

# Socio-economic aspects of steel production in conditions of Russia agriculture machinery demand increase

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**Abstract.** The paper is devoted to the study of socio-economic aspects of the production of Russian steel. A distinctive feature of the Russian steel industry is that it is deservedly considered one of the basic sectors of the national economy. The paper proves that the dynamics of production began to serve as an indicator of the development of the Russian industry and economy. It is shown in which industries steel is used in the national economy. The paper shows that steel production plays a special important role in the Russian economy. The place of Russia in the world steel market is shown. The ranking of the leading countries in the production of steel is presented. The authors have substantiated and highlighted the following main socio-economic aspects of steel production in Russia: production and economic; social; financial; environmental and integration. It is stated that the revealed aspects determine state and development prospects of Russia's metallurgical complex. It is also shown that the systemic crisis in production is aggravated by the social aspect. The influence of the production of steel on the formation of aspects of the vital activity of the population in Russian single-industry cities is revealed. Steel enterprises form the industrial specialization of such cities and significantly affect the vital activities of people. The authors have made use of the material concerning the features of mono-industrial cities located in the Arctic zone of the Russian Federation; special attention has been paid to the residents' social problems.

## 1 Introduction

Steel is an alloy of iron with carbon and other elements. A distinctive feature of the Russian steel industry is that it is deservedly considered one of the basic sectors of the national economy. Steel enterprises are part of the steel industry. Ferrous metallurgy unites more than 1,500 industrial and auxiliary non-industrial enterprises. It accounts for: 1.5% of GDP, about 12% of industrial production, and more than 6% of exports. Steelmaking

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enterprises produce steel of various grades in the form of billets and rolled steel. Thus, referring to the metallurgical enterprises in the future, the authors will speak only about the enterprises of the steelmaking sector, unless special provisions are made in the text.

The choice of enterprises of the steel industry as an object of this research is explained by the special role of this industry for the national economy. This special role has developed under the influence of several key aspects that determine the state and prospects of development of Russian steelmaking.

The purpose of this research is to identify and analyze the main socio-economic aspects affecting the production of Russian steel.

To achieve this goal, it is necessary to solve several interrelated tasks:

- identify the place of Russian steel producers in the world;
- identify whether the dynamics of production began to serve as an indicator of the development of Russian industry and the economy;
- reveal main socio-economic aspects of steel production in Russia;
- identify the impact of production of steel on the formation of activities of people in Russian single-industry cities;
- identify groups of objective and subjective factors that increase social tension in single-industry cities of the Russian Arctic.

## **2 Methods**

The research methodology is related to the tasks to be solved. So, the first task is to identify the position of Russian steel producers in the world market:

- hence, a ranking of countries producing steel in 2018 is made; the authors studied the indicators of gross production output, and per capita;
- to solve the second task, data on the structure of steel use in the Russian industries for 2018 is used; the dynamics of steel production in Russia in 1991-2018 was also studied;
- in order to solve the third problem, the authors have used the variety of analytical material and highlighted socio-economic aspects of steel production in Russia;
- to solve the fourth task, data on the effect of steel production and export on the development of single-industry cities was used;
- the authors have analyzed the peculiarities of the influence of steelmaking enterprises on formed on their basis mono-industrial cities;
- to solve the fifth problem, the authors have made use of the material concerning the features of mono-industrial cities located in the Arctic zone of the Russian Federation; special attention has been paid to the residents' social problems.

In the course of the research the materials from Russian and foreign researchers on the topic have been utilized.

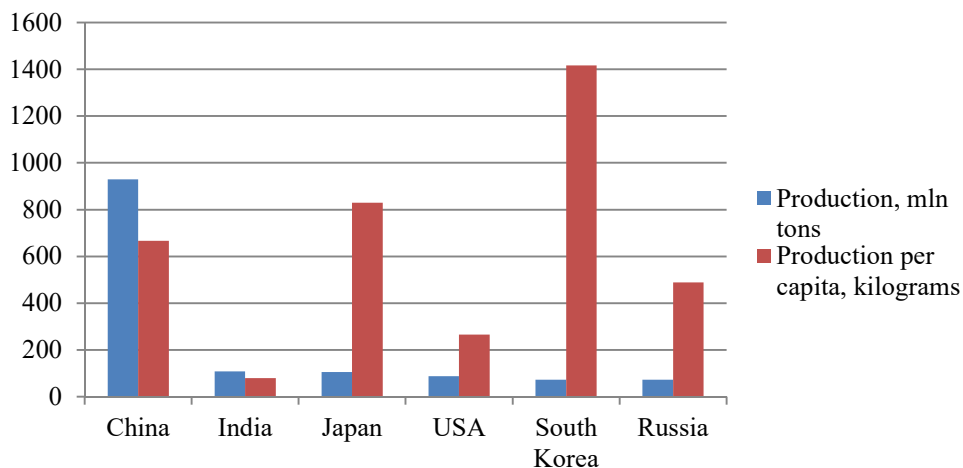
## **3 Results**

### **3.1 Place of Russian steel producers in the world**

High export volumes are explained by the fact that in recent years Russia has been producing more metallurgical products than is necessary for its domestic consumption. Russia ranks sixth in steel production (as of 2018). In the ranking of steel producers, China is leading. For many years, Russia ranked fifth in steel production. However, in 2018, South Korea outstripped it. In the same 2018, Japan lost second place among steel producers and India ranked second.

