

## FACTOR ANALYSIS AND GROWTH PROSPECTS OF POTABLE WATER LOCAL MARKET

G. E. Mekush\*, A. V. Antonova, A. M. Lavrov, and V. I. Buvaltseva

Kemerovo State University,  
Krasnaya Str. 6, Kemerovo, 650043 Russian Federation

\* e-mail: mekush\_ge@mail.ru

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**Abstract:** Currently, the clean potable water is globally the restricted economic benefit. In highly urbanized and environmentally unfavorable regions, including the Kemerovo region, development of food plants to fill drinking water is the most promising way to solve the problem of potable water availability. Factors and conditions of the drinking water market formation are studied by integral evaluation of drinking water availability in all municipal districts of the region, using the criteria of availability in terms of geographic location, management, technological process, economic value and quality. The volume of supply of bottled drinking water is also analyzed in view of its availability. As a result, the data on the level of availability of drinking water is first obtained for residents of all municipal districts of the Kemerovo region, on the potential of the population to pay for the pure water delivery and on prospects to expand the bottled water production market. The most population was identified to live in conditions with low technological, economic and environmental access to drinking water. The residents of big and medium-sized cities live in conditions of low environmental availability and high potential to pay for the drinking water delivery. The residents of peripheral municipalities live in conditions with low access to potable water due to management, technology and economic restriction but within the high geographic availability. Thus, the analysis of the drinking water availability and volume of its production suggest the possibility of the local market considerable capacity and its growth in future.

**Keywords:** drinking water availability, bottled water, local market, potential to pay, market capacity

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### INTRODUCTION

Bottled water market formation is quite new for the Russian economics. Previously, it was common to assume that the country with the largest fresh water reserves cannot be short in drinking water. However, the geographic access of fresh water does not absolutely mean that the population has permanent supply of drinking water. In Russia and in the other world, the problem of clean drinking water supply is due to extremely irregular distribution and the extent of considerable water source contamination. Drinking water availability and supply mechanisms have long been the global public problem under discussion at all major global forums for the last 20 years: at the Environment and Development Conference in Rio de Janeiro in 1992, at the United Nations General Assembly session "Rio+5" (1997) dedicated to outcomes of Rio conference resolutions, in the Millenium Summit (2000), in the The World Summit on Sustainable Development "Rio+10" Johannesburg in 2002, in Rio de Janeiro in 2012, etc. The global water supply problem caused events performed every three years, namely: World Water Forum in 1997 in Marrakech, in the Hague in 2000, in Kyoto, Osaka, Shiga in 2003, in Mexico City in 2006, in Istanbul in 2009, in Marcel in 2012, in Korea in 2015. 40–50 years

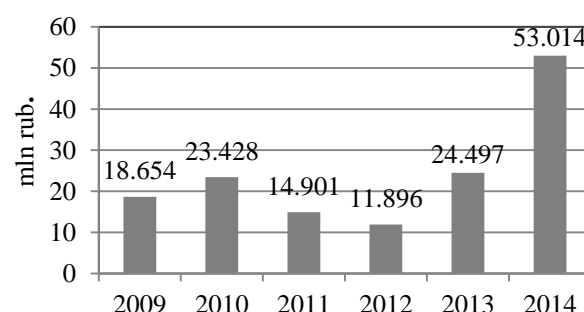
ago, on initial stages, the discussion mainly focused on irregular distribution of freshwater sources, that was followed by the priority of water source contamination. In the last 20–30 years only, including forums held by major international organizations, the problem to create various mechanisms to ensure free access to safe drinking water [1] became the top topic. The International Water Management Institute established in Europe introduced the strategy to supply clean drinking water around the world until 2025 using a variety of organizational and economic mechanisms and technologies [2]. Since then, the problem of drinking water availability has become the the domain of interests of economists, lawyers and policy makers.

