



## A Critical Review of Russia's Energy Efficiency Policies in the Construction and Housing Sector

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### ABSTRACT

The paper critically reviews the existing energy efficiency policies in the construction and housing sector of Russia, focusing on the following: (i) The government management system; (ii) technological regulations; (iii) financial incentives and funding; (iv) and supporting mechanisms. The methodology used by the Government of Russia to specifically monitor energy efficiency performance in the construction and housing sector is evaluated, with the use of statistical data obtained from the government statistical service. On the basis of the conducted review, the paper proposes three recommendations for the Government of Russia, which could become the first step for improving energy efficiency policies in the construction and housing sector: (i) To provide an appropriate assessment of the energy efficiency potential; (ii) to develop a comprehensive regulatory framework and implementation mechanisms aimed at increasing energy efficiency; (iii) to develop a clear causal mechanism between energy efficiency policies and actual performance, which could be quantitatively measured using an appropriate methodology.

**Keywords:** Energy Efficiency, Construction and Housing, Russia

**JEL Classifications:** Q43, Q48, L74, L78, N64

### 1. INTRODUCTION

Russia has one of the highest values of energy intensity of its GDP among all other industrialized countries, which could partially explained by ineffective and wasteful approaches used in by the Soviet leadership in economic development in general and the fuel and energy complex in particular (Mimouni and Temimi, 2018). Thus, Russia has an enormous potential to increase the energy efficiency of its economy. According to the International Energy Agency, Russia's "vast potential to reduce inefficient or wasteful energy consumption can be considered a significant energy reserve," and "energy efficiency improvements in Russia's district heating sector, alone, could save 30 bcm/year-50 bcm/year of natural gas" (IEA, 2011).

There is a considerable body of research that addresses the issue of Russia's energy inefficiency and proposed various measures

to reduce energy intensity of its economy as a whole (Asif and Muneer, 2007; Bashmakov, 2009; Malmendier, 2011; Strakhova and Lebedinsky, 2012; Orlov et al., 2013; Camioto et al., 2016; Kreydenko et al., 2018) or of its particular sectors (Overland, 2013; IFC and World Bank, 2014; Tyutikov et al., 2016; Lezier et al., 2017; Orlov, 2017).

The current paper focuses on the energy efficiency policies conducted in the construction and housing sector of Russia. In particular, the papers critically reviews the existing federal policies, focusing on government administration, technological regulation, financial incentives, and supporting mechanisms. Also, the paper critically analyzes on how effective the Ministry of Construction of Russia monitors energy efficiency performance in the sector. We also would like to note that this paper is part of our series focusing on energy efficiency of Russia's economy, including its fuel and

energy complex (Lobova et al., 2019), agriculture (Bogoviz et al., 2018a), and industry (Bogoviz et al., 2018b).

In the scholarly literature, there is a strong body of research on energy efficiency of Russia's housing and construction sector (Gagarin and Kozlov, 2011; Kulakova et al., 2013; Severova et al., 2013; Golubtsov et al., 2013; Zadvinskaya and Gorshkov, 2014; Kopylova et al., 2016; Korovina and Barashkova, 2017; Zhukov et al., 2018). The current paper is different in a number of ways. First and foremost, this paper is the first one, to our best understanding, that is fully devoted to federal policies adopted and implemented in Russia's construction and housing sector and comprehensively evaluates them using the framework outlined above. Also, none of the published papers analysis the mechanism used by the Ministry of Construction to evaluate energy efficiency performance in the construction and housing sector of Russia. Thus, the paper significantly contributes to the scholarship on Russia's energy efficiency in the construction and housing sector by addressing the gap existing in the literature.

The paper proceeds as follows. The next sections explains the data and methods used to critically reviews Russia's policies. Then we analyze the existing energy efficiency policies in Russia in the construction and housing sector, focusing on overall goals and priorities, etc. The following sections provides our critical feedback on the overall policies and the methodology used by the Ministry of Energy to quantitatively monitor the progress made in the country. Finally, we conclude with final remarks.

