Innovations as a Source of the Best Available Technique in Russia

N G Kuznetsov¹, S G Tyaglov², M A Ponomareva² and N D Rodionova¹

¹Department of Theoretical Economics, Rostov State University of Economics, 69 B. Sadovaya Street, Rostov-on-Don 344002, Russia
²Department of Regional Economy, Industries and Enterprises, Rostov State University of Economics, 69 B. Sadovaya Street, Rostov-on-Don 344002, Russia

E-mail: ndrodonova@mail.ru

Abstract. The purpose of the article is to determine the development trends of the best available technique installation mechanism and innovative institutions as suppliers of Russian analogues of such techniques in Russia and its regions. The best available techniques are considered in this article as the latest techniques, initially formed in the innovative sector with their subsequent implementation and inclusion in the category of the best available ones. The sources of this technique are considered as regional innovation systems, in which the innovative investigations are created and tested. In this regard, when forming a mechanism for the best available technique installation in the Russian regions, including the forest sector, it is necessary to ensure communication with the innovation sector, which would form the industrial enterprises’ demand for innovative environmental investigations. Taking into consideration the manufacturing industries’ linkage, the necessary innovations in the forest sector have been analyzed. Forestry is a supplier of raw materials for furniture and paper industries. Therefore, the modernization of reference books on the industries should be appropriate and comply with the programs for the forestry development in the Russian Federation.

1. Introduction

The best available technique (BAT) has been an effective tool to stimulate the production activity greening in the European Union (EU) practice for about two decades. The mechanism of rational environmental management based on BAT, allows to issue the integrated environmental permissions to enterprises implementing projects of the energy efficiency modernization and improvement, taking into account their financial capabilities, which makes it effective not only in terms of achieving high parameters to reduce the negative impact on the environment, but also cost-effective. This contributes, on the one hand, to a higher level of the enterprises and their competitiveness development, and the constant technical renewal of the countries’ and regions’ economy, on the other.

The "best available technique" plays the central role in the proposed mechanism. The "best available techniques" are understood as "technique and managerial measures to minimize the impact on the environment as a whole and do not require excessive costs" [1-3]. The "best available technique" concept has been initially defined in the IPPC Directive as "the most effective and advanced stage of the plants operation production activity and methods development, which indicates the practical suitability of certain methods (techniques, technical methods) to provide a fundamental
basis for ensuring emission/discharge limits intended to prevent and, if it is not possible, to reduce overall emissions/discharges and the impact on the environment as a whole" [1].

It was subsequently replaced by the Directive 2010/75 / EU, also known as Directive 2010/75/EU of the European Parliament and the Council of the European Union from 24 November 2010 "On industrial emissions (integrated pollution prevention and control). Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control). It is a normative act regulating the compliance with the rules for the prevention, reduction and if possible, the industrial activities pollution exclusion. The document was adopted on November 24, 2010 in Brussels by the European Parliament and the Council of Europe and entered into force on January 1, 2011 [2].

Directive 2010/75 /EU discloses the BAT concept as follows:
1. The "technique" concept includes both the used technique itself and its investigation, construction, commissioning, operation and decommissioning.
2. Technique is "available" if developed at the scale necessary for implementation in the relevant industrial sectors with economically acceptable conditions on the basis of benefits and costs, their availability or application in the EU countries, the payback period acceptable to the operator (enterprise).
3. Technique is "the best" if it is the most effective technique in achieving a high overall level of environmental protection in general [2].

Specific industries and activities regulated by this Directive have been identified in the EU countries. These enterprises are required to comply with the requirements of the Directive in order to obtain comprehensive permissions and strictly follow the requirements described in them. At the same time, all newly installed facilities (not only new enterprises, but also new installation facilities at existing enterprises) from the very beginning must meet the BAT requirements. So, in the forestry, technique and conditions for environmentally friendly production should be provided. This contributes to the raw materials production for a number of industries (furniture, pulp and paper), and their final products consumption significantly affects the consumers health.

