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BEST AVAILABLE TECHNIQUES AND BEST ENVIRONMENTAL MANAGEMENT PRACTICES: COLLABORATION BETWEEN INDUSTRIES AND REGIONS*

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Abstract

This study analyzes two concepts used to reduce environmental impacts and to improve environmental performance of industrial activities. The concept of Best Available Techniques (BAT) is used in many countries as the major regulatory one, while the concept of Best Environmental Management Practices falls under the category of voluntary approaches, promoted by the European Union (EU). BEMP is understood as the most effective way to implement the Environmental Management System (EMS) to achieve the best environmental performance. Whereas Reference Documents on BAT have been drawn up, reviewed and used since the 1990s, Sectoral Reference Documents (SRD) on BEMP developed since 2009, are much less known, especially outside the EU. Priority sectors for SRD are set by the European Commission (EC) and include both "heavy" industrial sectors regulated by BAT-related legislation and such areas as Public Administration, Tourism, and Telecommunications. Several examples of BEMP implemented by Russian companies are presented. Some of them develop BEMP as EMS voluntary procedures relevant from the point of view of Sustainable Development Goals (SDGs).

Keywords: BAT, BEMP, EMS, obligatory requirements, voluntary approaches

1. Introduction

The interrelatedness between obligatory requirements and voluntary approaches is often discussed by regulators, industrial companies and civil society stakeholders. What is the best strategy: to be compliant with the legislation or to go beyond compliance developing and implementing company best practices? Can voluntary approaches be effective at all or should they be considered mostly from the marketing point of view?

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In any case, voluntary approaches aiming at better environmental performance and resource efficiency should be welcomed by all stakeholders. But regulators and environmental non-governmental organizations often argue that voluntary approaches do not necessarily lead to achieving reasonable targets.

In Russia, the internationally recognized concept Best Available Techniques (BAT) makes the basis for the new environmental legislation; larger industrial installations are obliged to implement applicable BAT and obtain Integrated Environmental Permits (IEP). At the same time, many companies operating such installations claim that they explore modern voluntary approaches contributing towards SDG achievement at the regional and national level (United Nations, 2015). Quite often they call such approaches Best Environmental Management Practices. Let us consider the environmental effectiveness of obligatory and voluntary instruments analyzing several sectoral and regional case studies.

The research problem of this paper is caused by the complexity of relationships between policy instruments applied to improve environmental performance and resource efficiency of industrial production. Main policy instruments studied include:

Best Available Technique defined as “the most effective and advanced stage in the development of activities and their methods of operation, indicating the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where this is not practicable, to reduce emissions and the impact on the environment as a whole” (EP Directive 2010/75/EU, 2010) and introduced in Russia by the Federal Law “On Environmental Protection” (RF Federal Law No. 7-FZ, 2002);

Best Environmental Management Practice (BEMP) means the most effective way to implement the Environmental Management System by organizations in a relevant sector and that can result in best environmental performance under given economic and technical conditions (EP Directive 2006/21/EC, 2006).

Best Environmental Practice (BEP), the term often used instead of or along with BEMP roots in Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention, 2014). Helsinki Convention sets criteria for selecting BEP and Best Available Technologies (not techniques), in many instances these criteria were considered while setting internationally recognized BAT criteria.

In most cases, Best Environmental Practices defined as “the application of the most appropriate combination of environmental control measures and strategies”. Several other international conventions (for example, (United Nations, 2013, 2017)) use BAT and BEP terms in combination: “For its new sources, each Party shall require the use of Best Available Techniques and Best Environmental Practices to control and reduce emissions, as soon as practicable but no later than five years after the date of entry into force” (United Nations, 2013). “Guidelines on Best Environmental Practices for Environmentally Sound Management of Mercury Contaminated Sites in the Mediterranean (UNEP, 2015) is an example proving that BEP and BEMP principles have many similarities. In most cases. BEP have a more compulsory than voluntary character, while BEMP are more often associated with voluntary policy instruments.

