Applying best available techniques and best environmental practices to preserve ecosystem services

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Abstract. The study offers an analysis of two concepts used for reducing negative environmental impact: best available techniques and best environmental practices. The concept of best available techniques has been widely used for a long time and has proven to be an effective tool for implementing various regulatory mechanisms. Best environmental practices, on the other hand, have not been known for very long and their application is not yet widespread. Best environmental practices are only applied voluntarily; this fact distinguishes them from best available techniques which in most cases are regulated by legal acts. However, it would be a mistake to assume that best environmental practices are not particularly important within the framework of environmental regulation. On the contrary, their role is increasing, because any additional tools can not only help modernise industrial manufacturing processes, but also improve the image of the enterprise. The relevance of the study stems from the need to find solutions to preserve and restore ecosystem services. The concepts in question can serve as a framework for preventing further degradation of ecosystem services. The study has reviewed normative legal acts of the Russian Federation along with papers and monographs by researchers or experts in the field.

1. The Concept of Best Available Techniques

The concept of best available techniques (hereinafter, BAT) has been globally known for more than 50 years and has been a basis for industrial regulation in most developed countries [1].

The term ‘BAT’ was introduced into the Russian legal framework in connection with the adoption of the Russian Federal Law No. 219-FZ dated 21.07.2014 “On Amendments to the Federal Law On Environmental Protection and Certain Legislative Acts of the Russian Federation" [2]. According to the above, BAT is a feasible technique for manufacturing products / goods, performing work, or rendering services, based on modern scientific and technological achievements and the best combination of criteria for achieving environmental protection goals [3]. The adoption of these legislative amendments has closed the existing gap and made the terminology consistent, as the terms "best achieved techniques", "best existing techniques", "best environmentally safe techniques", etc. had also been used in various normative acts [4].

Yet, one cannot claim with certainty that the above definition fully reflects the specifics of BAT. D.O. Skobelev suggests interpreting BAT as a set of technological, technical, and managerial solutions

ensuring high resource and energy efficiency of industrial production while minimising the negative environmental impact [5]. This definition, although a broader one, is a scientifically more accurate way of defining BAT.

One can say that the BAT concept is a universal mechanism for stimulating modernisation of industrial production, and best available techniques reference documents (hereinafter referred to as BREF(s)) are one of the tools used in addressing this goal. Usually, a BREF will contain an overview of the respective economic sector, an assessment of the sector's technological condition, characterisation of resource and environmental efficiency, and a description of the solutions which are recognised as the best available ones by the date a certain BREF has been drawn up.

The term 'BAT' was first used in Council Directive 96/61/EC concerning Integrated Pollution Prevention and Control (IPPC Directive) [6]. Early BREFs prepared by the European IPPC Bureau [7] did not contain any numerical indicators which would later on be referred to as BAT-associated emission levels (BAT-AELs). Russian BREFs issued in 2015-2017 already included BAT-AELs introduced by the relevant orders of the Ministry of Natural Resources and Environment and Decrees of the Government of the Russian Federation [8].

In the Russian Federation there has been adopted a set of measures towards refusal to use outdated and inefficient techniques, switching to the principles of best available techniques and introducing modern technologies, as approved by Russian Government Executive Order No. 398-*r* of 19.03.2014 [9], as well as ensuring the transition of Russian industry to the principles of best available techniques, including the development and manufacturing of localised, home-made industrial equipment. The statistics on the current BREFs and BREFs being reviewed are given in Table 1 below.

Table 1. BREF Statistics.

Current BREFs	BREFs Updated	BREFs to be Updated in 2022	New BREFs Being Drafted
51	24	13	3

In Russia, the internationally recognised BAT concept not only forms a basis of technological regulation in the field of environmental protection but is also used to stimulate the real sector modernisation [10]. The BAT compliance assessment is a part of several regulatory mechanisms:

1. Issuing Integrated Environmental Permits;
2. Approving draft Environmental Performance Enhancement Programmes;
3. Reviewing investment projects during the procedure of providing government support to industrial BAT-implementing enterprises, etc.

It is necessary to note that the BAT application, contrary to popular belief, is not limited to obtaining an Integrated Environmental Permit, instead, it has a larger scope.

The key advantage of BAT is that the BAT compliance criteria are measurable and feature indicators that fall under the following three groups [11] (table 2).

Each new generation of the above indicators is complementary to the previous one, thus improving the mechanism for determining BAT compliance, which, in turn, contributes to a higher resource and energy efficiency of industrial production [12]. The best available techniques are a set of minimum mandatory requirements that apply both in Russia and abroad to all major industrial, energy generating, or agricultural (pig farming and poultry farming) businesses. The ambition of businesses to establish themselves as market leaders and demonstrate their social and environmental responsibility has led to the expansion of the so-called best environmental practices or best environmental management practices.

