199

Int. J Sup. Chain. Mgt   Vol. 8, No. 4, August 2019

Specific Aspects of Land Use Planning and Forecasting For Effective Supply Chain Management

Ivan Stafiychuk[1], Amir Kutliyarov[2], Damir Kutliyarov[3], Enric Galeev[4], Alfiya Lukmanova[5], Gulnaz Gubaydullina[6]

[1,2,4,5,6]*Department of land management, Federal State Budgetary Educational Establishment of Higher Education «Bashkir State Agrarian University», Ufa, Russian Federation*

[3]*Department of nature arrangement, building and hydraulics, Federal State Budgetary Educational Establishment of Higher Education «Bashkir State Agrarian University», Ufa, Russian Federation*

[1]stafijchuk@rambler.ru

[2]kutliarov-a@mail.ru

[3]Kutliarov-d@mail.ru

[4]galyunrik@mail.ru

[5]lyk_alfiya@mail.ru

[6]gulnazik_yangi@mail.ru

ABSTRACT- **The paper describes specific aspects of land use planning and forecasting for effective supply chain management. Close attention is paid to the territorial planning projects having been implemented in the United States, England, Germany, the former Soviet Union and Russia. Land is characterized as an object for planning and forecasting as well as the basis for food security. There is a real need for area development planning and forecasting to provide management of agri-food supply chains. The paper reveals the nature and the relationship of territorial forecasting, planning and land use schemes to develop logistics. Russia has long experience in land reforms, land use planning and forecasting for further social and economic development of territories as well as effective management of supply chains in them.**

Keywords: *supply chain management, logistics, territory, planning, forecasting, district planning, food, land management scheme, sustainable development of the territory, farmland*

1.   Introduction

Supply chains are becoming global in nature, with all participants being linked together through information systems that coordinate every stage of joint activities, logistics infrastructure and supply chain management [1]. Logistics companies act as intermediaries that connect all stages of the international supply chain [2]. The logistics firms under study, namely those that deal with material flows of goods between separate locations and the related storage activities, require large amounts of land. In that, their geography is close to that of most industrial companies. Therefore, to shed light on the theory of logistics firms' decision making, it is useful to draw upon the long history of conceptual and Imperial research on industrial firm local decision making within the field of economic geography [3]. The traditional logistics is known to deal with the challenges of production, storage, consumers and modeling supply chains to optimize costs and deadlines. There is an innovative approach, based on the logistics mechanism of integrated management for self-regulated economic entities, located in different areas including farmlands [4, 5].

It becomes important to consider the environmental aspect when planning and allocating land for logistics services [6]. Chinese scientists Qiangyi Yu ORCID Icon, Peter H., Verburg & Wenbin Wu [7] claim that there is an ecological linkage between farmland use and food security. Meanwhile, Kees Klein Goldewijk ORCID Icon, Stefan K., Dekker and Jan Luiten van Zanden [8] underline the relationship between the population size and land use regimes.

Volkov S.N., Shapovalov D.A., Klyushin P.V., Shirokova V.A., Khutorova A.O. nconsider issues of strategic planning of territories in the country with development of land monitoring in conditions of land relations reforming [9]. They proved that the system of rational land use should be environmental, resource-saving and include the preservation of soil fertility [9].

Effective supply chain management in land use planning requires taking into account the economic and market aspect [10]. To replace the planned economy to market relations there was adopted the Federal law No.115-FZ "On state forecasting of socio-economic development of the Russian Federation" of July 20, 1995 being taken to the next stage in the Act No. 172-FZ "On strategic planning in the Russian Federation" of June 20, 2014. The Law introduced new concepts instead of the "state

planning" one: "state forecasting" and "development of socio-economic development strategy" [11]. The first "Concept of long-term socio-economic development of the Russian Federation for the period up to 2020" was approved by the order of the Russian Federation government No. 1662-r of November 17, 2008. The strategic goal of socio-economic reforms in Russia was to achieve the economic level corresponding to the status of the great world power of the XXI century and joining the top five countries in terms of gross domestic product in 2015-2020.

Significant changes in land use planning and land protection were made by the Urban Development Code of the Russian Federation. It stipulates the concept, content, structure and procedure to elaborate territorial planning documents by levels: Russian Federation, subjects of the Russian Federation and municipalities [12]. As a whole on the Russian Federation the Urban Development Code of the Russian Federation makes provisions for development of General schemes for:

1) Federal transport (railway, air, marine inland water, pipeline vehicles, federal roads);
2) Defense and security of the country;
3) Energy;
4) Higher education;
5) Public health.