According to the BAT reference book on the pulp and paper industry at present, despite the huge potential, the forestry of the Russian Federation is not among the priority sectors of the economy. We could note a shortage of capacities for the paper goods production and the increased demand for them is satisfied mainly by import. The existing imbalance between the growing domestic demand of the Russian market and the lag in the volume and assortment of Russian paper and cardboard products has led to a significant increase in import over the past twenty years. Therefore, when making the forecast, the main priority for achieving indicators ensuring import substitution in the industry provides the creation of new capacities for the production of high-quality paper grades, modern packaging materials and sanitary products oriented primarily to the domestic market mainly in forest-surplus areas.

The BAT describes the technique and relevant limit values for emissions. According to the regulatory authority decisions effectiveness those criteria are important, which make it possible to evaluate (or not evaluate) the technique as the best available one. Those BAT criteria, in addition to the ratio of costs and benefits, in particular, include the use of low-waste technology, substances that are least hazardous to humans and the environment; the possibility of introducing the resulting by-products into the production cycle; previous successful use of comparable processes, installations, management methods on an industrial scale; technological advantages and improving the level of scientific knowledge; the nature, the type of the impact and specific mass values of the emissions and discharges associated with the process; commissioning time for the new and existing installations; deadlines for the BAT implementation; consumption and nature of the raw materials (including water) used in the process; energy efficiency general negative environmental impact of emissions / discharges and associated risks; probability of accidents and associated risks.

These principles apply to all large enterprises, which are determined by the regulatory authority on the basis of their strong negative impact on the environment and their resource and energy intensity.
Special attention should be given to the Directive 2010/75/EU, also known as the European Parliament and the Council Directive of November 24, 2010 on industrial emissions (integrated pollution prevention and control). It is a regulatory act governing the compliance with the rules for the prevention, reduction and, if possible, the industrial activities pollution exclusion. The document was adopted on November 24, 2010 in Brussels by the European Parliament and the Council of Europe (effective since January 1, 2011).

Nowadays, a great number of foreign investigations carried out in the framework of the best available techniques is devoted to the development of methods/techniques for determining and selecting the best available techniques at various levels (enterprises, production facilities, industries, authorities), as well as the European technique adaptation to the needs of the economies in non-European industrialized countries.

Thus, Roger Dijkmans in his article notes the need to determine the BAT in many European regions at the industry level, basing his assumptions not only on the expert method, but also on the methods that allow to formalize the expert opinion.

The author proposes a multi-stage procedure for the selection of the sectorial BAT, which allows to evaluate the technique in terms of their technical feasibility, economic efficiency and ecological parameters of environmental impact and its components [3,4].

H Schollenberger, M Treitz, J Geldermann consider the need to adapt BAT transfer technology to industrialized countries, in particular, Chile and China, in terms of determining its main criteria due to the differences in economic, legal and technical conditions. Moreover, the BAT defined in the EU should also take into account the differences in priorities formed in the countries in terms of the polluted components of the environment (atmosphere, soil, water bodies) [5].

Also, it is important and urgent to investigate the problems relating to the process of making decisions on the BAT implementation at the level of enterprises and regulatory authorities. Thus, the scientific work by A Cikankowitz and V Laforest reflects the increased emphasis in the EU policy on the BAT implementation in terms of the methodologies development for the quantitative integrated assessments of pollution degree necessary to improve the BAT implementation at the stage of installation and to facilitate their selection for the European reference documents.

A Cikankowitz and V Laforest propose a methodology aimed at assistance to the stakeholders (industrialists, authorities) in updating their operating license (i.e. in this case the French technical report), focused on the evaluation of the existing BAT methods and providing a basis for the production units and management processes’ assessment [6].

In the investigation by Damien Evrard, Jonathan Villot, Chad Armiyaou, Rodolphe Gaucher, Sofia Bouhrizi, Valerie Laforest there is an integrated method for the multi-criteria assessment of reference installations for the BAT implementation on the basis of mathematical and statistical methods is offered [7].

D Huybrechts, A Derden, L Van den Abeele, S Vander Aa T Smet consider the problem of the BAT implementation assessment relating to the value chain, analyzing the possibility to introduce the supply chain sustainable management principles into the BAT definition, that can be a driving force for the global value chains greening [8].

Russian scientists also actively explore the problem of introducing the BAT into the environmental management practice. Taking into consideration the significant territorial differentiation of Russia relating to natural and climatic conditions, the investigations are devoted to assessing the effectiveness of the BAT introduction in the industry and natural regional factors influencing on them [9,10].