The ranking of six major steel producers is as follows:

- China comes first, producing 928.3 million tons of steel;
- India ranks second with the production of 106.5 million tons of steel;
- Japan ranks third with the production of 104.3 million tons of steel;
- the United States ranks fourth with production of 86.7 million tons of steel;
- South Korea ranks fifth with the production of 72.5 million tons of steel;
- Russia ranks sixth with the production of 71.7 million tons of steel (Fig. 1).



**Fig. 1.** Rating of countries for the production and export of steel [1].

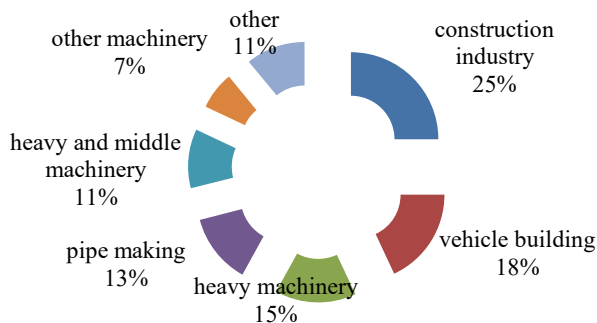
At the same time, in per capita terms, Russia goes to the fourth position after South Korea, Japan and China. In this rating South Korea is an absolute leader. More than 1.4 tons of steel production for each inhabitant.

The ranking of six major steel producers per capita was distributed as follows:

- South Korea comes first with a production of 1,417.1 kg of steel per capita;
- Japan ranks second with the production of 827.2 kg of steel per capita;
- China ranks third with the production of 665.4 kg of steel per capita;
- Russia ranks fourth with a production of 488.2 kg of steel per capita;
- the United States ranks fifth with production of 265.0 kg of steel per capita;
- India ranks sixth with a production of 78.7 kg of steel per capita (Fig. 1).

### **3.2 Dynamics of steel production as an indicator of the development of the Russian economy**

In previous studies, the authors paid attention to the fact that the development of ferrous metallurgy is an indicator of the development of Russian industry [2]. This conclusion is supported by Antipin and Zinoveva [3], Romenets and Ilyichev [4], Kerkhoff [5]. The authors also believe that this trend extends to steel production. Steel and rolled steel are the main products of ferrous metallurgy. Steel as a production resource is used in many sectors of the national economy, as can be seen from Fig. 2.



**Fig. 2.** Use of steel in the Russian economy [6].

A quarter of steel production is used in the construction industry for the production of building materials and metal structures; a significant part is used in mechanical engineering, including the automotive industry. As soon as the economic crisis sets in, the volume of construction is reduced, the demand for automobiles falls, the industry reduces the pace of renovation of machinery and equipment [7, 8]. Therefore, the demand for steel and rolled steel also falls. This affects the entire process chain: the fall in demand for steel reduces its production. As a result, mining and processing plants are forced to reduce the extraction and enrichment of iron ore. This situation is emerging not only in Russia but also in other countries that produce steel for the domestic and foreign markets [9; 10]. The dynamics of steel production in Russia for 1991-2018 is presented in Fig. 3.

As can be seen, the trends in steel production largely coincide with the trends in the functioning of the Russian industry: sharp drops are noticeable after 1991 – the year of the collapse of the USSR and the Soviet economy, in the crisis years of 1998, 2008, 2009. The country's recovery from the crisis is accompanied by an increase in steel production.

Obviously, the recent growth in Russia's economy will lead to a new growth of demand for steel.

The main strategies for the development of the steel industry in Russia have not changed recently. It is planned to steadily increase the industrial potential due to putting into operation new capacities. Much attention is still being paid to resource saving and improving energy efficiency of production. Digital technologies are being actively introduced, especially at the stage of control of production and finished products. A relatively new strategy is investment in staff development. In our opinion, such strategies are also characteristic of other industrial sectors of Russia [12].

### 3.3 Main aspects of steel production

The following key socio-economic aspects of steel production in Russia are examined:

1. Production and economic aspect. As long as the production of steel, firstly, provides resources for many sectors of the economy, while secondly it creates the regional specialization.

2. The social aspect. As producing steel companies, first, for the most part act as city planners, and secondly, provide the employees and their families with certain quality of life.

3. The financial aspect. Because steel producers, first of all, create a high purchasing power of their employees and promote national cash assets movement; secondly, they pay high taxes, thereby ensuring financial security at various levels: from municipal to Federal.

4. The environmental aspect, because steel production is accompanied by a comprehensive negative impact on the environment.

5. The integration aspect, as steel producers, first of all, are the part of technical core, which forms the basis for the development of Russian industry and economy; secondly, they are integrators that adapt import technology and management techniques to Russian conditions; thirdly, steel producers integrate Russia into the world economic space and actively supply Russian products to the world market.