2. Results and discussion

2.1. Best Available Techniques and Best Environmental Management Practices

Best Available Techniques continue attracting attention of researchers in many countries: the concept is a “moving target”, it is continually developed, revised and new Reference Documents on BAT (BREFs) are published by the European Joint Research Center (JRC), in particular, by Integrated Pollution Prevention and Control (IPPC) Bureau. In 2017-2019, Organization for Economic Cooperation and Development (OECD) being the

most known of them. OECD published three analytical reports on BAT-related policies (OECD, 2017, 2018, 2019); new reports are in progress.

BREFs form part a series of documents “presenting the results of an exchange of information between European Union (EU) Member States, the industries concerned, non-governmental organizations promoting environmental protection and the EC, to draw up, review, and where necessary, update BAT Reference Documents as required by Article 13(1)” of the Industrial Emissions Directive (EP Directive 2010/75/EU, 2010). Sector-related BAT Conclusions (BATC) are the reference for setting IEP conditions for installations covered by Chapter II of (EP Directive 2010/75/EU, 2010). The competent authorities set emission limit values which ensure that, under normal operating conditions, emissions do not exceed the emission levels associated with the applicable BAT as laid down in the BATC.

So far, 16 sector BREFs with corresponding BATC and 14 “first generation” BREFs drawn up in accordance with the previous (IPPC) Directive are available at the website of IPPC Bureau. In addition, there are two “horizontal” BAT reports (on Energy Efficiency and on Environmental Self-Monitoring) as well as BREFs developed under other policies.

In Russia, BREFs have been drawn up, reviewed and updated since 2015. There are 39 sector BREFs and 12 inter-sectoral, “horizontal” documents. BATC-like documents – Government Decrees or Orders of the Ministry for Natural Resources and Environment – have been prepared for all sector BREFs (Skobelev et al., 2018).

Both in the EU and in Russia, BREFs are drawn up for IPPC installations, those causing significant negative environmental impacts. Though BREFs are reference documents, BATC and IEPs make BAT requirements obligatory. Thus, speaking of BAT, in most cases we discuss mandatory compliance with the EU or national legislation.

At the same time, organizations of all sectors and sizes have a scope for improving their environmental performance. Being motivated by eco-efficiency opportunities, reputation considerations and concerns about the sustainability, many companies try to reduce their impact on the environment. Quite often, organizations develop and implement Environmental Management Systems; standards of the International Organization for Standardization (ISO) and EU Eco-Management and Auditing Scheme (EMAS) are the most known and widely recognized sources of information on EMS requirements.

For many years, advocates of ISO 14000 family and EMAS have been discussing principles for setting environmental performance related objectives. Many researchers agree that EMAS has always been clearer and stricter in terms of environmental performance assessment; naturally, EMAS is more accepted by EU companies or organizations collaborating with European partners (Erauskin - Tolosa et al., 2020; Testa et al., 2014).

The latest revision of EMAS issued in 2009, (EP Directive 2006/21/EC, 2006) promotes Best Environmental Management Practices through the development of Sectoral Reference Documents (SRD) on BEMP. These documents are discussed much more seldom than BREFs, and therefore we describe them in this article.

According to the EC plans, SRDs on BEMP will be elaborated for a list of priority sectors. To draw up SRDs, the JRC studies experience of frontrunner organizations in different sectors. For each SRD, the JRC sets up a technical working group (TWG) of sectoral experts to gather and review information on the BEMP of the sector. The JRC organizes the work of the TWG, fosters the exchange of information, makes a scientific and technical analysis of information exchanged and elaborates the SRD. The process is very similar to that managed by IPPC Bureau while developing BREFs. Unlike BREFs, SRDs fall under the responsibility of the Circular Economy and Industrial Leadership Group.

The SRDs available at the website of JRC are: Retail Trade, Tourism, Construction, Public Administration, Agriculture and Food and Beverage Manufacturing. For other sectors (Waste Management, Manufacture of Fabricated Metal Products, and Telecommunications) the development of the Best Practice Reports and SRDs is still on-going.

For all SRDs, special Commission Decisions (EU) are issued; they establish Best Environmental Management Practices, sector environmental performance indicators and benchmarks for priority sectors under EMAS regulation (Fig. 1). Energy efficiency, material efficiency, water, water, waste, emissions (first of all, of greenhouse gases) are key environmental performance indicators used for all sectors. Biodiversity issues are covered too, though in some cases it is not easy to select appropriate indicators. Sector specific indicators and alternative indicators are also developed by TWGs, too.