Also, it is important to determine the relationship of the BAT institution with other institutions of environmental management for the BAT implementation in Russia. In this research area the work of T V Nevalinna, O N Lazdina on the voluntary environmental certification analysis in the process of accelerating the best available techniques’ implementation should be noted [11]. T V Guseva, Ya P Molchanova, M V Begak and A V Mironov consider the best available techniques as a tool of industrial and environmental policy, paying special attention to energy management systems that
improve the production resource efficiency as well as the problem of specialists' training to ensure the transition to the best available techniques [12].

The sectoral aspect of the BAT implementation is also relevant for the Russian theory and practice of environmental management [13]. A group of scientists, such as I I Rebrik, A G Bernatski, V S Burkat, R V Mhchan, S Yu. Vasin, D A Toshev, I V Ilyukhin, A V Tarasov, N P Akimov, Z N Voronina, T V Kramareva, M V Dobrokhotova, T N Somova, V O Samoylenko, I S Koroshev, P A Makeyenko, O V Sletskina, R V Starshinov, I A Kosorukov, O R Kadyrov, V M Kostyleva, A S Malyavin, A S Kuzmina, M I Saparov, O E Shalina, S A Skachkova, V A Serdyukov, T V Guseva, S A Konstantinova, V B Saporzhnikov, I S Poddubnyi, O V Grevtsov, N V Kostyleva, Y P Molchanova, M V Begak, K A Shchelchikov consider the BAT implementation specifics into various branches of the Russian economy – the nickel industry, production of lead, precious metals, mining industry, production of solid and other inorganic substances, etc. [13,14].

The broader aspects of the BAT introduction, such as the Russian economy modernization processes, the transition to the model of "green economy" as the basis of environmental management as whole are investigated in the articles of L A Mochalova [15], Yu A Timofeyeva [16] and I N Ovchinnikova [17].

At the same time, despite a large number of various studies both in Russia and abroad, hardly any studies on connection of the BAT Institution with functioning the innovative subsystems of territories (countries, regions) can be found. Taking into account that the best available techniques are the basis for regular modernization of the economies of the countries and their territories and should be periodically updated with the best technique solutions and also taking into account the existing technique limitations on the adaptation of foreign techniques in the Russian economy, it is necessary to increase the number of domestic studies in this area. In order to generate the demand from the enterprises for relevant investigations, as well as for the reorientation of the Russian research organizations to the needs of the BAT implementation sectors, it is necessary to ensure the interaction and consistency of the institutions supporting the innovation subsystem and the sector of the BAT installation interaction.

The purpose of this article is to analyze the European BAT principles installation in the Russian environment and to determine the directions of the innovative institutions’ development focused on the needs of the enterprises in the Russian analogues of the potential BAT.

2. Methods and materials

To study the development opportunities of the Russian institutions aimed at the supply of innovative technologies, which will subsequently replenish the list of the best available ones, the article discusses the principles of the environmental management production based on BAT and integrated environmental permits in force in the EU countries. It also analyzes the institutions and instruments of the Russian environmental management system from the point of view of introducing EU experience in their implementation.

As research methods, observation and abstraction, deduction and induction, economic, logical and comparative analysis, data grouping, normative and systemic methods, generalization of actual and theoretical material, tabular and graphical data visualization methods are used.

The informational and empirical basis of the materials presented in the article and used to substantiate the authors’ conclusions was presented by the official materials of the Federal State Statistics Service of the Russian Federation and its regional divisions in the Rostov Region, scientific articles by economists representing Russian and foreign science on the issues under consideration and a national project “Ecology” and its federal project “Implementation of the best available techniques”, materials of official portals of executive bodies of RF and RR legislative system, online resources, as well as many years of the authors’ practical experience and personal observation and generalization.

The legal framework of the study consists of the Russian Federation federal laws, resolutions of the Russian Federation Governments and the Rostov region, program-targeted documents as well as
legislative and regulatory acts affecting the environmental management regulation in the Russian Federation and regions.

3. Results and discussion

The EU countries experience perception and the mechanics using the BAT introduction in Russia have been carried out for more than a decade.

Recent years have been marked by the most significant changes in the Russia’s environmental legislation, allowing this mechanism’s active implementation.