In October 2009 there was the VIII All - Russian forum "Strategic planning in the regions and cities of Russia" in St. Petersburg with a round table "Territorial planning schemes of the Russian subjects" within it. The forum noted that land use planning schemes had been developed for all the subjects of the Russian Federation and municipalities, but their quality, especially the regulatory framework, gave rise to numerous remarks from the society as well as government bodies of all levels.

The subjects of the Russian Federation and municipalities have issued relevant documents to elaborate federal laws and regulations, forecasts, concepts and programs of socio-economic development. In particular, the Republic of Bashkortostan produced:

- Law "On strategic planning in the Republic of Bashkortostan of February 27, 2015"
- Strategy of social and economic development of the Republic of Bashkortostan until 2020", approved by the government resolution of the Republic of Bashkortostan No. 370 of September 30, 2009 .
- "Agro-industrial complex development strategy of the Bashkortostan Republic until 2020";
- "The scheme of territorial planning of the Republic of Bashkortostan until 2020," schemes of territorial planning of district municipalities and general plans for the development of settlements.

The given paper aims to provide a new understanding of the drivers to make land use planning decisions and to quantify the relative importance of different characteristics of potential locations for logistics companies. Thus, the aim of the paper is to study specific aspects of land use planning and forecasting for effective supply chain management.
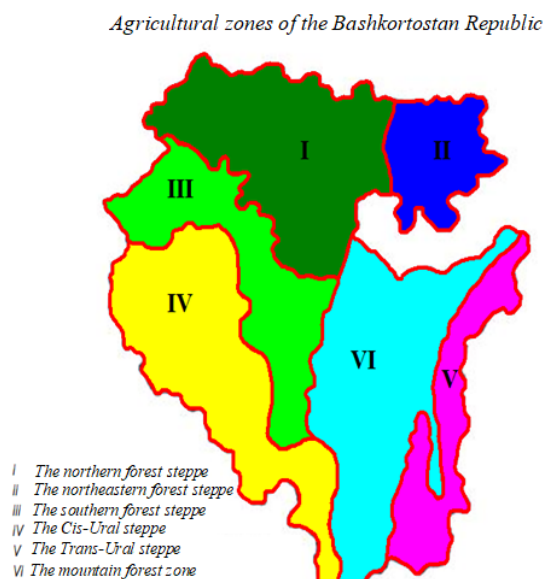
2. Methods

The given paper carries out an analysis of land use planning and forecasting to make provisions for effective supply chain management. Regardless of the approach to investigate decision-making on location of economic activity, access to land turns out be an important factor expressed by distance, transport cost or any other more complex accessibility measurements.

2.1. The object of the study was the Republic of Bashkortostan

As of January 1, 2019 the Republic of Bashkortostan occupies 14293.7 thousand hectares, being one thousandth of the Earth's land area. The main share of the Republic's land fund is agricultural land (7273.7 thousand hectares or 50.9%) and forest (5722.7 thousand hectares or 40.0%). The Republic of Bashkortostan ranks 25th for the total area among 85 subjects of the Russian Federation and 7th for the area of agricultural lands. It positions from 1st to 10th for production of main agricultural products. Access to land per capita in the Republic is higher than in the Russian Federation and the worldwide as a whole (Table 1) [13].

Table 1. Access to land availability per capita, as of January 1, 2019

Region	Area of all lands, ha	including	
		farmlands	arable land
Worldwide	2.04	0.70	0.19
in the Russian Federation	12.05	1.55	0.86
in the Republic of Bashkortostan	3.41	1.75	0.88

Agricultural zones of the Bashkortostan Republic

I The northern forest steppe
II The northeastern forest steppe
III The southern forest steppe
IV The Cis-Ural steppe
V The Trans-Ural steppe
VI The mountain forest zone

Figure 1. Farmland frontiers in the Republic of Bashkortostan

The territory of the Republic is characterized by a wide variety of natural conditions from the mountain-forest zone to the arid steppe and belongs to the zone of intensive manifestation of water and wind soil erosion. (Figure 1).

To study specifics of land use planning and forecasting the basic provisions of the territorial planning scheme of the Republic of Bashkortostan were used.

To process the data the statistical analysis was applied.