Low accessibility of drinking water does not result from the source limits. This tells on the market "failure" to properly manage the water sector and use the shared resources. The peculiarity of drinking water as the irreplaceable product of high priority, unlike other food products, is that any country is held liable to ensure free access to it for the entire population. Since the market "failure" is caused by ineffective management of water resources by a country, the latter should be, thus, liable to ensure availability of drinking water for the population. The foreign and Russian practices of drinking water supply management were

analyzed to identify that three mechanisms are used to ensure water availability, that is, the administrative, economic and market mechanisms. The purpose of this policy is to achieve the high level of quality water supply for different segments of population by creating the effective institutional policy to apply and timely improve regulatory mechanisms. However, for Russia, it is difficult to address the issue of drinking water access for different population segments against the low level of of institutional environment and economic activity players. Russia and most countries are known to apply the administrative management policy to ensure drinking water access since it defines water pricing conditions, cost recovery and internalisation of environmental and resource costs. Developed countries proceeded to take measures for free access to pure water for the entire population by increasing the number of water-supply networks and their partial transfer for private ownership. However, it was found to be quite expensive to address the problem of drinking water access even for the leading European and Asian countries. The fact is that the clean water supplied to residential houses is not only used for drinking but also for domestic needs and it results in significant increases in the size of utility bills. Therefore, there was a need to offer options to the population to meet their demand in potable water, based on their willingness to pay for this economic wealth while improving their life quality [3, 4]. Application of economic and market mechanism convergence resulted in the potential to expand the drinking water availability in some regions of Russia, including the Kemerovo region, based on the public and private partnership. When placing the government order to supply drinking water to health and education facilities, the government encourages the development of bottled water production which drastically changes the population attitude to this product and improves the

quality of life. The public-private partnership in the production of drinking water was first practiced in Russia as part of the Federal target program "Clean Water". The Kemerovo region is still a member of this program. It successfully implemented a range of projects for construction of plants for drinking water bottling whereas stimulating the local market formation and changing the behavior pattern of bottled water consumers. The experience to improve the water is successful for the Kemerovo region, either, through events as part of sub-program "Use of water resources" and "Development of Water Management Complex" of the state program "Ecology and Natural Resources of Kuzbass" for the Kemerovo region in the 2014–2017s. The funding of such events is growing from year to year which results in the direct impact on improvement of drinking water access (Fig. 1).

This is indirectly proved by the upward trend of main water resource ratio for the last 10 years (Table 1).



Source. Statistical Digest "Kuzbass Environment" of the Federal Statistics Service Department, Kemerovo, 2009–2015.

**Fig. 1.** Scope of finance of events to use and protect water bodies within the framework of the long-term governmental program "Ecology and Natural Resources of Kuzbass".

**Table 1.** Ain water resource ratio for the Kemerovo region (1995–2014)

No.	Parameter	1995	2014	Changes for 20 years
1	Number of utility and drinking water supply lines	788	825	increase for 37
2	Share of water samples from the distribution network that do not meet requirements in terms of health and chemical parameters as per microbiological values	16.7	8.6	decrease twice as less 9.5 times reduction
		21.9	2.3	
3	Fresh water intake from natural water bodies (mln m <sup>3</sup> )	2624	2047	reduction for 577 mln m <sup>3</sup>
4	Water intake from underground water bodies (mln m <sup>3</sup> )	566	427.01	reduction for 139 mln m <sup>3</sup>
5	Fresh water used (mln m <sup>3</sup> ) for: household and domestic needs industrial needs	2155	1726.37	reduction for 429 mln m <sup>3</sup>
		278	210.04	reduction for 68 mln m <sup>3</sup>
		1705	1449.9	reduction for 255 mln m <sup>3</sup>
6	Waste water drained to water bodies (mln m <sup>3</sup> ): contaminated waste water purified as per standard partially clean (without purification)	2178	1703.97	reduction for 474 mln m <sup>3</sup>
		839	588.1	1.4 times reduction
		132	109.52	1.2 times reduction
7	Losses during water transportation (mln m <sup>3</sup> )	67	47.47	1.4 times reduction
8	Water flow in recycling water supply, water recycling and consistent water supply (mln m <sup>3</sup> )	4983	4765.56	reduction in 217 mln m <sup>3</sup>
9	Capacity of treatment plants (mln m <sup>3</sup> )	1814	1044.37	1.7 times reduction
10	Wear-out of basic production assets, %	43	59	increase for 16%
11	Specific weight of water lines need to be replaced, %	45	47	insignificant 2% increase

Source. Governmental reports on "Environment protection in Kemerovo region", 1995–2015.

The data supplied was reviewed to prove the effectiveness of the administrative policy to improve the quality and availability of drinking water.