Thus, in 2014, a list of the best available techniques’ application areas was approved [18].

The introduction of amendments to the Federal Law No 7-FL "On environmental protection" created the clearer legally enshrined understanding of this term: "technique of production (goods), works, services, determined on the basis of modern science and technique and the best combination of criteria for achieving the purposes of environmental protection, the technical possibility of its application" [19], which to a greater extent correspond with the original BAT idea, laid down by the EU countries’ practice.

Also, in 2014 the Russian legislation defined the "criteria for classifying the technique processes, equipment, technical methods, means to the best available technique" [20].

Such criteria are:

a) the lowest level of negative impact on the environment per unit of time or volume of products (goods), work, services or compliance with other environmental impact indicators provided by the Russian Federation international treaties;

b) economic efficiency of the implementation and operation;

c) the use of resource and energy saving methods;

d) the installation period;

e) the industrial implementation of technique processes, equipment, technical methods, means at 2 or more enterprises in the Russian Federation, which have a negative impact on the environment.

Changes in the Federal law "On environmental protection" provide measures aimed at encouraging enterprises to introduce the BAT. Thus, since January 1, 2020, the system of coefficients in determining the fee for negative impact on the environment, according to which the company is exempt from payments for the negative impact on the environment if it implements the best available techniques [19], is coming into force.

In addition, in recent years, a number of documents have been adopted – industry directories on the BAT (in the field of energy efficiency, certain industrial activities). In our opinion, in the forestry the following pattern of increasing energy efficiency could be proposed: to utilize a certain amount of the waste generated during logging and in the primary stages of wood processing with certain humidity as a raw material for further energy use. In the BAT reference books, the energy potential of the forest resource should be calculated according to the requirements for the physical parameters of logged wood (density, humidity).

The list of 300 objects which are the largest polluters of the environment by gross volume of discharges and emissions was approved in 2018 [21].

All the industrial enterprises of the first category of danger are planned to use the best available techniques by 2025 [22].

In accordance with the Federal law from 21.07.1997 N 116-FL (ed. from 29.07.2018) "On industrial safety of hazardous production facilities" [23], all hazardous production facilities, depending on the level of accidents potential danger on them for the vital interests of the individual and society are divided into four hazard classes: I hazard class - hazardous production facilities of extremely high danger; II hazard class-hazardous production facilities of high danger; III hazard class-hazardous production facilities of medium danger; IV hazard class - hazardous production facilities of low danger.

Since January 1, 2019 the changes made by the Federal law from 21.07.2014 No 219-FL "On amendments to the Federal law "On environmental protection" and certain legislative acts of the
Russian Federation", according to which "the technique standards are developed by the legal entities and individual entrepreneurs engaged in economic and/or other activities at the objects of the I category on the basis of technique indicators not exceeding the technique indicators of the BAT, integrated environmental resolution" entered into force [19].

Since 2019, the national project "Ecology", in which the 11-th item includes the priority "Introduction of the best available techniques" has been launched in the Russian Federation and in its regions [24].

The mechanism for regulating the negative impact on the environment, based on the integrated environmental permissions and the best available techniques’ issuance, differs in a number of aspects from the current one in Russia. At the same time, the country's reforms in the field of environmental management are focused today on the BAT principles, and therefore there are prerequisites for its effective implementation in the Russian regions.

This mechanism can be schematically presented as follows (figure 1).

![Figure 1](image_url)

**Figure 1.** The mechanism of modernization and energy efficiency improving the regional economy on the basis of integrated environmental permissions and the best available techniques [25].

In accordance with this mechanism, the permissible parameters of the enterprise-pollutant impact on the environment and its components are determined on the basis of the following criteria [25].

- the enterprise is obliged to install the environmentally friendly (energy-efficient) technique;
- the degree of their implementation is determined by the enterprise’s capabilities (primarily financial ones);
- the basis for making a decision by the regulatory authority according to the reasonability of the introduction of one or the other technique process (technique) in the enterprise are reference books on the best available techniques;
- the specific parameters of the enterprise's environmental impact (i.e. standards of discharges/emissions/waste generation and disposal) are determined individually, both by the planned technical changes in production processes and by the mode of the use of natural
objects in the territory (for example, for water bodies used for fish farming and fishing, the impact regulations may be more strict relating to a number of pollutants).

