.1.10.2 Reports

The water quality data are reported in Water Quality Status Year Book¹⁴. A report concerning the status of the water quality in India (2009) is also available¹⁵.

4.4 Policies to prevent & control industrial emissions to soil

There is no specific legislation which deals in regulation of land pollution or which gives a definite scope and meaning. Unlike water pollution, air pollution, deforestation etc. having a specific statute to govern, land pollution is in general being touched upon by the Environmental Protection Act. The EPA comprehensively deals with all aspects of environmental problems.

The Environmental Protection Act give the general powers of the central government to take measures to protect and improve the environment, including water, air and land and the inter- relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property. Besides standards for emission or discharge of environmental pollutants from the industries, processes or operations and general standards for discharge of effluents, the Act includes provisions on ambient air quality standards in respect of noise and standards for emission of smoke, vapour etc. from motor vehicles.

No information is available concerning environmental quality-based policies and practices or flexibility concerning the policies and practices under this Act.

4.5 References

- Anonymous ECOLEX, IUCN, UNEP, FAO.
- CPCB. Industry Specific Standards. http://cpcb.nic.in/Industry_Specific_Standards.php.

¹⁴ <http://www.google.be/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiCqbbJ4t7OAhVpKsAKHWxTAcEQFggeMAA&url=http%3A%2F%2Fcpcb.nic.in%2FHighlights%2F2007%2F1-14.pdf&usg=AFQjCNEyGKHRknIzI7BaDYDBZhX1-6PDOA>

¹⁵ http://cpcb.nic.in/upload/NewItems/NewItem_129_NWMP-2007.pdf

- Indian Central Government (1974). The Water (Prevention and Control of Pollution) Act.
- Indian Central Government (1981). The Air (Prevention and Control of Pollution) Act.
- Indian Central Government (1986). The Environment (Protection) Act.
- indian Central Government (2012). Indian Standard - Drinking Water - specifications (IS 10500:2012).

5 POLICIES & PRACTICES IN PEOPLE'S REPUBLIC OF CHINA

5.1 Overview

The environmental legal framework of China consists of national fundamental laws (i.e. Constitutional law, Criminal law, Civil law and Administration law), the basic environmental laws (i.e. the Environmental Protection Law) and individual, fundamental environmental laws. These laws are implemented through administrative regulations, rules and policies.

The environmental laws can be divided into 3 groups:

- Pollution prevention laws:

These laws focus on pollution prevention and control of a certain kind of pollution source, but they can also be related to resource protection (conservation) and management. The laws concerned are the Air Pollution Prevention and Control Law (PPCL), the Water PPCL, the Solid Waste PPCL, the Noise PPCL and Radioactivity PPCL.

There is no basic law on soil pollution prevention and control in China.

- Conservation laws:

These laws focus on conservation and management of natural resources. The laws concerned are, amongst others, the Grassland Law, the Forestry Law and the Water Law.

- Management laws

These laws are made to support environmental management and to promote sustainable development. The laws concerned are, amongst others, the Environmental Impact Assessment Law, the Cleaner Production Promotion Law and the Recycling Economy Promotion Law.

The Environmental Protection Law introduces two types of national standards: environmental quality (ambient) standards and discharge/emission standards. Quality standards are maximum are defined as allowable concentrations of pollutants in water, air or soil. Emission or discharge standards are defined as maximum allowable concentrations of pollutants in industrial emissions or discharges.

The Air PPCL and Water PPCL foresee emissions and discharge standards. National standards are defined taking into account national quality standards and national economic and technological conditions. Both Laws encourage and support the implementation of advanced, clean technologies and elimination of backward techniques and equipment.

5.2 General policies to prevent & control industrial emissions

5.2.1 *Environmental Protection Law of the People's Republic of China*

5.2.1.1 *Description*

The objectives of this Law are to protect and improve the environment, to prevent and control pollution, to safeguard human health, and to promote modern development. The Law provides for: (i) the integration of environmental protection into development planning; (ii) the promotion of environmental education; (iii) the obligation of the individuals and units to protect the environment; (iv) the responsibilities of Government bodies, at central, provincial, regional and municipal levels, in respect of supervision and administration of environmental protection activities.

For the purposes of supervision and administration, the competent authorities have power to: (i) formulate standards for environmental quality and the release of pollutants; (ii) establish a system of supervision and monitoring; (iii) evaluate the state of the environment and design environmental protection plans; (iv) undertake, where necessary, environmental impact assessments; (v) inspect polluting units.

Appropriate measures must be taken by the competent authorities in order to; (i) safeguard natural ecosystems and habitats, rare and endangered wild animals and plants, and important conservation areas; (ii) prevent soil erosion, land degradation, agricultural pollution, and fresh and marine waters pollution.

Polluting units must likewise adopt effective measures to prevent and control wastes, residues, radioactive materials, as well as noise, vibrations and electro-magnetic radiation.

New industrial units must use low-waste technologies.

The Law provides a sound legal base for guiding construction of the legal framework for pollution prevention and control by stipulating general environmental quality and pollutant emission standards.

5.2.1.2 *Type of policy / Driving force for implementation*

Driving force for implementation is *command and control*.

5.2.1.3 *Pollutants to which the policy applies*

See Atmospheric Pollution Prevention and Control Law and Water PPCL.

5.2.1.4 *Sectors / activities to which the policy applies*

See Atmospheric Pollution Prevention and Control Law and Water PPCL.

5.2.1.5 *Timing for implementation*

This Law entered into force on 1 January 2015 (consolidated version).

5.2.1.6 *Technology-based approach*

China does not have an integrated permitting regime. It implements a separate pollutant discharge permitting regime (PDP) for different types of emissions including emissions to air and water. Different national laws have provided for this separate PDP regime.

Facilities that emit or discharge pollutants are subject to the PDP regime. The operator must declare and register any emission of pollutants with the local EPB (Environmental Protection Bureau) shortly after acceptance and start of operations. The registration form includes information on the quantity and the frequency of emissions and their concentration. The competent EPB issues a permit containing emission/discharge limits of pollutants with reference to both volume and concentration.

In view of environmental permitting, the Environmental Protection Law introduces two types of national standards: environmental quality (ambient) standards and discharge/emission standards.

Quality standards are maximum are defined as allowable concentrations of pollutants in water, air or soil. Emission or discharge standards are defined as maximum allowable concentrations of pollutants in industrial emissions or discharges.

5.2.1.7 Definition of BAT & criteria that underlie

See Atmospheric Pollution Prevention and Control Law and Water PPCL.

5.2.1.8 Responsible bodies

The Ministry of Environmental Protection (MEP) plays the most significant role in environmental governance and implementation. MEP is an integral part of the State Council, the authority to enact all basic laws, including environmental laws.

At the local level, provinces, autonomous regions and municipalities have local legislative powers, by which they allocate mandatory environment targets into the city and county level and for industrial sectors and major businesses.

5.2.1.9 Additional information

According to (Liu 2012) “in 2006 China’s Ministry of Environmental Protection (MEP) established a best available techniques (BAT) determination system, in which BATs are defined as technologies and organisational measures expected to minimize overall environmental pressures at acceptable private costs. The purpose of this system was to offer technical support for project design, construction, quality evaluation and test approval in various industrial sectors. The thermal power, iron and steel industries, as well as several others also characterized by high levels of energy consumption and pollutant emissions, were selected as pilot applications for the BAT determination.”

According to (Wang 2013) “trial work of compiling a batch of best available techniques guidelines were initiated in China in the Eleventh Five-year Plan Period, in order to improve the management level of the environmental technology. The current development of BATs in China showed that the investigation work was large, the technical information collected was not comprehensive, it lacked innovative technologies promotion mechanism, the BATs screened out could not effectively guide the direction of the technology development.”

5.3 Policies to prevent & control industrial emissions to air

5.3.1 *Atmospheric Pollution Prevention and Control Law of the People's Republic of China*

5.3.1.1 *Description*

This Law provides for the prevention and control of air pollution and for the protection and improvement of the living and ecological environment. The Law consists of 129 articles divided into 8 Chapters:

- General Provisions (I);
- Atmospheric Pollution Prevention and Control Standards and Plans for Reaching Standards within the Prescribed Time (II);
- Supervision and Administration of Atmospheric Pollution Prevention and Control (III);
- Atmospheric Pollution Prevention and Control Measures(IV);
- Joint Prevention and Control of Atmospheric Pollution in Key Areas (V);
- Response to Heavy Air Pollution Weather (VI);
- Legal liabilities (VII);
- Supplementary provisions (VIII).

The Law highlights the improvement of atmospheric environmental quality. It provides for strengthening the government responsibilities on atmospheric environmental quality improvement. Local governments at various levels shall be responsible for the quality of the atmospheric environment under their own jurisdictions (art.3). The competent department of environmental protection under the State Council shall assess the progress made by provinces, autonomous regions and municipalities in realizing the targets of improving the atmospheric environment quality and in undertaking key tasks of preventing and controlling atmospheric pollution (art.4). With regard to the municipalities not meeting the national standards of the quality of atmospheric environment, the municipal people's government should formulate plans and take measures to meet the standards within the time limit prescribed by the State Council or the people's government at the provincial level (art.14). Chapter II regulates the atmospheric environmental quality standards, and standards for pollutant discharge, as well as the use and implementation of standards. Chapter IV makes provisions on prevention and control measures for atmospheric pollution caused by coal, industries, motor vehicles and ships, dust and agriculture, etc. In addition, the Law provides for regional joint prevention and control on atmospheric pollutants and greenhouse gases, establishment of the heavily polluted weather monitoring and warning system, information disclosure and public participation, supervision and administration, offences and penalties.

This Law was previously adopted in 2000, and revised in 2015.

5.3.1.2 *Driving force for implementation*

Driving force for implementation is command and control.

5.3.1.3 Pollutants to which the policy applies

- Persistent Organic Pollutants (POPs)
- Heavy metals (Lead)
- Inorganic substances (Sulphur dioxide, Nitrogen dioxide, Carbon monoxide)
- Chlorinated and brominated organic substances
- Ozone depleting substances
- Greenhouse gases (GHGs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants (Dust/Particulate matter)

A full list of pollutants is available¹⁶.

5.3.1.4 Sectors / activities to which policy applies & type of installations to which policy applies

- Energy (Power plants and factories)
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities (Motor vehicles, Industrial facilities (in general))

A full list of sectors/activities is available¹⁷.

5.3.1.5 Timing for implementation

This Law entered into force on 1 January 2016 (consolidated version).

5.3.1.6 Technology-based approach

Quality standards are defined by the State Council (MEP). In absence of national quality standards the provinces, autonomous regions or municipalities may define local quality standards. In defining quality standards different aspects, i.e. public health, ecological environment and economic and social development are taken into account.

According to Article 8 the competent department of environmental protection under the State Council or people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall establish standards of the quality of atmospheric environment. Such standards, being

¹⁶ http://english.mep.gov.cn/Resources/standards/Air_Environment/

¹⁷ http://english.mep.gov.cn/Resources/standards/Air_Environment/

scientific and rational, shall aim at protecting public health and ecological environment and match economic and social development.

Governments of provinces, autonomous regions, and centrally directly controlled municipalities can set local ambient air quality standards on items not covered in the national ambient air quality standards.

Emission standards are also defined by the State Council, or provinces, autonomous regions and municipalities, taking into account the quality standards, and national economic and technological conditions.

Article 9 states that the competent department of environmental protection under the State Council or people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall establish standards of the discharge of atmospheric pollutants in accordance with the standards of atmospheric quality and the country's economic and technological conditions.

According to Article 10 standards of atmospheric environment quality and for the discharge of atmospheric pollutants shall be proved and reviewed by experts. Relevant departments, industry associations, enterprises, public institutions and the general public should be consulted in establishing such standards. Emission standards for air can be divided into two categories.

- The first category covers emissions from a particular industry or of a particular pollutant.
- The second category covers general standards. These are specified in the Integrated Emission Standard of Air Pollutants, which includes those industries and pollutants that are not covered by a specific emission standard. The former are mainly prescribed for five types of stationary sources: boilers, thermal power plants, industrial kilns and furnaces, coke ovens, and cement plants; and two types of mobile sources: motor vehicles and motorcycles; and eight types of facilities that discharge malodorous substances. The number of categories has expanded over time.

China's new national air pollution standards for thermal power plants went into effect January 1, 2012. These are comparable to standards in the developed world in important respects.

China sets national and local objectives (i.e. quality standards, but also emission reduction %). It also establishes mass-based objectives for specific pollutant reductions, e.g. quantity of coal saved, quantity of steel production eliminated, etc. These objectives are binding, and in addition to emission standard that may be in place.

Other interesting articles from the Law mention the elimination of backward production techniques, equipment and products and the use of clean (production) techniques.

- Article 27 The State shall eliminate backward production techniques, equipment and products that seriously pollute the atmospheric environment. The competent department for comprehensive economic affairs under the State Council shall, in conjunction with relevant departments under the State Council, shall prescribe the time limit to eliminate the techniques, equipment and products that seriously pollute the atmospheric environment and incorporate these categories of techniques, equipment and products in the catalogue for comprehensive industrial policy of the State. Producers, importers, sellers or users shall stop the production, importation, sale or use of the equipment and products listed in the catalogue specified in the preceding paragraph. Users of production techniques listed in the catalogue specified in the

preceding paragraph shall stop using such techniques within a time limit. The eliminated equipment and products shall not be transferred to another for use.

- Article 32 Relevant departments under the State Council and local governments at various levels shall adopt measures to improve energy structure and popularize the production and utilization of clean energy; optimize the utilization of coal to be cleaner and more effective; and reduce the proportion of coal in primary energy consumption and the discharge of atmospheric pollutants during the production, utilization and transformation of coal.
- Article 41 Coal-fired power plants and other coal-using units shall adopt clean production techniques. They must install supporting facilities of dust removal, desulphurization and denitration or take other measures such as technology upgrade to control the discharge of atmospheric pollution. The State encourages coal-using units to adopt advanced technologies and equipment for the coordinated control of atmospheric pollutants including dust removal, desulphurization, denitration and demercuration.
- Article 42 In electricity dispatch, power plants using clean energy should be prioritized.
- Article 43 Enterprises producing steel, construction materials, non-ferrous metal, petroleum and chemicals etc. that discharge dust, sulphides and nitrogen oxides shall adopt techniques for clean production, install equipment of dust removal, desulphurization and denitration or adopt other measures including technology upgrade to control the discharge of atmospheric pollutants.
- Article 79 Enterprises, public institutions, other producers and business operators and operators of incineration facilities that emit persistent organic pollutants into the atmosphere shall, in accordance with relevant State regulations, adopt technologies and techniques to reduce such emissions and install effective purification devices so as to meet the emission standards.
- Article 101 It violates this Law to produce, import, sell or utilize the equipment and products prohibited in the State catalogue for comprehensive industrial policy; to adopt techniques prohibited in this State catalogue; or to transfer the equipment and products already phased out to another for use.

5.3.1.7 Definition of BAT & criteria that underlie

No reference is made to BAT or similar concept.

The law foresees emission standards. These standards are defined taking into account quality standards and economic and technological conditions. Law also encourages and supports implementation of advanced, clean technologies and elimination of backward techniques and equipment.

5.3.1.8 Responsible bodies

The Ministry of Environmental Protection (MEP) plays the most significant role in environmental governance and implementation. MEP is legally responsible for the permit issuance, but in practice permits for major industrial and urban sources are issued by the local EPBs at the provincial level on behalf of MEP. Other permits are issued by the local EPB at the city-county level.

The China Research Academy for Environmental Science (CRAES) and the Chinese Academy of Environmental Planning (CAEP) are part of MEP. Tsinghua University works with MEP and the two Academies to evaluate technologies and their efficacy. International experts from the USA and EU provide

advice and recommendations on technologies, and best practices, based on their experience in designing and implementing BAT in their home countries.

5.3.1.9 Additional information

In addition, other national environmental laws are closely related to prevention and control of air pollution. According to Feng (2016) “the Cleaner Production Promotion Law takes steps toward reducing and avoiding air pollution by promoting cleaner production and improving energy efficiency. The Environmental Impact Assessment Law aims at preventing (air) pollution through environmental impact assessment of plans and construction projects. The Energy Conservation Law establishes a strategic position of energy conservation in Chinese energy development, calling for economic structural adjustment and energy-efficiency improvement to lower carbon dioxide intensity of the economy. The Forest Law emphasizes protection of forests, which also contributes to maintaining ambient air quality.”

Feng (2016) provides an up-to-date overview of legislation at national, local, and international levels, including the Constitution, national laws, national administrative regulations and departmental rules, and local regulations and rules. It also describe the 12th Five-Year Plan for National Economic and Social Development, the 12th Five-Year Plan on Prevention and Control of Air Pollution in Key Regions, the Action Plan on Prevention and Control of Air Pollution, and a series of policies on energy conservation, emission reduction, and energy use.

In September 2013, the Action Plan of Air Pollution Prevention and Control was officially issued by the State Council. The Plan proposes to improve overall air quality across the nation through five years, reduce heavy pollution by a large margin and make obvious improvement of air quality in Beijing-Tianjin-Hebei Province, the Yangtze River Delta and the Pearl River Delta. To achieve above objectives, the Action Plan defines ten measures, including, amongst others:

- Increasing effort of comprehensive control and reducing emission of multi-pollutants
- Optimizing the industrial structure and promoting industrial restructure
- Accelerating the technology transformation and improving the innovation capability
- Adjusting the energy structure and increasing the clean energy supply

China has issued energy efficiency standards for 22 key industries.

Schultz (et al. 2009) further states that, “although efficiency standards are designed to conserve energy, not control pollution, they will effectively reduce direct and indirect emissions of greenhouse gases and other pollutants associated with energy consumption.”

Also according to Ayres(2009), “energy efficiency standards can bring about significant reductions in criteria and other hazardous pollution emissions and reduce carbon dioxide and other greenhouse gases. If the energy efficiency standards are implemented and enforced successfully, the affected industries in many cases will have to shift their energy use to cleaner fuels and cleaner production processes, including combined heat and power (CHP), polygeneration and waste-heat recovery. These industrial energy efficiency standards, consequently, directly serve the interest of environmental regulators. From an environmental perspective the energy efficiency standards are essentially output-based CO₂ emission standards, which consider cogeneration and waste heat recovery.” According to Ayres (2009) “this is a world-class mechanism that, if broadened to include other pollutants and if implemented, enforced and

combined with strong technology-based standards, can be more effective than either the U.S. BACT or the EU BAT approaches.”

5.4 Policies to prevent & control industrial emissions to water

5.4.1 Law of the People's Republic of China on Prevention and Control of Water Pollution

5.4.1.1 Description

The Law is divided into eight Chapters:

- General provisions (I);
- Standards and planning for the prevention and control of water pollution (II);
- Supervision and administration of the prevention and control of water pollution (III);
- Measures for the prevention and control of water pollution (IV);
- Protection of drinkable water sources and other special waters (V);
- Management of water pollution accidents (VI);
- Legal liability (VII);
- Supplementary provisions (VIII).

This Law aims at the prevention and control of pollution of rivers, lakes, canals, irrigation channels, reservoirs and other surface water bodies and groundwater. State quality standards of water environment and for the discharge of water pollutants shall be established at the central and local level by the competent authorities. According to the provisions of this Law, said authorities shall also, in the process of developing, utilizing, regulating and allocating water resources, make integrated and rational plans for the purpose of: (a) maintaining proper river flows, proper water levels of lakes and reservoirs and proper groundwater tables; (b) protecting urban water sources, preventing and controlling urban water pollution; (c) controlling the placement of industry; (d) designating protected zones; (e) controlling the direct or indirect discharge of pollutants into water bodies. Similar provisions are made with respect to the prevention of surface water and groundwater pollution. Final provisions establish the penalties to be applied in case of contravention.