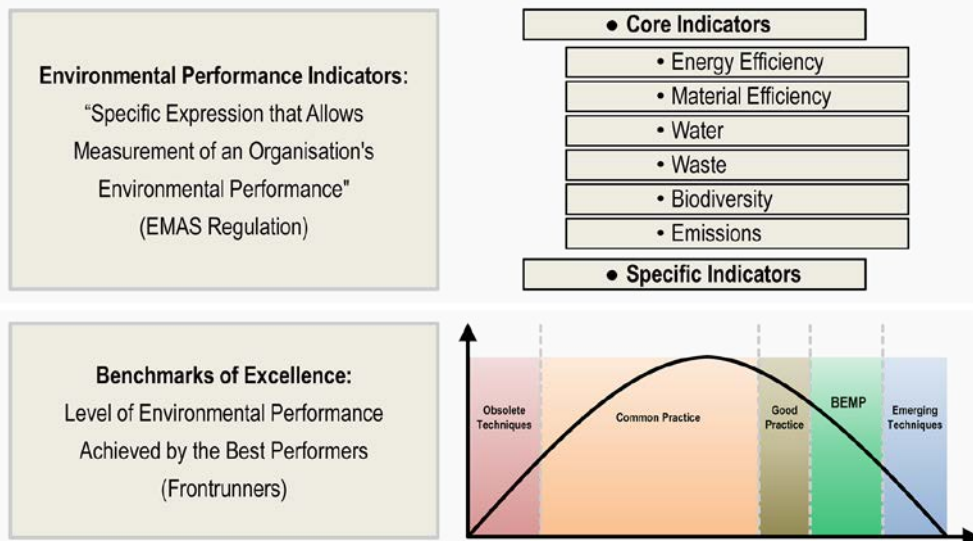


Fig. 1. Environmental performance indicators and benchmarks of excellence

Thus, for organizations voluntarily registered against EMAS, sector environmental performance indicators become compulsory. Since this issue is very sensitive, let us quote the original definition, "Given the voluntary nature of EMAS and SRD, no disproportionate burdens should be put on the organizations to provide such evidence. Verifiers shall not require an individual justification for each of the best practices, sector-specific environmental performance indicators and benchmarks of excellence which are mentioned in the SRD and not considered relevant by the organization in the light of its environmental review. Nevertheless, they could suggest relevant additional elements to be taken into account in the future as further evidence of its commitment to continuous performance improvement" (EC Decision 2017/1508, 2017).

As it is already mentioned, researchers and practitioners tend to use a variety of terms: Best Environmental Practices, Best Environmental Management Practices, Good Environmental Practices, etc. We'll discuss BEMP not necessarily connecting them to EMAS, but emphasizing their character: they are voluntary by origin, but can become obligatory within the framework of certain regulatory constructions, and finally, they describe practices that allow achieving best results by economically and technically feasible measures (better than simply good (Fig. 1)).

2.2. Sustainability Issues and Best Environmental Management Practices

Recently, PwC published a review entitled "Sustainability in the Boardroom. Russian Boards Survey 2019" (Fegetsyn and Dubovitskaya, 2019). Highlighting the increased level of engagement with sustainability among boards of directors in Russia, authors of the survey

offer a kind of a distribution of “very” and “rather” important company development topics. Fig. 2 presents this distribution (derived from interviews of over 70 board members of 200 leading Russian companies) and suggests aspects most promising for the development and implementation of Best Environmental Management Practices.