3. Results and discussion

Under the Civil Code of the Russian Federation (articles 14, 15) the content of the scheme of territorial planning of subjects of the Russian Federation is somewhat different from similar works in the whole of Russia. Firstly, the preparation and development of territorial planning schemes of subjects of the Russian Federation "can be carried out as part of one or more documents of territorial planning" (paragraph 1 of article 14), "in relation to the entire territory of the subject of the Russian Federation or its part" (paragraph 2 of article 14). Secondly, the objects to apply territorial planning schemes to have been changed. For the subjects of the Russian Federation there are not developed schemes in the field of defense and security of the country. However, there are provisions to elaborate land use planning schemes to prevent emergencies, natural disasters, epidemics and eliminate their consequences as well as land use planning schemes for physical culture and sports and other areas in accordance with the powers vested in subjects of the Russian Federation. As for the whole Russian Federation, land use planning schemes of its subjects include written provisions on the scheme and location planning maps for regional or local objects.

The land use planning scheme of the Republic of Bashkortostan was developed for the first time in 2005 by the private limited company "Leningradskii Promstroi proekt" (St. Petersburg) for the period up to 2020. It was approved by the order of the Government of the Republic of Bashkortostan No. 130-r of February 27, 2006. Later the government of the Bashkortostan Republic prepared and accepted "Strategy of socio-economic development of the Republic of Bashkortostan until 2020" No. 370 of September 30, 2009. The given document was based on strategies (programs) for development of separate industries, priority national programs, programs of social and economic development of municipalities, investment programs of subjects of natural monopolies, housing and public utility sector companies as well as data of the state information system.

Taking into account the developed Strategy and the changes that had taken place in the economy of the Republic and the country as a whole, the LLC "Institute of construction projects" made changes to this strategy under contract No. 90/09 of July 17, 2009 with the Construction and Architecture Ministry of the Bashkortostan Republic. Implementation of the Scheme was provided in three stages: - the first stage - 2015; the estimated term - 2020 and the prospect - 2025.

The analysis of the main indicators of the Scheme for the first stage and statistical data showed that the projected indicators of the industry, agriculture and population development were below the achieved level. At the same time, the number of people employed in the economy, housing and utilities, the length of railways and roads, the number of students in schools were lower than the projected indicators. That made necessary an adjustment of the Scheme. Changes in the Scheme were made by the public company "Bashkirgrazhdanproekt" under the contract with the State Committee of the Republic of Bashkortostan for construction and architecture. The scheme is developed on the basis of the following initial data:

- 142.9 thousand sq. km of the total area of the Republic;
- as of January 1, 2014 population of 4069.7 thousand people, including urban population of 2499.9 thousand people (61.4%) and rural one of 1569.8 thousand people (39.6%);
- the population density is 28.5 people per $1km^2$, with 8.3 people per $1 km^2$ in the RF;
- there are 54 municipal districts and 9 city districts in the Republic.
. Main strategic objectives of STP:

- to achieve a long-term economic and environmental security in the Republic's development;
- to increase the investment attractiveness of the territory;
- to improve population displacement and achieve sustainable development of settlements and industries;
- to use all types of resources efficiently.

The planning structure of the land use planning scheme is based on the development of settlements radially directed from Ufa along the main transport communication and the largest waterway corridors. This point in the strategy is very important for effective supply chain management. Earlier studies showed that logistic firms with only road transport are more sensitive to road access and less sensitive to port access. More importantly, they focus on low land rents. Firms that work with pallets also show an above average interest in the proximity to main roads. Firms that only deal with container transport are significantly less interested in the land rent and they are also less sensitive about being on a business park [3, 14].

There was defined a list of priority investment projects for the industry and agro-industrial complex of the Republic. Oil refining, petrochemical, mining and chemical industries will retain their dominant position in the industry, but on a qualitatively new basis. Further development of the industry requires preserving and increasing the production, design and researching potential of these sectors of the economy.

Perspective development indicators for the agro-industrial complex in the Republic are determined based on the projected population for the estimated period (4070.5 thousand people), scientifically based nutrition standards per capita (Table 2), taking into account the needs of the domestic and foreign market.

Table 2. Agricultural production in the Republic of Bashkortostan per capita for 2020

Subitem No.	Indicator	Per capita consumption rate, kg, units/year [1]	Total required (thousand tons/ million pcs.)
1	Bread products (in flour equivalent)	110	447.8
2	Meat and meat products (in meat equivalent)	78	317.5
3	Milk and dairy products	390	1 587.5
4	Eggs (pieces)	291	1 184.5 million pcs.
5	Fish and fish products	23.3	94.8
6	Sugar	39	158.7
7	Potato	117	476.2
8	Vegetables and cucurbit crops	139	565.8

Note: Developed by the Institute of nutrition RAMS, 1987;

The urban focus of the agro-industrial complex development in the Republic is placed on large agricultural holdings and agricultural firms with maintained peasant (farmer) and personal subsidiary farms as well as farms sole proprietors (table 3). Modern trends in the development of the agro-industrial complex are influenced, on the one hand, by the intention of enterprises, agricultural producers to autonomy and independence, and on the other hand, by the desire to maximize the conjugation of logistics operations by all participants in the supply chain. These requirements determine the need to search for forms and methods of integrated interaction of supply chain links in the framework of coordinated efforts of companies and centralized material and information support of the process to realize agricultural products [15].