As the economic wealth and the functional food product, water is complicated to exclude from everyday life and its competitive nature of its use is known, so the water should not be in private ownership. This means that the access to water cannot be limited. However, the water consumers are quite competitive. Not authorized consumers are willing to pay for the access to this wealth, thus creating the industry demand. Therefore, the concept that the water is a market commodity has been practiced for the last decade. Bottled water production has been acknowledged as one of the most reliable and fastest ways to meet the population needs in drinking water. Delivery of bottled water home or work places (Home & Office Delivery) has become one of self-sustained and actively developing segment of the services market. Private multinational companies in the field of bottled drinking water sale entered the market, like Perier, Evian, BonAqua (Coca-Cola Company), Aqua Minerale (Pepsi Bottling Group), etc. As a consequence, the entire economic sector emerged to produce the relevant equipment (filters, coolers, bottling lines and packaging of water, etc.).

The Russian market of bottled water is one of the extended and progressing one. In Europe, the bottled water consumption is 110 to 150 liters per year, while in Russia it is 30–40 liters. In view of that, the potential to increase the capacity of this market is quite high. Use of coolers in offices and the public urge to healthy lifestyle contribute to the above. The current situation resulted in that the purchase of mineral and drinking water for many Russians has turned to be a daily item of expenditure. The market of drinking water is represented by both national and international manufacturers. The regional product, although offered in the low price segment, significantly competes for the recent years with imported goods. However, local producers highly compete between each other whereas the average price segment goods are produced by larger market players. The share of imported products remains stable at 10–12% and is mainly represented by premium class goods.<sup>1</sup> Currently, plants in Russia tend to extend and upgrade by buying-up small regional plants by larger ones. The production concentrated region by region is reported. North Caucasus, Southern, Far Eastern and Siberian federal districts produce a total of about 75% of waster in Russia. Every year, more than 11 000 million liters of bottled mineral and drinking water is produced in Russia with the increase of up to 16–20% per year. In view of such prospects, the Russian market may become one of the most intensive markets in the world [5]. The global nature of the issue to supply pure water to population involves the development of local mechanisms to address the problem. In this view, this study seeks to analyze and assess the market prospects of drinking

water in the industrial region in terms of drinking water access as per geographic, organizational, technological, economic and qualitative criteria, as well as the willingness by the population to pay for the quality improvement and level of availability through creating the local plant market and water delivery services.

## OBJECTS AND METHODS OF STUDY

The local market of bottled drinking water is determined as the object of study in the Kemerovo region, the old industrial area with the high anthropogenic load on water bodies and relatively low population income. To clarify the term "study object", the definition of the bottled water should be explained. The water is considered bottled if it meets state standards, hygienic requirements to drinking water, is packed in the hygienic tare and is sold for human consumption. However, it should not contain artificial sweeteners or additives; flavors, essences and extracts of natural origin may be added to the bottled water in the amount not exceeding one weight percent. In case of using a greater percentage of additives, the water is considered as the soft drink. This is how the International Bottled Water Association (IBWA) defines the bottled water. The bottled water is classified for water for personal and household use, and it falls into three categories, either, as follow: ineral, artificial and potable. This study focuses on the bottled drinking water that is classified for two groups: first category drinking water (table water) and high category drinking water.

The market of the Kemerovo region mostly offers the natural water of the first category. As per WHO international standard requirements, the natural water should be bottled in containers directly from the well. in this case the bottles should be labeled with "Water from the artesian well" mark. The water category should be also considered. Drinking water of the first category may be developed from any source, but the drinking water of the highest category, which is in scarce at our market, may be only the artesian or spring water that complies with specified requirements. Water of both categories is safe to drink. They only differ in that the first category water should have the maximum permissible concentration of trace elements, whereas the requirements to the highest category water are strict – the standard defines the best concentration of substances in it. This is not of great significance for the consumer. This is rather the matter of prestige for the manufacturer and the so-called corporate competition. The highest category water should contain the certain amount of iodine and fluorine.

The Kemerovo region is known for the high urbanization which is 90% with the dense population and intense industries. As a result, more than 70% of the population was in the "high risk zone" associated with low access to drinking water due to the high level of technogenesis in water catchment areas of water bodies with the most population communities along them. When monitoring the drinking water market, it is important to consider specifics of human distribution on the territory of the region. As per the population pooling, three groups of areas may be emphasized:

<sup>1</sup> Investigation of the Russian market of drinking and mineral waters. Group of Companies Step by Step - <http://www.step-by-step.ru/example11/sww.pdf>.