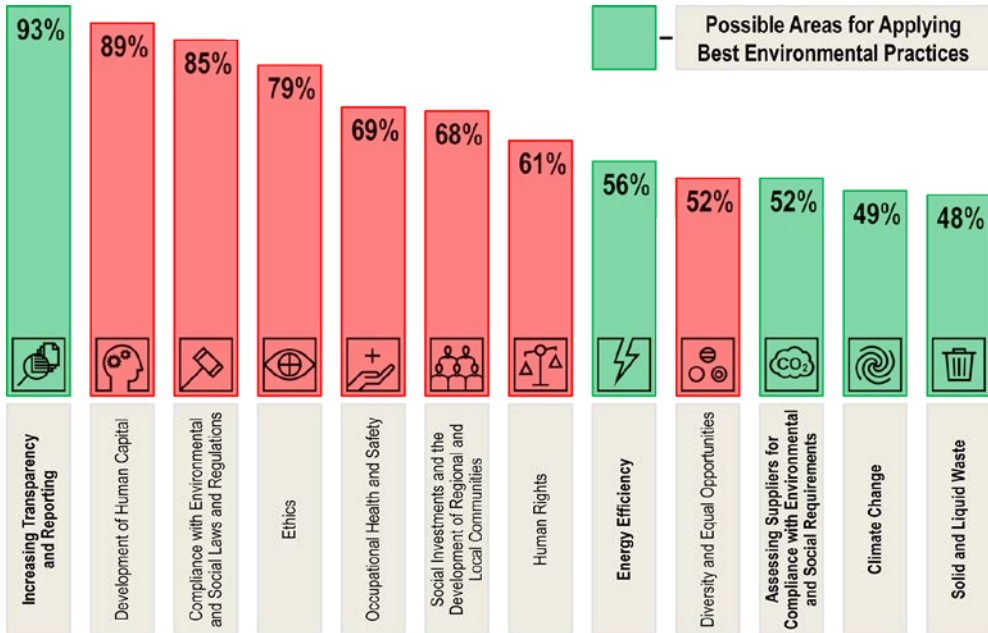


Fig. 2. “Very” and “rather” important topics to the development of the company (PwC, 2019, with comments)

Compliance is seen as a very important issue (85% of respondents believe so); we assume that environmental legislation attracts attention of many companies due to the introduction of new BAT-based requirements. Energy efficiency (56%) and assessment of suppliers (52%) are seen as less important issues, while climate change and solid and liquid waste can be described as “rather” important topics. It is not quite clear though why solid and liquid waste issue is considered separately from the compliance with environmental regulations, and air emissions of “ordinary” pollutants (other than greenhouse gases) are not mentioned at all. Still, three pillars and most SDGs are clearly reflected, while increase of transparency sounds promising for promoting open reporting practices.

Nowadays, international companies recognize that sustainability is a necessity. They understand how important it is to follow the global sustainability agenda and build a more inclusive economy gaining thereby the trust of their stakeholders. Companies become increasingly ambitious in pursuing long-term sustainability advantages. As it is already noticed, in Russia, organizations also begin recognizing the importance of integrating sustainability issues in strategic planning and everyday practices. Some of them are committed to managing their businesses according to highest environmental and social responsibility standards, others consider risks and opportunities and focus their attention on obligatory requirements of respective legislation (Vakula et al., 2020).

In the past 5 years, larger companies, (mining industry, metallurgy, chemistry and petrochemicals specifically) have felt the need to incorporate BEMP into their development strategies. Despite the fact that the general principles of BEMP have not been developed for these economic sectors, companies independently begin to prepare and implement long-term

environmental strategies as integral parts of their sustainability strategies. Recommendations have been developed for several industrial sectors under UNDP/GEF-Ministry for Natural Resources and Environment of Russia project “Mainstreaming Biodiversity Conservation into Russia’s Energy Sector Policies and Operations”: “Compendium of Innovative Solutions for Biodiversity Conservation for the Oil Exploration Sector” (2015), “Compendium of Innovative Solutions for Biodiversity Conservation for the Coal Mining Sector” (2017), “Compendium of Innovative Solutions for Biodiversity Conservation for the Hydropower Sector” (2017). The word “innovative” reflect here that solutions are quire advanced and developed by frontrunner organizations.

2.3. Best Environmental Management Practices of Russian Industries: Case Studies

Cases presented below consider approaches followed by organizations with which co-authors of this paper work within the framework of national and international projects.

2.3.1. Large Combustions Plants: Shaturskaya Power Plant

Unipro company operates 5 power plants located in the Central Russia, Urals and Siberia. Shaturskaya power plant is a branch located in the town of Shatura, within the Meshchera Lowlands (the Moscow Region). Natural gas is the main fuel, however, coal, fuel oil and peat may also be used at the power plant. The total installed capacity of Shaturskaya power plant is 1,500 MW, while the heating capacity is 344.5 Gcal (Unipro, 2020).