## 2. MATERIALS AND METHODS

Since the purpose of the paper is to review the current energy efficiency policies of Russia in the construction and housing sector, we collect all the relevant information on federal legislation and federal government programs. In particular, the data comes from the Ministry of Energy of the Russian Federation as the main federal body in charge of reducing the energy intensity of the Russian economy (Ministry of Energy, n.d.). The focus on federal legislation and programs is determined by the overwhelming importance of the federal legislation and government strategic planning in Russia. Consequently, our focus on the federal agenda allows us to analyze the general framework for increasing energy efficiency in the construction and housing sector, which is to be followed in all regions of the Russian Federation. Particularly, we focus on the following aspects while reviewing energy efficiency policies: (i) The government management system; (ii) technological regulations; (iii) financial incentives and funding; (iv) and supporting mechanisms.

Also, we rely on the data from the Russian Federal State Statistical Service (Rosstat, n.d.) to review the methodology used the Ministry of Energy of Russia. In particular, we analyze the indicators used to evaluate energy efficiency performance in the construction and housing sector of the Russian economy. We have to limit our analysis by the total of 4 years (2014-2017) because of the availability of data. Thus, the methodological framework used by the Ministry of Energy to monitor energy efficiency performance in the fuel and energy complex is applied on the

data. In addition, we point out its limitations and then discuss how energy efficiency policies in the construction and housing sector could be further developed.

## 3. RESULTS

### 3.1. Energy Efficiency in the Construction and Housing Sector

This section of the paper summarizes the key Russian federal policies aimed at increasing energy efficiency of the construction and housing sector. In particular, we overview such dimensions as (i) the government management system; (ii) technological regulations; (iii) financial incentives and funding; (iv) and supporting mechanisms. Then we turn to the methodology used by the Ministry of Energy to evaluate energy efficiency performance in the construction and housing sector of Russia, focusing on the following: (i) The specific water consumption by population, m<sup>3</sup> per person; (ii) the specific consumption of thermal energy in apartment buildings, Gcal/m<sup>2</sup>; (iii) the specific consumption of electrical energy and house-building needs in apartment buildings, kWh/m<sup>2</sup>.

#### 3.1.1. The government management system

According to our analysis, the Government of Russia has not included any energy efficiency indicators (as a target goal) into any major strategic planning documents aimed at regulating the construction and housing sector. The brightest case is the state program of the Russian Federation "Providing affordable and comfortable housing and utilities services to citizens of the Russian Federation," which was approved by Decree of the Government of the Russian Federation on April 15, 2014 (Government of Russia, 2017a).

At the same time, the Ministry of Construction of Russia developed an action plan (also called a "road map" very often) to improve the energy efficiency of buildings and structures. This plan includes indicators in the field of energy conservation and energy efficiency as the key targets to be achieved (Government of Russia, 2016). In particular, there is a target indicator called "The share of administrative and public buildings of the highest class of energy efficiency in the total number of administrative and public buildings commissioned in the territory of the Russian Federation." However, it is worth mentioning that the legislation on energy saving and energy efficiency does not define the rules for classifying the energy class of buildings and structures other than apartment buildings, which can be also considered a serious shortcoming of the federal policies.

With respect to apartment buildings, a special law was passed. The rules for determining the energy efficiency class of apartment buildings were approved by the order of the Ministry of Construction of Russia of June 6, 2016 (Ministry of Construction, 2016a). These rules established the basic values of the specific annual consumption of energy resources in apartment buildings, as well as the requirements for the implementation of key energy efficient technologies for some energy efficiency classes.

Of the 9,062 apartment buildings commissioned in 2017, 8,686 received an energy efficiency class. Of these, the highest energy efficiency class (classes B, A, A+, A++, according to the Order of

the Ministry of Construction of Russia) received 6,542 apartment buildings (Fadeyev, 2018), i.e., >75% (Table 1).

Another indicator of the Plan, “The share of apartment buildings of the highest class of energy efficiency in the total number of apartment buildings commissioned in the Russian Federation,” sets the following targets: 10% in 2018; 20% in 2020; 30% in 2025 (Ministry of Construction, 2016a). At the same, the observed value of the indicator in 2017 is more than twice (75%) the target level of the indicator in 2025. This means that the target dynamics of the indicated indicator is out of date.

### 3.1.2. Technological regulation and standardization

In accordance with the Decree of the Government of the Russian Federation of January 25, 2011 No. 18, the Ministry of Construction of Russia has the authority to approve the energy efficiency requirements for buildings and structures. Moreover, the documents establishes the rules for determining the energy efficiency class of multi-unit residential buildings (Government of Russia, 2011). The Order of the Ministry of Construction of Russia No. 1550/pr adopted on November 17, 2017 approved the Requirements for the energy efficiency of buildings and structures, which the purpose of establishing similar requirements at the regional level and for the network of subordinate institutions of federal executive bodies (Ministry of Construction, 2017a).