Integrated environmental permit (hereinafter referred to as IEP) in the European Union, initially authorized by Directive 96/61/EU on Integrated Pollution Prevention and Control are further enshrined in Directive 2010/75/EU of the European Parliament and of the Council of the European Union from 24 November 2010 "On industrial emissions (on integrated pollution prevention and control) [25], according to which they provide the following tasks decision.

- issuing permissions to the industrial facilities on individual basis, taking into account the local circumstances;
- the implementation of an integrated approach to authorization (meaning the need to take into account all the impacts of industrial and other activities on the environment as a whole, rather than each of its elements separately; the assessment in terms of energy consumption and waste minimization, consideration of the production plant impact taking into account all the stages of its life cycle; consideration of the raw materials consumption factors, including water; taking measures to prevent the contamination risk after decommissioning) and to protect the environment as a whole (preventing accidental or unintentional contamination from one environment to another);
- opportunity for the public to participate in the decision-making process on authorization and information access;
- the “best available techniques” application;
- focus on preventing and reducing contamination at the source unlike purification and control “at the end of the pipe”;
- prevention of accidents and minimization of the accidents’ consequences
- minimization of damage to the environment when closing the facility.

If the enterprise complies with the regulations established in the IEP, planned to improve the environmental impact indicators, it is exempt from any financial sanctions (in the form of fines in foreign practice, and in the form of environmental payments in Russia). Such sanctions arise only if the planned works have not been carried out and the established limits have not been reached due to the fault of the enterprise.

In addition, the IEP system provides an integrated approach to the assessment of harmful effects on the environment, which means that it is impossible to reduce the negative impact on one of the components of the environment (atmosphere, water, soil) by increasing it for another component.

Thus, the advantages of the IEP and BAT mechanism for the Russian economy are rather significant. This mechanism installation will solve a number of interrelated problem "bottlenecks" of the rational environmental management regulation system, which used to operate in the Russian Federation before. Such “bottlenecks” are low interest of polluting enterprises in the installation of environmentally friendly techniques and reduction of pollutants discharges/emissions into the environment, excessively "rigid" standards of the enterprises’ negative impact on the environment, based on sanitary and hygienic standards and the concept of "zero risk" for human health, which often led to technological or financial impossibility to install them. Non-tax and "voluntary" nature of the system of environmental payments for polluting enterprises, absence of the "presumption of innocence" of industrial enterprises forced to pay the environmental payments regardless of whether they comply with the environmental impact limits (with coefficients of different levels) and the unlimited list of enterprises and activities in respect of which the environmental legislation could be applied are also among these problems.

The mechanism based on the BAT and the IEP makes it possible to provide the financially affordable options for the installation of modern techniques in the industrial enterprises’ activities at the modern available technical and technological level, while the list of pollutants is clearly defined. A focus on the current level of technological advances in each area of activities provides a transition to the concept of "risk management" for human health, which allows putting a gradual reduction of
negative impact as a "floating goal". Such goal is considered to be more achievable as opposed to its complete elimination.

The procedure for transferring the European BAT process into the Russian context is laid down in the new system of national projects implemented since 2019 in the Russian Federation. In particular, the procedure performs as the basis for the national project "Ecology", which includes a separate Federal project "The best available technique Installation". By the beginning of the national project implementation (in 2016) on the basis of the FSAU "Research Institute "The center for environmental industrial policy" , a new structure – the Bureau of the best available technique – was formed (www.burondt.ru) [20]. There is also a specialized technical Committee for standarization "Best available technique" functioning on the basis of Rosstandart. Technical working groups have been created to develop information and technical guides [26], draft guides undergo a public discussion procedure [27].

The BAT reference books are approved by Rosstandart and published on its official website in the public domain. All stakeholders can use them for free and monitor the changes made in the current mode. Nowadays, about 50 BAT industry handbooks have already been adopted. By the end of the Federal project – by 2024 – it is planned to update all the information and technical manuals on the BAT, develop and update existing national BAT standards. Also, all the facilities having a significant negative impact on the environment and related to the areas of the BAT application are planned to be provided with comprehensive environmental permits. It is planned to issue about 6900 integrated environmental permits by 2024. The Federal budget will spend more than 27.0 billion rubles on the implementation of the Federal project "Installation of the best available technique", as well as 2,400.0 billion rubles from extra-budgetary sources.