Table 2. Groups of BREF indicators.

BREF Generation	*"Technological indicators"*
BREF Generation I	emission of pollutants
BREF Generation II	resource efficiency of a technique
BREF Generation III	indicative figures for carbon intensity of products and/or technological processes

2. Best Environmental Practices

Best environmental practices imply the application of environmentally, economically and socially best environmental control measures and strategies, with due account of national, regional and local conditions [10].

Best environmental practices can be incorporated in standards, strategies, guidelines, or other documents intended for voluntary application. Although the term "best environmental practice" is not currently part of the Russian legal framework, Russia participates in HELCOM, the International Commission for Baltic Marine Environment Protection. HELCOM was established under the 1992 Helsinki Convention [13] and associating countries such as Sweden, Denmark, Finland, Lithuania, Latvia, Estonia, Germany, Poland, and Russia.

The Eco-Management and Audit Scheme (EMAS) is another example [14]. Notwithstanding that EMAS is a voluntary scheme, it is widespread in Europe and businesses applying for certification under EMAS effectively have to assume additional commitments.

BAT do not apply to smaller businesses; therefore, the latter should use a softer and more flexible instrument, i.e., best environmental practice. What the BAT and best environmental practices have in common is that both aim at maintaining and restoring the ecosystem services. Let's take a closer look at the concept of ecosystem services now.

3. Ecosystem services

Ecosystem services are an element of natural capital, representing a stock of natural resources which create essential conditions of human vital activity [15]. The significance of ecosystem services is increasingly recognised globally in relation to sustainable development, as they largely relate to wildlife.

The United Nations Environment Programme (UNEP) distinguishes four groups of ecosystem services [16], and, although there is no common classification in place, this classification is widely accepted and scientifically recognized (table 3):

Table 3. Groups of ecosystem services.

Group	Meaning
Provisioning services	supply of timber, food, water, etc. (something that has a market value and a price)
Regulating services	water management, flood prevention, which is relevant for Russia
Cultural services	science, art, religion, etc.
Supporting services	complex natural cycles, underground ecosystem processes

At the local level, ecosystem services are often the basis of rural livelihoods (non-commercial fishing, plant gathering, etc.). At the regional level, riparian forests cater for the protection of residential areas or businesses from flooding and soil erosion; and at the national level, ecosystem

services are represented, for example, by locations that are part of a country's cultural heritage. At the global scale, it is ecosystems that regulate the climate and maintain biodiversity.

Despite numerous benefits from ecosystem services, many global ecosystems are on the decline, prone to degradation and depletion. The global annual economic cost of the loss of ecosystem services is enormous, at US$7 trillion [17]. To make thing worse some consider the benefits of ecosystem services to be free while their importance is dramatically undervalued.

The application of BAT and best environmental practices should aim at preventing the whole of ecosystem services from degradation; instead, the latter should be maintained or even improved [18]. The authors argue that the application of best environmental practices should be supported by reviewing the industrial and governmental leaders' experience and developing standards and documents for:

1. Restoration of landscape elements;
2. Cleaning up and restoration of water bodies;
3. Construction of roads and facilities in remote or mountainous areas;
4. Landscaping and reforestation;
5. Establishing new functions in areas disturbed by mining, unauthorised waste disposal, etc.

Various entities can commit to the document drafting function, including international organisations, non-governmental organisations or associations, research centres, etc. Such drafts would be advisory in nature but using those in practice could help improve the image and investment appeal of businesses who implement ecosystem service restoration projects, which is in line with the current ESG agenda and the sustainable development goals.

Such projects should be implemented in a comprehensive and adequate way, involving the cooperation of the government, industrial enterprises, educational and research institutions.

4. BREF 53 "Elimination of accumulated environmental damage"

As regards to the preservation of ecosystem services, the current agenda includes the drawing up of a new BREF 53 "Elimination of accumulated environmental damage". A working group is being set up to define the BAT for elimination of landfills, sludge holding ponds, hazardous or toxic waste sites, technogenic environmental pollution caused by industrial activity, and other objects of accumulated environmental damage. Application of BATs in accordance with the above BREF would prevent the degradation of ecosystem services [19].

One important aspect of preserving the ecosystem services is their restoration and maintaining of their capacity for natural regeneration. Physical, biological, chemical, and thermal methods are used for the restoration of ecosystem services.