5.4.1.2 Type of policy / Driving force for implementation

Driving force for implementation is *command and control*.

5.4.1.3 Pollutants to which the policy applies

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances
- Chlorinated and brominated organic substances
- Ozone depleting substances
- Greenhouse gases (GHGs)

- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants

A full list of pollutants is available¹⁸.

5.4.1.4 Sectors / activities to which the policy applies

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

A full list of sectors/activities is available¹⁹.

5.4.1.5 Timing for implementation

This Law entered into force on 1 June 2008 (consolidated version).

5.4.1.6 Technology-based approach

According to Article 9 discharge of water pollutants shall be within the state or local standards for the discharge of water pollutants and indicators for the total discharge control of major water pollutants.

A fundamental provision is the “total discharge control” strategy or “total emission control” strategy. This strategy aims at establishing the total allowed discharge amount of pollutants within a certain region, during a limited period, taking into consideration the water quality objective and pollution assimilating capacity of the receiving water body. Operators should thus not only comply with the requirement of discharge standards, but they should also comply with the allocated responsibilities of effluent reduction based on the TEC strategy. Or the quality standards are to be achieved by TEC, through discharge allocation and setting discharge standards. The TEC strategy only aims to control major pollutants from industrial and municipal sources and animal feeding farms. These pollutants can differ for each Five Year Plan.

Quality standards are defined by the State Council (MEP). In absence of national quality standards the provinces, autonomous regions or municipalities may define local quality standards. In defining quality

¹⁸ http://english.mep.gov.cn/standards_reports/standards/water_environment/Discharge_standard/

¹⁹ http://english.mep.gov.cn/Resources/standards/water_environment/

standards, next to the function of the water body, local conditions on economy and technology may be taken into account.

Article 11 states that the power to formulate the state quality standards of water environment shall remain with the administrative department of environmental protection under the State Council. However the people's government of any province, autonomous region or municipality directly under the Central Government may, for issues not provided in the state quality standards of water environment, work out local standards and file such standards with the administrative department of environmental protection under the State Council for archival purpose.

According to Article 12 the administrative department of environmental protection under the State Council may, together with the competent department of water administration under the State Council and the people's governments of the related provinces, autonomous regions or municipalities directly under the Central Government, in accordance with the use functions of the waters of important rivers and lakes as determined by the state as well as the relevant local conditions on economy and technology, determine the quality standards of water environment applicable to the waters of these important rivers and lakes at provincial boundary areas, and implement such standards after filing them with the State Council and obtaining the approval thereof.

The first national quality standards were set in 1983 (GB 3838-83) and have been updated three times in 1988 (GB 3838-88), 1999 (GHZB 1-1999), and 2002 (GB 3838-2002) and have gradually become more stringent and expanded to cover more items.

Discharge standards are also defined by the State Council (MEP) taking into account the national quality standards, and national economic and technological conditions. They cover 64 categories of industries, municipal sewage treatment plants and animal feeding plants and are technology-based. In absence of national discharge standards the provinces, autonomous region or municipality may define local discharge standards. They also have the possibility to define stricter local discharge standard, i.e. stricter than the national discharge standard.

Article 13 states that the administrative department of environmental protection under the State Council shall formulate the state standards for the discharge of water pollutants in accordance with the state quality standards of water environment and the national economic and technological conditions. For issues not provided in the state standards for the discharge of water pollutants, the people's government of any province, autonomous region or municipality directly under the Central Government may work out local standards for the discharge of water pollutants; for issues provided in the state standards for the discharge of water pollutants, it may also work out local standards stricter than the state standards. Such local standards must be filed with the administrative department of environmental protection under the State Council for archival purpose.

Discharge of pollutants to waters under the governance of certain local standards for the discharge of water pollutants must strictly abide by the said local standards.

According to Article 14 the administrative department of environmental protection under the State Council and the people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall, in light of the requirements of water pollution prevention and control as well as the state or local economic and technological conditions, amend the quality standards of water environment and the standards for the discharge of water pollutants at time appropriate. Thus although technology-based discharge standards have been developed, the total emission strategy is the leading approach, which is actually a more environmental quality-based approach.

According to Yuan (2016) “these discharge standards have so far been proposed by industry, with MEP only playing a supervisory role.” Yuan further states that “local standards are playing a leading role in effluent discharge permit issuance, and prevail over the national standards. If local and national standards are in conflicts, e.g. in a water pollution dispute, the local standards apply.”

According to Li (2012), “China emphasizes the formulation of BAT-based discharge standards, but economic considerations still account a lot at the present stage.” Li further states that “according to the present Chinese laws on water pollution control, if a control technology is not available to remove some pollutants to the level of the water quality standard, the economic and technological factor can be considered when setting the effluent limits. As a result, discharge standards are often set higher than water quality standards. But the problem is there lacks a clear specification on the weights of the economic and environmental factors when choosing a technology. Consequently, difference in discharge limit would occur when employing a BAT compared to an economically feasible technology, and there are risks that a low consideration of water quality would lead to pollutant discharge beyond the acceptable level of a water body.”

Other interesting articles from the Law mention support of advanced technologies, and technical innovation and the publication of a catalogue of highly polluting techniques and equipment and the use of clean techniques.

- Article 6 “The state encourages and supports the scientific and technological research on the prevention and control of water pollution, the application and promotion of advanced technologies as well as the publicity and education of water environment protection.”
- Article 40 “The relevant departments under the State Council and the local people’s governments at or above the county level shall reasonably plan the distribution of industry, require enterprises causing water pollution to make technical innovation and take comprehensive prevention and control measures to improve the repeating utilization factor of water and reduce the discharge of waste water and pollutants.”
- Article 41 “The state applies the washing-out system to backward techniques and equipment that seriously pollute water environment. The department of macroeconomic control under the State Council shall, together with the relevant departments of the State Council, publish the catalogue of techniques which seriously pollute water environment and are to be eliminated within a certain time limit and the catalogue of equipment which seriously pollutes water environment and is prohibited to be produced, sold, imported and used. Producers, sellers, importers or users shall, within the prescribed time limit, stop producing, selling, importing or using any equipment listed into the aforesaid catalogue of equipment to be eliminated. Entities and individuals adopting any technique listed into the aforesaid catalogue of technique to be eliminated shall stop using it within the prescribed time limit. Equipment to be eliminated pursuant to the preceding two paragraphs of this Article may not be transferred to others to use“.
- Article 43 “Enterprises shall adopt clean technique that utilizes raw materials at a higher efficiency and discharges fewer pollutants, and strengthen administration to reduce the generation of water pollutants.”

5.4.1.7 Definition of BAT & criteria that underlie

No reference is made to BAT or similar concept.

The law foresees emission standards. These standards are defined taking into account quality standards and economic and technological conditions. Law also encourages and supports implementation of advanced, clean technologies and elimination of backward techniques and equipment.

5.4.1.8 Responsible bodies

The Ministry of Environmental Protection (MEP) plays the most significant role in environmental governance and implementation.

MEP is legally responsible for the permit issuance, but in practice permits for major industrial and urban sources are issued by the local EPBs at the provincial level on behalf of MEP. Other permits are issued by the local EPB at the city-county level.

5.4.1.9 Additional information

Water pollution is primarily regulated by the Law on the Prevention and Control of Water Pollution.

In addition to this Law, there are however numerous policies dealing with water pollution in China, e.g. the Water Pollution Prevention and Control Action Plan.

On 16th of April 2015 the State Council issued the Water Pollution Prevention and Control Action Plan, also known as the Water Ten Plan. The Water Pollution Prevention and Control Action plan sets out 10 general measures. In general, the plan covers the following 4 broad actions:

- Control pollution discharge, promote economic and industrial transformation and save and recycle resources;
- Promote science and technology progress, use market mechanisms and enforce law and regulations;
- Strengthen management and ensure water environment safety; and
- Clarify responsibilities and encourage public participation.

The plan foresees strict controls on polluting industries by means of emission limits and provides stricter supervision by authorities. An English version of the Water Ten Plan is available²⁰.

5.5 Policies to prevent & control industrial emissions to soil

There is no basic law on soil pollution prevention and control in China. In 2016, the Soil Pollution Prevention Action Plan was published. The Action Plan for Soil Pollution Prevention and Control aims to improve soil quality and ensure safe agricultural products and a healthy living environment for people.

5.6 Projects & reference documents related to BAT

5.6.1 Scientific article

According to Schollenberger (2008) “the technology transfer to industrialising countries, however, requires the adaptation of the underlying criteria, due to differences in economic, legal and technical

²⁰ <http://www.ecegp.com/chinese/DataBase/UploadFile/20150511113319501.pdf> (unofficial translation)

conditions. Additionally, their prevailing technology standards and different priorities concerning the affected environmental media (air, soil, and water) must also be considered.” By means of case studies for VOC emission reduction and prevention for coating applications in Chile, China and Germany, Schollenberger proposes the use of a metric for country-specific determination of BAT.

Chen 2012 states “China produced a huge amount of medical wastes due to its large population. Through a decade, the medical waste centralized disposal sector has rapidly developed with both incineration and non-incineration technology.” Chen emphasizes the use of Best Available Technology (BAT) and Best Environmental Practices (BEP) at medical wastes centralized incineration facilities, and provides an overview of 2 BAT demonstration cases.

According to Liu (2012) “the Chinese Government has established an industrial environmental management system to execute its pollutants gross control policy in 2006. A key component of this system is the Best Available Techniques (BAT) determination method and pollution control management.” Liu augments BAT with Data Envelopment Analysis (DEA) to create a technology selection model for thermal power techniques as case study. Emissions reduction and energy conservation potentials can be weighed against technological feasibility to create best fit assessments for a wide variety of power generation installations.

5.6.2 *BAT/BEP Forum in East and South East Asia (ESEA)*

UNIDO formally launched its first BAT/BEP Forum in East and South East Asia (ESEA) in October 2007 during a Ministerial meeting in Bangkok, Thailand, as a means to promote and create an enabling environment for the development, diffusion, deployment and transfer of existing cost-effective and environmentally sound best available techniques and practices to mainly reduce unintentional emission of POPs from thermal sources such as industrial boilers, metallurgical sectors, and waste incineration. The ESEA BAT/BEP Forum Member Countries are Brunei, Cambodia, China, Indonesia, Lao PDR, Malaysia, Mongolia, Philippines, Singapore, South Korea, Thailand and Vietnam. This Forum has formulated a project proposal as a regionally concerted effort which culminated into the approved GEF project on the demonstration of BAT and BEP in fossil fuel-fired utilities and industrial boilers in response to the Stockholm Convention on POPs.

5.6.3 *Environmentally Sustainable Management (ESM) of medical wastes in China*

This project is determined to carry out BAT/BEP measures for the environmentally sound management of medical waste to reduce U-POPs releases. UNIDO is upgrading the incineration equipment and air pollution control system to the BAT level and replacing outdated incineration facilities with alternative, non-incineration techniques. More than 20 medical institutions are supported by UNIDO to perform good procurement practices, waste segregation at source, waste reduction/minimization, reuse and recycling, intermediate storage, transportation, traceability and staff training. Dedicated disposal facilities keep the incineration and pyrolysis processes and U-POPs releases under optimal control to meet performance levels associated with BAT, while diverting a significant portion of medical waste to alternative processes such as autoclaving, microwaving, and chemical disinfections that avoid releases of U-POPs. The project budget amounts to a total of U\$ 44.7 million over 5 years.

5.7 References

- Anonymous (2012). China Adopts World-Class Pollutant Emissions Standards for Coal Power Plants, World Resources Institute.

- Anonymous (2013). Best Available Techniques and Best Environmental Practices (BAT/BEP) For the elimination of unintentionally produced POPs releases. Vienna, Austria, UNIDO.
- Anonymous (2015). Research Handbook on Chinese Environmental Law. Cheltenham, UK & Northampton, USA, Edward Elgar Publishing.
- Anonymous (2016). China announces soil pollution controls, China.org.cn.
- Anonymous (2016). Practical Law, Thomson Reuters, Legal UK & Ireland.
- Ayres, R., James, C., Novello, D., Olson, J., Williams, A., Walsh, M. (2009). Amending China's air pollution prevention and control law: Recommendations from the international experience.
- Chen, J., Zhiyuan, R., Yajing, T., Kaixiang, W. (2012) Application of best available technologies on medical wastes disposal/treatment in China (with case study). *Procedia Environmental Sciences* 16, 257-265.
- China Water Risk (2015). New 'Water Ten Plan' to Safeguard China's Waters. <http://chinawaterrisk.org/>, China Water Risk.
- Feng, L., Liao, W. (2016) Legislation, plans, and policies for prevention and control of air pollution in China: achievements, challenges, and improvements. *Journal of Cleaner Production* 112, 1549-1558.
- Li, W.-W. (2012). Comparative Policy and Practice Study 1 - "China Volume" - Environmental Monitoring and Public Reporting. Hong Kong, China, City University of Hong Kong.
- Li, W.-W., Sheng, G.-P., Zeng, R. J., Liu, X.-W., Yu, H.-Q. (2012) China's wastewater discharge standards in urbanization: Evolution, challenges and implications: Evolution, challenges and implications. *Environmental Science and Pollution Research* 19, 1422–1431.
- Liu, X., Wen, Z. (2012) Best available techniques and pollution control: a case study on China's thermal power industry. *Journal of Cleaner Production* 23, 113-121.
- OECD (2006). Environmental Compliance and Enforcement in China, OECD.
- Qi, Y., Zhou, X. (2009). Water Pollution Control in China: Review of laws, regulations and policies and their implementation. Japan, Institute for Global Environmental Strategies (IGES).
- Schollenberger, H., Treitz, M., Geldermann, J. (2008) Adapting the European approach of Best Available Techniques: case studies from Chile and China. *Journal of Cleaner Production* 16, 1856-1864.
- Wang, Z., Song, Q, Feng, H., Qin, Q., Jiang, P., Wang, Y. (2013) The Implementation Experience and Its Enlightenment of Best Available Techniques (BAT) in European Union. *Journal of Environmental Engineering Technology* 3, 266-271.
- Williams, A., et al. (2009). Reducing industrial air pollution and greenhouse gas emissions through technology standards: Comparing the US, EU and China, The Regulatory Assistance Project.

- Yuan, Y. (2016). A Comparative Study: China's Water Pollutants Discharge Permit System with Reference to the National Pollutants Discharge Elimination System of the United States of America. High Law Faculty. Cologne, Germany, University of Cologne. Doctorate: 123.

6 POLICIES & PRACTICES IN JAPAN

6.1 Overview

Although there is no particular system of integrated control of pollution in Japan, general approaches with regard to pollution control and environment protection are set forth in the Basic Environmental Law and Basic Environmental Plan. Japan's environmental policy and laws are based on three fundamental principles: the polluter pays/polluter acts principle, the precautionary principle and the cooperative principle.

The pollution prevention policy in Japan does not contain a definition of BAT and no official references are made to BAT or similar concepts. Although there are no systematic rules for setting emission standards (in addition to environmental quality standards) (in principal for emissions to air and water) in Japan, BAT may be one of the considerations.

Business operators are encouraged to undertake the measures, based on information on techniques and technologies for controlling the emission or dispersal of hazardous air pollutants (= technology-based standards).

The Basic Environmental Law is the general national policy concerning the environment in Japan. It provides the basic national policy concerning the environment. The Law is based on the following three basic principles of environmental policy:

- The blessings of the environment should be enjoyed by the present generation and succeeded to the future generation.
- A sustainable society should be created where environmental loads by human activities are minimized.
- Japan should contribute actively to global environmental conservation through international cooperation.

Further, the Law defines the responsibilities of each actor in the society, i.e. central government, local governments, corporations and the people. These actors should make efforts to protect the environment through fair burden sharing and cooperating with each other.

Based on the above mentioned principles and responsibilities, the Law stipulates the policy instruments of Japanese environmental policy.

In addition to regulatory measures traditionally taken for pollution control and nature protection, the Law also prescribes the following measures: environmental consideration in policy formulation, establishment of the Basic Environment Plan (established on 16 December 1994) which describes the directions of long-term environmental policy, environmental impact assessment for development projects, economic measures to encourage activities for reducing environmental load, improvement of social infrastructure such as sewerage system, transport facilities etc., promotion of environmental activities by

corporations, citizens and NGOs, environmental education, and provision of information, and promotion of science and technology.

The Basic Environmental Law was structured as follows:

- General provisions (purpose and definitions) – chapter 1
- Basic Policies for Environmental Conservation – chapter 2
- Environmental Council etc. – chapter 3

Besides the Basic Environmental Law, other main laws, regulations and standards relating to the environment are the Basic Environmental Plan, the Nature Conservation Law and the Environmental Impact Assessment Law.

The national environmental laws concerning air pollution are:

- The Air Pollution Control Law,
- The Law Concerning Special Measures for Total Emission Reduction of Nitrogen Oxides from Automobiles in Specified Areas,
- The Environmental Quality Standard for Air.

The national environmental laws concerning water pollution are:

- The Water Pollution Control Law,
- The Law concerning Special Measures for the Preservation of Lake Water Quality,
- The Environmental Quality Standard for Water.

The following three acts are the main policies which prevent or control industrial emissions to soil in Japan.

- Water Pollution Control Act (WPCA)
- PRTR Act
- Waste Disposal Act

The laws mentioned in bold are described in more detail in the following paragraphs.

6.2 Policies to prevent & control industrial emissions to air

6.2.1 Air Pollution Control Act/Air Pollution Control Law

6.2.1.1 Description

The purpose of the Air Pollution Control Law is, among other things, to protect the health of citizens and to protect the environment from air pollution by controlling emissions. This is done by promoting the

implementation of measures against hazardous air pollutants and by setting maximum permissible limits for automobile exhaust.

The Air Pollution Control Law is structured as follows:

- Regulation of Soot and Smoke Emission (chapter 2)
- Regulation on Particulate (chapter 2)
- Promotion of Measures Concerning Hazardous Air Pollutants (chapter 2-3)
- Regulation on Motor Vehicle Exhausts (chapter 3)
- Monitoring of the Level of Air Pollution (chapter 4)

6.2.1.2 Type of policy / Driving force for implementation

Driving force for implementation is command and control.

6.2.1.3 Pollutants to which the policy applies

- Heavy metals (Cadmium(-compounds), Lead(-compounds))
- Inorganic substances (Sulphur dioxide, Nitrogen dioxide, Carbon monoxide)
- Chlorinated and brominated organic substances
- Other pollutants (Soot and dust, Asbestos)

6.2.1.4 Sectors / activities to which the policy applies

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

6.2.1.5 Timing for implementation

The Air Pollution Control Law was established in 1968 to promote air pollution control measures comprehensively. Laws and regulations representing extensions of regulatory objects, nationwide regulation and enforced standards were subsequently introduced into this law as revision (1970), the total amount control (1974), asbestos (1989), vehicle fuel (1995), harmful air pollutants (1996), VOC (2004), and mercury (2015).

6.2.1.6 *Technology-based approach*

Although there are no systematic rules for setting emission standards in Japan, BAT may be one of the considerations (e.g. mercury standard). The Air Pollution Control Law does not contain a definition of BAT and no official references to BAT or similar concepts are made.