Taking into account the difficulties in adapting foreign techniques in a particular country, as shown by a number of above-mentioned studies, for the Russian economy incompatibility of a number of foreign technique solutions with the existing domestic practice is also relevant.

A usual analysis of the comparison of the number of created and used advanced techniques given in the Table 1, shows that the predominant part of the techniques introduced in Rostov Region, comes from outside (as in the Russian Federation).

**Table 1.** The proportion of developed and applied advanced production technique in the Russian Federation and Rostov Region, 2008-2017 [2].

|                    | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|--------------------|------|------|------|------|------|------|------|
| **The Russian Federation** |      |      |      |      |      |      |      |
| Created techniques, units | 1138 | 1323 | 1429 | 1409 | 1398 | 1534 | 1402 |
| Used technique, units     | 191650 | 191372 | 193830 | 204546 | 218018 | 232388 | 240054 |
| The proportion of technique used technique to created once, times | 168 | 145 | 136 | 145 | 156 | 151 | 171 |
| **Rostov Region**         |      |      |      |      |      |      |      |
| Created technique, units  | 13  | 12  | 16 | 19 | 22 | 25 | 15  |
| Used techniques, units    | 2670 | 2822 | 2932 | 3104 | 3047 | 3314 | 3368 |
| The proportion of technique used technique to created once, times | 205 | 235 | 183 | 163 | 139 | 133 | 225 |

The BAT mechanism introduction could be an extra incentive for Russian innovative companies and enterprises.

At the same time, various regulatory authorities are responsible for the introduction of the BAT and the development of innovations in Rostov Region as in a number of other subjects of the Russian Federation. The Ministry of natural resources is responsible for the BAT implementation, the Ministry of economic development is responsible for the innovation support institutions. This requires synchronization of their activities.
4. Conclusions

Thus, in general, the Russian Federation and the regions have created the necessary conditions for the introduction of a mechanism for the delivery of integrated environmental permissions based on the BAT.

Both regulatory authorities and enterprises-polluters, when making decisions on improving the environmental parameters of the enterprise’s impact on the environment will need to focus on the BAT reference books. The reference books themselves, in this regard, become a serious tool to stimulate the introduction of environmental management into the enterprises’ management.

The BAT reference books should be periodically updated with improvements in order to achieve the permanent progress in reducing the negative impact of enterprises on the environment.

The BAT reference books and their periodic updates require constant supply with new technique solutions. The sources of these techniques are the regional innovation systems, creating and testing innovative studies. The sources of these techniques are regional innovation systems, in which the innovative studies are created and tested. In this regard, the issue of filling the reference books with new techniques for their periodic updating is extremely important.

For the BAT mechanism effective functioning, it is necessary to ensure the parallel development of the innovation system, which should be focused on the needs of enterprises in cheaper and effective technique decisions in terms of environmental and economic indicators of their activity.

The development of the economy in the Russian Federation is strongly territorially (regionally) oriented, and therefore such an orientation should be provided at the regional level.

To do this, it is necessary to ensure the synchronization of the regional innovation system and the mechanism of the BAT and their institutions’ implementation. An example of such synchronization is the forestry development program aimed at innovative technique and the BAT mechanism installation into the pulp and paper and furniture industries.

First of all, it is reasonable to ensure the formation of cross-sectoral working groups in the region for the BAT implementation, including the representatives of both the Ministry of natural resources and sectoral ministries and departments responsible for enterprises-polluters included into the list of priority enterprises where the introduction of the BAT is necessary, as well as the innovative development issues.

It is also necessary to provide the possibility of extra incentives for innovative enterprises and organizations involved into the investigation and installation of technique in the field of the potential BAT. This should be envisaged at both the Federal and regional levels. In our opinion, it is necessary to subsidize the pulp and paper industry enterprises ensuring the greening of production throughout the cycle, starting with environmentally friendly raw materials (wood) and ending with the end consumer, in particular children / schoolchildren, paper and cardboard supplies.

However, nowadays, there is no a real demand for the investigations in the area of ecological technique in the regions. The BAT installation should contribute to its growth.