Table 3. Forecast of the gross agricultural output structure by types of farms and industries for the period up to 2020

Industries	Total		plant growing		animal breeding	
	2015	2020	2015	2020	2015	2020
Total, including:	100	100	100	100	100	100
farm enterprises	38	42	54	55	24.2	26
Private farms and sole proprietors	5.5	5.3	8.4	8.2	3.3	3.1
household farms	56.5	52.7	37.6	36.8	72.5	70.9

According to the Strategy of socio-economic development of the Republic of Bashkortostan, the grain crop planting acreage in 2020 should be at least 1800-2000 thousand hectares, and their yield 30-35 c/ha. This will bring the average annual grain production in different types of farms to 5.4-5.6

203

Int. J Sup. Chain. Mgt   Vol. 8, No. 4, August 2019

million tons in the near future and 6.5-7.0 million tons in the long term perspective.

To provide the population of the Republic with meat and meat products, it is planned to increase their production to 330 thousand tons. The total volume of milk production in all types of farms in the Republic is expected to increase to 3.0 million tons by 2020. This will meet the needs of the population of the Republic in milk in the amount of 390 liters per person and provide selling 47-50% of dairy production out of Bashkortostan. (Table 4) The output of other types of products is determined. Because these agricultural products are very perishable, they have very strict requirements for ambient temperature and humidity in the logistics process. Therefore, when exporting it outside the Republic, it is necessary to take into account modern models of supply chain management and developed supply chain tracking systems. It requires further elaboration of tracking technologies such as RFID (Radio-Frequency IDentification) and blockchain technology [16].

Table 4. Forecast of animal breeding products production and consumption in the Republic of Bashkortostan for the period up to 2020

Indicator name	Production		Per capita consumption, kg
	total, thousand tons	including per capita consumption, kg	
Meat and meat products	330	81	78
Milk and dairy products	3000	737	390

The absence of a unified integrated land use planning schemes of Russia, especially when placing linear infrastructure facilities (federal roads, oil and gas pipelines) had a significant impact on the quality of the Republic's land use planning scheme development. The content of land use planning scheme is greatly influenced by the legal framework, quality state and the use of land.

The updated Scheme of territorial planning was approved by the government decree of the Bashkortostan Republic No. 289 of August 5, 2015. It is a comprehensive document of urban development in the Republic.

Land use planning scheme materials are presented in text and graphics. The text part of the Scheme provides a feasibility study of design solutions. The graphic part (figures) depicts location of the designed objects and activities on the territory of the Republic. The scheme is supplemented by annexes (figure 2).
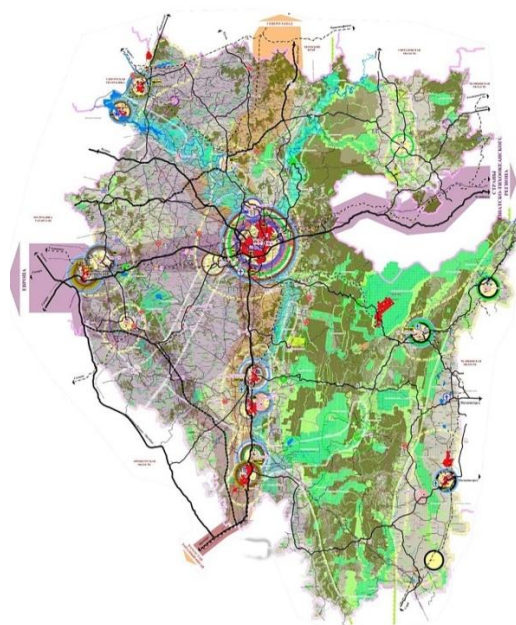
Figure 2. Project plan of the territorial planning scheme

The text part of the Scheme contains the following sections:

- general characteristics of the Republic as an object of territorial planning (historical features of the territory, place in the system of the Russian Federation and the Federal district);
- analysis and assessment of natural, environmental and socio-economic conditions, infrastructure and trends in the development of the territory;
- design decisions and their justification on development of transport system and engineering infrastructure, nature protection, prevention of emergency situations of natural and technogenic character, preservation of objects of historical heritage;
- priority investment projects. The main technical and economic indicators of the project.