The clause 15 of the Decree of the Government of the Russian Federation No. 18 established the annual specific value of the consumption of energy resources in buildings and structure: (i) Not <15% relative to the base level from January 2011 (for the period 2011-2015); (ii) not <30% compared to the base level from January 1, 2016 (for the period 2016-2020), 2020; (iii) not <40% compared to the base level by 2020. Due to the fact that any requirements for energy efficiency of buildings and structures were not approved, the above values were “shifted” by 7 years in accordance with the Resolution of the Government of the Russian Federation No 603 (Government of Russia, 2017b). The Decree also clarified the list of indicators characterizing energy efficiency requirements and mandatory measures to ensure their achievement. It also corrected the mechanism for determining the energy efficiency class of an apartment building.

The section “Thermal protection of buildings: The updated version of SNiP 23-02-2003” established mandatory requirements for the consumption of thermal energy for heating and ventilation of newly created buildings and structures until July 1, 2015 (TekhEkspert, 2013). Since July 1, 2015, according to the Resolution of the Russian Federation No. 1521, this section ceased to be mandatory (Government of Russia, 2014). Thus, at present, the mandatory requirements for the specific consumption of energy resources for the newly created buildings and structures are not defined.

In accordance with the plan of measures to improve the energy efficiency of buildings and structures, the Government of the Russian Federation approved the priority requirements for the energy efficiency of buildings and structures, providing for the mandatory use of energy efficient lighting and individual heating units with automatic weather control from January 1, 2018 during construction, reconstruction, and major repairs for a number of types of buildings, structures, structures (Government of Russia, 2017c).

Another important development is also concerned with special energy efficiency requirements in the construction and housing sector of the national economy. The Decree of the Government of the Russian Federation No. 275 established priority requirements for the energy efficiency of buildings, structures, and facilities. Another Order of the Ministry of Construction of Russia, No. 1422/pr (adopted in continuation) approved the criteria of an individual heating units installation with automatic weather control (Ministry of Construction, 2017b).

In addition, Orders of the Ministry of Construction of Russia No. 8/pr and 98/pr approved (i) the List of recommended measures for energy saving and energy efficiency in the objects of horticultural and gardening infrastructure and (ii) the list of activities, the implementation of which could increase energy saving energy efficiency of the apartment buildings (Ministry of Construction, 2017c, Ministry of Construction, 2017d). Even that these documents were not obligatory, they served as a methodological basis for determining the lists of energy saving and energy efficiency measures.

Among other important measures in the construction and housing sector, one could mention the Resolution of the Government of the Russian Federation No. 486 (Government of Russia, 2017d). That document developed and approved changes to the rules for establishing energy efficiency requirements for goods and services in the implementation of procurement for state and municipal needs. This also applies to constructing any municipal building. Thus, priority energy efficiency requirements have established on the municipal level of the construction and housing sector.

### 3.1.3. Financial incentives and funding

With the purpose of supporting the federal policies in the construction and housing sector, the Fund for Assistance to the Housing and Public Utilities Reform has been established (ConsultantPlus, 2007). For the 1<sup>st</sup> time the funds were allocated not only for the reimbursement of interest on loans and credits but were also used to reimburse the expenses of energy saving and energy efficiency services (in the amount of 33.98 million rubles). In particular, the Fund covered 10% of the costs of paying for new utilities resources aimed at increasing energy efficiency in apartment buildings.

**Table 1: Energy efficiency classes of apartment buildings in 2017**

Put in operation	Got a class	Russia								
		Out of them							G	
		A++	A+	A	B	C	D	E		F
9062	8686	116	176	811	5439	1854	276	13	1	0

Another important development concerns the co-financing programs at the expense of the Fund (adopted in June 2016), which included mandatory requirements for the implementation of key energy-efficient technologies. According to the Order of the Ministry of Construction of Russia No. 223/pr a residential building or an apartment building should have the B energy efficiency class in order to apply for reimbursement from the Fund (Government of Russia, 2014). It is worth mentioning that the B class could be assigned only in the presence of the following: (i) An individual heating unit with the function of automatic control and (ii) LED lighting. However, a few months later, this provision was excluded according to the Order of the Ministry of Construction of Russia No. 800/pr (Ministry of Construction, 2016e).