- Areas with dense population primarily engaged in industrial production (Kemerovovskiy, Prokopyevskiy, Leninsk-Kuznetskiy, Belovskiy, Novokuznetskiy, Yurginskiy regions);
- Areas with the average density of population that tends to industrial production employment (Yayskiy, Guryevskiy, Mezhdurechenskiy, Mariinskiy, Promyshlenniy, Yashkinskiy, Topkinskiy regions);
- Areas with low population density, tending to agricultural production (Chebulinskiy, Izhmorskiy, Krapivinskiy, Tisulskiy, Tyazhinskiy regions).

As per the data by the Federal Public Service for Supervision of Consumer Rights Protection and Human Welfare for the Kemerovo region, the share of population supplied with safe drinking water in urban districts was 87.2% in 2014 (81.4% in 2013), in rural areas – 28.7% in 2014. In general, the water quality as per the water pollution index for the Kemerovo region is as follows:

- Tom' River Basin – "contaminated-dirty";
- Inya River Basin – "dirty";
- Chulym River Basin – "highly contaminated";
- Chumysh River Basin – "dirty".

Another equally important factor driving this market development is the high level of morbidity due to the use of poor-quality drinking water. The population of urban and rural areas of all ages suffer from kidney diseases. [6] Earlier, the macro-economic assessment studies revealed significant economics losses due to the environment-induced morbidity in the Kemerovo region. Such losses amount to 7% to 10% of the Gross Regional Product cost. For regions similar to the Kemerovo region, the drinking water quality is one of life quality and sustainable development evidence [7, 8]. The state of water resources and high morbidity due to poor water quality determine the demand for clean drinking water.

In this view, it is also important to assess the state of water infrastructure that directly affects the quality of water and creation of the demand for drinking water. The location of the technological water supply infrastructure in the cross-sectional area of the Kemerovo region is uneven: higher density in urban districts and smaller – in municipal areas, which leads to differentiation in improvement of housing with supply services. The housing industry insufficiently provided with water supply services in terms of municipalities also indicates on the low level of access

to drinking water. In relatively prosperous situation in case of water supply mains and the networks capacity, the insufficient number of wastewater treatment plants is reported in Belovskiy, Izhmorskiy, Kemerovskiy, Tisulskiy, Topkinskiy, Tyazhinskiy, Chebulinskiy and Yurginskiy areas. Berezovskiy, Kaltanskiy, Polysaevskiy, Taiginskiy municipal districts do not have the centralized water treatment facilities; in most municipal areas the water pass level through treatment plants does not exceed the average regional level (57.8%). The average rate of water treatment for urban districts amounts to 87%. Depreciation of the fixed capital stock of water supply system for the Kemerovo region is 59%. The percentage of the water supply system extension required to be replaced makes 47% in the total length of water supply networks average for the region. Financial needs in repair of water supply networks are estimated at over 10.5 billion rubles. High level of water body contamination in the Kemerovo region and lack of hydroeconomic infrastructure have been the very cause to open first plants in the region to manufacture bottled water and to render delivery services about twenty years ago.

Low population incomes and willingness to pay for the higher quality water were factors of equal significance that alternatively restricted the market of drinking water development in the Kemerovo region. It should be emphasized that the wage remains the main source of income for the majority of working population of the Kemerovo region. The wage share in the income of Kuzbass population is 43%, and among the Siberian Federal District (SFD) subjects, the region ranks the 6th when evaluated by the index above. The average monthly salary of the employed in the region is only 86% against the national rate and 98% as compared with the average rate for SFD. Despite the fact that the cash revenue of the Kemerovo region population, both nominal and actual, increase over the years, the region is ranked the 71<sup>st</sup> in the Russian Federation in terms of the minimum living wage (see Table 2) [9].

The average monthly income per capita is not the indicative parameter. This data may not be used to state that the most population in the region has the positive cash flow. The income in excess of 35000 rubles was reported in 8.5% of the population in the Kemerovo region in 2014, which is 1.5% higher than that in 2013.