However, it is necessary to make some efforts, such as the formation of institutions promoting environmental innovations for the manufacturing sector, as well as their production testing (including financial support).

It should be taken into account that before being included into the BAT list, the technique should be requested by the real consumer, developed, tested in a certain production in a scale sufficient for its further dissemination. The research organizations and enterprises taking risks in its development and installation may not achieve the desired effect: that is, they may not be included into the BAT category since their results may be worse than the results of other analogues. Eventually, it is necessary to get stimulating support for such organizations and enterprises.

The creation of special innovative zones of technical and innovative type, focused directly on research and testing of the environmentally friendly technique could be an effective tool. Such zones can be formed both separately and on the basis of already existing special development territories. For example, in a number of the Russian Federation regions, including Rostov Region, there are areas of the advanced socio-economic development of single-industry towns. The inclusion of innovative
enterprises and organizations into their structure, providing them with the same benefits as residents of the advanced development territories, enhanced by the motivation to include a developed technique into the BAT references books, could contribute both to the development of the single-industry towns, and to increase the effectiveness in the field of replenishing the market of new technique with the potential BAT. Among the potential BAT technique, we note the technique for the wood waste processing generated as a result of the forestry enterprises production activities. This will have a synergistic effect, taking into account the modernization of a number of industries (furniture, pulp and paper).

It is necessary to take into consideration that the inclusion of the technique developed by the enterprise into the BAT reference books will significantly increase the relevant sales market. Therefore, the subjects of the innovation system will receive the new powerful incentives, as well as specific directions for increasing their efforts, tied to the practical activity of the economic system subjects on the region and the country level.

The tool also needs to be interrelated with the technique of the new technical solutions selection for the BAT references books. Nowadays the Russia’s BAT reference books are developed by groups of experts, but the mechanism for selecting technique for inclusion into the BAT list is not presented in whole.

It is necessary to form a transparent and clear algorithm for the new potential BAT and its developers’ inclusion into the selection mechanism, ensuring their direct and easy access to the selection procedure. This will form a competitive environment providing incentives for innovative enterprises to focus on the BAT development.

5. Acknowledgement
The reported study was funded by RFBR, project number 19-010-00860.

References
[1] The Directive on Integrated Pollution Prevention and Control (Directive 96/61/EU with the Amendments Introduced by the Directives 2003/35/ EU и 2003/87/EU). In Project Materials “Harmonization of environmental standards – II”. Programme of the EU-Russia cooperation
[2] Regions of Russia. Socio-economic indicators 2018 Collection of articles (Rosstat, Moscow)
[3] The Directive of the government of the Russian Federation from December 28, 2016 No. 1508
[4] Dijkmans R 2000 Methodology for Selection of the Best Available Techniques (BAT) at the Sector Level. Journal of Cleaner Production 8 11 https://doi.org/10.1016/S0959-6526(99)00308-X
[5] Schollenberger H, Treitz M, and Geldermann J 2008 Adapting the European Approach of Best Available Techniques. Case Studies from Chile and China. Journal of Cleaner Production 16 (17)1856 https://doi.org/10.1016/j.jclepro.2008.02.007
[6] Cikankowitz A and Laforest V 2013 Using the BAT Performance as an Evaluation Method of Techniques. Journal of Cleaner Production 42 141 https://doi.org/10.1016/j.jclepro.2012.10.005
[7] Evrard D, Villot J, Armiyaou C, Gaucher R, Bouhrizi S, and Laforest V 2018 The Best Available Techniques: An Integrated Method for Multicriteria Assessment of Reference Installations. J. of Cleaner Product. 176 1034 https://doi.org/10.1016/j.jclepro.2017.11.234
[8] Huybrechts D, Derden A, Van den Abeele L, Vander AaS, Smets T 2018 The Best Available Techniques and the Value Chain Perspective. Journal of Cleaner Production 174 847 https://doi.org/10.1016/j.jclepro.2017.10.346
[9] Zhuravel N M 2015 Best available technique for the Sustainable Regional Development: Measurement of Their Efficiency. Interexpo Geo-Siberia, 1 (3) 89
[10] Nevalenova T V and Lazdina O N 2015 A System of Voluntary Environmental Certification as a Tool for the Implementation of the Best available techniques. Exposition Oil Gas [Ekspozitsiya Neft' Gaz – in Russian] 3 77