An important area in the provision of financing is to attract extra budgetary investments in the housing and utilities sector. The Ministry of Construction of Russia throughout 2015-2017 Work was carried out on a draft federal law "On Amendments to the Housing Code of the Russian Federation (regarding energy saving measures and energy efficiency in relation to the common property of apartment owners in an apartment building)," aimed at improving the legal regulation of the procedure for concluding energy service agreements (contracts) in multi-family residential buildings. The draft law provides for a decision on the conclusion of energy service agreements (contracts) by the general meeting of the owners of the premises of an apartment building. This draft federal law has been submitted to the Government of the Russian Federation.

#### 3.1.4. Supporting mechanisms

With respect to the energy efficiency supporting mechanisms in the construction and housing sector, one could only mention (i) the measures aimed at popularization of energy saving and energy efficiency technologies among the population and (ii) the festival of energy saving called "Vместе Yarche" ("Brighter Together").

### 3.2. Monitoring Energy Efficiency Performance in the Construction and Housing Sector of Russia

In order to analyze the general state of the energy efficiency performance in the construction and housing sector, the Ministry of Construction and the Ministry of Energy use the following indicators: (i) The specific water consumption by population, m<sup>3</sup> per person; (ii) the specific consumption of thermal energy in apartment buildings, Gcal/m<sup>2</sup>; (iii) the specific consumption of electrical energy and house-building needs in apartment buildings,

kWh/m<sup>2</sup>. Since the purpose of this paper section is to review the mechanism used by the Government, we obtained the necessary data from the Federal State Statistics Service (Rosstat, n.d.) for all years available and analyzed how well the mechanism captures energy efficiency performance in the construction and housing sector. Data for each indicator are visualized in Figures 1-3.

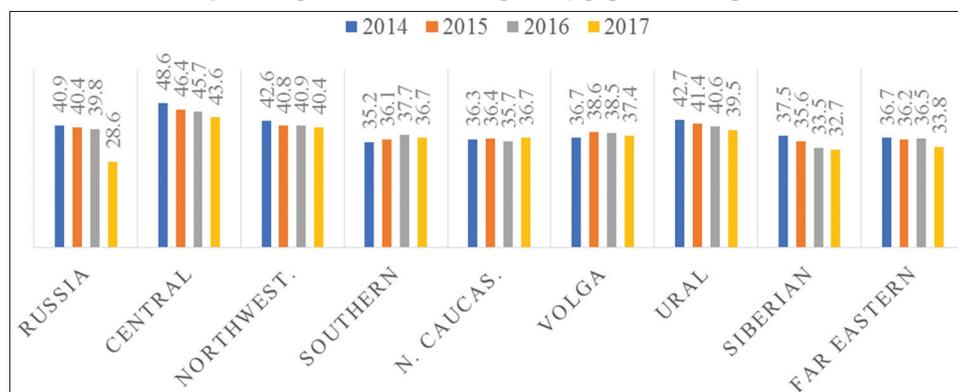
First of all, it should be mentioned that the Ministry of Construction is responsible for formulating and implementing state policies in the field of energy efficiency in the construction and housing sector (Government of Russia, 2013). The federal statistical observation form No. 22/Housing and Public Utilities is used) along with general statistical research conducted by the Federal State Statistics Service. Data on the aforementioned indicators has been collecting since 2014. (But the goal to reduce energy intensity of the GDP was proclaimed in 2008 by President Dmitry Medvedev). Accordingly, the values of these indicators can be calculated from 2014, data on indicators for earlier periods are simply not available.

According to the data, the specific consumption of water by the population tends to decrease (Figure 1). In the observable period, the decrease is 30.08% (from 40.9% in 2014 to 28.6% in 2017). The highest water consumption by person is observed in the Central Federal District in 2017, with the decrease of 10.28% since 2014. The Siberian Federal District demonstrates the lowest water consumption in the country, amounting to 32.7 m<sup>3</sup> per person in 2017. Consumption in the District has also decreased since 2014—by 12.8%. The growth of water consumption (if compared with 2014) is observed in the Southern Federal District (35.2 vs. 36.7) and the North Caucasian Federal District (36.3 vs. 36.7). However, the growth is not dramatic.

