Abstract—The article deals with the problems of decision-making on the development of a complex of structural materials. The features of meeting the needs of the economy in materials in the 2000s are shown. Particular attention is paid to changes in the global market and the specifics of processes in the Russian economy. It is noted that the transition to assessing the prospects of companies engaged in the production of structural materials, based on the dynamics of invested funds, business assets, makes it possible to resolve conflicts of market participants regarding income, eliminate differences in the attractiveness of the domestic and foreign economic environment. Directions for improving the tools of state regulation of the processes of sectoral development are proposed.

Keywords: construction materials, company assets, development conditions, industry forecasting, resource provision, market drivers, institutional development constraints

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The presence of a developed structural materials complex (SMC) for centuries has been the most important advantage of the countries that dominate the global economy [1, 2]. Russia is one of the world’s largest producers of traditional and advanced materials. The issue of their effective use is topical. For the SMC of Russia for the forecast period, the main goal may be to maintain a reliable resource supply for the country’s economy. Achieving this goal involves solving the problems of ensuring the availability of materials for various consumer groups, maintaining a system for improving the quality of materials and deepening the degree of their processing. The tasks are difficult, and their scale is indicated by the numerous problems of production and consumption of structural materials in the 2000s, the low efficiency of the system of market interactions. In this regard, we note the following points.

— In the structure of production, less than 25% of produced structural materials fall to the share of advanced processing products, less than 1% are high-tech types of materials (special steels, structural plastics, composite materials based on wood raw materials). During the 2000–2010s, the problems of improving the quality of materials were exacerbated, which led to the use of administrative measures (restrictions on the export of unprocessed raw materials and the simplest materials).

— Regional availability of materials is related to the specifics of production location and transaction costs. If the regional specificity of production, as a rule, is determined by the availability of raw materials, then there are many more reasons for regional differentiation in the consumption of materials. As a result, seven regions of the Russian Federation, occupying 3.5% of the country’s territory, account for over 60% of the total metal consumption in the country. For comparison: 35 regions (42% of the country’s territory and 20% of the population) consume about 3% of the metal [3].

— Opportunities for efficient use of materials depend on the level of their price. Currently, there is a significant (1.5 times or more) variation in prices for materials across Russia. Statistics state that during the 2000s, market prices for individual materials were 1.5–2 times higher than the costs of their production. The difference between production and consumption prices for relatively simple water pipes is 30% higher than for pipes for the oil and gas industry. In Russia, the availability of the simplest materials for intra-industry purposes, which are in high demand on the global market, is limited (up to 90% of their commercial output is exported) [4]. The effects of price discrimination periodically cause a violent reaction from the country’s leadership (“the doctor will have to be sent,” “the state has been slammed,” etc.).

The main difficulty is related to the low interest of business owners in the development of the domestic materials market [5]. It is important that this happens
Many investment decisions of the 2000s were aimed not at eliminating disproportions in the domestic market of structural materials, but at their “strengthening” (modernization of production for export supplies) [6], which gave rise to an increase in state intervention in the priorities of the chemical industry, and the timber industry complex (TIC).

The total financial investments of SMC enterprises in 2020 exceeded 16.7 trillion rubles, of which long-term amounted to 1.8 trillion rubles, while investments in fixed capital were only 1.2 trillion RUB. There is an “implicit” refusal of company owners to increase investment in increasing value added, improving the quality of products. Companies prefer to concentrate the efforts of all enterprise services on cost savings. This is the all-Russian situation with the motives of investment activity. Compared to 2000, the desire of companies to increase production capacity has significantly decreased (from 42 to 35%), to create new jobs (from 30 to 22%). If the leadership in investment motives remains with the replacement of worn-out equipment (growth from 64% in 2016 to 68%), then the next positions are occupied by energy savings (growth from 36% in 2016 to 68%), then the next positions are occupied by energy savings (growth from 36% to 40%) and reduction in production costs (growth from 37 to 40%).

At present, management decisions remain situational, depending on political events and global market conditions. Since the late 1980s, there has been one internal Russian goal—to make money on structural materials. Uncertainty remains with regard to the target settings for the development of the country and the participation of SMC enterprises in their achievement [7]. The uncertainty of the economic situation is leading in business responses to the question about the factors limiting investment activity in the country (growth from 32% to 64% in 2019).