### **3.4 The impact of steel production on the activity of single-industry cities**

Among the above aspects one focuses only on one – the impact of steel production on the activity of mono-towns. First of all, this is due to the fact that more than 70% of ferrous metallurgy enterprises are city-forming. Studies show that no more than 5-10% of the population works in the city-forming enterprises [13]. However, it is precisely steel enterprises that form the sectoral specialization of the city. A city actually becomes mono-functional, or a single-industry cities. The role of city-forming enterprises in single-industry towns concerns scientists all over the world. This is confirmed by studies by Herrera, Torrent and Hernández in South America [14], Anas and Xiong in the USA and Canada [15], Bjornland and Thorsrud in Norwegian [16], Korchak, Serova, Emelyanova and Yakovchuk in the Arctic [17], Sachs and Warner in Western Europe [18].

The influence of the metallurgical complex on the vital activity of Russian single-industry towns' population is difficult to overestimate. Socio-economic development of such towns and cities is directly dependent on city-forming enterprises which influence almost all aspects of life: provide work, contribute to the creation of infrastructure, determine the line of vocational training at universities and colleges and ensure the fullness of budgets.

City-forming enterprises pay stable and rather high wages in the regions. As a rule, the average wage at the enterprises of the metallurgical complex is higher than in the region as a whole. In addition, the employees of metallurgical complex enterprises have the opportunity to receive loans and interest-free loans, wild cards to sanatoriums for themselves and family members, partially offset travel costs etc. Thus, the enterprises of the metallurgical complex provide fairly high and stable quality of life for the employees and their families.

What is also important in the social aspect – ensuring the quality of life of the population. Steel enterprises of ferrous metallurgy have a complex negative impact on the environment. The complexity of the impact lies in the fact that steel companies simultaneously pollute all elements of the natural environment – from the atmosphere to groundwater [10, 19]. The problem for people is outdated, and environmentally dirty production technology of steelmaking.

### **3.5 Features of mono-industrial cities of the Russian Arctic**

In the course of the research of the features of mono-industrial cities, we have paid special attention to the single-industry towns of the Russian Arctic [20-22]. This particular focus is due to a number of reasons:

- firstly, the Arctic zone of the Russian Federation in recent years has been under scientists, politicians and entrepreneurs' close attention who consider it as a basis for the development;
- secondly, the creation of single-industry towns concentrating human resources was one of the principles for the development of the Arctic in Soviet times;

- thirdly, currently the bulk of the population of the Russian Arctic is living in cities, many of which continue to be single-industry ones.

In the course of the studying of the mono-industrial cities of the Russian Arctic, we have come to the conclusion that social tension in these cities is increasing. We have identified a number of factors that denote this. Among them, there are factors that in a varying degree are inherent in all mono-industrial cities of the Arctic. We have called them objective. Another group of factors is associated with imperfection of municipal administration and is noted only in some mono-industrial cities. We have called these factors subjective. The groups of objective and subjective factors are presented in Figure 3.



**Fig. 3.** Groups of objective and subjective factors that increase social tension in single-industry cities of the Russian Arctic.

Thus, the entrepreneurs who develop steel production must take into account the particularities of the development of mono-industrial cities and coordinate their activity with government authorities. Otherwise, the increase in social tension can lead not only to social problems, but to production ones as well as noted by several researchers [23, 24].

## 4 Conclusion

In recent years Russian steel producers have been quite successful. It is especially important that the demand in the domestic market has increased. As can be seen from Fig. 3, this situation is noticed for the first time since 2011. For example, the demand of the Russian automotive industry increased by almost 15% [10]. This growth is associated with an improvement in the position of the domestic automotive industry. This supports the authors' conclusion that steel production is an indicator of the development of Russian industry as a whole.

Predicting demand for Russian steel products, meaning steel production and export, is quite difficult. In the near future, the Russian domestic market may fall. This is due to the fact that Russia has completed the implementation of several key projects, for which large volumes of steel were required. For example, the construction of facilities for the World Cup in 2018, the laying of the "Southern Corridor"— a system of gas pipelines in the center and in the south of the European part of Russia, etc.

The crisis caused by the coronavirus pandemic will also be of great importance. The crisis will inevitably lead to the reduction in steelmaking because it is an indicator of the economic development of the country and the world. However, the way out of the crisis is always accompanied by the growth of mechanical engineering, machine-tool manufacture and construction engineering. And steel production will increase again.

It is well to bear in mind that during the crisis social problems which are already inherent in mono-industrial cities formed on the basis of steel production are aggravated. Anti-crisis measures of the government and private industry should take into account the peculiarities of the development of single-industry towns. Otherwise, increased social tension can lead not only to social, but to production problems as well.

The problem of forecasting the production and export of steel lies in the lack of certainty of external factors is considered significant. The rise in prices, coupled with an increase in demand for Russian steel products, will have a positive effect on steel production and exports, and therefore on the country's national income.

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