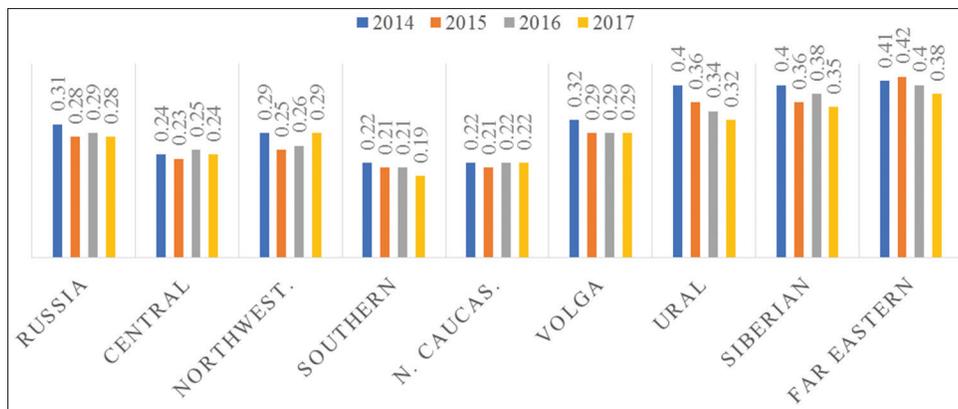
The specific heat consumption in the Russian Federation as a whole for 2017 decreased by 2% compared to the previous year and amounted to 0.284 Gcal/m<sup>2</sup>. In this case, if compared to 2016, in all federal districts, with the exception of the Northwestern and Volga Federal Districts, the indicator decreased. The lowest specific consumption of heat energy is observed in the Southern and North Caucasian Federal Districts. This situation may be due to the natural and climatic conditions of these federal districts.

Dynamics of electricity consumption by the population in apartment buildings for the period 2014-2017 remained stable. Specifically, the growth rate over 4 years amounted to about 1%.

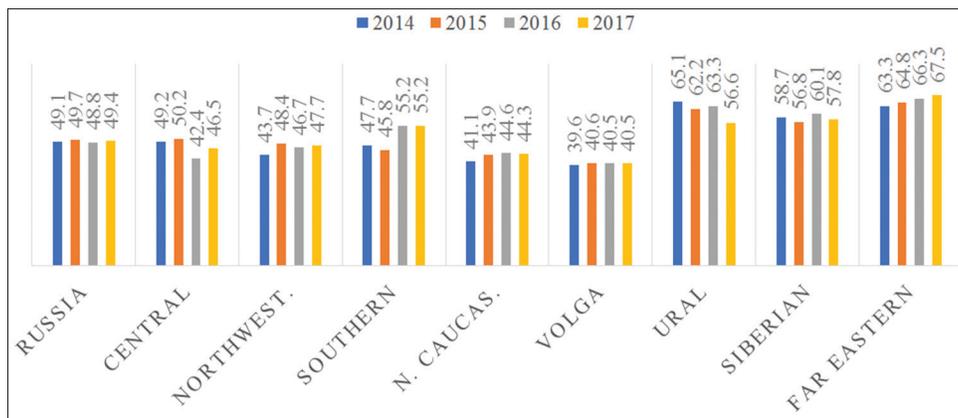
Figure 1: Specific water consumption by population, m<sup>3</sup>/person



**Figure 2:** Specific consumption of thermal energy in apartment buildings, Gcal/m<sup>2</sup>



**Figure 3:** Specific consumption of electrical energy and house-building needs in apartment buildings, kWh/m<sup>2</sup>



The downward trend in specific consumption is observed only in the Urals Federal District, while in a gradual increase is observed in the Far Eastern Federal District.

#### 4. DISCUSSION

The analysis of energy efficiency policies in Russia's construction and housing sector demonstrates that they are highly fragmented. There are no comprehensive policies that are timely implemented, reviewed in-depth, and sufficiently supported on the federal level. More than that, there is no adequate energy efficiency monitoring mechanism that could be able to measure performance and provide insights into relevant dynamics. Consequently, the whole energy efficiency potential of the construction and housing sector is unknown and not fully addressed.

**Recommendation 1:** The Government of Russia should provide an appropriate assessment of the energy efficiency potential in the construction and housing sector.

First of all, it is highly necessary, in our opinion, to conduct a comprehensive evaluation of the energy efficiency potential in the construction and housing sector in order to understand the current situation in the sector and develop appropriate policies. The already adopted legislation is too narrow, because it does not cover the entire sector and mainly addresses the residential buildings. In our perspective, this is characteristic of the general energy efficiency program in Russia and its subprograms in various

sectors of the economy (agriculture, transport, industry, etc.). Such a fragmentation and lack of coordination might be due to the fact that there was no any prior comprehensive assessment of energy consumption and energy efficiency issues in the Russian economy (Niels, 2018).