At the end of 2015—2020 (investment decline in industries and growth of dividend payments), the need for radical changes in economic policy became obvious [7–10]. A systemic transition is required from “attempts” to regulate processes in the commodity market (which, in fact, is controlled by the global market) to the management of assets located in Russia. With regard to SMC, this means a change in economic development priorities: from the orientation of production to profit to the orientation towards capital growth [11–13]. We emphasize that business does not see problems with demand (only 22% of respondents indicate this factor of limiting investment activity) or with investment returns (limited only for 24% of respondents). Everyone is concerned only with the future of invested funds (and not only abroad). There will be a “transfer” of assets, which determines the increased interest in their condition [14, 15]. The exceptionally high price of the issue being solved (trillions of dollars) overshadows the indicators of the current profitability of production (tens of billions of dollars) and the efficiency of resource use. The motivational basis for making long-term managerial decisions is fundamentally changing. Despite the importance of the dynamics of investments in fixed assets (valuation in terms of the cost method), public recognition of the value of invested funds plays an equally significant role. Among the most important characteristics of assets for the forecast period, of particular interest is everything related to social requirements, including environmental (climatic) effects, and the quality of jobs [16, 17].

Let us consider the basic prerequisites for the growth in the value of the assets of SMC of Russia. A key role in asset valuation is played by their demand in the future. Interest in SMC enterprises in the Russian Federation has not decreased for more than 30 years, and their value has increased significantly over this period [18, 19]. In the first world rating of the attractiveness of companies for employment (World’s Best Employers, Forbes, 2017), four Russian companies...
entered the TOP-500, the best of which was named Magnitogorsk Metallurgical Plant (214th place). Despite the conventionality of Forbes estimates and various ratings of the investment attractiveness of companies, there is no doubt that companies operating in the construction materials market have valuable assets. Thus, in 2019, the capitalization of the world’s largest metallurgical company ArcelorMittal was 15.7 billion USD with the production of 97.3 million tons of steel, and Novolipetsk Metallurgical Plant, 15.9 billion USD, (15.6 million tons of steel, 21st in the world). This is rather an exception to the rule, since the price of many domestic businesses remains at the level of the price of a possible disposal of property for scrap.

When evaluating the prospects for the SMC industries, it is important to take into account the fact that economic growth in Russia is material-intensive. For key types of structural materials (ferrous metals, plastics, timber industry products), the growth in their consumption in the 2000–2010s outpaced the growth rate of GDP [20]. In 2010–2019 with GDP growth of 10.8%, the index of industrial production amounted to 126.4%. During this period, there was an increase in the production of traditional materials: processed timber, from 21.9 to 30 million cubic meters, and plastics in primary forms, from 4.96 to 8.7 million tons. The volume of production of a number of materials increased at double-digit rates (plastic plates, pipes).

The analysis points to the features of the material support of the economy in the 1990s–2020s using the resources of the global market, which influenced the dynamics of demand for materials. According to the formal indicator of apparent consumption of steel, the metal intensity of GDP for 2000–2014 increased by only 7%. A correct calculation shows that metal costs, taking into account net imports of finished metal products and metal-containing products per unit of GDP, increased by 43% [21]. In the period 2015–2020 there was a decrease in imports of materials, which reduced the integral material intensity of production with a stable metal intensity of GDP, estimated from data on domestic supplies. We emphasize in particular that the growth of the metal intensity of GDP in 2005–2007 by 12% testified to the normalization of the use of metal in the country, increasing efficiency. The decrease in the metal intensity of Russia’s GDP by 21% in the period 2007–2009 meant the presence of a crisis in the system of circulation of metal products. In the 1990s–2020s, the estimated metal intensity of GDP for metals in demand on the global market (nickel, cobalt, copper, rare earth metals, etc.) dropped especially sharply. There is no reason to be proud of the fact that in Russia the metal intensity of GDP for the consumption of aluminum, lead or nickel is lower than in the US or China (since 2005). In this case, the parameter does not reflect the efficiency of resource use in the country, but is an indicator of “backwardness.” And the task is to eliminate the backlog by increasing the consumption of resources, and not in trying to “save” them at any cost.

At present, the level of production of basic structural materials per capita differs slightly from the world average, but in terms of their use, Russia is inferior to the indicators of the leading countries. In the Russian Federation, steel consumption is 280 kg/person per year, which is 30% higher than the world average. Russia is inferior in this indicator to Germany (418 kg/person, 2019), Japan (498 kg/person), increases the backlog from China (from 1.7 times in 2010 to 2.1 times in 2019), and South Korea (by 3.5 times in 2019) [22]. The reason for the change of leaders in the world lies in the change in the level of efficiency in the use of materials, in the amount of adding value to them [3, 23, 24]. For the forecast period, the most important task is to increase the efficiency of the use of materials, including those actively exported from the country. If we are guided by data on foreign trade deliveries, then in metallurgy the value of products should be increased by 40–45%, in the woodworking industry by 60–80%, in the production of engineering plastics, 1.8 times.