The graphic part (on the drawings) shows the placement of the designed objects and activities in the Republic.

4.   Conclusions

This paper analyzes schemes of territorial planning of the Republic of Bashkortostan. It considers the prospects of territorial planning in terms of supply chain management. It is found that in the long-term perspective there will be a significant reduction in the area of agricultural land as the result of their removal for settlements, the needs of industry, transport and recreation areas. Such a situation is difficult to justify. It requires finding ways to reduce the seizure of fertile land for that purposes.

The development plan is shown to include building settlements along the main transport

communication and the largest waterway corridors. This will make it possible to increase the number of centers to supply agricultural products. There is substantiated a necessity to develop the tracking technology to supply agricultural products to other republics with the help of Radio-Frequency Identification and block chain technology.

References

[1] Bagliani, M., Dansero, E., & Puttilli, M. *Territory and energy sustainability: the challenge of renewable energy sources*. Journal of Environmental Planning and Management, Vol. 53, No.4, pp. 457-472, 2010.

[2] Wang, G., Gunasekaran, A., Ngai, E. W., & Papadopoulos, T. *Big data analytics in logistics and supply chain management: Certain investigations for research and applications.* International Journal of Production Economics, Vol. 176, pp. 98-110, 2016.

[3] Verhetsel, A., Kessels, R., Goos, P., Zijlstra, T., Blomme, N., & Cant, J. *Location of logistics companies: a stated preference study to disentangle the impact of accessibility.* Journal of Transport Geography, Vol. 42, pp. 110-121, 2015.

[4] Newton, P., Agrawal, A., & Wollenberg, L. *Enhancing the sustainability of commodity supply chains in tropical forest and agricultural landscapes*. Global Environmental Change, Vol. 23, No.6, pp. 1761-1772, 2013.

[5] Zolfpour-Arokhlo, M., Selamat, A., & Hashim, S. Z. M. *Route planning model of multi-agent system for a supply chain management.* Expert Systems with Applications, Vol. 40, No.5, pp. 1505-1518, 2013.

[6] Fahimnia, B., Sarkis, J., & Davarzani, H. *Green supply chain management: A review and bibliometric analysis.* International Journal of Production Economics, Vol. 162, 101-114, 2015.

[7] Osman, T., Shaw, D., & Kenawy, E. *An integrated land use change model to simulate and predict the future of greater Cairo metropolitan region*. Journal of Land Use Science, Vol. 13, No.6, pp. 565-584, 2018.

[8] Yu, Q., Verburg, P. H., & Wu, W. *Environmental cognitions mediate the causal explanation of land change*. Journal of land use science, Vol. 13, No.5, pp. 535-548, 2018.

[9] Volkov, S.N. *General scheme of land management of the territory of the Russian Federation (content and methods of development).* Moscow: State University for Land Management Publ., pp. 370, 2009.

[10] Rajeev, A., Pati, R. K., Padhi, S. S., & Govindan, K. *Evolution of sustainability in supply chain management: A literature review*. Journal of Cleaner Production, Vol. 162, pp. 299-314, 2017.

[11] On strategic planning in the Republic of Bashkortostan: the law of the Republic of Bashkortostan No.194-z of 27.02 2015 - adopted by the State Assembly - Kurultai of the Bashkortostan Republic 26.02.2015. The Russian reference retrieval system "Consultant Plus". URL: http://docs.cntd.ru/document/424038990

[12] The Urban Development Code of the Russian Federation: No.190-FZ of December 29, 2004 : adopted by the State Duma on December 22, 2004: approved by the Federation Council on December 24, 2004. The Russian reference retrieval system "Consultant Plus". URL: http://www.consultant.ru/document/cons_doc_LAW_51040/

[13] State (national) report "On the state and use of land in the Republic of Bashkortostan in 2018". Federal service for state registration, cadastre and cartography (Rosreestr) in the Bashkortostan Republic. Ufa, pp. 244, 2019.

[14] Hye, Q. M. A., Lau, W. Y., & Tourres, M. A. Does economic liberalization promote economic growth in Pakistan? An empirical analysis. Quality & Quantity, vol.48, no.4, 2097-2119, 2014.

[15] Behzadi, G., O'Sullivan, M. J., Olsen, T. L., & Zhang, A. *Agribusiness supply chain risk management: A review of quantitative decision models*. Omega, 79, 21-42, 2018.

[16] Tian, F. An agri-food supply chain traceability system for China based on RFID & blockchain technology. In *2016 13th international conference on service systems and service management (ICSSSM).* IEEE, pp. 1-6, 2016.