**Recommendation 2:** The Government of the Russia should focus on developing a comprehensive regulatory framework and implementation mechanisms aimed at increasing energy efficiency in the construction and housing sector.

Second, our review clearly shows that all major pillars of energy efficiency policies (government administration, technological regulation, financial incentives, supporting mechanisms) are too underdeveloped. For instance, why the Government of Russia was not able to include energy efficiency indicators into the strategic document regulating the construction and housing sector? The importance of such a step is hardly to overestimate both at the federal and local level. Another issue is that there are the requirements for establishing energy efficiency classes (A, B, C, etc.) solely for apartment buildings! And all other newly constructed buildings are simply ignored. Moreover, this sector of the economy covers not only buildings but also all other infrastructure related to them, which is also simply ignored by the Ministry of Construction. It seems that the Government of Russia cannot cover energy efficiency issues of even apartment buildings. For example, our review of technological regulation and standardization demonstrates that mandatory energy efficiency requirements are not established for the newly created buildings

at all! With respect to financial incentives, the most important issue is not addressed, given the state of Russian federal budget and the ability of the Government of Russia to invest into energy efficient technologies and practices. And this issue is clear in the context of the vast energy efficiency potential of Russia: There is a strong need to develop financial incentives (even via taxation) that would attract private investments or create private-public financial cooperation focused on supporting energy efficient technologies and practices in the construction and housing sector of the national economy.

**Recommendation 3:** The Government of the Russia should develop a clear causal mechanism between energy efficiency policies and actual performance, which could be quantitatively measured using an appropriate methodology.

Third, the current mechanism used by the Ministry of Construction to monitor energy efficiency performance in the construction and housing sector is beyond any critique. The three indicators used (water consumption, thermal energy consumption, electrical energy consumption) do not allow to comprehensively measure any real dynamics in the sector and are absolutely useless. In our perspective, this is due to the fact that the Government of Russia (and the Ministry of Construction in particular) was not able to develop a clear causal mechanisms between the policies adopted on the federal level and the actual energy efficiency performance. Consequently, there was no necessity in developing an effective monitoring mechanism.

## 5. CONSLUSION

In spite of some noticeable energy efficiency measures adopted in the construction and housing sector, our review demonstrates how fragmented and underdeveloped the federal policies are. The main issues of the sector are similar to the overall situation with energy efficiency in Russia: No clear picture of the energy efficiency potential, no comprehensive legal framework, no effective implementation mechanism, no effective monitoring mechanism.

On the basis of the review, we propose three recommendations for the Government of Russia (focusing solely on the construction and housing sector): (i) To provide an appropriate assessment of energy efficiency potential; (ii) to develop a comprehensive regulatory framework and implementation mechanisms aimed at increasing energy efficiency; (iii) to develop a clear causal mechanism between energy efficiency policies and actual performance, which could be quantitatively measured using an appropriate methodology.