**Table 2.** Income of the Kemerovo region population (2001–2014)

Parameter	2001	2005	2009	2011	2013	2014
Gross Regional Product per capita, rub.	39702	103.8	181624	272564	244064	254199
Consumer Price Index (December against December of previous year), %	118.0	110.5	107.7	106.5	106.7	111.9
Average earnings per capita: nominal, rub, actual (in % against previous year)	3058 112	7813 128	13470 84.4	16666 100.1	19697 99.5	19795 100.5
Average monthly wage paid, total for region, rub.	3313	8654	15995	20478	25326	26809
Average monthly pension size, rub.	1154	2554	6204.9	8250.9	10008	10891

The method to assess the readiness to pay for the better quality water may be used to identify that regional residents are concerned in the quality of drinking water. Sociological researches were first conducted in Russia in terms of the Kemerovo region with the involvement of authors and partners from the University of Hiroshima (Japan) to assess the readiness of the population to pay for the better quality drinking water. Researches were carried out in terms of settlements specific for the Kemerovo region, the big Kemerovo city and middle-sized Belovo and Belovo municipal district. More than a thousand households were surveyed in total. It was further found that almost all surveyed households in Kemerovo, Belovo cities and Belovo district take measures to improve the quality of drinking water (92.3%) by boiling, settling, water filtration or purchasing bottled drinking water. Boiling is the most popular way to decontaminate personal water reserves at home. 69.7% respondents were reported to use boiling. Settling is the second popular measure used by 51% respondents, whereas 49% filter the water and 23.3% regularly buy bottled water. Only 15% respondents drink the tap water and 4% use water from natural sources. Popularity of boiling and settling can be explained by reliability, decontamination speed and the relative cost-effectiveness. Installation of filters and bottled water purchase are more expensive ways to reduce the risk of the poor-quality drinking water use at home. On average, the cost of bottled drinking water is 150 rubles per 18.9 L in the Kemerovo region. Nine plants are constructed and run in Kemerovo, Novokuznetsk, Mezhdurechensk, Yurga, Belovo, Topka, and Mariinsk to produce and deliver the bottled drinking water. 172 cubic meters of water is produced every day, so the Kemerovo Region people pay more than 500 million rubles per annum to buy bottled water. The cost of water filters (flowing water purifiers) is 2500–6000 rub on average with the filter element service of up to 10 thousand L, and the cost of filter jugs is 500 to 1000 rubles with the replaceable cartridge service life of up to 350 L. The costs of preventive measures to improve the quality of drinking water make 207.02 rubles per family monthly, i.e. 1.15% of the average monthly household income. However, only 2% respondents were willing to change the preventive charges upon the water quality is improved. This is due to some distrust of citizens in the ability of local authorities to improve the system of drinking water supply. Over 30% respondents were willing to pay extra funds to reduce the risk of poor-quality water consumption. On average, it costs 315.4 rub/mth for a family which makes 1.75% of the average household income in addition to the actual water rate in the amount of 210.6 rub/mth per person or 631.8 rub/mth for a family of three members, which makes 3.5% of the household income on average. However, most respondents tend to make the decisions above since they were aware of the problem significance (75.5%), some others found more convenient to pay at the proposed rate (11.3%), whereas individuals were greatly concerned in the personal income that might be

lost during any illness, that is, the so-called loss of profit (1.7%). As a whole, the total commitment to pay for the quality water in the region amounted to about 336.5 million rubles per year [10, 11]. Since everything remains the same in terms of quality and availability of drinking water for the Kemerovo region population, the previously obtained data is used as the actual data in this study. The population size of the Kemerovo region has not changed significantly. For comparison purposes, let's see the assessment results for the European population to pay for higher quality drinking water at the time when the study was conducted in the Kemerovo region. In the European Union countries and namely in Germany, France, England, Spain and Slovenia and other countries people are available to bear expenses at a rate of 0.42 to 1.4% of the household income to increase the level of drinking water availability (Source: EEA, 2012, Eurostat household budget survey based estimates of the annual costs of water supply and sewage in EEA Member Countries, EEA staff data, Copenhagen).

The data obtained during the study of the population commitment to pay for the higher quality drinking water throughout the Kemerovo region and in European countries was analyzed to conclude that the regional public is available to bear expenses of the family budget at the same level, or even higher than that in the developed countries. It should be clarified that the drinking water market in these states is far maturer than that in Russia. However, we face the intentions of the Kemerovo region people to bear expenses above for the drinking water while the European population pays for the water quality improvement in view of the fact that the quality of tap water in those countries is much higher than that in Russian regions.