The current situation in Russia with the production and consumption of structural materials is reflected in the results of macroeconomic forecasts carried out by think tanks and policymakers. Outside of crisis scenarios, it is most likely that a 3% (parameters of the 2010s) average annual growth in demand for the forecast period will remain and an increase in the world production of basic structural materials by 1.5–1.75 times by 2040 is possible. Accelerating the processes of global industrialization is also possible by expanding the list of newly industrialized countries.

Mobilization of growth reserves in the Russian Federation implies an increase in the utilization rates of capacities for the production of a number of materials, in particular, timber (56–57% capacity utilization level in 2017–2019), cement (52–54%), and finished metal products. Expanded involvement in the production of materials produced in these sectors in the short term (until 2025) is provided for within the framework of national projects and federal programs. While maintaining the proportions of the 2010s, the proposed development of 8.3 billion dollars of investment will require about 1 million tons of metal in various forms, including in the form of imported

2 2020 World Steel in Figures. https://www.worldsteel.org/steel-by-topic/statistics/World-Steel-in-Figures.html Cited October 12, 2021. How NLMK became more expensive than ArcelorMittal. https://www.vedomosti.ru/business/articles/2019/06/05/803400-nlmk. Cited October 12, 2021.

3 Period 2020–2021 not indicative due to the COVID-19 pandemic accompanied by an economic downturn.

4 Russian Statistical Yearbook (Rosstat, Moscow, 2020) [in Russian].

5 National projects of Russia. national projects.rf. Cited October 12, 2021.
equipment [20]. In the long term (2030–2040), it will be necessary to impart qualitatively new properties to materials in order to obtain system-wide effects. The potential for growth in the value of exports when reaching the average world price level is almost two times, and when reaching the parameters of the leading countries, 2.5 times. In turn, the results of the development of the country as a whole depend on the efficiency of production and use of materials.

In the process of predictive justification, one should take into account both the presence of global prerequisites for “wrong development” and the domestic specifics of the formation and satisfaction of needs for structural materials. In the 21st century in the market of structural materials, the connection between market (price) and production (output) processes turned out to be broken, the effectiveness of economic regulation measures decreased [3, 25, 26]. Of fundamental importance is the correct assessment of the processes observed in the global market of structural materials.

For more than 300 years, there has been a fairly stable trend of reducing the relative cost of structural materials and expanding the scale of their involvement in the national economy. This ensured the success of the global economy [1, 2]. Since 2004, there has been an accelerated increase in prices for structural materials (from 4 to 12 times). Against this background, there was a campaign to eliminate “surplus capacity,” and restrictions on access to materials (protectionism, restrictions on the export of resources) were formed. The contradictions gradually grew and became explicit in 2007, continuing to escalate to the present (violation of established rules and change of decision-making centers).

The managerial crisis in the market of structural materials did not arise due to errors in regulatory systems, but became a natural result of their development. This is a logical attempt to maintain the status quo by transnational companies (TNCs) in the context of the spread of competencies for the production of modern materials around the world. Thus, in the world in the 1970–1990s, steel consumption per capita decreased by 18%. The share of metal products supplied for export in the total volume of metal sales increased from 26.8% (1990) to 39.2% (2000)6. ArcelorMittal, the world’s largest metallurgy company, was formed not by investment and production methods, but by buying up assets. Prices in the market are dictated by transnational companies (TNCs) in the exchanges and have little bearing on the actual state of production or consumption of materials in the world. Many segments of the construction materials market have become “intermediary markets,” as trends in them are regulated by traders and trade policy.

The active intervention of the state in the processes in the market of structural materials and in the activities of the dominant companies in the 2010s is typical for most countries of the world. According to EUROFER, 60% of imports of metal products to the EU are carried out under special agreements (antidumping measures) and over 30% under intracorporate agreements. Intergovernmental agreements ensure the strengthening of the resource bases of the United States, China, Japan, and EU countries. The power resource becomes an integral part of commodity contracts concluded by TNCs, as well as existing systems of rating estimates for the reliability of investment. Production changes in the SMC industries are increasingly becoming the result of processes in the financial market, sociopolitical processes, and the reaction of business to economic factors is less and less observed. A global market has been formed, in which the internal “market laws” in individual countries either do not work or operate with great distortions.