6.2.1.6.1 Regulation on Soot and Smokes

The Regulation on Soot and Smokes under the Air Pollution Control Law contains regulatory measures against air pollutants emitted from factories and business sites (stationary sources). Emission standards (emission concentrations) in Japan include discharge standards that are maximum permissible limits for each type and size of facility, for the following parameters: SO_x, soot and dust, harmful substances (such as Cd(-compounds), Cl₂, HCl, F, HF, SiF₄, Pb(-compounds), NO_x), asbestos, specific substances (E.g. ammonia, CO, methanol), hazardous air pollutants, benzene, trichloroethylene, tetrachloroethylene and dioxins.

For areas where air pollution has or is likely to exceed the limits, special standards which are stricter can be set. Further more stringent prefectural emission standards can be set in areas where national emission standards might be insufficient to protect human health or living conditions. Finally for specific large-scale factories, standards for controlling total emissions can be set that prescribe maximum limits.

Business operators are encouraged to undertake the measures, based on information on techniques and technologies for controlling the emission or dispersal of hazardous air pollutants (= technology-based standards).

Besides the above mentioned standards, environmental quality standards, aiming to reduce the concentrations of atmospheric constituents, help to prevent the pollution from spreading over a wide area. EQS for air pollution are introduced in the 1993 Basic Environmental Law. This Law provides the basic national policy concerning the environment.

6.2.1.6.2 Management of Hazardous Air Pollutants (HAPs)

In the framework of the Management of Hazardous Air Pollutants (HAPs) (1996) under the Air Pollution Control Law, the business sectors prepare and implement a plan for emission prevention for other chemicals. In contrast to the emission standards as set by the government, for some chemicals, this is a voluntary mechanism.

Regardless sectors, 248 chemical substances are specified as HAPs. 23 chemicals are prioritized.

Some examples of chemicals for which such voluntary plans are set are: polycyclic aromatic hydrocarbons (PAHs) and active substances of plant protection products or biocidal products.

Although there are no systematic rules for setting emission limits in Japan, BAT may be one of the considerations. The Air Pollution Control Act does not contain a definition of BAT and no official references to BAT or similar concepts are made.

6.2.1.7 *Definition of concept & criteria that underlie*

Although technology-based principles and cost-effectiveness are taken into account to reduce air emissions in Japan, no BAT or similar concept and criteria that underlie are directly defined in this Law.

6.2.1.8 Requirements linked to the use of BAT

Under this Law, factories and business sites (stationary sources) that release emissions to air should be operated in accordance to the legal provisions of this Law.

6.2.1.9 Responsible bodies

The Ministry of the Environment is responsible for the Emission Standards. E.g. for Soot and Smoke generated at facilities that generate Soot and Smoke these standards shall be prescribed by an Ordinance of the Ministry of the Environment. Prefectural governors may, by decree, set more stringent standards in areas under their jurisdiction.

6.2.1.10 Additional information

Besides the Air Pollution Control Law (see above), there are:

- two additional laws relating to stationary sources such as facilities and business workplaces: (1) Law Concerning Special Measures against Dioxins and (2) Offensive Odour Control Law, and
- Two additional laws concerning the migrating generating sources such as vehicles: (1) Automobile NO_x/PM Law²¹ and (2) Off Road Vehicle Law.

Further, the Japanese Law concerning Pollutant Release and Transfer Register (PRTR, 1999) aimed to promote voluntary improvement of the management of chemicals by business, and to prevent any impediments to the preservation of the environment by understanding the release amounts of chemicals by business operators.

An overview of Reports on Air Pollution Control Technologies and Products in Japan can be found at https://www.jetro.go.jp/tppoas/special/env_rep2_english/index.html, as well as recommended examples of Air Pollution Control Technologies and Products.

A summary table of process Technologies for the control of air emissions can be found via https://www.jetro.go.jp/tppoas/special/env_rep2_english/env_rep_04_hyo5e.html, containing process technologies for different categories such as sulphur oxide, soot and dust, volatile organic compound, asbestos, dioxins, etc.

Factories have to monitor and to report on results. Besides this, inspections are carried out by the Ministry of the Environment and/or prefectural governors, against polluting parties, fines and arrests are levied. The Ministry of Environment surveys the status of enforcement and publicizes it annually.

The state of air pollution is constantly monitored throughout Japan state at about 2 thousand monitoring stations by prefectural and ordinance-designated municipal governments. Taking into account the monitoring results, the Ministry of the Environment (MoE) will further enhance the comprehensive efforts to achieve the EQSs through taking measures for emission reduction from factories and business establishments, automobile exhaust gas, dissemination of low-emission vehicles, etc.

²¹ Law Concerning Special Measures to Reduce the Total Amount of Nitrogen Oxides and Particulate Matter Emitted from Motor Vehicles in Specified Areas

6.3 Policies to prevent & control industrial emissions to water

6.3.1 Water Pollution Control Law

6.3.1.1 Description

The purpose of the Water Pollution Control Law is to prevent the pollution of the Public Water Areas (e.g. rivers, lakes and marshes, gulfs, coastal areas and waterways) and penetration into groundwater by regulating effluent discharged by factories or establishments, to protect human health and to preserve the living environment, and to protect sufferers. The Law is applicable since 1970 and is structured as follows:

- Chapter I - General Provisions
- Chapter II (1) - Regulation of Discharge of Effluent, etc.
- Chapter II (2) - Promotion of Measures for Domestic Wastewater
- Chapter III - Monitoring of the Conditions of Water Pollution, etc.
- Chapter IV - Compensation for Damages
- Chapter V - Miscellaneous Provisions
- Chapter VI - Panel Provisions.
- Supplementary Provisions.

6.3.1.2 Type of policy / Driving force for implementation

Driving force for implementation is *command and control*.

6.3.1.3 Pollutants to which the policy applies

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Chlorinated and brominated organic substances
- Other organic substances
- Active substances of plant protection products or biocidal products

6.3.1.4 Sectors / activities to which the policy applies

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

6.3.1.5 *Timing for implementation*

The Law entered into force in 1971.

6.3.1.6 *Technology-based approach*

Although there are no systematic rules for setting standards / emission limits in Japan, BAT may be one of the considerations. The Water Pollution Control Law does not contain a definition of BAT and no official references to BAT or similar concepts are made.

In Japan, the water pollution control is regulated via:

- **Effluent Standards:** These *standards* are employed for the control of most of water types. Article 3 of chapter II of the Water Pollution Control Law contains the rules concerning effluent standards. Among other provisions in this article, for Harmful Substances, the effluent standards shall be established in terms of the maximum permissible levels established by each substance. In case of other kinds of pollution, standards shall be established in terms of the maximum permissible levels.
- **Environmental Quality Standards:** EQS are introduced in the 1993 Basic Environmental Law. This Law provides the basic national policy concerning the environment and Law establishes two kinds of (EQS) relating to water pollution: Environmental water quality standards for protecting human health, Environmental water quality standards for protecting the living environment. Each type of standard establishes levels desirable for achieving and maintaining public-water and other water-quality policy objectives.
- **Total Pollutant Load Regulation:** This method is applied to water bodies in large closed public water bodies receiving large amount of effluent emitted from daily life and industry sectors, when *environmental quality standards* cannot be achieved just only by restriction of pollutant concentration. Article 4-2 of chapter II of the Water Pollution Control Law contains, among others, the following provisions concerning total pollution load, which is a similar concept of BAT: In the Fundamental Policy for Reduction of Total Pollution Load, the reduction target volume, the target year and other fundamental matters relating to the reduction of the pollutant load shall be set forth. These methods focus on point source loads.

Although there are no systematic rules for setting standards / emission limits in Japan, BAT may be one of the considerations. The Water Pollution Control Law does not contain a definition of BAT and no official references to BAT or similar concepts are made.

6.3.1.7 *Definition of concept & criteria that underlie*

Although technology-based principles and cost-effectiveness are taken into account to reduce air emissions in Japan, no BAT or similar concept and criteria that underlie are directly defined in this Law.

6.3.1.8 *Requirements linked to the use of BAT*

Under this Law, factories and business sites (stationary sources) that release emissions to water should be operated in accordance to the legal provisions of this Law. No information is available concerning flexibility with respect to the legal provisions of this Law.

6.3.1.9 Responsible bodies

The effluent standards regarding the extent of pollution (E.g. pH, BOD, COD, SS) are established by Ordinance of the Ministry of the Environment. The Ministry of the Environment may, if necessary for the prevention of water pollution in Public Water Areas, advise the Prefectures to establish their own effluent standards. The national and local governments are responsible for taking the measures required to implement the Plans for Reduction of Total Pollution Load.

6.3.1.10 Additional information

The Law concerning Special Measures for the Preservation of Lake Water Quality is the basic policy for conservation of lake water quality. The measures and policies were formulated to be implemented for lakes which need to secure the Environmental Quality Standards, and also take special measures to regulate facilities which discharge polluted water, effluent and the other sources of water pollution, in order to ensure the nation's health and culture. This Law aims to prevent eutrophication in closed water bodies and encouraged the development and commercialization of advanced technologies to remove COD, nitrogen and phosphorus.

Further, the Japanese Law concerning Pollutant Release and Transfer Register (PRTR, 1999) aimed to promote voluntary improvement of the management of chemicals by business, and to prevent any impediments to the preservation of the environment by understanding the release amounts of chemicals by business operators.

6.3.1.10.1 Monitoring

Article 3 of chapter III of the Water Pollution Control Law contains the regulations concerning monitoring of the conditions of water pollution. Besides continuous monitoring and reporting by the governor of the prefecture, they shall (after consulting with the chiefs of the local offices of national administrative organs) also establish a Measurement Program. The national or local government shall measure the water quality in the Public Water Area and ground water in compliance with the Measurement Program, and report the findings of the measurement to the governor of the prefecture.

6.4 Policies to prevent & control industrial emissions to soil

The following three acts are the main policies which prevent or control industrial emissions to soil in Japan.

- Water Pollution Control Act (WPCA)
- PRTR Act
- Waste Disposal Act

In concrete, the WPCA regulates continuous underground infiltration of water containing the Harmful Substances (Article 12-3: Restrictions on Infiltration of Specified Underground Infiltrated Water and Article 13-2: Order for Improvement), and underground infiltration of water containing the Harmful Substances in case of accidents (Article 14-2: Measures in Case of Accidents).

Also, the PRTR Act regulates underground infiltration of Designated Chemical Substances in manufacture and use of them (Article 3: Chemical Substance Management Guidelines and Article 4: Responsibilities of Business Operators).

The Waste Disposal Act regulates landfill of chemical substances (In case of Industrial Waste, Article 12(1): Waste Disposal of Business Operators, Article 14(12): Waste Disposal according to the Industrial Waste Disposal Standards and Article 19-3: Order for Improvement).

Environmental Quality Standards (ESQ) for soil contamination are introduced in the 1993 Basic Environmental Law. This Law provides the basic national policy concerning the environment. These standards set forth in an Ordinance of the Ministry of the Environment.

To ensure smooth implementation of surveys and countermeasures based on the EQS and Evaluation Standards Relevant to Soil and Groundwater, guidelines for Investigation and Countermeasures for Soil and Groundwater Pollution were established in November 1994. Also administrative guidance is provided to polluters to urge them to clean up polluted soil voluntarily under these guidelines.

EQS are not applicable to places where natural toxic substances exist (such as near mineral veins) and places designated for storage of toxic materials such as waste disposal sites. The EQS regulate the following 25 substances: cadmium, total cyanide, organic phosphorus, lead, chromium (VI), arsenic, total mercury, alkyl mercury, PCBs, copper, dichloromethane, carbon tetrachloride, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene, tetrachloroethylene, 1,3-dichloropropene, thiuram, simazine, thiobencarb, benzene and selenium.

6.4.1 Soil Contamination Countermeasures Law (SCCL)

6.4.1.1 Description

SCCL is a national law relating to contaminated land. In line with the polluter pays principle, under the SCCL, corrective measures are to be performed by the persons responsible for the soil contamination. The purpose of this Act is to facilitate the implementation of countermeasures against soil contamination by formulating measures to grasp the situation of soil contamination by Designated Hazardous Substances and measures to prevent harm to human health resulting from such contamination, and thereby to protect the health of the citizens.

The Law is structured as follows:

- Chapter I - General Provisions
- Chapter II - Soil Contamination Investigation
- Chapter III - Designation, etc., of Areas
- Chapter IV - Regulations Concerning Carrying-Out of Contaminated Soil, etc.
- Chapter V - Designated Investigation Institution
- Chapter VI - Designated Support Corporation
- Chapter VII - Miscellaneous Provisions
- Chapter VIII - Penal Provisions
- Supplementary Provisions.

6.4.1.2 *Type of policy / Driving force for implementation*

Driving force for implementation is command and control.

6.4.1.3 *Pollutants to which the policy applies*

- Heavy metals
- Other organic substances
- Active substances of plant protection products or biocidal products
- Other pollutants

6.4.1.4 *Sectors / activities to which the policy applies*

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

6.4.1.5 *Timing for implementation*

This Law came in force in 2002.

6.5 **References**

- Government of Japan - Ministry of the Environment. Environmental Quality Standards for Soil Pollution. <http://www.env.go.jp/en/water/soil/sp.html>.
- Government of Japan - Ministry of the Environment. Japan's regulations and environmental law. <http://www.env.go.jp/en/coop/pollution.html>.
- Government of Japan - Ministry of the Environment. Regulatory Measures against Air Pollutants Emitted from Factories and Business Sites and the Outline of Regulation. <http://www.env.go.jp/en/air/aq/air.html>.
- Government of Japan - Ministry of the Environment The Structure of Air Pollution Control Law.
- Government of Japan - Ministry of the Environment (2015). Air Pollution Control Act.
- Government of Japan - Ministry of the Environment (2015). Water Pollution Control Law.
- JETRO. Regulations and Standards Concerning Water Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep_english/env_rep_03_1.html.
- JETRO. Regulations and Standards Relating to Air Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep2_english/env_rep_03_1.html.

- Government of Japan - Ministry of the Environment. Environmental Quality Standards for Soil Pollution. <http://www.env.go.jp/en/water/soil/sp.html>.
- Government of Japan - Ministry of the Environment. Japan's regulations and environmental law. <http://www.env.go.jp/en/coop/pollution.html>.
- Government of Japan - Ministry of the Environment. Regulatory Measures against Air Pollutants Emitted from Factories and Business Sites and the Outline of Regulation. <http://www.env.go.jp/en/air/aq/air.html>.
- Government of Japan - Ministry of the Environment. The Structure of Air Pollution Control Law.
- Government of Japan - Ministry of the Environment (2015). Air Pollution Control Act.
- Government of Japan - Ministry of the Environment (2015). Water Pollution Control Law.
- JETRO. Regulations and Standards Concerning Water Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep_english/env_rep_03_1.html.
- JETRO. Regulations and Standards Relating to Air Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep2_english/env_rep_03_1.html.
- Government of Japan - Ministry of the Environment. Environmental Quality Standards for Soil Pollution. <http://www.env.go.jp/en/water/soil/sp.html>.
- Government of Japan - Ministry of the Environment. Japan's regulations and environmental law. <http://www.env.go.jp/en/coop/pollution.html>.
- Government of Japan - Ministry of the Environment. Regulatory Measures against Air Pollutants Emitted from Factories and Business Sites and the Outline of Regulation. <http://www.env.go.jp/en/air/aq/air.html>.
- Government of Japan - Ministry of the Environment The Structure of Air Pollution Control Law.
- Government of Japan - Ministry of the Environment (2015). Air Pollution Control Act.
- Government of Japan - Ministry of the Environment (2015). Water Pollution Control Law.
- JETRO. Regulations and Standards Concerning Water Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep_english/env_rep_03_1.html.
- JETRO. Regulations and Standards Relating to Air Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep2_english/env_rep_03_1.html.
- Government of Japan - Ministry of the Environment. Environmental Quality Standards for Soil Pollution. <http://www.env.go.jp/en/water/soil/sp.html>.
- Government of Japan - Ministry of the Environment. Japan's regulations and environmental law. <http://www.env.go.jp/en/coop/pollution.html>.

- Government of Japan - Ministry of the Environment. Regulatory Measures against Air Pollutants Emitted from Factories and Business Sites and the Outline of Regulation. <http://www.env.go.jp/en/air/aq/air.html>.
- Government of Japan - Ministry of the Environment The Structure of Air Pollution Control Law.
- Government of Japan - Ministry of the Environment (2015). Air Pollution Control Act.
- Government of Japan - Ministry of the Environment (2015). Water Pollution Control Law.
- JETRO. Regulations and Standards Concerning Water Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep_english/env_rep_03_1.html.
- JETRO. Regulations and Standards Relating to Air Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep2_english/env_rep_03_1.html.
- Government of Japan - Ministry of the Environment. Environmental Quality Standards for Soil Pollution. <http://www.env.go.jp/en/water/soil/sp.html>.
- Government of Japan - Ministry of the Environment. Japan's regulations and environmental law. <http://www.env.go.jp/en/coop/pollution.html>.
- Government of Japan - Ministry of the Environment. Regulatory Measures against Air Pollutants Emitted from Factories and Business Sites and the Outline of Regulation. <http://www.env.go.jp/en/air/aq/air.html>.
- Government of Japan - Ministry of the Environment The Structure of Air Pollution Control Law.
- Government of Japan - Ministry of the Environment (2015). Air Pollution Control Act.
- Government of Japan - Ministry of the Environment (2015). Water Pollution Control Law.
- JETRO. Regulations and Standards Concerning Water Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep_english/env_rep_03_1.html.
- JETRO. Regulations and Standards Relating to Air Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep2_english/env_rep_03_1.html.
- Government of Japan - Ministry of the Environment. Environmental Quality Standards for Soil Pollution. <http://www.env.go.jp/en/water/soil/sp.html>.
- Government of Japan - Ministry of the Environment. Japan's regulations and environmental law. <http://www.env.go.jp/en/coop/pollution.html>.
- Government of Japan - Ministry of the Environment. Regulatory Measures against Air Pollutants Emitted from Factories and Business Sites and the Outline of Regulation. <http://www.env.go.jp/en/air/aq/air.html>.
- Government of Japan - Ministry of the Environment The Structure of Air Pollution Control Law.
- Government of Japan - Ministry of the Environment (2015). Air Pollution Control Act.

- Government of Japan - Ministry of the Environment (2015). Water Pollution Control Law.
- JETRO. Regulations and Standards Concerning Water Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep_english/env_rep_03_1.html.
- JETRO. Regulations and Standards Relating to Air Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep2_english/env_rep_03_1.html.
- Government of Japan - Ministry of the Environment. Environmental Quality Standards for Soil Pollution. <http://www.env.go.jp/en/water/soil/sp.html>.
- Government of Japan - Ministry of the Environment. Japan's regulations and environmental law. <http://www.env.go.jp/en/coop/pollution.html>.
- Government of Japan - Ministry of the Environment. Regulatory Measures against Air Pollutants Emitted from Factories and Business Sites and the Outline of Regulation. <http://www.env.go.jp/en/air/aq/air.html>.
- Government of Japan - Ministry of the Environment The Structure of Air Pollution Control Law.
- Government of Japan - Ministry of the Environment (2015). Air Pollution Control Act.
- Government of Japan - Ministry of the Environment (2015). Water Pollution Control Law.
- JETRO. Regulations and Standards Concerning Water Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep_english/env_rep_03_1.html.
- JETRO. Regulations and Standards Relating to Air Pollution Control in Japan. https://www.jetro.go.jp/tppoas/special/env_rep2_english/env_rep_03_1.html.