Thus, the analysis of factors that influence the creation of the bottled drinking water market in the Kemerovo region, allows, based on the methodical approach proposed by A.V. Antonova [12], identifying four criteria types to assess the availability of drinking water, namely, geographic, organizational and technological, economic and qualitative (Table 3).

As per authors, all these factors and criteria are extremely important to take into account when assessing the potential formation of the drinking water market and primarily, in terms of territorial coverage. When analyzing the market trend developments, the demand for particular product should be identified in terms of geographic point and the volume along with the population availability and potential to purchase it. This opinion is shared by other authors who study the drinking water market both in Russia, on whole, and in certain regions. They also conclude that the demand is formed in view of low availability of drinking water because of water source contamination and unfavorable condition of water supply networks, especially in old industrial regions of the Urals and Siberia. Also, most authors state that these regions tend to purchase the low-cost bottled water by local manufacturers which is more accessible as compared with the expensive water by international brands [13, 14].

**Table 3.** Criteria and indicators of the drinking water availability assessed [12]

Criteria to assess the drinking water availability	Indicators of the drinking water availability assessment
Geographic	Availability of water bodies Population density Urbanization extent Enterprise organization
Qualitative	Waste water volume Anthropogenic impact on water bodies Water body pollution degree (as per SCWPI, Specific combination water pollution index); Sample specific weight not consistent with hygienic standards; Excess level of quality standards
Organizational and technological	Number of utility infrastructure objects Specific weight of water supply networks in the need to be replaced Number of accidents per 100 km of networks Density of water supply lines Wear out of fixed capital stock Level of the housing total area coverage by water supply Level of water supply capacity available
Economic	Population income Population's commitment to pay

### RESULTS AND DISCUSSION

To evaluate the bottled water market in the Kemerovo region, materials provided by manufacturers, companies that specialize only on water delivery and retail networks have been analyzed. Specialists of the “Chistaya voda” LLC, the largest regional company to produce the bottled drinking water were invited as experts. Currently, 9 companies run throughout the Kemerovo region for production and delivery of bottled drinking water in bottles of 0.5, 1.5, 5.0, 10.0 and 18.9 L in volume (Table 4). Most of them are on the market for at least 5 years, except for “Chistaya voda”, “Noringi” and “Talinka”. In addition, often they do not own their plants but resell other manufacturers' products. First listed three companies own large productions at the Kemerovo region territory. They are perspective to increase sales since they run for the less capacity. The annual sales growth makes 10% on average. For example, the equipment capacity owned by the “Chistaya voda” LLC is 1200 bottles per hour. Currently, they have more than 30 thousand customers since they are for over 15 years on the market.

“Chistaya voda” LLC is the only company in the region that bottles the natural water taken from deep-water wells upon four-stage purification. Drinking Artesian water packaged in bottles and labeled with the “Berdovskaya tayozhnaya” trademark (“Chistaya voda” LLC) is also the only product in the Kemerovo region that successfully validated by the ecological expertise committee and certified as the product of the highest ecological purity. The management system of the “Chistaya voda” LLC is certified in compliance with requirements of GOST R ISO 9001:2008 and the Food Industry Standard HASP<sup>2</sup>. In addition, other companies proved to be reliable suppliers of carefully

purified drinking water. All companies that are engaged in water production and delivery possess their own regional client base, though 60–70% customers reside in larger cities like Kemerovo, Novokuznetsk and Prokopyevsk. The competitive environment of bottled water manufacturers is significantly mixed with numerous suppliers of drinking water from retail chains who sell it in small bottles of 0.5 to 2.0 L and hold their steady niche in the market space. In our opinion, all these companies and retail chains are prospective to increase sales in bottled water, since more than 70% of water consumers in the Kemerovo region are their potential clients today.

To assess the geographic discrimination in drinking water availability for the population and the growth prospects of the bottled water regional market, the area groups have been used in our study by the variety of accessibility as offered by A.V. Antonova. In particular, all municipal districts of the Kemerovo region were grouped and ranked as per geography, quality, management and technology and economic accessibility (Table 5) [15]. Arithmetic mean of the scoring results was used to assess the status of regional territories in terms of criteria and the minimum of these values.