## REFERENCES

- Asif, M., Muneer, T. (2007), Energy supply, its demand and security issues for developed and emerging economies. *Renewable and Sustainable Energy Reviews*, 11(7), 1388-1413.
- Bashmakov, I. (2009), Resource of energy efficiency in Russia: Scale, costs, and benefits. *Energy Efficiency*, 2(4), 369-386.
- Bogoviz, A.V., Lobova, S.V., Ragulina, Y.V., Alekseev, A.N. (2018a), A critical review of energy efficiency policies in agriculture. *International Journal of Energy Economics and Policy*, 8(3), 67-75.
- Bogoviz, A.V., Lobova, S.V., Ragulina, Y.V., Alekseev, A.N. (2018b), Russia's energy efficiency policies in the industry sector: Critical perspectives. *International Journal of Energy Economics and Policy*, 8(6), 48-58.
- Camioto, F.C., Morales, H.F., Mariano, E.B., Rebelatto, D. (2016), Energy efficiency analysis of G7 and BRICS considering total-factor. *Journal of Cleaner Production*, 122, 67-77.
- ConsultantPlus. (2007), Federal Law On the Fund for Assistance to the Housing and Public Utilities Reform No 185-FZ of July 21, 2007. Available from: [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_69936](http://www.consultant.ru/document/cons_doc_LAW_69936).
- Fadeyev, A.V. (2018), Building Energy Efficiency Classes and Energy Consumption Indicators. Available from: [https://www.abok.ru/for\\_spec/articles.php?nid=6391](https://www.abok.ru/for_spec/articles.php?nid=6391).
- Gagarin, V.G., Kozlov, V.V. (2011), Prospects of increase of power efficiency of residential buildings in Russia. *MGSU Vestnik*, 3, 192-200. Available from: <https://www.cyberleninka.ru/article/v/perspektivy-povysheniya-energeticheskoy-effektivnosti-zhilyh-zdaniy-v-rossii-1>.
- Golubtsov, N.V., Efreinov, L.G., Ismayatullin, R.G. (2013), Energy efficiency pf buildings and constructions in aspect of management of their life cycle. *Vestnik Chuvashskogo Universiteta*, 1, 225-247.
- Government of Russia. (2011), Decree of the Government of the Russian Federation of January 25, 2011 No 18 On Approval of the Rules for Establishing Energy Efficiency Requirements for Buildings and Structures and Requirements for the Rules for Determining the Energy Efficiency Class of Apartment Buildings (with Amendments and Additions). Available from: <http://www.base.garant.ru/12182261/#ixzz5dhV3btup>.
- Government of Russia. (2013), Resolution of the Government of the Russian Federation No. 1038 of November 18, 2013. Available from: [http://www.consultant.ru/document/cons\\_doc\\_LAW\\_154589](http://www.consultant.ru/document/cons_doc_LAW_154589).
- Government of Russia. (2014), Decree of the Government of the Russian Federation dated December 26, 2014 N 1521. Available from: <http://www.docs.cntd.ru/document/420243891>.
- Government of Russia. (2016), On Approval of the Action Plan ("Road Map") to Improve the Energy Efficiency of Buildings and Structures. Available from: <http://www.government.ru/docs/24410>.
- Government of Russia. (2017a), State Program of the Russian Federation Provision of Affordable and Comfortable Housing and Utilities for Citizens of the Russian Federation. Available from: <http://www.gov.garant.ru/SESSION/PILOT/main.htm>.
- Government of Russia. (2017b), Decree of May 20, 2017 No 603 On Amendments to the Decree of the Government of the Russian Federation of January 25, 2011 No 18.
- Government of Russia. (2017c), Degree of the Government of the Russian Federation No 275 of March 7, 2017.
- Government of Russia. (2017d), Decree of the Government of the Russian Federation No. 486 of April 21, 2018. Available from: <http://www.static.government.ru/media/files/A0T0RQIZwAKUPFvIOSj2AJMHYBrFdHjI.pdf>.
- IEA, International Energy Agency. (2011), Development of Energy Efficiency Indicators in Russia. Paris: OECD/IEA.
- IFC, World Bank. (2014), Energy Efficiency in Russia: Untapped Reserves. Available from: <https://www.ifc.org/wps/wcm/connect/de1e58804aababd79797d79e0dc67fc6/IFC+EE+in+Russia+Untapped+Potential.pdf?MOD=AJPERES>.
- Kopylova, A.I., Bogomolova, A.K., Nemova, D.V. (2016), The energy efficiency of the building with application of green roof technology. *Construction of Unique Buildings and Structures*, 10(49), 20-34.
- Korovina, M.D., Barashkova, P.S. (2017), Substantiation of the necessity of the energy saving in the multistory civil engineering. *Ecologiya and Stroitelstvo*, 2, 4-8.