7 POLICIES & PRACTICES IN THE RUSSIAN FEDERATION

7.1 Overview

The environmental legislation in Russia is represented by dozens of federal laws and hundreds of governmental regulations and ministerial acts. These can be divided into 3 groups:

- Natural resources legislation, e.g. Federal Law on Subsoil²² and Federal Law on Continental Shelf²³
- Environment protection legislation and
- Ecological safety provision legislation, e.g. Federal Law on Sanitary and Epidemiological Well-being of the Population²⁴

These are closely interrelated to each other.

A key place is taken by the Federal Law On Environmental Protection. The law sets out the fundamental principles of Russian environmental regulation, provides an overall framework for environmental management, and, imposes general environmental protection requirements related to the construction and operation of various facilities that may be harmful to the environment.

Environmental permitting for air and water is further specified in relevant federal laws. The Federal Law on the Protection of the Atmospheric Air addresses issues of air quality and air emission limitations provides for a permitting procedure for facilities that emit pollutants and outlines the control procedures. Wastewater discharges (setting of standards, permitting and enforcement) are regulated by the Water Code. Requirements to wastes generation and disposal are established by the Federal Law on Industrial and Consumer Waste. Under the law facilities are obliged to determine waste generation limitations and acquire a permit for waste disposal. The Land Code defines requirements for land protection, including those for prevention of chemical contamination.

²² The Federal Law on Subsoil (No. 2395) regulates relations originating from geological study, use and protection of subsoil of the national territory, continental shelf of the Russian Federation, and also connected with the use of mining waste and processing industries related thereto, peat, sapropel and other specific mineral resources including groundwater, brine and brine of salt lakes and sea gulfs.

²³ The continental shelf of the Russian Federation includes the seabed and subsoil layers of submarine areas laying beyond the boundaries of the territorial sea of the Russian Federation throughout the length of the natural extension of its terrestrial territory to the external limits of the submarine border of the continent. This Law establishes that the licenses for fishing and harvest of marine biodiversity on the continental shelf are issued by the Russian Federal Agencies to foreign fishing vessels for the period of one calendar year.

²⁴ The Law on Sanitary and Epidemiological Well-being of the Population aims at ensuring sanitary and epidemiological well-being of the population. The Law prescribes the development of sanitary-hygienic norms.

The Federal Law No. 219-FZ makes significant changes to the Federal Law On Environmental Protection and other related laws, e.g. the Law On the Protection of the Atmospheric Air. The Law introduces a gradual transition to a technological regulation system, based on the best available technologies (BATs).

7.2 General policies to prevent & control industrial emissions

7.2.1 Federal Law No. 7-FZ on environmental protection

7.2.1.1 Description

The Federal Law determines legal grounds for state policy in the sphere of environmental protection ensuring conservation of natural environment, biological diversity and natural resources for the purpose of meeting the demands of the present and the future generations, strengthening law enforcement in the sphere of environmental protection and ensuring ecological safety.

The Federal Law is based upon the following principles: 1) the right of citizens to favourable environment; 2) sustainable development; 3) protection, conservation, reproduction and management natural resources ensuring ecological safety; 4) nature management requiring payment and compensation of environmental damage; 5) precautionary principle; 6) priority of ecosystem preservation.

It was amended by:

- Federal Law No. 219-FZ amending Federal Law No. 7-FZ on environmental protection in 2014,
- Federal Law No. 409-FZ amending Federal Law No. 7-FZ on environmental protection in 2013,
- Federal Law No. 331-FZ amending Federal Law No. 7-FZ on environmental protection in 2011,
- Federal Law No. 93-FZ amending Federal Law No. 7-FZ on environmental protection in 2008,
- Federal Law No. 199-FZ amending some legislative acts in 2005.

The Federal Law No. 219-FZ makes significant changes to the Federal Law on Environmental Protection and other related laws, e.g. the Law on the Protection of the Atmospheric Air

7.2.2 Federal Law No. 219-FZ amending Federal Law No. 7-FZ on environmental protection & separate legal acts

7.2.2.1 Description

The Federal Law No. 219-FZ makes significant changes to the Federal Law on Environmental Protection and other related laws, e.g. the Law on the Protection of the Atmospheric Air. The Law introduces a gradual transition to a technological regulation system, based on the best available technologies (BATs), using the EU experience and specifics of the domestic economy in Russia.

The law aims at improving the competitiveness of domestic industry products, increasing investment attractiveness of business, and at the same time reducing negative impacts on the environment.

7.2.2.2 *Type of policy / Driving force for implementation*

Driving forces for implementation are:

- Command and control,
- Economic instruments,
- Liability, damage compensation,
- Management and planning,
- Assessment instruments.

7.2.2.3 *Pollutants to which the policy applies*

Several regulations were enacted to implement the Federal Law No. 219-FZ, including RF Government Decree No. 1316-r of 08.07.2015. This Decree provides a list of pollutants subject to the state environmental regulation. The list of pollutants is available²⁵. The list covers air, water and soil pollutants.

Norms on payment for pollutants emissions are set in the Governmental Decree of the Russian Federation from 12 June 2003 N344²⁶.

7.2.2.4 *Sector / activities to which the policy applies*

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector

Several regulations were enacted to implement the Federal Law No. 219-FZ, including RF Government Decree No. 2674-r of 24.12.2014. This Decree provides a list of spheres of application of best available technologies. The list is available²⁷.

7.2.2.5 *Timing for implementation*

This Federal Law entered into force on 1 January 2015.

²⁵ <http://government.ru/media/files/NQsLnpwkA9vtceGoj46TRcTsm6yxJXmH.pdf> (only in Russian).

²⁶ http://base.consultant.ru/cons/cgi/online.cgi?req=doc&base=LAW&n=172885&dst=0&mb=LAW&div=LAW&BA_SENODE=2018038487-4081201017&SORTTYPE=0&rnd=214990.108563864&REFFIELD=134&REFSEGM=64&opt=1&REFTYPE=QP_MULTI_REF&REFBASE=LAW&REFDOC=200681&REFDST=100232%2c0&REFPAGE=0&dirRefFld=1%2c18%2c200681

²⁷ http://www.gost.ru/wps/wcm/connect/7b1a9100474a8fe2b4bef70c407bc797/2674.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=7b1a9100474a8fe2b4bef70c407bc797 (only in Russian).

7.2.2.6 Technology-based approach

The Law introduces a gradual transition to a technological regulation system, based on the best available technologies (BATs), using the EU experience and specifics of the domestic economy in Russia. The law establishes economic incentives (state support) for industrial facilities to integrate best available technologies into their production processes and reduce emissions (discharge) of polluting substances. In particular, facilities using BAT may be provided with tax incentives, benefits in payments for the adverse environmental impact or allocated with budgetary funds (art. 17).

The Law also introduces new administrative sanctions for a failure to comply with the newly established requirements in the forms of administrative fines in the amount up to RUB 100,000. Until January 2019 permit conditions are set in accordance with sanitary-hygienic norms.

Emission levels associated with the best available techniques will be derived from a consideration of BAT on a sectoral basis. Although it is expected that these levels will become legally binding, the interaction with the sanitary-hygienic norms still needs to be determined.

Certainly, the Russia stands at the beginning of the transition to a technological regulation system. The planned stages of the transition are shown below:

Table 2. Stages of transition to the technological regulation system

Period	Work stage contents
2015-2017	The division of companies into <i>four categories</i> according to the degree of their negative impact on the environment State registration of working companies and category conferment The development of BREF Reference documents
Since January 2015	State regulation measure in the field of environmental protection will only apply to the pollutants included in the list established by the Government of the Russian Federation
2019-2022	The operators of Category I facilities, with the contribution to the total pollutant emission not less than 60%, are required to apply for an integrated permit (IEP)
Since January 2019	The coming into force of the legal requirements for the inclusion into IEP of the mandatory program of eco-efficiency increase and environmental protection action plans for Category II facilities
Until January 2025	The rest of facilities will have to apply for an IEP

Source: (Berezyuk 2015)

The Law classifies industrial facilities depending on the level of adverse environmental impact. The requirements applicable to industrial facilities will depend on their category which is to be assigned upon the facility's state registration. However, the category may be changed if information on its profile is updated. Categorization criteria are established by the Russian Government via RF Government Decree No 1029 of 28.09.2015²⁸.

Operators of industrial facilities of 1st category with a significant level of environmental adverse impact must obtain an integrated environmental permit. Such a permit will be issued for a period of seven years and will prescribe the maximum permissible level of emissions of pollutants, the maximum

²⁸ <http://government.ru/media/files/oHAMAREx1e9uyphc0U8Vq5ikOoyMOrAo.pdf>

permissible level of physical impact and limits for waste disposal. The Law also states that such facilities have to be equipped with automatic devices to measure the volume of emissions and the concentration of pollutants and technical means to transfer such information to the unified state ecological monitoring system. The operators must apply the BAT.

Operators of facilities of 2nd category with a medium level of adverse environmental impact must submit a declaration on environmental impact every seven years. Such a declaration must provide information on anticipated emissions of pollutants and generated and disposed waste. Calculations on maximum permissible levels of emissions of pollutants are to be submitted together with the declaration. The operators may apply the BAT (on a voluntary basis).

Operators of facilities of 3rd category with insignificant negative environmental impact must submit a report on actual emissions of pollutants into the air and waste related activities. Maximum permissible levels of emissions for such facilities must only be established with respect to radioactive, highly toxic substances and chemicals that are carcinogens and mutagens.

The Law significantly removes administrative barriers for operators of facilities of 4th category with minimum adverse environmental impact. Such operators are released from an obligation to (i) develop maximum permissible levels of emissions of pollutants; (ii) approve limits for waste disposal; and (iii) develop a programme on industrial ecological control. Moreover, the facilities are not subject to scheduled inspections conducted by controlling authorities.

Previous, the environmental permitting regime was the same for all stationary sources.

From January 2019 300 pilot facilities which are main polluters in Russia (Category I, with a contribution to the total pollutant emission of more than 60%) are obliged to obtain an integrated permit, and apply the BAT. Afterwards, but before January 2025, all remaining Category I facilities must

7.2.2.7 Definition of BAT & criteria that underlie

Best available technology is a technology of products (goods) production, services and works determined on the basis of modern scientific and technical achievements and on the combination of environmental objectives under the condition of their technical applicability.

Best meaning most effective in achieving a high general level of protection of the environment as a whole, energy and resource efficient. Available meaning economically efficient, already implemented on two or more sites. Technique meaning technological processes, methods and equipment. Criteria to determine best available techniques are:

- The lowest level of negative impact on the environment calculated per volume of production, or per unit of production, or per unit of time need to perform a job;
- Economic effectiveness of BAT implementation and exploitation;
- Usage of resource and energy saving methods;
- Time needed for BAT implementation;
- Industrial application of technological processes, equipment, technical methods at 2 or more installations with negative impact located in Russia.

7.2.2.8 Responsible bodies

Ministry of Natural Resources and the Environment (MNR) is responsible for public policy making and statutory regulation in the study, use, renewal and conservation of natural resources, environmental monitoring and pollution control.

Federal Service for Supervision of Natural Resources (Rosprirodnadzor), a federal executive body under the Ministry of Natural Resources and Environment. Rosprirodnadzor supervises and monitors the use of natural resources, providing safety and reasonable nature management. Its competences are ecology, environmental protection and decrease of negative technological impacts and waste management. EQS are set by the Ministry of Natural Resources and the Environment. ELV are set by the Rosprirodnadzor and Rostekhnadzor (for radioactive substances).

The National Bureau for Best Available Techniques (<http://burondt.ru/>) is responsible for developing BAT reference documents (BREFs). The tasks and operation of the Bureau are similar to those of the European IPPC Bureau, with the difference being that the actual writing is being done by members of the Technical Working Group (TWG), not by the Bureau itself. Tasks and operation are determined by the Order of Rosstandatr from 11 June 2015 N 707, available²⁹.

For the drawing up of a BREF document, a TWG is set up by the National bureau for Best Available Techniques. Each TWG consists of technical experts representing authorities (14%), industries (60%), scientific, public and non-governmental organisations (26%). The National Bureau for Best Available Techniques also provides training on BAT and underlying regulation for regional executive bodies and other interested parties. Examples of training sessions can be viewed³⁰.

7.2.2.9 Additional information

Similar to the EU, Russia is developing a wide number of reference documents on Best Available Techniques (BREFs), ca. 51 in total. The first 11 BREFs have already been finalized. All BREFs are deemed to be finalized by the end of 2017. The BREFs can be available, and some have been translated into English³¹. The BREFs are considered guidance documents, with a recommendation status. The BAT conclusions only become legally binding upon official publication by the Russian Government.

Other relevant legislation in this regard is:

- RF Government Order, 31.10.2014 N 2178-r.
- RF Government Regulation, 23.12.2014 N 1458 on establishing guidelines on BAT determination

These Orders provide an overview of the BREFs, the time schedule and responsible bodies for their elaboration.

²⁹ http://www.gost.ru/wps/wcm/connect/db830d00474a915fb4cdf70c407bc797/p_707_11.06.2015.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=db830d00474a915fb4cdf70c407bc797

³⁰ <http://www.burondt.ru/informacziya/obuchenie/vebinarvi.html>

³¹ <http://www.burondt.ru/index/its-ndt.html>

7.3 Policies to prevent & control industrial emissions to air

7.3.1 Federal Law No. 96-FZ on the protection of the atmospheric air

7.3.1.1 Description

The present Federal Law establishes the legal basis for the protection of the atmospheric air and is aimed at the realization of the constitutional rights of the citizens to favourable environment and access to reliable information on its state. The basic principles of state regulation in the sphere of the protection of the atmospheric air include: 1) prevention of the irreversible consequences of atmospheric pollution for environment; 2) compulsory state regulation of the emissions in the atmosphere and hazardous physical impact thereon; 3) completeness and reliability of the information on the state of the atmospheric air and its pollution; 4) mandatory observance of the requirements of the national legislation in the sphere of the protection of the atmospheric air and liability for the infringement thereof.

The present Federal Law consists of 10 Sections composed of 34 articles.

- Section 1 (arts. 1-2) lays down general provisions.
- Section 2 (arts. 3- 8) regards management in the sphere of the protection of the atmospheric air.
- Section 3 (arts. 9-20) regards organisation of the activity in the sphere of the protection of the atmospheric air.
- Section 4 (arts. 21-22) regards state registration of hazardous impact of emissions and their sources on the atmospheric air.
- Section 5 (arts. 23-27) regards monitoring of the atmospheric air.
- Section 6 (art. 28) establishes the economic mechanism of the protection of the atmospheric air.
- Section 7 (arts. 29 and 30) determines the rights of citizens, legal persons and social associations.
- Section 8 (arts. 31 and 32) establishes liability.
- Section 9 (art. 33) regards international cooperation.
- Section 10 (art. 34) establishes the modalities of the enactment of the present Federal Law.

Hygienic and ecological standards of the atmospheric air quality and maximum permissible limits of physical impact thereon shall be set for the purpose of the determination of safety criteria for human beings, plants and animals, and also for protected areas (art. 11). Emissions of the pollutants in the atmosphere by stationary sources shall be authorized by special permit issued by federal executive body in the sphere of environmental protection. The aforesaid authorization for the emission of the pollutants in the atmosphere must set maximum permissible limits and other terms and conditions that shall ensure the protection of the atmospheric air (art. 14). Emission in the atmosphere of substances the degree of danger of which to human life and health has not been established shall be prohibited (art. 15). Manufacturing and running of transport and other mobile sources which emissions contain pollutants exceeding the established requirements (art. 17). Environmental fees shall be collected from natural and legal persons for the atmospheric pollution caused by emissions (art. 28).

7.3.1.2 Type of policy / Driving force for implementation

Driving forces for implementation are:

- Command and control,
- Economic instruments,
- Liability, damage compensation.

7.3.1.3 Sector / activities to which the policy applies

The Law applies to all installations, including mobile, which emit pollutants to air.

7.3.1.4 Timing for implementation

This Law entered into force in 1999.

7.3.1.5 Technology-based approach

Facilities that have stationary sources of emission must develop a project for maximum permissible emissions (MPE) of air pollutants, and obtain permits for emissions of air pollutants. The norms of anthropogenic impact (so called the maximum permissible emission (MPE)) are determined in such a way as to ensure compliance with the requirements set by the maximum permissible concentrations (MPCs). MPEs for industrial facilities are calculated on the base of sanitary-hygienic MPCs. The function of MPEs is similar to the emission limit values (EVL) in waste gasses, as by the European Directive 2010/75/EU (IPPC).

The air quality norms, named maximum permissible concentrations (MPCs), establish the upper safe level of pollutants impact. MPCs were determined for some hundred individual substances (e.g. CO, NO_x, SO₂, benzene and methane) and for some ten binary mixtures. They are introduced by the sanitary-hygienists for protection of human health. In total the MPCs correspond to limit values for the protection of human health and vegetation, as by the European Directive 2008/50/EC. However, the BAT concept is introduced via Federal Law No 219-FZ.

Emission levels associated with the best available techniques will be derived from a consideration of BAT on a sectoral basis. Although it is expected that these levels will become legally binding, the future status of the MPCs and thus interaction with air quality norms still needs to be determined.

7.3.1.6 Requirements linked to the use of BAT

Chapter 7, art. 30. 1 states “Legal entities and private persons which poses stationary sources are obliged ... to use BAT, low waste and waste less technologies in order to decrease pollution to air.”

7.3.1.7 Responsible bodies

Ministry of Natural Resources and the Environment (MNR) is responsible for public policy making and statutory regulation in the study, use, renewal and conservation of natural resources, environmental monitoring and pollution control.

Federal Service for Supervision of Natural Resources (Rosprirodnadzor), a federal executive body under the Ministry of Natural Resources and Environment. Rosprirodnadzor supervises and monitors the

use of natural resources, providing safety and reasonable nature management. Its competences are ecology, environmental protection and decrease of negative technological impacts and waste management.

Rosprirodnadzor is responsible for issuing air emission permits (with exception of radioactive substances).

7.4 Policies to prevent & control industrial emissions to water

7.4.1 Water Code (No. 74-FZ)

7.4.1.1 Description

The Water Code shall be applicable to surface water and groundwater, and it shall be based upon the following principles: (a) priority of water protection and prevention of negative environmental impact resulting from waterbodies management; (b) conservation of protected waterbodies; (c) purposeful use and priority of potable water supply; (d) equal access to purchase of waterbodies; (e) basin-related regulation of water relations; (f) charged water management; (g) traditional water management of scanty indigenous population of the North, Siberia and Far East.

The Act consists of seven Chapters divided into 69 articles dealing with the following matters: (1) general provisions; (2) water ownership and water rights; (3) water uses contract; (4) management of waterbodies; (5) water use; (6) protection of waterbodies; (7) liability. The Act establishes that all waterbodies shall be public property (federal ownership) granting the citizens access to public and municipal waterbodies and free use thereof for personal and domestic needs. Waterbodies can be granted in use in accordance with water uses contract for: (a) water abstraction; (b) recreational water use; (c) hydropower generation. The period of validity of water uses contract shall not exceed 20 years and it must envisage charged water management. In the Russian Federation shall be constituted 20 basin management institutions responsible for rational management, protection and monitoring of waterbodies. Regarding discharge of waste and drainage water it shall be prohibited into waterbodies for medicinal uses, protected waterbodies and fish protection waterbodies. Waterbodies that are natural habitats of game can be used for hunting in accordance with water- and wildlife legislation.