As a result, a group of Tyazhinskiy, Yurginskiy, Leninsk-Kuznetskiy, Novokuznetskiy, Yaiski districts is classified as the category with “too low” at almost the critical level of availability by the aggregate parameter. The second group of districts with “low” accessibility of drinking water includes Belovski, Izhmorskiy, Kemerovski, Mariinskiy, Prokopyevski, Tisulski, Topkinskiy and Chebulinskiy districts. Guryevski, Krapivinskiy, Promyshlennovskiy, Tashtagolskiy, Yashkinskiy districts refer to areas of “medium” level of accessibility and only the Mezhdurechenskiy district refers to the category of “high” level of availability.

<sup>2</sup> “Chistaya voda” LLC [Electronic resource] – URL: <http://www.vodakem.ru/feedback/>.

**Table 4.** Production and delivery of drinking water in the Kemerovo region in bottles of 18.9 L in volume, 2015

No.	Company name	Sales volume, bottl/mth.	Delivery to population
1	Clean water	60000	+
2	Rodniki Kuzbassa	35000	+
3	Talinka	11000	+
4	Noringa (Novosibirsk)	10000	+
5	Osobaya (Special)	4500	+
6	Luchshaya (Best)	–	+
7	Vodovozov	–	+
8	Dalniy kluch	–	+
9	Yugus	–	+

**Table 5.** Rating of the Kemerovo region districts\* in terms of drinking water availability

No.	Territory	$k_1^{**}$	$k_2^{**}$	$k_3^{**}$	$k_4^{**}$
1	Belovskiy	1	2	3	4
2	Guryevskiy	1	4	4	2
3	Izhmorskiy	4	3	2	1
4	Kemerovskiy	1	1	4	4
5	Krapivinskiy	4	3	3	1
6	Leninsk-Kuznetskiy	1	1	4	3
7	Mariinskiy	2	4	2	2
8	Mezhdurechenskiy	2	3	3	4
9	Novokuznetskiy	1	1	3	4
10	Prokopyevskiy	1	1	4	4
11	Promyshlennovskiy	4	2	3	2
12	Tashtagolskiy	2	2	4	3
13	Tisulskiy	4	3	1	2
14	Topkinskiy	2	3	2	3
15	Tyazhinskiy	3	2	2	1
16	Chebulinskiy	4	4	1	1
17	Yurginskiy	2	1	4	1
18	Yaiskiy	2	2	3	2
19	Yashkinskiy	3	3	3	2

Note. \* Here, a district is location of a municipal district of the same name and the city district; \*\*  $k_1$  – criterion of the drinking water geographic availability,  $k_2$  – criterion of quality water availability,  $k_3$  – criterion of organizational and technological water accessibility,  $k_4$  – criterion of economic water accessibility.

The study showed that 1110.7 thousand persons live in areas with "too low" total availability of drinking water (40.5% of the Kemerovo region population), and 1300.7 thousand persons live in areas with "low" accessibility (47.4% of the Kemerovo region population). It should be noted that these two groups include all towns in the Kemerovo region, where the enormous human-made anthropogenic load is imposed on water bodies. The highest rate of morbidity is reported in Novokuznetsk, Kemerovo, Prokopyevsk, Belovo, and other towns due to poor-quality water. Currently, bottled water sales by all manufacturers are concentrated in these areas. However, it should be noted that peripheral rural areas, namely Tisulskiy, Yaiskiy, Izhmorskiy and other areas, are assigned to this group though due to the scarce water supply networks or due to absolute absence of the latter. The sellers of bottled water in these areas are not so much active since the price for water will be higher than that in larger cities due to the small market size – poorly populated areas and high transport costs. Unlike other Russian regions, there are no areas in the

Kemerovo region where water is supplied as per the schedule or just imported.

More than 300 thousand people (12% of the total population) reside in areas with the medium to high levels of water availability. These are area with the high level of geographical and quality accessibility. The human-made impact on water bodies is far less in here as well as the free access to a greater volume of pure natural water. Currently, the bottled water sale is these areas, as well as in rural areas of previous groups, is less and they represent a potential market for sellers. Thus, by the results of analysis it was found that 88% of the Kemerovo region population live in conditions of "too low" and "low" accessibility to drinking water and it proved that the potential capacity of the local bottled water market in the Kemerovo region is hypothetically quite great totaling more than 1500 thousand people.