The Russian specificity becomes the source of many, at first glance, paradoxical phenomena, for example, when the improvement in the global market situation was accompanied by a deterioration in the situation in the domestic market of structural materials. The paradox of the modern system of production and use of structural materials in the Russian Federation lies in the fact that the “bottlenecks” in its development are not low-income industries, but highly profitable and superloaded capacities for the production of highly liquid products (blanks, slabs, strips). A huge number of enterprises (about 30% in metallurgy, 35–45% in the timber industry and the production of building materials) have been operating at losses for a long time and regardless of market conditions.8

In the process of developing the domestic market, conflict zones of income distribution emerged (the profitability of materials producers is 3–4 times higher than that of their consumers), limiting the growth in demand for materials and their production volumes. There is no doubt that the economic phenomena observed in the domestic market (prices, demand, supply, etc.) cannot be reduced to relations between producers and consumers [4, 10, 18]. The discrepancy between the structure of production and consumption of structural materials in the domestic market has become stable.

The institutional features of doing business in SMC suggest its development with a focus on processes in the global economy and with a specific attitude to solving the macroeconomic problems of the country [27–29]. Macroeconomic and corporate factors in 2000–2010 formed an integral system of maintaining stability as an alternative to the tool of the investment

6 2020 World Steel in Figures. https://www.worldsteel.org/steel-by-topic/statistics/World-Steel-in-Figures.html. Cited October 12, 2021.

7 The global power turned out to be weaker than the power of the natives. https://rusmet.ru/globalnaya-sila-okazalas-slabee-sily-aborigenov/. Cited April 30, 2021.

8 Russian Finances (Rosstat, Moscow, 2020) [in Russian].
solution for emerging problems. In the construction materials market, prices play an important role. During the 2000s, the demand for steel products in the domestic market increased almost 10 times (from 5.1 to 49 billion USD), while domestic deliveries in tonnage increased by about 15%. Metal market volume for 2010–2020 increased by about 1.35 times in value terms, but at the same time decreased in physical terms. The events after the devaluation of the ruble in 2014 are indicative as an attempt by the state to stimulate domestic production. The efficiency of exports increased, but over the past period, the increase in exports (by 5 million tons) was ensured by the withdrawal of resources from the domestic market and slightly affected the growth in metallurgical production (by 1 million tons), while the investment attractiveness of the industry decreased [3]. Thus, in Russia, the path to a positive medium-term development of the SMC industries will be determined not only by macroeconomic factors, but also by solving the problems of managing companies’ assets. They have a special institutional nature and require an institutional solution in the period 2022–2040. The approach to the observed phenomena from the standpoint of company asset management eliminates the contradictions that arise when supply and demand are coordinated in the commodity market (Fig. 1).

It is very important to realize that in order to carry out social development, society does not need profit from SMC enterprises, but rather affordable materials, while business needs to increase wealth.

Stimulation of investment development is possible by expanding credit lines for the implementation of investment projects. A more rigid scheme is also possible, including the stage of control over the preparation of design solutions and subsequent recommendations for their implementation.

Capital reinvestment should provide the basis for SMC’s investment development. A transition to a system of return on invested capital is required through depreciation, with progressive taxation of funds not directed to investments in fixed capital. The state is able to ensure the withdrawal of “unearned” income, i.e., superprofits that are not related to the results obtained from investment.

The development of the SMC industries implies a transition from individual projects to integrated investment solutions for the problems of coordinating the supply and demand of materials, covering large production systems in which conflicts of interest arise, along with risks of oppositional business behavior. The fee for participation in cooperation will increase as market relations become more complex. Increasing the efficiency of the domestic market of structural materials implies a reduction in transaction costs, and the withdrawal of intermediary rent. Conditions are required from the state to ensure the growth of trust in the system. This is achieved by raising barriers to entry into the market, creating preconditions for upgrading the system on the basis of new participants. Acceptance of management and risks in projects of national

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**Fig. 1.** Main forecast processes determining SMC development priorities. Source: compiled by the author.
economic importance should be undertaken by state structures.

The reproductive system is made operational by public recognition of the value of the funds invested in its development. Currently, investments and dividends are not adequately reflected in the change in the level of capitalization of companies producing structural materials. This makes it difficult to find funds for the implementation of large-scale projects in Russia, and limits the possibility of attracting private investment. The solution of financial problems in the forecast period presupposes the recognition of the value of the created capacities by the state, and later by society.

The situation when changes in materials change the face of the economy as a whole is most likely in the period up to 2040. It is the approach from the point of view of the long-term value of assets that makes it possible to interconnect the business interests of the business and its strategic prospects. This determines the interest in participating in the creation of new technological structures of manufacturers of traditional materials.

The economic competition in the world is not about who has more stones, sand, clay, wood, and the like. Much more important is who can make the best structural materials out of them, build the material conditions of people’s lives on their basis. Thus, the attractiveness of investments in the production of materials becomes the basis for solving the problems of filling national economic programs with resources.

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