The legal framework for the restoration of ecosystem services is laid down by Federal Law No. 254 dated 03.07.2016 On Amendments to Certain Legislative Acts of the Russian Federation, which amended Federal Law No. 7-FZ dated 10.01.2002 On Environmental Protection [20] while defining the concept of 'accumulated environmental damage' (total environmental damage caused by past economic or other activity and not eliminated partially or completely contrary to the respective obligations) and 'the objects of accumulated environmental damage'i.e. (1) land or water areas where accumulated environmental damage has been identified, (2) capital construction projects and (3) waste disposal sites which are the sources of accumulated environmental damage.

Currently 1,929 objects of accumulated environmental damage occupy an area of approximately 14,800 hectares [21]. To address these, a Federal Project entitled "*Generalnaya uborka*" (General clean-up) has been under way since January 1, 2022, with the main goals (1) to prepare a national inventory of the objects of accumulated damage along with (2) an assessment of their impact on human life and health and (3) their subsequent elimination.

In most cases, the degradation of ecosystem services is caused by human impact on the components of the environment (atmosphere, soil, water bodies, etc.), resulting in negative changes to their condition. Anthropogenic objects posing a threat to ecosystem services include:

1. Smelter slags generated during ferrous or non-ferrous metal production processes;

2. Agro-industrial waste;
3. Ash and slag dumps of thermal power plants and boiler facilities;
4. Landfills for solid communal waste and sludge drying beds.

Technogenic mineral formations of mining enterprises account for the largest areas exposed.

Leachate, formed by leaching of various substances from waste dumps by precipitated water, makes a significant contribution to the contamination of ecosystems, soil and ground water in the first place. Data on the objects of accumulated environmental damage are carried into the State Register of Objects of Accumulated Environmental Damage (Register). The Register regulations have been introduced by the Resolution of the Government of the Russian Federation No. 445 dated 13.04.2017 [22]. To apply for registration of an object within Register, public authorities of the subjects of the Russian Federation or local self-government bodies should make an assessment of the objects of accumulated environmental damage in accordance with the following indicators:

1. Volume or mass of pollutants, wastes and their hazard classes;
2. Size of land or water areas where the object of accumulated environmental damage is located, their zoning and permitted uses of land;
3. Level and volume of negative environmental impact, including potential migration of pollutants to other components of the environment, potential pollution of water bodies, including those that are the sources of drinking or domestic water supply, exposure to environmental risks;
4. Hazardous substances inventory included in the international treaties of the Russian Federation at the objects of accumulated environmental damage;
5. Size of population residing in the area subjected to a negative environmental impact resulting from an object of accumulated environmental damage;
6. Size of population residing in the area which is under threat of being exposed to an adverse environmental impact resulting from an object of accumulated environmental damage.

Administration of Register includes reviewing documents on identification and assessment of the objects of accumulated environmental damage, decision-making on inclusion or refusal to include in the State Register of Objects of Accumulated Environmental Damage, classification of the objects of accumulated environmental damage, updating information on the objects of accumulated environmental damage, removal from Register [23]. Based on the classification of objects of accumulated environmental damage, priority objects will be identified where the accumulated environmental damage is to be eliminated as a matter of priority.

5. Conclusion

The environmental industrial policy implementation in Russia includes but is not limited to the application of the concept of BAT and it finds its logical continuation not only in the imperative norms dictated by the state, but also in voluntary documents. Thus, the experience of applying the BAT concept has shown that this regulatory mechanism is suitable not only for establishing mandatory requirements for compliance by industrial enterprises related to limiting discharges/emissions of pollutants, but also in a broader sense: for the formation of methodological approaches (i.e., best environmental practices). In addition, on the basis of this concept, internal corporate standards establishing environmental policy of the enterprise could be developed. An environmentally responsible approach should contribute to the maintenance and restoration of ecosystem services.

Ecosystem services play a significant role in the implementation of sustainable development goals.

The BAT concept is a live mechanism being updated and supplemented. The use of the BAT concept will contribute to the establishment of a set of indicators for assessing ecosystem services; these indicators will later serve as a basis for specifying the values of such indicators that the objects with the respective values better or worse than the thresholds will be considered compliant with the respective modern requirements or outdated, correspondingly.

Also, the legislation needs to be expanded by introducing the definition of best environmental practices. This consolidation will eliminate the existing gap, and will become the basis for the

development of state support measures for organizations or companies ready to implement the best environmental practices into their environmental policy.

The drawing up of the BREF 53 "Elimination of accumulated environmental damage" will contribute to preserving the ecosystems of the Russian Federation and reducing the degradation of the ecosystem services.

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