However, the demand for drinking water by the territorial difference will be insufficiently described, unless it is complemented with the comparative evaluation of ranking resultants for economic

accessibility indicators of drinking water for people residing in different areas of the Kemerovo region. Analysis of the regional statistics results and assessment of the population commitment to pay for the higher water quality allowed classification of all districts for four groups:

- A group with "too low" level of economic accessibility, that is, Izhmorskiy, Krapivinskiy, Tyazhinskiy, Chebulinskiy districts;
- A group with "low" level of economic accessibility, that is, Guryevskiy, Mariinskiy, Promyshlennovskiy, Tisulskiy, Yaiskiy, Yashkinskiy districts;
- A group with "medium" level of economic accessibility, that is, Leninsk-Kuznetskiy, Tashtagolskiy, Topkinskiy districts;
- A group with "high" level of economic accessibility, that is, Kemerovskiy, Mezhdurechenskiy, Novokuznetskiy, Prokopyevskiy districts.

The resultants are of significance for suppliers of bottled drinking water and commercial networks, since they give a good indication on the spatial perspectives of market development. It should be noted that the expansion of bottled water sales in areas with "low" and "too low" economic accessibility will be significantly slow-paced than that in larger cities with "high" level of accessibility. For long years, the low population income will limit the market expansion towards poorly populated rural areas. In this case it is important to realize that understanding of the term "drinking water accessibility" and the understanding of other economic benefit accessibility is different from area to area with the varied socio-economic background. This is again to prove that there are no universal methods to create the bottled drinking water market to be used in each and every district and region. In this given case, is necessary to understand that the rarity of drinking water is the permanent imbalance of supply and demand due to contamination of drinking water sources or over-intensive exploitation thereof. The drinking water scarcity relates to the water distribution mechanism. Rarity, as compared with the scarcity, indicates on imbalance of demand and possibilities of the population, opportunities. The most difficult is to provide free access to this wealth. However, the best development practices of the society of today shows that the effective mechanism to regulate the access to water is infeasible without the public active intervention. Each party, whether business or community shall have significant advantages in case of free access to the welfare and influence, whether directly or indirectly the other party. The society may fail when confining the business within the strict limits. As per the authors, further on, the bottled water manufacturers and their customers will achieve the agreement by improving the life quality and adjusting the extent of socio-economic development in the Russian regions, as a whole.

## CONCLUSIONS

Formation of global and local markets of drinking water requires the analysis and assessment of the demand volume for this product essential for human

functionality and also the causes and factors decisive for the demand formation. Most activities in the drinking water market relate to the performance and production volumes, formation of delivery services, product branding and promotion, indeed. Activities to assess accessibility ratio of drinking water are in short and, in our opinion, it adds a greater complexity to the assessment of prospects for the drinking water market development.

The current situation known for rapid changes in scientific, technical, financial, economic and social industries contributes to support the tendency to convergent administrative, economic and market mechanisms of drinking water accessibility. Currently, the Russian policy of the drinking water accessibility is the aggregate of administrative and economic tools where market-based tools are rarely applied due to non-enforceability. The mechanism in place ensures current needs in water resources for economic industries and the population. However, the prospects for the national economics development require the volume of water resources of the proper quality guaranteed to meet drinking and household needs, as well as to be used for industrial, agricultural, energy and recreational purposes. Thus, it is required to develop the efficient combination of applicable tools to improve the current mechanism of drinking water accessibility in view of regional peculiarities (geographic, organizational and technological, qualitative and economic availability of the drinking water in the region).

The market of drinking water is created in old-industry regions at the background of low economic, qualitative (environmental) and technologically managed accessibility. Drinking water manufacturers and sellers are most concerned in areas of high population density and high economic availability; the availability of population to pay for the drinking water quality also makes sense. In other regions with low economic, organizational and technologically managed accessibility the governmental involvement is required along with integration of various types of public-private partnerships to encourage investors and increase the public access to drinking water. The governmental procurement for drinking water, among these tools, is beneficial for public and bottled water manufacturers, in conditions of low geographic, technologically managed accessibility, since the construction of new water facilities and infrastructure is not economically feasible due to the scarcity of consumers in these regions. This is also due to the fact that the government, for example, is held liable for the environmental safety, including the safety of water sources.

The market of bottled water in the Kemerovo region may be considered as one of the most potentially intensive markets among Siberian regions because of the total low availability of drinking water. Almost all the regional residents are the potential consumers of bottled water. Improvement of the life quality and increase in the public income will definitely result in the increase in the actual capacity of the drinking water market.



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