7.4.1.2 Type of policy / Driving force for implementation

Driving forces for implementation are:

- Command and control,
- Economic instruments,
- Liability, damage compensation.

7.4.1.3 Pollutants to which the policy applies

Sanitary-hygienic norms are available via: <http://www.dioxin.ru/doc/gn2.1.5.1315-03.htm>. The list covers more than 1,300 pollutants.

7.4.1.4 Sector / activities to which the policy applies

The Law covers all sectors/activities linked to use, and subsequent discharge, of water.

7.4.1.5 Timing for implementation

This Law entered into force in 2006.

7.4.1.6 Technology-based approach

When waste water is discharged into surface water, the operator of the facility must develop a project for maximum permissible discharge, and obtain a permit for discharge of water pollutants. The approach is similar to the one for air. The BAT concept is however introduced via Federal Law No 219-FZ. Emission levels associated with the best available techniques will be derived from a consideration of BAT on a sectoral basis. Although it is expected that these levels will become legally binding, the future status of the maximum permissible concentrations (MPCs) and thus interaction with water quality norms still needs to be determined.

7.4.1.7 Responsible bodies

Ministry of Natural Resources and the Environment (MNR) is responsible for public policy making and statutory regulation in the study, use, renewal and conservation of natural resources, environmental monitoring and pollution control.

The Federal Service for Hydrometeorology and Environmental Monitoring (Rosgidromet) is responsible for monitoring the pollution of surface water.

The Federal Fishery Agency (Rosrybolovsto) performs the federal state control (supervision) in the field of fisheries and conservation of aquatic biological resources of the inland waters of the Russian Federation, with the exception of internal waters of the Russian Federation.

The Russian Federal Service for Surveillance on Consumer Rights Protection and Human Well-being (Rosпотребнадзор) provides supervision of sanitary and epidemiological requirements to water objects.

7.5 Policies to prevent & control industrial emissions to soil

7.5.1 Federal Law No. 89-FZ on industrial and consumer waste

7.5.2 Description

This Federal Law determines the legal aspects of the treatment of industrial and consumer waste products for the purpose of the prevention hazardous impact of industrial and consumer waste products on human health and environment and its reutilization as raw materials for industrial use. This Act consists of 8 Sections composed of 31 articles.

- Section 1 lays down the general provisions (arts. 1-4).
- Section 2 establishes the authority of the Russian Federation, its subjects and local administration in dealing with the waste products (arts. 5-8).
- Section 3 establishes the general requirements in dealing with the waste products (arts. 9-17).
- Section 4 regards regulation, state control, and accountability in dealing with the waste products (arts. 18-20).

- Section 5 concerns economic regulation in the field of treatment of the waste products (arts. 21-24)
- Section 6 regards state control and supervision in the field of the treatment of the waste products (arts. 25-27).
- Section 7 establishes liability for the infringement of the Russian Legislation in the field of the treatment of the waste products (arts. 28 and 29).
- Section 8 is the conclusive part (arts. 30 and 31) that establishes the modalities of the entry into force of this Law and the conformation of the Legislative Acts of the Russian Federation to this Law.

7.5.2.1 Pollutants to which the policy applies

All wastes are divided into 5 hazard classes or categories). The class or category is attributed based on the hazard of components present and their concentration.

7.5.2.2 Sector / activities to which the policy applies

The Law covers all spheres of waste production, but also waste treatment.

7.5.2.3 Timing for implementation

This Law entered into force in 1998.

7.5.2.4 Technology-based approach

Currently the main principles in waste management are:

- Reduction of waste;
- Valorisation of waste;
- Payment for waste disposal;
- Economic stimulation of waste management activities.

7.5.2.5 Responsible bodies

Ministry of Natural Resources and the Environment (MNR) is responsible for public policy making and statutory regulation in the study, use, renewal and conservation of natural resources, environmental monitoring and pollution control.

Federal Service for Supervision of Natural Resources (Rosprirodnadzor), a federal executive body under the Ministry of Natural Resources and Environment. Rosprirodnadzor supervises and monitors the use of natural resources, providing safety and reasonable nature management. Its competences are ecology, environmental protection and decrease of negative technological impacts and waste management.

Rosprirodnadzor is responsible for issuing waste permits (with exception of radioactive substances).

7.5.3 *Land Code (No. 136-FZ)*

7.5.3.1 *Description*

The present Land Code and other legislative acts issued in accordance with it are based upon the following principles: 1) consideration of the importance of land as the basis of vital and economic activity of man and at the same time as immovable property, object of the right of ownership and other land rights; 2) priority of protection of land as the main environmental component in accordance with consideration of land as immovable property that guarantees to the owner the right of ownership, possession and disposal of land freely on condition that it does not cause environmental damage; 3) priority ensuring decision-making and carrying out such types of activity that ensure protection of human life and prevention of negative impact on it; 4) unity of destination of the plots of land and objects strictly connected with them; 5) priority of conservation of particularly precious land and protected areas; 6) charged use of land except for cases envisaged by Federal and regional legislation; 7) purposeful sub-division of land in accordance with predestination of certain categories of land; 8) delimitation of state property on land by sub-division of land into federal, regional and municipal land; 9) differentiated legal status with the consideration of natural, social, economic and other factors; 10) consideration of legitimate public interests and interests of single individuals ensuring the right of each citizen to free ownership, use and disposal of the plots of land owned by him.

7.5.3.2 *Pollutants to which the policy applies*

- Heavy metals
- Inorganic substances
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Non-grouped organic substances
- Sulphur Dioxide, Nitrogen Oxides, Carbon Monoxide, Dust

A full list of pollutants is available³²:

7.5.3.3 *Sector / activities to which the policy applies*

The Law covers all spheres of land use.

7.5.3.4 *Timing for implementation*

This Law entered into force in 2001.

7.5.3.5 *Technology-based approach*

The Government of the Russian Federation establishes the maximum permissible levels for land contamination. The maximum permissible levels are set out for numerous contaminants. Sanitary-hygienic standards and regulations specify the permissible levels for land contamination by setting a list of the regulated contaminants and their maximum permissible levels.

The BAT concept is being introduced via Federal Law No 219-FZ.

³² <http://www.gosthelp.ru/text/GN217204106Predelnodopust.html>

7.5.3.6 *Responsible bodies*

Ministry of Natural Resources and the Environment (MNR) is responsible for public policy making and statutory regulation in the study, use, renewal and conservation of natural resources, environmental monitoring and pollution control.

Federal Service for Supervision of Natural Resources (Rosprirodnadzor), a federal executive body under the Ministry of Natural Resources and Environment. Rosprirodnadzor supervises and monitors the use of natural resources, providing safety and reasonable nature management. Its competences are ecology, environmental protection and decrease of negative technological impacts and waste management.

Rosprirodnadzor is responsible for issuing permits (with exception of radioactive substances).

7.6 **Projects & reference documents related to BAT**

7.6.1 *Scientific article*

According to the authors, the high level of the negative impact on the environment in the Russian Federation remains steady for many years. Significant and specific contribution to the current level of pollution is made by the companies of the energy sector, which is among the top three in terms of the negative impact on the environment. The planned transition to technological regulation system in Russia is based on the use of the best available technology (BAT). The concept formation of the transition to BAT is a challenge for the industry. The basis of the concept is the unified approach development, harmonized with the European approaches, Russian practice and methodological guidelines for BAT identification, which will facilitate informational and technical implementation of BAT in the economy entities of the energy sector. To solve this problem, the authors have developed a model for BAT implementation, using a step-by-step logical approach to decision-making. This approach is based on a comparison of the environmental protection measures effectiveness with costs that the economic entity should bear to avoid or minimize man-made impact in normal conditions of management, that is, before BAT introduction. The economic expediency evaluation of the technology in a particular industry is an integral part of BAT implementation concept.

7.6.2 *Project on Climate friendly economy: Introduction of best available techniques*

The aim of the project is to introduce and spread efficient climate friendly technologies in selected sectors of industry in Russia. The significant reduction of GHG should be reached by increasing the energy efficiency and by using best available techniques (BAT). The regulations for these technologies in Russia are recently embodied in law. The project is planned as a common activity of the German KfW (Kreditanstalt für Wiederaufbau) and GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit). The part of KfW is to finance investments in cooperation with Russian partner banks. The GIZ part will focus on counselling of legal and institutional framework, training, knowledge transfer and the planning and support of pilot projects.

7.6.3 *Project on BAT for intensive rearing of pig, poultry and cattle in EECCA countries using the example of Russia*

The project was jointly implemented by the consulting company Döhler Agrar and the Russian "Institute for Engineering and Environmental Problems in Agricultural Production (IIEP)", St. Petersburg. With this project, the German and Russian experts wanted to familiarize the European Seville process for intensive livestock farming in the EECCA (Eastern Europe, the Caucasus and Central Asia) countries. Russia (Leningrad region and Kaliningrad region) were taken as an example.

7.6.4 Environmental Information Centre for Enterprises in St.-Petersburg

The aim of the “Environmental Information Centre for Enterprises in St.-Petersburg” project is to increase the cooperation of the Finnish and Russian environmental companies and to promote the export of the environmental technology and knowhow of the Finnish environmental companies to Russia. The Environmental Information Centre is situated in the centre of St.-Petersburg. The Centre has published a book on “Best Available Technology: Experience and Prospects”³³.

7.6.5 BAT/BEP Centre for environmentally safe disposal of potentially hazardous consumer products and industrial wastes in Russia

The Russian Federation faces the challenge with the ever-increasing volumes of used consumer and industrial products and needs to undertake strong efforts to apply modern methods to reduce the negative environment impact and make possible the recycling and environmentally safe disposal of these products after their decommissioning. The project will address the creation of capacity for management of electronic, electric and rubber wastes. These products being safe during their utilization could become hazardous and toxic if recycled and disposed after their utilization by environmentally unsafe methods. The project assists in developing of the industrial strategy and building up the management capabilities at several demonstration regions for introduction of BAT/ BET for efficient recycling of these wastes, thus preventing the additional creation of toxic and hazardous wastes and saving of natural resources through reusing and recycling of valuable components of electronic, electric and rubber wastes. It will be done by improving and strengthening the regulation and the regulation enforcement practices; by creating organisational and technical capacities through training and strengthening of specialized centres; by collecting information and developing information systems for assessment of possibilities of application of BAT/BEP on recycling and disposal of the wastes; and by pilot applications of the several BAT and working out selected BEP for recycling and disposal of electric and electronic wastes (EEW) and rubber technical goods (RGT). The results of the project will be introduced for application in other countries of the Euro-Asian Economic Community (EurAsEC).

³³ <http://www.ecoprofi.info/en/ecoprofi/papers/publications>

8 POLICIES & PRACTICES IN NEW ZEALAND

8.1 Overview

To prevent and control industrial emissions, industry and government in New Zealand must comply with various Acts. These Federal Laws provide the principal framework for environmental permits. Although, the requirements for preventing and controlling emissions in New Zealand under the Resource Management Act (RMA) are technology-based, the permits itself do not mention technologies, except those the plant operator plans to implement in the plant. The Best Practical Option (BPO) in permits can expressed as treatment technologies, operating practices or performances standards.

The foundation of New Zealand's system of environmental legislation is the Resource Management Act 1991 (RMA). The RMA was created to achieve a more coordinated, streamlined, and comprehensive approach to environmental management (including air, water and soil/land). The Act came into force in October 1991, and replaced or amended more than 50 other laws relating to town planning and resource management.

The Act contains Regulations prescribing National Environmental Standards (NES). These NES prescribe among others (qualitative or quantitative) technical standards, methods, or requirements concerning contaminants, air quality, water quality, level, or flow, soil quality in relation to the discharge of contaminants, any discharge or the ambient environment, monitoring, and implementing of / exemptions from /transitional provisions for standards.

Among others, there are NES for air quality, for sources of drinking water, for assessing and managing contaminants in soil to protect human health and for plantation forestry. There are no NES for emissions to water.

Hazardous substances are regulated and controlled under the Hazardous Substances and New Organisms (HSNO) Act 1996. Act. Regulations provide the rules and controls under which the HSNO Act operates in practice.

A hazardous substance is defined in the HSNO Act as a substance that is:

- Explosive,
- Flammable,
- Oxidising (i.e., it can accelerate the combustion of other material),
- Corrosive (of metals or biological issue),
- Toxic,
- Eco-toxic.

A substance is also considered to be hazardous when any of the above properties result when the substance contacts air or water.

The consideration of technological potential is not addressed in the HSNO Act. Environmental Exposure Limits for substances with toxic or ecotoxic properties are stated in the Hazardous Substances Regulations 2001.

Additional concerning the water item, the Water Accord is a set of national good management practice benchmarks set by the dairy industry, which are aimed at lifting environmental performance on dairy farms. The Water Accord sets out the dairy industry's commitment to New Zealand and improving water quality, and includes commitments to targeted riparian planting plans, effluent management, comprehensive standards for new dairy farms and measures to improve the efficiency of water and nutrient use on farms. Some of the good management practice benchmarks in the dairy industry under the Water Accord are based on technological potential.

Besides the above mentioned policies and practices that affect (eventually among other environmental items) air, water and soil, additional regional policies and practices applies in New Zealand. Since we focus on national policies and practices in this project, we will not discuss regional policies and practices in the paragraphs below.

8.2 Policies to prevent & control industrial emissions to air

8.2.1 Resource Management Act (RMA)

8.2.1.1 Description

The Resource Management Act was introduced in 1991 and is New Zealand's principal legislation for environmental management. This Act replaces a large number of acts, regulations and orders, such as the Clean Air Act of 1972. The purpose of the Act is to promote the sustainable management of natural and physical resources. The RMA promotes sustainable management of air as well as water and soil/land.

Sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while:

- sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations, and
- safeguarding the life-supporting capacity of air, water, soil, and ecosystems, and
- Avoiding, remedying, or mitigating any adverse effects of activities on the environment.

8.2.1.2 Type of policy / Driving force for implementation

National environmental standards are mandatory. Driving force for implementation of the RMA is *command and control*. Besides this, the RMA also focusses on *education and information, management and planning and assessment instruments*.

8.2.1.3 Pollutants to which the policy applies

Persistent Organic Pollutants (POPs)

- Heavy metals
- Inorganic substances (Sulphur dioxide, Nitrogen dioxide, Carbon monoxide)
- Chlorinated and brominated organic substances
- Ozone depleting substances
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants (Dust/PM10)

Greenhouse gases are not covered by the National Environmental Standards for Air Quality. However, the Standards do have the requirement for landfills over 1 million tonnes of refuse to collect greenhouse gas emissions.

8.2.1.4 Sector / activities to which the policy applies

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

All industrial and agricultural activities that pollute air are covered the RMA.

8.2.1.5 Timing for implementation

The RMA entered into force in 1991. Standards were implemented in 2004, and implementation is still ongoing. Guidance for the Standards was released in 2011.

8.2.1.6 Technology-based approach

Under the Act, primarily ‘effects based’ management is backed by technology-based means of compliance in guidelines. These national guidelines describe the main processes and its requirements and must be applied all over the country (guarantee of a level playing field).

The Act contains Regulations prescribing national environmental standards (NES). These NES prescribe among others (qualitative or quantitative) technical standards, methods, or requirements concerning contaminants, air quality, any discharge or the ambient environment, monitoring, and implementing of / exemptions from /transitional provisions for standards.

8.2.1.6.1 The National Environmental Standards for Air Quality (NES)

NES are regulations made under the Resource Management Act 1991. NES were first introduced in 2004 (amendments and revisions in 2005, 2008 and 2009). The aim of these standards is to set a

guaranteed minimum level of health protection for all New Zealanders. The Standards are made up of 14 separate but interlinked standards including: (1) seven standards banning activities that discharge significant quantities of dioxins and other toxics into the air (such as burning of wastes at landfills, burning of tyres, burning of coated wires, as part of meeting Stockholm Convention obligations), and (2) five standards for ambient (outdoor) air quality (maximum allowable levels of key pollutants CO, NO₂, O₃, SO₂ and PM₁₀). There are no specific requirements in the Standards to assess or improve the technological potential of polluters.

NES for Air Quality is one of the five standards that are in force as regulation under the RMA. Resource Management (National Environmental Standards for Air Quality) Regulations 2004 came into force on 1 October 2006 (regulation 1), on 1 September 2005 (regulations 13-24) and on 8 October (all other regulations). It contains, among others, the following information:

- Ambient air quality standards for contaminants
- Monitoring methods for ambient air quality standards (CO, NO₂, O₃, SO₂ and PM₁₀)
- Resource consents for discharges of PM10
- Resource consents for discharges of other contaminants
- Wood burners³⁴ (restrictions and design standards)
- Domestic solid-fuel burning open fires³⁵
- Control of greenhouse gas emissions at landfills³⁶ (technology-based requirements for flaring)

Certain activities that discharge hazardous pollutants into the air are banned e.g. open burning of tyres.

The 2011 Users' Guide to the revised National Environmental Standards for Air Quality (NES) explains the regulations (including the 2011 amendments) and how they should be implemented. This provides guidance on implementing the standards for local government air quality practitioners and regional council officers and their elected representatives on how to implement the RMA. The Users' Guide has been developed for local government air quality practitioners in particular, but has been made publicly available to provide additional information on the NES.

Since application of the law is devolved to local councils, the approach to implementation varies. Some local councils will apply national or international standards. In deciding resource consent applications, methods to avoid, remedy or mitigate adverse effects are considered.

The likely definition applied by local councils when considering the technological potential of resource consent applications is the definition of Best Available Techniques (BAT). Section 108 of the RMA states that a discharge permit may contain a requirement for "the holder to adopt the best practical

³⁴http://www.legislation.govt.nz/regulation/public/2004/0309/latest/link.aspx?search=ta_regulation_R_rc%40rinf%40rnif_an%40bn%40rn_25_a&p=3&id=DLM1850304

³⁵http://www.legislation.govt.nz/regulation/public/2004/0309/latest/link.aspx?search=ta_regulation_R_rc%40rinf%40rnif_an%40bn%40rn_25_a&p=3&id=DLM3826285

³⁶http://www.legislation.govt.nz/regulation/public/2004/0309/latest/link.aspx?search=ta_regulation_R_rc%40rinf%40rnif_an%40bn%40rn_25_a&p=3&id=DLM1850305

option to prevent or minimise any actual or likely adverse effect on the environment of the discharge'. Also Best practical option (BPO) is defined. It is a synthesis of specific environmental, economic and technical constraints.

A BPO is determined for each facility and is applied as a requirement for plant managers to be implemented. Permits do not mention technologies, except those the plant operator plans to implement in the plant. The BPO in permits can be expressed as treatment technologies, operating practices or performance standards.

An Assessment of Environmental Effects (AEE) report is accompanied to a permit, including all known or anticipated environmental effects of the activity on the environment, a statement of whether they would be within acceptable standards/guidelines. In case standards/guidelines are expected to be exceeded, the AEE contains an indication of how the adverse environmental effects would be avoided, remedied or mitigated. The AEE can describe proposed mitigation measures which can include technology-based solutions (BAT).

8.2.1.6.2 Environmental quality standards (EQS)

Under the New Zealand Legislation, environmental quality standards are identified. These standards must be applied and may be described as national standards.