- Kreydenko, T.F., Chernyaev, M.V., Grigorieva, E.M. (2018), Issues of developing the tool for diagnosis of energy efficiency level of Russian regions' economy. *International Journal of Energy Economics and Policy*, 8(4), 187-198.
- Kulakova, T.V., Makeeva, D.R., Krukova, E.M. (2013), Financial mechanisms for improving the energy efficiency of housing and communal services of the Russian federation. *Ntsionalnye Interesy: Priority and Bezopasnost*, 23, 2-11. Available from: <https://www.cyberleninka.ru/article/v/finansovye-mehanizmy-povysheniya-energoeffektivnosti-zhilischno-kommunalnogo-hozyaystva-rossiyskoy-federatsii>.
- Lezier, V., Gusarova, M., Kopytova, A. (2017), Water supply of the population as a problem of energy efficiency on the example of the Tyumen region of Russia. *IOP Conference Series: Earth Environment Science*, 90, 012069.
- Lobova, S.V., Bogoviz, A.V., Ragulina, Y.V., Alekseev, A.N. (2019), The fuel and energy complex of Russia: Analyzing energy efficiency policies at the federal level. *International Journal of Energy Economics and Policies*, 9(1), 205-211.
- Malmendier, B. (2011), New Russian energy efficiency act. *Journal of Energy and Natural Resources Law*, 29(2), 177-208.
- Mimouni, K., Temimi, A. (2018), What drives energy efficiency? New evidence from financial crises. *Energy Policy*, 122, 332-348.
- Ministry of Construction. (2014), Order of the Ministry of Construction of the Russian Federation No 233/pr of May 5, 2014. Available from: <http://www.base.garant.ru/70687362>.
- Ministry of Construction. (2016a), Order of the Ministry of Construction of the Russian Federation No 399/pr of June 6, 2016. On the approval of the rules for determining the class of energy efficiency of apartment buildings. Available from: <https://minjust.consultant.ru/documents/20368>.
- Ministry of Construction. (2016b), Order of the Ministry of Construction of the Russian Federation No 800/pr. Available from: <https://normativ.kontur.ru/document?moduleId=1&documentId=286911>.
- Ministry of Construction. (2016e), Order of the Ministry of Construction of the Russian Federation No 800/pr. Available from: <https://www.normativ.kontur.ru/document?moduleId=1&documentId=286911>.
- Ministry of Construction. (2017a), Order of the Ministry of Construction of Russia of November 17, 2017 No. 1550/pr.
- Ministry of Construction. (2017b), Order of the Ministry of Construction of the Russian Federation No. 1422/pr of October 11, 2017. Available from: <https://www.rg.ru/2018/02/13/minstroy-prikaz-1422-site-dok.html>.
- Ministry of Construction. (2017c), Order of the Ministry of Construction of the Russian Federation No. 8/pr of January 9, 2017. Available from: <http://www.minstroyrf.ru/docs/13274>.
- Ministry of Construction. (2017d), Order of the Ministry of Construction of the Russian Federation No. 98/pr of February 15, 2017. Available from: <http://www.minstroyrf.ru/docs/13681>.
- Ministry of Energy. (n.d.), Energy Efficiency. Available from: <https://www.minenergo.gov.ru/node/5195>.
- Niels, S. (2018), The green menace: Unraveling Russia's elite discourse on enabling and constraining factors of renewable energy policies. *Energy Research and Social Science*, 40, 244-256.
- Orlov, A.K. (2017), Implementation of megaprojects for the creation of tourist clusters in Russia based on the concept of energy efficiency and sustainable construction. *IOP Conference Series: Earth Environment Science*, 90, 012060.
- Orlov, A., Grethe, H., McDonald, S. (2013), Carbon taxation in Russia: Prospects for a double dividend and improved energy efficiency. *Energy Economics*, 37, 128-140.
- Overland, I. (2013), Gas, price, and Russia's modernization: Pricing policy and energy efficiency in Russia. *Osteuropa*, 63(7), 61-74.
- Rosstat. (n.d.), Energy Efficiency Data. Available from: [http://www.gks.ru/wps/wcm/connect/rosstat\\_main/rosstat/ru/statistics/efficiency/#](http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/efficiency/#).
- Severova, E.A., Pashkevich, S.A., Adamtsevich, A.O. (2013), Energy efficiency in construction-aspects of development in Russia. *Construction of Unique Buildings and Structures*, 1(6), 18-21.
- Strakhova, N.A., Lebedinsky, P.A. (2012), Analysis of the energy efficiency of the Russian economy. *Inzhenerny Vestnik Dona*, 12(2), 840-843.
- TekhEkspert. (2013), 10 SP 50.13330.2012. Available from: <http://www.docs.cntd.ru/document/1200095525>.
- Tyutikov, V.V., Smirnov, N.N., Lapateev, D.A. (2016), Analysis of energy efficiency from the use of heat-reflective window screens in different regions of Russia and France. *Procedia Engineering*, 150, 1657-1662.
- Zadvinskaya, T.O., Gorshkov, A.S. (2014), Method of energy efficiency of residential house by implementing of automatic controlled heat metering system. *Construction of Unique Buildings and Structures*, 8(23), 79-92.
- Zhukov, A.D., Ter-Zakaryan, K.A., Semenov, V.S. (2018), Insulation systems with the expanded polyethylene application. *IFAC-PapersOnLine*, 51(30), 803-807.