[11] Zhuravel N M 2015 System Assessment of Ecological and Economic Efficiency of the Best available techniques: Regional Aspect. Region: Economics and Sociology 2(86) 200 DOI: 10.15372/REG20150610

[12] Guseva T V, Molchanova Ya P, Begak M V, Mironov A V 2015 The Best available techniques as an Instrument of Industrial and Environmental Policy. Bulletin of the Russian Chemical technique University named after D.I. Mendeleev: Humanitarian and Socio-economic Research [Vestnik Rossiyskogo khimiko-teknologicheskogo universiteta im. D.I. Mendeleyeve: gumanitarnyye i sotsial'no-ekonomicheskiye issledovaniya] 2 (6) 62

[13] The Best available technique. Application in Various Industries.(2016). In Collection of articles 4. (Moscow: Publishing House "Pero") p 176

[14] Shalina O E and Skachkova S A 2015 The Analysis of the Best available techniques in the Sphere of Environmental Management and the Water Management in Modern Conditions. International Technical and Economic Journal 3 63

[15] Mochalova L A 2016 Ecological Aspects of the Modernization of the Russian Economy. News of the Ural State Mining University 3 105 DOI: 10.21440/2307-2091-2016-3-105-108

[16] Timofeeva J A, Belyakova G Y, and Shumakova N A 2016 The Best available techniques – a Chance for a Green Economy. In Youth. Society. Modern Science, techniquey and Innovation pp 287–289

[17] Ovchinnikova I N 2017 The Best available techniques in the Basis of Environmental Management. In Geography and Ecology: Scientific Creativity, Snterdisciplinarity, Educational techniquees Materials of the International Scientific-practical Sonference. Res. editor Yu.M. Grishaeva (Moscow) pp 117–123

[18] The regulation of the Government of the Russian Federation from December 24, 2014 No 2674-p "On the approval of the List of areas of application of the best available techniques" [Electron resource] Avaliable at: http://docs.cntd.ru/document/420242884

[19] Federal law from 10 January 2002 No 7-FL "On environmental protection" (with changes and additions from: 22 August, 29 December 2004, May 9, December 31, 2005, 18 December 2006, 5 February, 26 June 2007, 24 June, 14, July 23, December 30, 2008, March 14, December 27, 2009, December 29, 2010, 11, 18, July 19, November 21, December 7, 2011, June 25, December 30, 2012, 2, July 23, 28 December 2013, 12 March, 21 July, 24 November, 29 December 2014, 29 June, 13 July, 28 Nov, 29, 2015 Wednesday, April 5, July 3, 2016).

[20] The regulation of the Government of the Russian Federation from December 23, 2014 No 1458 "On the order of determination of technique as the best available technique, and also investigation, updating and publication of information and technical reference books on the best available technique" (with changes and additions).

[21] The regulation of Ministry of natural resources of Russia No. 154 from 18.04.2018 "On the approval of the list of the objects having negative impact on the environment belonging to I category which contribution to total emissions, discharges of polluting substances in the Russian Federation makes not less than 60 percent" (it is registered in the Ministry of justice of Russia 29.06.2018 No 51494).

[22] By 2025, All Industrial Enterprises of the First Category of Danger will Use the Best available techniques: the Press center of the Ministry of natural resources of Russia.

[23] Federal law No. 116-FL from 21.07.1997 (ed. on 29.07.2018) "On industrial safety of hazardous production facilities".

[24] Passport of the National Project "Ecology".

[25] The directive 2010/75/EU of the European Parliament and of the Council from 24 November 2010 "On industrial emissions (integrated pollution prevention and control) (recast) (Text
with EEA relevance) ". Published in the Official journal (hereinafter - OJ) N L 334, 17.12.2010, p. 17.

[26] Technical Working Groups: Bureau of Best Available Technologies 2019 [Electron resource] Available at: http://burondt.ru/informacziya/tehnicheskie-rabochie-gruppy/

[27] Public Discussion: Bureau of Best Available Technologies 2019 [Electron resource] Available at: http://burondt.ru/informacziya/publichnoe-obsuzhdenie/