Environmental quality concerns are dominant. The necessary environmental quality standards are set first. From there, the cost and performance of the proposed technology to be installed to meet the environmental standards is set up, based on an assessment performed by regional council experts.

There are no EQS for air but there are quality guidelines, based on international standards.

When considering an application, a consent authority must have regard to

- any actual and potential effects on the environment of allowing the activity, and
- any relevant provisions of
 - a national environmental standard,
 - other regulations,
 - a national policy statement,
 - a New Zealand coastal policy statement,
 - a regional policy statement or proposed regional policy statement,
 - a plan or proposed plan, and
 - Any other matter the consent authority considers relevant and reasonably necessary to determine the application.

8.2.1.7 Definition of BAT & criteria that underlie

The terminology 'Best Available Techniques' is not generally used in New Zealand. However, there is a performance based environmental regulation.

8.2.1.7.1 Best Practical Option (BPO)

The best method for preventing or minimising the adverse effects on the environment having regard among other things to

- The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects, and
- The financial implication, and the effects on the environment, of that option when compared with other options, and
- The current state of technical knowledge and the likelihood that the option can be successfully applied.

Before a regional council includes in a regional plan a rule requiring the adoption of the best practicable option to prevent or minimise any actual or likely adverse effect on the environment of any discharge of a contaminant, the regional council shall be satisfied that, having regard to

- (a) the nature of the discharge and the receiving environment; and
- (b) other alternatives, including a rule requiring the observance of minimum standards of quality of the environment, the inclusion of that rule in the plan is the most efficient and effective means of preventing or minimising those adverse effects on the environment.

Examples of rules can be found in Auckland Council Regional Plan: Air Land, and Water. Economic considerations are part of the BPO definition. In specific situations, financial capacity of particular companies to finance the implementation of techniques/measures to prevent or reduce environmental impact is given little consideration. A plant may be forced to close if the techniques/measure cannot be afforded by the operator.

8.2.1.8 Requirements linked to the use of BAT

In 2011, the provision for exceptional circumstances was added to the NES for air quality. This provision allows regional councils to apply for an exceedance of air quality standards as being caused by exceptional circumstances.

The Ministry uses the following five criteria (as explained in the 2014 update of the 2011 user's guidance to the revised NES for Air Quality) to help assess whether an exceedance was caused by exceptional circumstances:

- Causation – whether the exceedance was caused by the events being assessed
- Control – the circumstances must be beyond the reasonable control of the regional council
- Foreseeability – an assessment of whether the circumstances were able to be reasonably predicted and/or planned for
- Frequency and likelihood of reoccurrence – an assessment of how unusual the events were
- Purpose of the RMA – whether a determination that circumstances were exceptional is consistent with the purpose of the RMA.

Exceptional circumstances are assessed on a case-by-case basis, on written application by a regional council, by the Minister for the Environment.

If decided by the Minister that an exceedance was caused by exceptional circumstances, it is excluded when determining whether the standard for the relevant contaminant has been breached in that airshed. The regional council is still required to give public notice of the exceedance.

8.2.1.9 Responsible bodies

The central government of New Zealand is responsible to administer the RMA, to provide national direction and to respond to national priorities to do with managing the environment and environmental issues. The Ministry for the Environment promotes clean and healthy air for all New Zealanders by developing national policies and tools to maintain and, where necessary, to improve air quality. There are no national regulations on the minimum level of environmental performance but a case-by-case approach is followed.

Under the RMA, the Ministry provides national guidance for regional councils and unitary authorities to manage the air in their region. This national guidance includes (1) ambient air quality guidelines, (2) good-practice guidance, (3) research and reporting, and (4) assistance with public education campaigns.

The Ministry does not have a formal enforcement role. This has been delegated to regional councils and unitary authorities. Thus, the application of the ACT is devolved to local councils, by setting plans for emissions, taking into account National Environmental Standards (NES) or international standards. One of the functions of the Environmental Protection Authority (EPA) is to provide technical advice to the Minister of the Environment on the development of national environmental standards.

Regional councils and unitary authorities are responsible for air quality managing under the RMA. Regional councils must also ensure the air quality standards are met within their regions. They are required to identify areas where air quality is to exceed the standards. These areas are known as airsheds.

Councils can use several different tools to meet the requirements of the RMA and Air Quality Standards. They can establish policies and rules to manage particular issues in their regions, issue resource consents for discharges from industrial and trade premises, carry out education campaigns and provide incentives for people to use cleaner forms of home heating.

Each council is at a different stage in the development of their regional plan. Regional plans (air plans) address specific air quality issues for each region. They outline a regional council's goals for air quality and contain rules about discharges to air from activities such as industry, domestic fires and vehicles. Preparing such a regional plan involves several stages. Public participation and communication with the local community is important and is achieved through meetings and submissions.

Local councils set plans for air emissions and administer resource consents that permit pollutants to be emitted into air by industry under the RMA. Various local councils choose to determine whether a resource consent application is successful or not, partially based on its demonstrable technological potential. The consideration of technological potential may therefore be part of issuing a resource consent and setting controls within this but it is not stipulated in the Act itself.

In sensitive ecosystems, more stringent emission limits can be set. Based on detailed site analyses and monitoring, the environmental impact of emission levels are evaluated. In addition foreign standards and international developments are taken into account.

8.2.1.10 Additional information

8.2.1.10.1 Monitoring and reporting

The National Monitoring System (NMS) is aimed to provide data to help determine how the RMA is being implemented locally, regionally and nationally and to help determine if the various functions, tools and processes under the RMA are achieving their intended purpose.

The NMS requires local authorities, the Environmental Protection Agency and the Ministry to provide detailed data each year on the functions, tools, and processes that they are responsible for under the RMA.

8.2.1.10.2 Good practice guides for councils

Good practice guides (E.g. (reference) methods for determination of PM₁₀, CO, NO_x, SO₂, ozone) have been developed by the Ministry to help councils meet their obligations to manage air quality under the Resource Management Act (1991).

8.2.1.10.3 Quality planning website

The Quality Planning website (QP website) was launched in 2001 to 'promote good practice by sharing knowledge about all aspects of practice under the RMA' among resource management practitioners, council planners, private practitioners, consultants and environmental managers among others. It offers over 70 guidance notes that provide information and good practice on all aspects of the Resource Management Act (RMA).

8.2.1.10.4 MfE Data Service

This Service provides access (free online) to environmental datasets published by the Ministry of the Environment. This page provides information on the service including licensing requirements.

8.2.2 Hazardous Substances and New Organisms Act (HSNO Act)

8.2.2.1 Description

The Hazardous Substances and New Organisms Act was introduced in 1996. It is a combined Environmental and OHS Legislation. This Act follows a 'cradle to grave' approach setting controls on how substances are classified, contained, labelled, stored, used, transported or disposed of. The purpose of the HSNO Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms.

The Act contains provisions to set exposure limits for discharges to air of substances with toxic properties. These limits are generally set by the EPA at the national level at the time of the assessment and approval of the substance. They act as a restriction on the use of a substance but can also be applied to restrict methods of disposal.

There are 22 regulations under this Act covering a broad scope of controls including fireworks and other explosive controls, and the management, disposal, classification, packaging and transport of hazardous substances and new organisms.

8.2.2.2 Type of policy / Driving force for implementation

Driving force for implementation of the HSNO Act is *command and control*. Besides this, the Act also focusses on education and information and assessment instruments.

New Zealand standards (based on international standards) are approved as preferred but they are not mandatory.

8.2.2.3 *Pollutants to which the policy applies*

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances (Sulphur dioxide, Nitrogen dioxide, Carbon monoxide)
- Chlorinated and brominated organic substances
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants (Dust/PM10)

8.2.2.4 *Sector / activities to which the policy applies*

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

All use and the full lifecycle of hazardous substances are covered by the HSNO Act.

8.2.2.5 *Timing for implementation*

The Act came into force in two stages. Provisions relating to new organisms took effect in July 1998 and the provisions relating to hazardous substances came into force on 2 July 2001. The first TELs were set in 2004.

8.2.2.6 *Technology-based approach*

The consideration of technological potential is not addressed in the HSNO Act.

Some controls are performance based:

- “what” must be achieved, not “how” to achieve it;
- flexibility in ‘how’ to meet requirements;
- ‘codes of practice’, which contain specific technology based requirements (e.g., NZ or international standards), can be approved as preferred (but not mandatory) means of compliance with the regulated controls.

Some controls are technology based requirements, e.g.:

- design, construction, operation and maintenance of bulk storage tanks (both above and underground) – rely on international standards;
- control of ignition sources and emission of flammable vapours;
- storage, handling and use explosives.

Any regulations prescribing hazard classification control may set, or provide for the setting of, exposure limits (1) within a range of values, or according to a methodology, (2) by adopting international values or international methodologies.

Exposure Limits for substances with toxic or ecotoxic properties as stated in the Act (section 77B) may comprise 1 or more of the following:

- (a) environmental exposure limits (EELs),
- (b) tolerable exposure limits (TELs),
- (c) workplace exposure standards (WESs).

8.2.2.6.1 EELs

Environmental exposure limit means the limit on the concentration of a substance (or any element or compound making up the substance) with ecotoxic properties in an environmental medium as set in accordance with this section or regulations made under section 75 of the Act.

8.2.2.6.2 TELs

Tolerable exposure limit means the limit on the concentration of a substance (or any element or compound making up the substance) with toxic properties in an environmental medium as set in accordance with this section or regulations made under section 75 of the Act.

- Health based exposure limit for toxic substances, can be set for air, water, or soil.
- The TEL provisions in the HSNO Act and regulations have not been widely used because of applicability issues. They can be used in respect of emissions from the use of fumigants where this is necessary to protect public health.
- Example:
- TELs set for methyl bromide used as a fumigant, for public health protection.
- This approval also include eventual requirement for recapture technology to be used.

8.2.2.6.3 WESs

Workplace exposure standard means the limit on the concentration of a substance (or any element or compound making up the substance) with toxic properties in air set in accordance with this section or

regulations made under section 75 of the Act for the purpose of protecting persons in a workplace from the adverse effects of toxic substances.

Management of Risks may include:

- Hazardous Property Controls
 - Biological hazards (includes TELs and EELs)
 - Physical hazards
- Lifecycle Controls
 - Packaging/containers/storage
 - Identification/labelling, SDSs
 - Disposal
 - Emergency Preparedness
 - Tracking
 - Competency of persons

Environmental Exposure Limits for class 6 substances with toxic or ecotoxic properties are stated in the Hazardous Substances Regulations 2001:

- Acceptable daily exposure value or RfD value: regulations 11-21
- Potential daily exposure value: regulations 22-23
- TEL: regulations 24-28
- WESs: regulations 29-30

8.2.2.7 Requirements linked to the use of BAT

Concerning HSNO controls, there is flexibility on how to meet the requirements.

8.2.2.8 Responsible bodies

The Ministry for the Environment administered the HSNO Act to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms.

The Authority must keep and maintain a register of all exposure limits set under this Act for substances with toxic or ecotoxic properties. This register must specify the type of exposure limit, the value of the exposure limit, the hazardous substance that the exposure limit will apply to, and if the exposure limits applies to any element or compound making up the hazardous substance, the element or compound that the exposure limit will apply to.

Among other things, the Authority may advise the Minister on any matter relating to the purpose of the Act, monitor and review, keep registers relating to hazardous substances and new organisms as may be required by this Act or as may be necessary to administer this Act, and approve standards for containment facilities.

Enforcement officers may give advice and information on the provisions of this Act, promote and monitor compliance with the provisions of this Act, provide information to the Authority if requested to do

so by the Authority, and carry out any powers, functions, and duties conferred on enforcement officers by or under this Act.

One of the functions of the Environmental Protection Authority (EPA) (formerly the Environmental Risk Management Authority or ERMA New Zealand) is to assess and decide on applications to introduce hazardous substances or new organisms into New Zealand. This includes genetic modification of plants, animals and other living things in New Zealand.

8.2.2.9 Additional information

8.2.2.9.1 Additional Environmental Legislation

Besides the Resource Management Act and the Hazardous Substances & New Organisms Act, environmental legislation in New Zealand is:

- Climate Change Response Act 2002
- Ozone Layer Protection Act 1996
- Imports and Exports (Restrictions) Act 1988 and Prohibition Order (No 2) 2004
- Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012
- Antarctica (Environmental Protection) Act 1994
- Stockholm Convention National Implementation Plan

8.2.2.9.2 Health and Safety Legislation

- linked to the HSNO Act;
- came into force 4 April 2016;
- integrates regulation of workplace use of hazardous substances into workplace health and safety system
- major hazard facility regulations are developed (based on Seveso Directive).

8.3 Policies to prevent & control industrial emissions to water

8.3.1 Resource Management Act (RMA)

8.3.1.1 Description

The RMA promotes sustainable management of water as well as air and soil.

Among other topics, the RMA contains restrictions to water (section 14) as well as provisions relating to discharge of contaminants into the environment (section 15).

Under the RMA, local councils set plans for emissions to water and administer resource consents that permit pollutants to be emitted to water by industry. Various local councils choose to determine whether a resource consent application is successful or not, in part, based on its demonstrable technological potential.

Under the RMA, water is classified in 11 classes, depending on the contaminants in the water, the receiving water and the effect of any natural perturbations that may affect the water body.

Regional councils provides in a plan that certain waters are to be managed for any purpose described in respect of any of the classes and that includes rules about the quality of water in those waters.

8.3.1.2 Pollutants to which the policy applies

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances
- Chlorinated and brominated organic substances
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants

8.3.1.3 Sector / activities to which the policy applies

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

8.3.1.4 Technology-based approach

Local councils set plans for water emissions and administer resource consents that permit pollutants to be emitted into water by industry under the RMA. The consideration of technological potential may be part of issuing a resource consent and setting controls within this, but it is not stipulated in the Act itself.

8.3.1.4.1 National Emission Standards (NES)

No national emissions standards for emissions to water are in force under this Act. Besides the NES for air quality, the following standards are in force as regulations:

- National Environmental Standard for Sources of Drinking Water

- National Environmental Standards for Telecommunication Facilities
- National Environmental Standard for Electricity Transmission Activities
- National Environmental Standards for Assessing and Managing Contaminants in Soil to Protect Human Health

8.3.1.4.2 Environmental Quality Standards (EQS)

EQS for water are developed at regional level. Water quality guidelines have been prepared for water colour, clarity, undesirable biological growths.

8.3.1.4.3 National Policy Statement for Freshwater Management

The National Policy Statement for Freshwater Management provides direction about how local councils should carry out their responsibilities under the RMA for managing fresh water. It's particularly important for regional councils, as it directs them to consider specific matters and to meet certain requirements when they are developing regional plans for fresh water. There are no specific requirements in the Policy Statement to assess or improve the technological potential of polluters.

The NPS-FM entered into force in 2014 and must be fully implemented no later than 31 December 2025 (or 31 December 2030 in certain circumstances).

The Ministry for the Environment and the Ministry for Primary Industries provide guidance to support councils and other people involved in implementing the NPS-FM in their local communities.

8.3.1.5 Responsible bodies

The Ministry for the Environment promotes clean and healthy water for all New Zealanders by developing national policies and tools to maintain and, where necessary, to improve water quality.

Under the RMA, the Ministry provides national guidance for regional councils and unitary authorities to manage the water in their region. The Ministry does not have a formal enforcement role. This has been delegated to regional councils and unitary authorities.

Regional councils are required to set water permit conditions and to control water permits aiming to keep the community drinking water safe.

NES for drinking water sources complements the Ministry of Health legislation for improving drinking water supply and delivery to ensure a comprehensive approach to managing drinking water from source to tap.

8.3.2 Hazardous Substances and New Organisms Act (HSNO Act)

8.3.2.1 Description

The Act contains also provisions to set exposure limits for discharges to water of substances with toxic properties. These limits are generally set by the EPA at the national level at the time of the assessment and approval of the substance. They act as a restriction on the use of a substance but can also be applied to restrict methods of disposal.

There are 22 regulations under this Act covering a broad scope of controls including fireworks and other explosive controls, and the management, disposal, classification, packaging and transport of hazardous substances and new organisms.

8.3.2.2 *Pollutants to which the policy applies*

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances (Sulphur dioxide, Nitrogen dioxide, Carbon monoxide)
- Chlorinated and brominated organic substances
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants (Dust/PM10)

8.3.2.3 *Sector / activities to which the policy applies*

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

All use and the full lifecycle of hazardous substances are covered by the HSNO Act.

8.3.3 *Sustainable Dairying - Water Accord*

8.3.3.1 *Description*

The Water Accord is a set of national good management practice benchmarks set by the dairy industry, which are aimed at lifting environmental performance on dairy farms. The Water Accord sets out the dairy industry's commitment to New Zealand and improving water quality, and includes commitments to targeted riparian planting plans, effluent management, comprehensive standards for new dairy farms and measures to improve the efficiency of water and nutrient use on farms.

8.3.3.2 *Type of policy / Driving force for implementation*

The Water Act is a voluntary programme with the aim to strive to be good dairy industry ambassadors, while setting up a successful and sustainable business. The programme includes the following steps:

- *Information gathering*
 - District and regional council requirements,

- Dairy company requirements,
- Any other requirements which may be of influence (e.g. irrigation schemes),
- *Planning*
 - Farm goals, policies and procedures documents,
 - Layout and design of buildings, paddocks, raceways etc.,
 - Nutrient budgets, effluent, riparian, nutrient management and wintering plans,
- *Implementation*
 - Make a list of good practice actions, relevant and suitable for the particular farm and situation, and incorporate them into the conversion plan.

8.3.3.3 Sector / activities to which the policy applies

Intensive livestock production and aquaculture

8.3.3.4 Timing for implementation

The Water Accord was launched and first adopted in 2013.

8.3.3.5 Technology-based approach

In the context of the Water Accord, information about effluent, land, water and nutrient management on dairy farms is collected and national good practice benchmarks are defined. There are national good management practice benchmarks available for four different activities:

- Water use in the milking stable³⁷:
- Water reduction at the farm³⁸:
- Water monitoring and water meters³⁹:
- Irrigation systems⁴⁰:

Some of these good management practice benchmarks are based on technological potential.

8.3.3.6 Definition of BAT & criteria that underlie

Some of these good management practice benchmarks are based on technological potential, taking into account the relevant research, quality nutrient management advice and proven cost effective solutions.

8.3.3.7 Requirements linked to the use of BAT

Under the Water Accord, dairy farmers learn about farmer responsibilities for environmental, animal and people considerations, participating in the voluntary programme⁴¹.

³⁷ <http://www.dairynz.co.nz/environment/water-use/smart-water-use-in-the-milking-shed/>

³⁸ <http://www.dairynz.co.nz/environment/water-use/smart-water-use-on-the-farm/>

³⁹ <http://www.dairynz.co.nz/environment/water-use/water-meters-and-monitoring/>

⁴⁰ <http://www.dairynz.co.nz/environment/water-use/irrigation/>

⁴¹ <http://www.dairynz.co.nz/environment/responsible-dairy-conversions>

No information is available concerning environmental quality-based policies and practices or flexibility concerning the policies and practices under the Water Accord.

8.3.3.8 *Responsible bodies*

DairyNZ regional offices, consulting officers, and our Farmer Information Service are the responsible bodies for the Water Accord⁴².

The dairy industry is responsible for setting the national good management practice benchmarks.