The first experimental 5 MW power plant was commissioned in 1920; local peat was the main fuel and remained to be up to the 1990s. In 2010, a modern combined cycle gas turbine CCGT-400 was commissioned; its efficiency of about 56 %, exceeding the efficiency factors of all the thermal power plants operating in the RF by more than a third.

In accordance with the new legislation, Shaturskaya power plant has to demonstrate its compliance with applicable BAT requirements and to obtain an Integrated Environmental Permit. Unipro is running environmental performance assessments at all sites and develops a plan for preparing IEP applications. This is BAT-related compulsory part of activities.

On the other hand, all company sites operate ISO 14001 registered EMS and set objectives going beyond BAT and other legislative requirements. Voluntarily Unipro considers opportunities for carbon offsetting activities, namely, for planting forest. In Russia, there are no official requirements to reducing carbon emissions, and the national legislation is still under discussion. For the Meshchera Lowlands these voluntary activities are very important since vulnerable Protected Landscapes of this area encompass pine forests and peatbogs, including those burnt during tremendous 2010 fires. Along with forest planting, in 2020, Unipro intends to run a regional environmental awareness raising project. Corresponding procedures will be formalized within the EMS framework getting thereby the status of BEMP. Thus, Energy Efficiency, Climate Change, and Support to Regional Communities are at least three BEMP directions (Fig. 2) explored by the company and in particular, by its oldest and most efficient power plant. Forestry (as a specific indicator in accordance with Fig. 1) can be probably added to the list. Regional governments are mostly interested in the voluntary activities dealing with the collaboration with the Protected Landscapes, forestry enterprises, and local educational establishments, which is quite logical.

2.3.2. Pulp and Paper Industry: Mondi Syktyvkar

Mondi Syktyvkar is one of the leaders in the Russian pulp and paper industry and the largest paper producer in the Russian Federation. The annual output of the mill exceeds 1.2 mln tons of office, offset and newsprint paper, containerboard, and market pulp (Mondi, 2020). In 2019, Mondi Syktyvkar completed implementation of two strategic investment projects – modernization of power plant and wastewater treatment plant. These projects resulted in the significant improvement of the environmental performance. In 2019, Mondi

Syktyvkar demonstrated its compliance with BAT requirements, and in 2020-2021, plans to obtain the IEP. Results achieved are better than BAT requirements, this reflects objectives of ISO 14001: 2015 certified Environmental Management System as well as the overall strategy of Mondi.

BEMP wise, Mondi Syktyvkar is one of the most energy efficient companies of the sector; the share of “green” energy gradually reaches 50%. The company preserves high conservation value boreal forests collaborating with WWF Russia and the Silver Taiga Foundation. All leased forests (2.1 mln hectares) are certified in accordance with the Forest Stewardship Council standards. This can be considered as a kind of “Assessing Suppliers” activity and definitely reflects principles of lifecycle thinking. In addition to 12% of forest areas conserved under forest management plan, Mondi Syktyvkar guards other 13% of the territory voluntarily. In its forest nursery, the company plants more than 8 mln containerized seedlings of conifers for the re-forestation of the Republic of Komi and neighboring regions.

Open reporting and information dissemination wise, Mondi Syktyvkar publishes sustainability reports and provides information online. Company staff delivers environmental courses at Syktyvkar Forest Institute and participates in many regional initiatives. Nevertheless, Mondi Syktyvkar is recognized as an environmental leader in the Republic of Komi (regional leader) while national non-governmental organizations argue that it does not participate in such activities as inquiries, comparative studies (environmental benchmarking) of pulp and paper companies, etc. Summarizing, one can conclude that Mondi Syktyvkar implements BEMP associated with the Development of Regional and Local Communities, Environmental Assessment of Suppliers, Energy Efficiency and Climate Change, Solid and Liquid Waste (Fig. 2) as well as Biodiversity, Material Efficiency and such specific field as Forestry.

2.3.3. Precious Metals Production: Polymetal Company

Polymetal International plc is a global gold (top-10) and silver (top-5) producer with assets in Russia and Kazakhstan. The company systematically enhances its EMS and ensures continual improvement of the environmental performance (Polymetal, 2020).