8.4 Policies to prevent & control industrial emissions to soil

8.4.1 *Resource Management Act (RMA)*

8.4.1.1 *Pollutants to which the policy applies*

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances
- Chlorinated and brominated organic substances
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants (Sediment (National Environmental Standard for Plantation Forestry))

8.4.1.2 *Sector / activities to which the policy applies*

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

All industrial and agricultural activities that pollute land/soil are covered the Resource Management Act.

Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 came into force on 1 January 2012. It applies to any land contaminated with chemical contaminants (see Hazardous Industries and Activities List (HAIL))

⁴² <http://www.dairynz.co.nz/contact-us/>

8.4.1.3 Technology-based approach

Under the RMA, local councils set plans for emissions to soil/land and administer resource consents that permit pollutants to be emitted to soil/land by industry. Various local councils choose to determine whether a resource consent application is successful or not, in part, based on its demonstrable technological potential.

8.4.1.3.1 The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health

NES for Assessing and Managing Contaminants in Soil to Protect Human Health is one of the five standards that are in force as regulation.

The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health is a nationally consistent set of planning controls and soil contaminant values. It ensures that land already affected by contaminants and pollutants in soil is appropriately identified and assessed before it is developed - and if necessary the land is remediated or the contaminants contained to make the land safe for human use. Thus, the Standard does not specifically prevent or control contaminants and pollutants to soil, but recognizes that past use of contaminants and pollutants from industry and agriculture has in places within New Zealand left a legacy of soil contamination. There are no specific requirements in the Standard to assess or improve the technological potential of polluters.

Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 came into force on 1 January 2012 contains, among others, the following information:

- HAIL: Hazardous Activities and Industries List (Ministry for the Environment)
- 2 methods for land evaluation
- Methodology for Deriving Standards for Contaminants in Soil to Protect Human Health (Ministry for the Environment)
- Standards
 - Guideline value derived in accordance with the methods and guidance on site-specific risk assessment provided in the Methodology.
 - Soil contaminant standard for the priority contaminant of the exposure scenario adopted in the Methodology with greater assumed exposure than the actual exposure.
 - Guideline value for the protection of human health that is chosen in accordance with the current edition of Contaminated Land Management Guidelines No. 2–Hierarchy and Application in New Zealand of Environmental Guideline Values (Ministry for the Environment).
- List of permitted and controlled activities.

The users' guide 'National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health' explains the regulations and provides guidance to territorial and unitary authorities on implementing the NES.

8.4.1.3.2 National Environmental Standard for Plantation Forestry

The National Environmental Standard for Plantation Forestry is a proposed policy under the Resource Management Act. The intent of the proposed standard is to improve national consistency in local council plans relating to plantation forestry and includes proposed rules regarding soil erosion susceptibility. It is understood, that there are no specific requirements in the proposed Standard to assess or improve the technological potential of polluters.

8.4.1.3.3 Environmental Quality Standards (EQS)

Soil quality guidelines have been prepared for some substances to guide the clean-up of contaminated sites.

8.4.1.4 Responsible bodies

The Ministry for the Environment promotes clean and healthy soil for all New Zealanders by developing national policies and tools to maintain and, where necessary, to improve soil/land quality. Under the RMA, the Ministry provides national guidance for regional councils and unitary authorities to manage the soil/land in their region. The Ministry does not have a formal enforcement role. This has been delegated to regional councils and unitary authorities.

Concerning the proposed NES for Assessing and Managing Contaminants in Soil to Protect Human Health, The Minister received (a majority of) submissions (2010) from local government as well as from and industry, following workshops that were given to inform people.

Health-based values for specific contaminations are available for remediation of contaminated sites.

Concerning the NES for Plantation Forestry, the Government first proposed a National Environmental Standard for Plantation Forestry in 2010 as regulations under the RMA. The Ministry for the Environment consulted on a proposal in 2010 and a revised proposal in 2011. Feedback from submissions indicated that further development of the proposal was needed. The Ministry for Primary Industries has led that work since 2013 and recently sought views on the proposed NES.

8.4.1.5 Additional information

8.4.1.5.1 Tools

In addition, tools (e.g. OVERSEER⁴³) are available that support farmers and land-users to make more informed decisions about their nutrient use on-farm to improve performance and reduce losses to the environment.

The likely definition for the application of OVERSEER as a tool is the definition of Best Environmental Management Practice (BEMP). BEMP means the most effective way to implement the environmental management system by organisations in a relevant sector that can result in best environmental performance under given economic and technical conditions.

⁴³ software application that supports farmers and growers to make informed decisions about their nutrient use on-farm to improve performance and reduce losses to the environment (<http://overseer.org.nz/>)

8.4.2 *Hazardous Substances and New Organisms Act (HSNO Act)*

8.4.2.1 *Description*

Under this Act, there are provisions to set exposure limits for discharges to soil (or sediment) of substances with toxic and/or ecotoxic properties.

The exposure limits are set at the national level by the EPA generally at the time of the assessment and approval of the substance. They act as a restriction on the use of a substance but can also be applied to restrict methods of disposal. There are also corresponding provisions in regulations under the HSNO Act.

8.4.2.2 *Pollutants to which the policy applies*

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances (Sulphur dioxide, Nitrogen dioxide, Carbon monoxide)
- Chlorinated and brominated organic substances
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Other pollutants (Dust/PM10)

8.4.2.3 *Sector / activities to which the policy applies*

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

All use and the full lifecycle of hazardous substances are covered by the HSNO Act.

8.5 **References**

- DairyNZ (2013). Sustainable Dairying: Water Accord. <http://www.dairynz.co.nz/environment/in-your-region/sustainable-dairying-water-accord/>.
- Government of New Zealand - Ministry of the Environment. About exceptional circumstances and how to apply. <http://www.mfe.govt.nz/air/national-environmental-standards-air-quality/exceptional-circumstances-and-applying>.

- Government of New Zealand - Ministry of the Environment. About the National Environmental Standard for Sources of Human Drinking Water <http://www.mfe.govt.nz/fresh-water/reform-programme/sources-drinking-water-nes/about-standard>.
- Government of New Zealand - Ministry of the Environment. An everyday guide to the RMA: Applying for a resource consent. <http://www.mfe.govt.nz/publications/rma/everyday-guide-rma-applying-resource-consent>.
- Government of new Zealand - Ministry of the Environment. National environmental standards. <http://www.mfe.govt.nz/rma/rma-legislative-tools/national-environmental-standards>.
- Government of New Zealand - Ministry of the Environment. National Environmental Standards for Air Quality. <http://www.mfe.govt.nz/air/national-environmental-standards-air-quality/about-nes>.
- Government of New Zealand - Ministry of the Environment. National Policy Statement for Freshwater Management. <http://www.mfe.govt.nz/fresh-water/freshwater-management-nps>.
- Government of new Zealand - Ministry of the Environment. Schedule 3 Water quality classes - RMA. http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM241596.html?search=ta_act_R_ac%40ainf%40anif_an%40bn%40rn_25_a&p=5%20-%20DLM241596.
- Government of New Zealand - Ministry of the Environment (1996). Hazardous Substances and New Organisms Act. <http://www.mfe.govt.nz/more/acts-and-regulations/hsno-act-1996>.
- Government of New Zealand - Ministry of the Environment (2011). users' guide to the revised National Environmental Standards for Air Quality: Updated 2014. <http://www.mfe.govt.nz/publications/rma-air/2011-users-guide-revised-national-environmental-standards-air-quality-updated>.
- Government of New Zealand - Ministry of the Environment (2014). Guidance on implementing the National Policy Statement for Freshwater Management. <http://www.mfe.govt.nz/fresh-water/national-policy-statement-freshwater-management/implementing-nps>.
- Government of New Zealand (1991). Resource Management Act.
- Government of New Zealand (1991). Resource Management Act - Reprint as at 5 July 2016. http://www.legislation.govt.nz/act/public/1991/0069/latest/DLM230265.html?search=ta_act_R_ac%40ainf%40anif_an%40bn%40rn_25_a&p=5.
- Government of New Zealand (1996). Hazardous Substances and New Organisms Act - Reprint as at 18 October 2016.
- Government of New Zealand (2001). Hazardous Substances (Classes 6, 8, and 9 Controls) Regulations - Reprint as at 1 March 2016.
- Government of New Zealand (2012). Users' guide: National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health.
- Government of New Zealand (2014). National Policy Statement for Freshwater Management.

- New Zealand Government - Environmental Protection Agency - Te Mana Rauhi Taiao (2011). Methyl bromide fumigations - Post-reassessment guidance for fumigators - Technicam Guide.

9 CONCLUSIONS

Table 3 provides an overview at a glance of the policies and practices that envisage prevention and control of industrial emissions to air, water or soil in the 7 OECD Member and Partner Countries under study, namely United States, Europe, India, People's Republic of China, Japan, Russian Federation, and New Zealand.

The table also indicates whether these policies and practices are considered to be technology-based or not. It also provides the definition of the technology-based concept (e.g. Best Available Techniques), if any, its underlying criteria, and the sectors/activities and the type of installation to which it applies.

Referring to the project request, no assessment, nor comparison of policies and practices was made. And thus no "best concept" was selected. However, we can draw some general conclusions from the survey:

- Policies to prevent and control industrial emissions often propose a technology-based approach (BAT or similar concept), whether or not combined with an approach based on environmental quality objectives (EQO concept).
- For prevention and control of emissions to air and water, there is often a hierarchy of general legislation supported by specific legislation. For the prevention and control of emissions to soil/land however, there is often no specific legislation, only general legislation.
- The technology-based approach is not always (clearly) defined (if there is already one). Underlying criteria might be referred to in legislation explicitly, however practice might be different. It is not always clear if, and to what extent the criteria are taken into account when selecting techniques as "advanced techniques" and determining associated emission values.

Table 3. Table 4: BAT or similar concepts in OECD Member and Partner Countries

COUNTRY	Technology-based requirements?	Required by ...	Definition & Criteria that underlie	Sectors / Activities & Type of installations
United States				
➤ General	Yes	Pollution Prevention Act (PPA)	<p>This Act is focusing on industry, government, and public attention to reduce the amount of pollution via cost-effective changes in production, operation, and raw materials use. Pollution prevention includes practices that increase efficiency in the use of energy, water, or other natural resources, and protect our resource base through conservation.</p> <p>Source reduction refers to practices reducing hazardous substances from being released into the environment prior to recycling, treatment or disposal. It includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control.</p> <p><i>Best demonstrated available technology (BDAT)</i> Most effective commercially available means of treating specific types of hazardous waste.</p>	<p>Generally applicable</p> <p>Sources: stationary</p>
➤ Air	Yes	Clean Air Act (CAA)	<p>National Ambient Quality Standards 1. <i>New sources (new, modified and reconstructed):</i> <i>Best available control technology (BACT)</i></p>	<p>Generally applicable</p> <p>Sources: stationary</p>

			<p>An emissions limitation for major new or modified stationary emission sources in attainment/clean areas, based on the maximum degree of reduction of air pollutants achievable determined by the permitting authority on a case by case basis, taking into account energy environmental and economic factors, through application of add-on control equipment or changes in production processes and available methods, systems, and techniques.</p> <p><i>Lowest achievable emissions rate (LAER)</i></p> <p>An emissions limitation for major new or modified stationary sources in areas not meeting the NAAQS (non-attainment areas), based on the most stringent emission limitation which is contained in the implementation plan of any State for such class or category of source, or the most stringent emission limitation achieved in practice by such class or category of source. It is determined by the permitting authority on a case-by-case basis.</p> <p><i>New Source Performance Standards (NSPS)</i></p>	
--	--	--	---	--

			<p>National emission standards for categories of new, modified and reconstructed stationary sources reflecting the degree of emission limitation achievable through the application of the best system of emission reduction which it determines to be adequately demonstrated, taking into account the cost of such reduction and any nonair quality health and environmental impact and energy requirements.</p> <p><i>2. Existing sources:</i> <i>Reasonably available control technology (RACT)</i> Emissions limitations for existing stationary sources, applied by states in areas that are in non-attainment with the NAAQS, designed to be technology forcing, considering cost and feasibility of implementation.</p> <p><i>National Emission Standards for Hazardous Air Pollutants</i> <i>Maximum Achievable Control Technology (MACT)</i> Technology-based standards applied to major new and existing sources of hazardous air pollutants, representing the maximum degree of reduction in emission taking into consideration the costs of achieving such emission reduction and any non-air health and</p>	
--	--	--	--	--

			environmental impacts and energy requirements. They typically are in the form of emissions limit. The standards are set by EPA and apply nationally.	
➤ Water (1)	Yes	Clean Water Act (CWA)	<p><i>1. Existing sources - Direct Dischargers:</i></p> <p><i>Best Practicable Control Technology Currently Available (BPT)</i> Technology-based standards applied for priority, conventional as well as nonconventional pollutants taking into account the total cost of application of technology in relation to the effluent reduction benefits to be achieved as well as the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements).</p> <p><i>Best Conventional Pollutant Control Technology (BCT)</i> Technology-based standards applied for conventional pollutants taking into account the reasonableness of the relationship between the costs of attaining a reduction in effluents and the effluent reduction benefits derived as well as the comparison of the cost and level of reduction of such</p>	<p>Applicable to waste water treatment plants, industrial process water, and cooling water and in some cases industrial storm water</p> <p>Sources: stationary</p> <p>Thresholds linked to the:</p> <ul style="list-style-type: none"> - Severity of pollution - Area - Size of installation

			<p>pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources, and the age of equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements)..</p> <p><i>Best Available Technology (Economically Achievable) (BAT(EA))</i> Technology-based standards applied for priority as well as nonconventional pollutants. This level of control is generally described as the best technology currently in use and includes controls on toxic pollutants.</p> <p><i>2. Existing sources - Indirect Dischargers: Categorical Pretreatment Standards for Existing Sources (PSES)</i> Technology-based standards applied for priority as well as nonconventional pollutants, issued to existing industrial users contributing wastes to municipal waste water treatment plants, developed in conjunction with the effluent guidelines program.</p>	
--	--	--	--	--

			<p>3. <i>New /modified Sources - Direct Dischargers:</i> <i>New Source Performance Standards (NSPS)</i> Technology-based effluent standards applied for priority, conventional as well as nonconventional pollutants which limit the amount of pollution allowed from new sources or from modified existing sources.</p> <p>4. <i>New /modified Sources - Indirect Dischargers:</i> <i>Categorical Pretreatment Standards for Existing Sources (PSNS)</i> Technology-based standards applied for priority as well as nonconventional pollutants, issued to new industrial users contributing wastes to municipal waste water treatment plants, developed in conjunction with the effluent guidelines program.</p>	
➤ Water (2)	Yes	Safe Drinking Water Act (SDWA)	<p>National Primary Drinking Water Regulations (NPDWR)</p> <p><i>Primary standards</i> Technology-based standards and treatment techniques that apply to public water systems aimed to protect public health by limiting the levels of contaminants in drinking water, taking into account a detailed risk and cost assessment.</p>	<p>Generally applicable</p> <p>Sources: stationary</p>
➤ Soil	Yes	Pollution Prevention Act	See row 'general'	Applicable to any activity that releases any hazardous

		(PPA)		<p>substance, pollutant, or contaminants into the environment prior to recycling, treatment or disposal</p> <p>Sources: stationary</p>
Europe				
➤ General (1)	Yes	Industrial Emissions Directive (IED)	<p>Installations must prevent and control industrial emission by applying the <i>best available techniques (BATs)</i>, efficient energy use, waste prevention and management and measures to prevent accidents and limit their consequences.</p> <p><i>Best available technique (BAT)</i> The most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole: (a) ‘techniques’ includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned; (b) ‘available techniques’ means those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the</p>	<p>Applicable to industrial installations operating one or more activities listed in Annex I of the IED and, where applicable, reaching the capacity thresholds set out in that Annex</p> <p>Sources: various industrial (stationary) sources, with a major pollution potential</p> <p>Thresholds linked to e.g.:</p> <ul style="list-style-type: none"> - Capacity - Input - Total rated thermal input

			costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator; (c) 'best' means most effective in achieving a high general level of protection of the environment as a whole.	
➤ General (2)	Yes	EMAS Regulation (EMAS III)	<i>Best environmental management practice (BEMP)</i> The most effective way to implement the environmental management system by organisations in a relevant sector and that can result in best environmental performance under given economic and technical conditions.	Applicable to all organisations regardless of size, type or sector Sources: stationary
➤ Air (1)		Medium Combustion Plant (MCP) Directive	Foresees <i>technology-based</i> emission standards for MCPs. Reference is made to <i>Best available and emerging techniques (BAT) and state-of-the-art technologies</i> in assessing the need to apply stricter emission standards to comply with air quality standards, to amend emission standards for new combustion plants and to set emission standards for other pollutants and minimum energy efficiency standards. Concept is not defined.	Applicable to MCP (combustion plants with a rated thermal input equal to or greater than 1 megawatt (MWth) and less than 50 MWth) Sources: stationary Treshold linked to total rated thermal input
➤ Air (2)		Directive on Stage I PVR	Foresees <i>technology-based</i> emission standards, and technical provisions for storage installations at terminals, loading and unloading installations at terminals, mobile	Applicable to storage of petrol at terminals and distribution to service stations (refineries, combustion plants, etc.)

			containers, loading installations at service stations. <i>No reference</i> is made to BAT or similar concept.	Sources: stationary & mobile
➤ Water			See row 'general (1)' and 'general (2)'	
➤ Soil			See row 'general (1)' and 'general (2)'	
India				
➤ General	n.a.	Environmental (Protection) Act (EPA)	The Act give the general powers of the central government to take measures to protect and improve the environment, including water, air and land and the inter- relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property. Besides standards for emission or discharge of environmental pollutants from the industries, processes or operations and general standards for discharge of effluents, the Act includes provisions on ambient air quality standards in respect of noise and standards for emission of smoke, vapour etc. from motor vehicles.	Generally applicable Sources: stationary
➤ Air	Yes	Air (Prevention and Control of Pollution) Act	<i>Minimal National Standards (MINAS)</i> Effluent standards achievable by the industry by installing pollution control measures which are within the techno-economic capability of the industry.	Applicable to 104 sectors/activities of schedule I of the Act Sources: stationary
➤ Water	Yes	Water (Prevention and Control of Pollution) Act	See row 'general'	Generally applicable Sources: stationary
➤ Soil	n.a.	Environmental (Protection) Act	See row 'general'	Generally applicable

		(EPA)		Sources: stationary
People's Republic of China				
➤ General	Yes	Environmental Protection Law	The Environmental Protection Law introduces two types of national standards: environmental quality (ambient) standards and discharge/emission standards. Quality standards are maximum are defined as allowable concentrations of pollutants in water, air or soil. Emission or discharge standards are defined as maximum allowable concentrations of pollutants in industrial emissions or discharges. See row 'air' and 'water'	Generally applicable Sources: stationary & mobile
➤ Air	Yes	Atmospheric Pollution Prevention and Control Law	The Law foresees emissions standards. National standards are defined taking into account national quality standards and national economic and <i>technological</i> conditions. The Law encourages and supports implementation of <i>advanced, clean technologies</i> and elimination of <i>backward techniques and equipment</i> . <i>No reference</i> is made to BAT or similar concept.	Generally applicable Sources: stationary & mobile
➤ Water	Yes	Law on prevention and control of water pollution	The Law foresees discharge standards. National standards are defined taking into account national quality standards and	Generally applicable Sources: stationary