One of top priorities is to increase energy efficiency at Polymetal production sites. That is why an action plan on energy consumption, efficient use of energy resources and new energy efficient equipment and technologies is annually updated by the management. Corporate goals are part of EMS and Energy Management System providing for targeted activities, for example, alternative energy sources (a solar power plant at Svetloye field and a wind farm at the seaport of Unchi). These projects have already begun to show positive results. In 2018, Polymetal International plc reduced intensity of greenhouse gas emissions across the company by 7%.

Thus, Energy Efficiency and Climate Change (Fig. 1 and Fig. 2) are key BEMP directions explored by Polymetal International plc. BEMP associated with SDGs, reflect Biodiversity (Life on Earth) as well as Social Investments and the Development of Regional and Local Communities. Collaboration with Regional Governments manifests itself via environmental and social programs. Responsibility on biodiversity conservation lays primarily on environmental teams and on the Safety and Sustainability Committee of the Board of Directors. Communication teams run awareness raising events for local communities. Implementation of corporate environmental and social programs is supported by the banking sector, too; for example, Societe Generale Group and Polymetal Group entered into a bilateral agreement on the provision of a loan (up to USD 75 mln) tied to Polymetal SDGs: interest rate will be related to five environmental goals in the field of Environmental and Social Policy.

2.3.4. Coal Mining

In the mining industry, an important aspect environmental aspect is generation of extraction waste. Quite often enterprises implement remediation programs by applying forest ecosystem rehabilitation and long-term environmental monitoring. Such programs usually apply indirect dust monitoring methods using local lichen as bioindicators.

Russian coal mining industry under long-term program for the development of the Russian coal industry until 2030 has to achieve 100% of land remediation for 100% of land disturbed by industrial operations (RF Decree 1099-r, 2014). This is why industry has planned a set of measures for landscape restoration by introducing indigenous steppe and grassland ecosystems on overburden rock sites of coal mines. Similar approaches are promoted by the Directive 2006/21/EC on the Management of Waste from Extractive Industries (EP Directive 2006/21/EC, 2006).

Advanced programs are implemented, for example, in the Kemerovo region by Kuzbass Fuel Company PJSC, where the destroyed part of the Karakan ridge is subject to restoration of the steppe vegetation that existed on the Karakan ridge before mining began. In addition to the restoration of land disturbed as a result of economic activity and following the extended liability, the company has created a Protected Landscape (Karakansky Regional Nature Reserve) – on “industrial land” owned by the company. This example has become the first step in Russian coal mining industry when a protected natural area is developed on the lands of a coal company in order to compensate for the environmental damage caused by industrial activities (Kuzbass Fuel Company, 2020).

To restore disturbed land plots, some coal mining companies use remediation agents on the basis of ash and slag waste from coal fired power plants. Thus, ash and slag from coal burning power plants located in Krasnoyarsk, Novosibirsk, Kuzbass Regions are used for the restoration of disturbed lands and highway development projects in the Republic of Khakassia and Novosibirsk Region. In 2019, all ash and slag produced by Krasnoyarsk power plant were used to restore the depleted quarry in the Berezovsky district of Krasnoyarsk Region. The total possible production volume of ash and slag-based remediation agents by SUEK Company is estimated at 3.2 mln tons/year, totaling 90% of ash and slag waste generated by SUEK thermal power plants (Landia and Rashevsky, 2019).

Overburden rocks from open coal mining are often used for filling sinkholes, backfilling and reclaiming land disturbed by mining operations (including projects to restore topography and soil, landscaping and gardening). SUEK company is implementing a unique project on land reclamation in order to create viable recommendations on forest reclamation.

The implementation of a long-term environmental action program is additionally supported by the participation in assessing industry environmental responsibility ratings (WWF Russia initiative and the UNDP/GEF/ Ministry for Natural Resources and Environment, RF (UNDP/GEF, 2017), which allows developing effective communication mechanisms between the industry and stakeholders (regional authorities and local communities).

3. Conclusions

Thus, Best Available Techniques and Best Environmental Management Practices form two interrelated instruments providing for reducing environmental impacts of industrial activities. While BAT concept is widely recognized worldwide, and many countries (including Russia) require larger industrial polluters to implement BAT on the mandatory basis, BEPMs remain connected primarily to the voluntary Eco-Management and Auditing Scheme spread mostly in Europe. Reference Documents on BAT and BEMP are worked out by the EU Joint Research Center and complement each other allowing organizations to improve their environmental performance. Besides that, there are so called Best Environmental Practices that are often associated with the international conventions. BEP are

described as the application of most appropriate combination of measures aimed at reducing (minimizing) environmental impacts. This combination usually includes both technological and technical approaches and management procedures.

Whereas in the European Union, BAT implementation has been obligatory since 1996, and EMAS first introduced in 1993, in Russia, BAT-related legislation was passed in 2014, and first Integrated Environmental Permits were issued in 2019. Voluntarily, leading companies have been considering applicable BAT requirements for many years; most of them have also been implementing Environmental Management Systems. Thus, results of experimental, voluntary projects allowed to develop an obligatory legislative construction aimed at enhancing resource efficiency and reducing environmental impacts of key industries.

Analysis of several BEMP cases (there are many more similar “stories” of course) allows suggesting that they are not linked to EMAS but follow major approaches formalized in Sectoral Reference Documents published by the JRC. Boards of directors of leading Russian companies believe that legislative compliance is very important for the good corporate governance, but they agree also that Energy Efficiency, Climate Change, Emissions, and Environmental Assessment of Suppliers are rather important topics to the development of the company, too. These “rather” important topics can be traced in most cases reflecting experience of organizations regardless of the industry sector.

Though most companies have assets in Russia and abroad, collaboration with regional stakeholders is very important: it allows setting feasible objectives and assessing environmental performance enhancement and effectiveness of local voluntary activities. At the same time, in Russia, Regional Governments are involved in the evaluation of Environmental Performance Enhancement Programs mandatorily developed and implemented by BAT-regulated installations not meeting BAT sector requirements. This fact opens opportunity for wider application of BEMP by companies obliged to obtain IEPs and seeking for the regional support.

It is likely, that internationally recognized BEMP and BEP can be used to work out so called sector normative environmental conservation documents (similar to General Binding Rules, GBR). When (and if) such GBR become obligatory or at least widespread, a new, more advanced cycle of voluntary-compulsory relationships can be started.

References

- EC Decision 2017/1508, (2017), Commission Decision (EU) 2017/1508 of 28 August 2017 on the reference document on best environmental management practice, sector environmental performance indicators and benchmarks of excellence for the food and beverage manufacturing sector under Regulation (EC) No 1221/2009 of the European Parliament and of the Council on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) (Text with EEA relevance.), European Commission, OJ L, On line at: <http://data.europa.eu/eli/dec/2017/1508/oj/eng>.
- EP Directive 2006/21/EC, (2006), Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC - Statement by the European Parliament, the Council and the Commission, European Commission, 102, On line at: <http://data.europa.eu/eli/dir/2006/21/oj/eng>.
- EP Directive 2010/75/EU, (2010), Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control), European Commission, On line at: <https://www.eea.europa.eu/policy-documents/directive-2010-75-eu-of>.
- Erauskin - Tolosa A., Zubeltzu - Jaka E., Heras - Saizarbitoria I., Boiral O., (2020), ISO 14001, EMAS and environmental performance: A meta - analysis, *Business Strategy and the Environment*, **29**, 1145-1159. DOI: 10.1002/bse.2422.
- Fegetsyn A., Dubovitskaya E., (2019), *Sustainability in the Boardroom. Russian Boards Survey 2019*, PwC Russia, On line at: <https://www.pwc.ru/materials/pwc-board-survey-2019-english.pdf>.