			<p>national economic and <i>technological</i> conditions.</p> <p>The Law encourages and supports implementation of <i>advanced, clean technologies</i> and elimination of <i>backward techniques and equipment</i>.</p> <p><i>No reference</i> is made to BAT or similar concept.</p>	
➤ Soil	No	-	-	-
Japan				
➤ General	No	Basic Environmental Law	<p>The Law provides the basic national policy concerning the environment and is based on the following three basic principles of environmental policy:</p> <ul style="list-style-type: none"> • The blessings of the environment should be enjoyed by the present generation and succeeded to the future generation, • A sustainable society should be created where environmental loads by human activities are minimized, • Japan should contribute actively to global environmental conservation through international cooperation. <p><i>Remark</i> The pollution prevention policy does not contain a definition of BAT and no official references are made to BAT or similar concepts.</p>	<p>Generally applicable</p> <p>Sources: stationary</p>
➤ Air	No	Air Pollution	Regulation on Soot and Smokes	Generally applicable to any

		Control Law	<p><i>Emission standards (emission concentrations)</i> Discharge standards that are maximum permissible limits for each type and size of facility, for the following parameters: SO_x, soot and dust, harmful substances (such as Cd(-compounds), Cl₂, HCl, F, HF, Pb(-compounds), NO_x, dust, asbestos, specific substances (for example ammonia, CO, methanol), hazardous air pollutants, benzene, trichloroethylene, tetrachloroethylene and dioxins.</p> <p>For areas where air pollution has or is likely to exceed the limits, <i>special standards</i> which are stricter can be set. Further more stringent <i>prefectural emission standards</i> can be set in areas where national emission standards might be insufficient to protect human health or living conditions. Finally for specific large-scale factories, <i>standards for controlling total emissions</i> can be set that prescribe maximum limits.</p> <p><i>Remark</i> Although there are no systematic rules for setting emission standards in Japan, BAT may be one of the considerations. The Air Pollution Control Act does not contain a definition of BAT and no official references to BAT or similar concepts are made.</p>	<p>factory that generates a certain level of soot and smoke (the facility is defined by size)</p> <p>Sources: stationary</p>
➤ Water	No	Water Pollution Control Law	<p>The water pollution control is regulated by three methods, controlling:</p> <ul style="list-style-type: none"> • Pollutant concentration of wastewater (Effluent Standards), 	<p>Generally applicable to any factory that has a facility which discharges polluted water</p>

			<ul style="list-style-type: none"> • Pollutant concentration in water bodies (Environmental Quality Standards), • The pollutant of wastewater in volume (Total Pollutant Load Regulation). <p><i>Remark</i> Although there are no systematic rules for setting standards for water emissions in Japan, BAT may be one of the considerations. The Water Pollution Control Law does not contain a definition of BAT and no official references to BAT or similar concepts are made.</p>	Sources: stationary
➤ Soil	No	see Water Pollution Control Act (WPCA)	See row 'water'	Generally applicable to any factory that has a facility which discharges polluted water Sources: stationary
Russian Federation				
➤ General	Yes	Federal Law On Environmental Protection	<p>Installations must prevent and control industrial emission by applying the <i>best available technology (BATs)</i>.</p> <p><i>Best available technology (BAT)</i> A technology of products (goods) production, services and works determined on the basis of modern scientific and technical achievements and on the combination of environmental objectives under the condition of their technical applicability.</p> <p>Criteria to determine best available techniques</p>	Generally applicable Sources: stationary & mobile

			are: <ul style="list-style-type: none"> • Minimum environmental exposure per unit time, or volume of production; • Economic efficiency; • Application of resource and energy saving methods; • Period of their installation; • Utilization of technique in two or more installations which provide negative environmental exposure. 	
➤ Air	Yes	Federal Law on the Protection of the Atmospheric Air	See row 'general'	Generally applicable Sources: stationary & mobile
➤ Water	Yes	Water Code	See row 'general'	Generally applicable Sources: stationary
➤ Soil (1)	Yes	Federal Law on Industrial and Consumer Waste	See row 'general'	Generally applicable Sources: stationary
➤ Soil (2)	Yes	Land Code	See row 'general'	Generally applicable Sources: stationary
New-Zealand				
➤ General (1)	Yes	Resource Management Act (RMA)	<i>National Environmental Standards</i> Technical standards, methods, or requirements concerning contaminants, air quality, water quality, level, or flow, soil quality in relation to the discharge of contaminants, any discharge or the ambient environment, monitoring, and implementing of / exemptions from / transitional provisions for standards.	Generally applicable Sources: stationary

			<p><i>Best Practical Option (BPO)</i></p> <p>In relation to a discharge of a contaminant or an emission of noise, the best method for preventing or minimising the adverse effects on the environment having regard among other things to</p> <p>a. The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and</p> <p>b. The financial implication, and the effects on the environment, of that option when compared with other options; and</p> <p>c. The current state of technical knowledge and the likelihood that the option can be successfully applied.</p> <p>A BPO is determined for each facility and is applied as a requirement for plant managers to be implemented. Permits do not mention technologies, except those the plant operator plans to implement in the plant. The BPO in permits can expressed as treatment technologies, operating practices or performances standards.</p>	
➤ General (2)	No	Hazardous Substances and New Organisms Act (HSNO)	The purpose of the HSNO Act is to protect the environment, and the health and safety of people and communities, by preventing or managing the adverse effects of hazardous substances and new organisms.	Generally applicable Sources: stationary
➤ Air (1)	Yes	Resource Management Act (RMA)	See row 'general (1)' <i>NES for Air Quality.</i>	Generally applicable Sources: stationary

➤ Air (2)	No	Hazardous Substances and New Organisms Act (HSNO)	See row 'general (2)'	Generally applicable Sources: stationary
➤ Water (1)	Yes	Resource Management Act (RMA)	See row 'general (1)' <i>No NES for emissions to water.</i> <i>NES for Sources of Drinking Water.</i>	Generally applicable Sources: stationary
➤ Water (2)	No	Hazardous Substances and New Organisms Act (HSNO)	See row 'general (2)'	Generally applicable Sources: stationary
➤ Water (3)	Yes	Sustainable Dairing – Water Accord	A set of national good management practice benchmarks set by the dairy industry, which are aimed at lifting environmental performance on dairy farms. Some of these good management practice benchmarks are based on technological potential, taking into account the relevant research, quality nutrient management advice and proven cost effective solutions. The Water Accord sets out the dairy industry's commitment to New Zealand and improving water quality, and includes commitments to targeted riparian planting plans, effluent management, comprehensive standards for new dairy farms and measures to improve the efficiency of water and nutrient use on farms.	Applicable to the dairy sector Sources: stationary
➤ Soil	Yes	Resource Management Act (RMA)	See row 'general (1)' <i>NES for Assessing and Managing</i>	Generally applicable Sources: stationary

ENV/JM/MONO(2017)12

			<i>Contaminants in Soil to Protect Human Health.</i>	
			<i>NES for Plantation Forestry.</i>	

n.a.: not available.

**ANNEX I: SURVEY ON POLICIES AND PRACTICES TO PREVENT AND CONTROL
INDUSTRIAL EMISSIONS OF POLLUTANTS**

**OECD Survey on policies and practices to prevent and control industrial emissions of
pollutants**

13 May 2016

We thank you for filling in this survey (estimated time required: 10 minutes). Please send it back to the OECD Secretariat by 26 May 2016.

Scope of the Survey:

As a part of the OECD Best Available Techniques (BAT) project⁴⁴, the OECD would like to collect,

- 1) information on policies and practices (both mandatory and voluntary) that aim to prevent and control industrial emissions of pollutants⁴⁵ to air, water and soil, and
- 2) *Especially* information on an assessment of the technological potential that are incorporated in the policies and practices (e.g. BAT⁴⁶).

The outputs will be compiled and presented to the OECD Expert Group of BAT, as well as discussed at the workshop in late 2016.

SECTION 1: CONTACT INFORMATION

Organization

Name:

.....

Country:

.....

Contact person

Name:

.....

E-mail:

.....

Phone number:

.....

⁴⁴ ENV/JM(2016)14.

⁴⁵ Mainly focus on chemical pollutants, but not excluding GHG and SO_x, NO_x, CO and PM.

⁴⁶ Examples of concepts such as BAT which are based on assessing technological potential are listed in Annex I.

SECTION 2: INFORMATION ON POLICIES AND PRACTICES TO PREVENT AND CONTROL INDUSTRIAL EMISSIONS

1. Policies on emission control to AIR

Q1. Please provide information on policies and practices that aim to prevent and control industrial emissions of pollutants to air.

- For policies that incorporate the standards or criteria based on an assessment of technological potential, please check "Yes" in the column. If not, please check "No".

	Name of Policies	Technological potential
1		Yes/No
2		Yes/No
3		Yes/No

(Please add table rows if needed)

Q2. Please provide information on the policy (see paragraph A). If there are two or more, please provide information on each of them.

2. Policies on emission control to WATER

Q3. Please provide information on policies and practices that aim to prevent and control industrial emissions of pollutants to water.

- For policies that address emissions to all environmental media in an integrated manner, please check "Yes" in the column. And please go to Q5.

	Name of Policies	Same policy as for air	Technological potential
1			Yes/No
2			Yes/No
3			Yes/No

(Please add table rows if needed)

Q4. Please provide information on the policy (see paragraph B). If there are two or more, please provide information on each of them.

3. Policies on emission control to SOIL

Q5. Please provide information on policies and practices that aim to prevent and control industrial emissions of pollutants to soil.

- For policies that address emissions to all environmental media in an integrated manner, please check "Yes" in the column. And please skip Q6.

	Name of Policies	Same policy as for air or water	Technological potential
1			Yes/No
2			Yes/No
3			Yes/No

(Please add table rows if needed)

Q6. Please provide information on the policy (see paragraph C). If there are two or more, please provide information on each of them.

A. Prevention and control of industrial emissions to AIR

a) Please provide the name of the policy

.....
.....

b) Please provide references to the policy (website, link to documentation)

.....
.....

c) What is the type of policy⁴⁷⁴⁸?

- Command and control
- Economic instruments
- Liability, damage compensation
- Education and information
- Voluntary approaches
- Management and planning
- Assessment instruments

d) To which pollutants/chemicals does it apply⁴⁹?

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances
- Chlorinated and brominated organic substances
- Ozone depleting substances
- Greenhouse gases (GHGs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Sulphur Dioxide, Nitrogen Oxides, Carbon Monoxide, Dust

e) To which sectors/activities does it apply?

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management

⁴⁷ Examples of the different types of drivers can be found in Annex II.

⁴⁸ Source: Greening development: Enhancing capacity for environmental management and governance, COM/ENV/EPOC/DCD/DAC(2011)1/FINAL, Organisation for Economic Co-operation and Development, 24-Jan-2012.

⁴⁹ PRTR harmonised list of chemicals:
[http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono\(2014\)32&doclanguage=en](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2014)32&doclanguage=en).

- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

.....
.....

f) What is the timing for implementation?

- Applicable since
- Applicable from
- Not known

g) If the policy incorporates the standards or criteria based on an assessment of technological potential,

i) what is the definition of the concept (e.g. BAT)?

.....
.....
.....
.....

ii) what criteria are the basis of the concept (production and technology factors, economic factors, socio-political factors, etc.)?

.....
.....
.....
.....

h) Additional information

Please feel free to add below additional information on the policies and practices that you consider relevant in the light of Activity I (e.g. on information gathering on advanced techniques (so-called “candidate BAT”), process to identify techniques as BAT, or coverage of the policy such as waste management, water reuse or energy).

.....
.....
.....
.....
.....
.....

B. Prevention and control of industrial emissions to WATER

a) Please provide the name of the policy

.....
.....

b) Please provide references to the policy (website, link to documentation)

.....
.....

c) What is the type of policy?

- Command and control
- Economic instruments
- Liability, damage compensation
- Education and information
- Voluntary approaches
- Management and planning
- Assessment instruments

d) To which pollutants/chemicals does it apply?

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances
- Chlorinated and brominated organic substances
- Ozone depleting substances
- Greenhouse gases (GHGs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Sulphur Dioxide, Nitrogen Oxides, Carbon Monoxide, Dust

e) To which sectors/activities does it apply?

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

.....
.....

f) What is the timing for implementation?

- Applicable since
- Applicable from
- Not known

g) If the policy incorporates the standards or criteria based on an assessment of technological potential,

i) what is the definition of the concept (e.g. BAT)?

.....
.....
.....
.....

ii) what criteria are the basis of the concept (production and technology factors, economic factors, socio-political factors, etc.)?

.....
.....
.....
.....

h) Additional information

Please feel free to add below additional information on the policies and practices that you consider relevant in the light of Activity I (e.g. on information gathering on advanced techniques (so-called “candidate BAT”), process to identify techniques as BAT, or coverage of the policy such as waste management, water reuse or energy)..

.....
.....
.....
.....
.....
.....
.....
.....

C. Prevention and control of industrial emissions to SOIL

a) Please provide the name of the policy

.....
.....

b) Please provide references to the policy (website, link to documentation)

.....
.....

c) What is the type of policy?

- Command and control
- Economic instruments
- Liability, damage compensation
- Education and information
- Voluntary approaches
- Management and planning
- Assessment instruments

d) To which pollutants/chemicals does it apply?

- Persistent Organic Pollutants (POPs)
- Heavy metals
- Inorganic substances
- Chlorinated and brominated organic substances
- Ozone depleting substances
- Greenhouse gases (GHGs)
- Polycyclic aromatic hydrocarbons (PAHs)
- Other organic substances
- Active substances of plant protection products or biocidal products
- Colors and dyes
- Active pharmaceutical ingredients (API)
- Non-grouped organic substances
- Sulphur Dioxide, Nitrogen Oxides, Carbon Monoxide, Dust

e) To which sectors/activities does it apply?

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Wastewater management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

.....
.....

f) What is the timing for implementation?

- Applicable since
- Applicable from
- Not known

g) If the policy incorporates the standards or criteria based on an assessment of technological potential,

i) what is the definition of the concept (e.g. BAT)?

.....
.....
.....

ii) what criteria are the basis of the concept (production and technology factors, economic factors, socio-political factors, etc.)?

.....
.....
.....

h) Additional information

Please feel free to add below additional information on the policies and practices that you consider relevant in the light of Activity I (e.g. on information gathering on advanced techniques (so-called “candidate BAT”), process to identify techniques as BAT, or coverage of the policy such as waste management, water reuse or energy).

.....
.....
.....
.....
.....
.....

APPENDIX: WORLD BANK GROUP ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES

The International Finance Corporation under the World Bank Group has developed the Environmental, Health, and Safety Guidelines, known as the "EHS Guidelines". Although this is out of the scope of Activity 1, the Appendix provides general information.

Overview

The EHS Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP), as defined in IFC's Performance Standard 3: Resource Efficiency and Pollution Prevention. IFC uses the EHS Guidelines as a technical source of information during project appraisal activities, as described in IFC's Environmental and Social Review Procedures Manual.

The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology. For IFC-financed projects, application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets with an appropriate timetable for achieving them. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if acceptable to IFC, become project or site-specific requirements.

There is a total of 63 guidelines; one general guidelines and 62 industry sector guidelines covering Forestry, Agribusiness, Food Production, Chemicals, Oil and Gas, Infrastructures, Manufacturing, Mining, and Energy. The general guidelines are designed to be used together with the relevant industry sector guidelines which provide guidance to users on EHS issues in specific industry sectors.

A complete list of industry sector guidelines can be found at: www.ifc.org/ehsguidelines.

General Guidelines

The general guideline provides a cross-cutting environmental, health and safety issues which could be applicable to all sectors. The General EHS Guidelines are organized as follows:

1. Environmental; Air Emissions and Ambient Air Quality, Energy Conservation, Wastewater and Ambient Water Quality, Water Conservation, Hazardous Materials Management, Waste Management, Noise and Contaminated Land
2. Occupational Health and Safety; General Facility Design and Operation, Communication and Training, Physical Hazards, Chemical Hazards, Biological Hazards, Radiological Hazards, Personal Protective Equipment (PPE), Special Hazard Environments and Monitoring
3. Community Health and Safety; Water Quality and Availability, Structural Safety of Project Infrastructure, Life and Fire Safety (L&FS), Traffic Safety, Transport of Hazardous Materials, Disease Prevention and Emergency Preparedness and Response
4. Construction and Decommissioning; Environment, Occupational Health and Safety and Community Health and Safety

This guideline complements the industry-specific emissions guidance by providing information about common techniques for emissions management that may be applied to a range of industry sectors. The guideline provides an approach to the management of significant sources of emissions, including specific guidance for assessment and monitoring of impacts. It is also intended to provide additional information on approaches to emissions management in projects located in areas of poor air quality, where it may be necessary to establish project-specific emissions standards.

Industry Sector Guidelines

The industry sector guideline provides information on industry specific impacts and management, performance indicators and monitoring (including benchmarks for emissions and wastewater), and cross-referencing of general guidelines and other sectors. The Industry sector guidelines cover following sectors;

1. Agribusiness / Food Production; Annual Crop Production, Aquaculture, Breweries, Dairy Processing, Fish Processing, Food and Beverage Processing, Mammalian Livestock Production, Meat Processing, Perennial Crop Production, Poultry Processing, Poultry Production, Sugar Manufacturing, Vegetable Oil Production and Processing
2. Chemicals: Coal Processing, Large Volume Inorganic Compounds Manufacturing and Coal Tar Distillation, Large Volume Petroleum-based Organic Chemicals Manufacturing, Natural Gas Processing, Nitrogenous Fertilizer Manufacturing, Oleochemicals Manufacturing, Pesticides Formulation, Manufacturing and Packaging, Petroleum Refining, Petroleum-based Polymers Manufacturing, Pharmaceuticals and Biotechnology Manufacturing, Phosphate Fertilizer Manufacturing
3. Forestry: Board and Particle-based Products, Forest Harvesting Operations, Pulp and Paper Mills, Sawmilling and Wood-based Products
4. General Manufacturing; Base Metal Smelting and Refining, Cement and Lime Manufacturing, Ceramic Tile and Sanitary Ware Manufacturing, Construction Materials Extraction, Foundries, Glass Manufacturing, Integrated Steel Mills, Metal, Plastic, Rubber Products Manufacturing
5. Printing, Semiconductors and Electronics Manufacturing, Tanning and Leather Finishing, Textiles Manufacturing
6. Infrastructure: Airlines, Airports, Crude Oil and Petroleum Product Terminals, Gas Distribution Systems, Health Care Facilities, Ports, Harbors and Terminals, Railways, Retail Petroleum Networks, Shipping, Telecommunications, Toll Roads, Tourism and Hospitality Development, Waste Management Facilities, Water and Sanitation
7. Mining
8. Oil and Gas; Liquefied Natural Gas (LNG) Facilities, Offshore Oil and Gas Development, Onshore Oil and Gas Development
9. Power: Electric Power Transmission and Distribution, Geothermal Power Generation, Thermal Power, Wind Energy
10. Occupational Health and Safety; General Facility Design and Operation, Communication and Training, Physical Hazards, Chemical Hazards, Biological Hazards, Radiological Hazards, Personal Protective Equipment (PPE), Special Hazard Environments and Monitoring, Community Health and Safety; Water Quality and Availability, Structural Safety of Project

Infrastructure, Life and Fire Safety (L&FS), Traffic Safety, Transport of Hazardous Materials,
Disease Prevention and Emergency Preparedness and Response