- Helsinki Convention, (2014), Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention), HELCOM, On line at: <https://helcom.fi/about-us/convention/>.
- Kuzbass Fuel Company, (2020), Kuzbass Fuel Company Environmental activities, KTK, On line at: <http://ktk.company/en/ecologi/ecology-monitoring>.
- Landia A., Rashevsky V., (2019), *Building competitive advantage. SUEK Integrated report*, JSC SUEK, Moscow, Russia, On line at: https://ar2019.suek.com/download/full-reports/ar_en_annual-report_spreads_suek_2019.pdf.
- Mondi, (2020), Mondi Syktyvkar Profile, Mondi Syktyvkar, On line at: <https://www.mondigroup.com/en/about-mondi/where-we-operate/our-locations/europe/russia/mondi-syktyvkar/>.
- OECD, (2017), Best Available Techniques (BAT) for Preventing and Controlling Industrial Pollution, Activity 1: Policies on BAT or similar concepts Across the World, Environment, Health and Safety, Environment Directorate, OECD, On line at: <https://www.oecd.org/chemicalsafety/risk-management/policies-on-best-available-techniques-or-similar-concepts-around-the-world.pdf>.
- OECD, (2018), Best Available Techniques (BAT) for Preventing and Controlling Industrial Pollution, Activity 2: Approaches to Establishing Best Available Techniques Around the World, Environment, Health and Safety, Environment Directorate, OECD, On line at: <https://www.oecd.org/chemicalsafety/risk-management/approaches-to-establishing-best-available-techniques-around-the-world.pdf>.
- OECD, (2019), Best Available Techniques (BAT) for Preventing and Controlling Industrial Pollution, Activity 3: Measuring the Effectiveness of BAT Policies, Environment, Health and Safety, Environment Directorate, OECD, On line at: <https://www.oecd.org/chemicalsafety/risk-management/measuring-the-effectiveness-of-best-available-techniques-policies.pdf>.
- Polymetal, (2020), Environmental Policy, On line at: <https://www.polymetalinternational.com/en/sustainability/environment/>.
- RF Decree 1099-r, (2014), On approval of the program for the development of the coal industry in Russia for the period up to 2030, RF Government, (in Russian), On line at: <https://legalacts.ru/doc/rasporjazhenie-pravitelstva-rf-ot-21062014-n-1099-r/>.
- RF Federal Law No. 7-FZ, (2002), On environmental protection, RF Government, (in Russian), On line at: http://www.consultant.ru/document/cons_doc_LAW_34823/.
- Skobelev D., Guseva T., Chechevatova O., Sanzharovskiy A., Shchelchikov K., Begak M., (2018), *Comparative Analysis of the Drawing up and Review of Reference Documents on Best Available Techniques in the European Union and in the Russian Federation*, 2, Pero, Moscow, Russia.
- Testa F., Rizzi F., Daddi T., Gusmerotti N., Frey M., Iraldo F., (2014), EMAS and ISO 14001: The differences in effectively improving environmental performance, *Journal of Cleaner Production*, **68**, 165-173. DOI: 10.1016/j.jclepro.2013.12.061.
- UNDP/GEF, (2017), Compendium of innovative solutions for biodiversity conservation, UNDP/GEF-Ministry of Natural Resources and Environment of Russia project “Mainstreaming Biodiversity Conservation into Russia’s Energy Sector Policies and Operations”, (in English), On line at: <http://bd-energy.ru/art.php?lan=en&id=140>.
- UNEP, (2015), Guidelines on Best Environmental Practices (BEP) for Environmentally Sound Management (ESM) of Mercury Contaminated Sites in the Mediterranean, United Nations Environmental Program, Barcelona Convention Secretariat, Athens, Greece, On line at: <https://wedocs.unep.org/handle/20.500.11822/9917?show=full>.
- Unipro, (2020), Shaturskaya GRES Profile, Shaturskaya GRES - Unipro, On line at: <http://www.unipro.energy/en/about/structure/shaturskaya/>.
- United Nations, (2013), Minamata Convention on Mercury, United Nations Environmental Program, Nairobi, Kenya, On line at: <http://www.mercuryconvention.org/Portals/11/documents/Booklets/COP3-version/Minamata-Convention-booklet-Sep2019-EN.pdf>.
- United Nations, (2015), Transforming Our World: The 2030 Agenda for Sustainable Development, United Nations, New York, NY, USA, On line at: <https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf>.
- United Nations, (2017), Stockholm Convention on Persistent Organic Pollutants, United Nations Environment Programme, Secretariat of the Stockholm Convention, Châtelaine, Switzerland, On

line at:
<http://www.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx>.
Vakula M.A., Guseva T.V., Tikhonova I.O., Molchanova Ya.P., Schelchkov K.A., (2020), *Green and resilient city: obligatory requirements and voluntary actions in Moscow*, In *Green technologies and infrastructure to enhance urban ecosystem services*, Vasenev V., Dovletyarova E., Cheng Z., Valentini R., Calfapietra C. (Eds.), Springer International Publishing, Cham, 249-268.