

# Using Supply Chain Strategy in Skilled Workers Migration: A Consequence for the Russian Far East's Economy

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**Abstract**— Supply chain management in human resource management of the workers in the large scale can be more efficient. Migration of highly skilled workers abroad and to the Russia's central territories is becoming a significant problem for Primorsky region which located in the key geopolitical zone in the Russian Far East. Every year due to migration losses the population engaged in the economy squeezes by 0.3-0.4 percent. It determines a loss of public services' quality in healthcare and education, and stipulates a degradation of business environment, which in turn limits the economic advances. Migration losses cause a change in demographic and ethnic structure of employment in the region, which in the long term will determine a structural imbalance in the labor force market. In addition, the outflow of labor force preconditions a slowdown of the economy and diminish the geopolitical status of the Russian Federation in the Far East due to depopulation process at the border's areas. It can be managed by supply chain strategies to manage the forces properly in their own requirements. Migration of skilled workers, or "brain drain", is a crucial factor for the economy of the Russian Far East. The consequence is a negative impact of migration processes for the age structure of the labor force, considering a fact that the major part of migration, some about 70 %, is due to outflow of the working age's people. Next consequence is reducing of the engaged population in the economy and, accordingly, shrinking supply of labor resources in the market. The processes of population's decline and labor migration off the region may squeeze the skilled workers offering in the labor market. Adequacy of qualified specialists will not exceed 40 percent following to the graduates' forecast of higher and secondary vocational education - 21.0 thousand annually. In this situation a "gap" will probably occur between supply and demand in the labor market as a result of deficit of specialists in long run period.

**Keywords**— *the Russian Far East, highly skilled*

*workers, supply chain, human resource management, migration loss, economic development, gross regional product, employment, population.*

## 1. Introduction

Since 1993, Primorsky region of the Russian Far East has been suffering a decline of the population, caused, on one hand, by low birth rate and high mortality rate, on the other hand, by migration decline, which according to the official statistics, amounted to 4,654 people in 2018. The estimated population following to the migration and natural loss will probably reduce to 1 892.6 thousand in 2021, in fact by 21.6 thousand in comparison to 2018 (figure 1).

The Supply Chain sector includes all the activities that take place to get a product to its intended market from the time of raw materials extraction to the minute the final product is delivered.

Companies involved in this process are linked to each other through a 'supply chain'. Supply Chain Management (SCM) focuses on planning and forecasting, purchasing, product assembly, moving, storing, and keeping track of a product as it flows toward you and other consumers.

SCM includes these functions:

- Purchasing/Procurement
- Strategic Sourcing
- Contract Management
- Materials/Inventory Management
- Logistics and Transportation

According to statistics data, the labor force at age 15 and elder in December 2018 amounted to 1040.2 thousand people (54.4% of total population of the region). Among them, 975.5 thousand people (93.8%) were engaged in the economy and 64.7 thousand people were unemployed but have been looking for job (according to the methodology of the International Labor Organization, they are classified as unemployed). The unemployment rate increased by 0.9 percentage points compared to the same period of the last year and amounted to 6.2% (in December 2017 – 5.3%) [1-10].

At background of the negative trends with employment, the migration outflow of the skilled workers continues to other regions of the Russian Federation. Every year due to migration decline economically active population of the region decreases by average of 0.3-0.4 percent. If we consider, also, the natural decline of population, annually the number of economically active population of the region decreases about 0.5 percent. In medium-term period, the migration decline, along with the natural decline and outflow of skilled workers, can lead to a structural deformation of labor market of Primorsky Krai. It is likely that the region will be able to provide only 40 percent of the demand for qualified specialists to procure the labor market of the region [11-18].

## 2. Problem Statement

Without the right tools in place, warehouse managers choose to fly by the seat of their pants when it comes to “human supply chain”

management, hoping that their tactics pay off in the long run. A “human supply chain” for managing workers within the firm is not what I want; in fact, perspectives from within or between firms seems to be a common element shared by most people using the term. Migration losses cause a change in demographic and ethnic structure of employment in the region, which in the long term can lead to a structural imbalance in the labor force market of Primorsky Krai. In addition, the outflow of population outside the region, in a long term, can lead to a slowdown in economic development of the region and deterioration of geopolitical status of the Russian Federation in the Far East due to depopulation of the border areas. According to estimation, by 2025, the number of Chinese residents on the border with Russia could reach 130-132 million people. High population growth rates are expected by 2025 in North Korea (32.1 million people), in the Republic of Korea (50.8 million people) [14], [19-22].

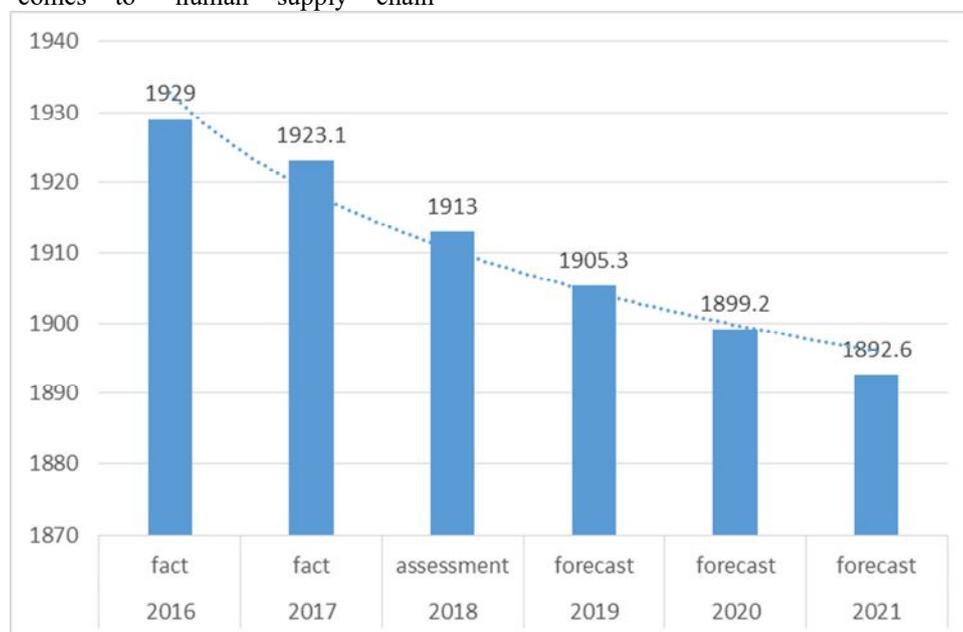


Fig.1. Primorsky region's population decline (thousand people)

There are qualitative differences in inter-regional migration upon arrival and departure. The share of arrivals to Primorsky Krai from other regions of Russia since 1993 is quite stable and averages 30.5 percent. It implies that motivation of the arriving people has not changed. The proportion of departures from Primorsky Krai to other regions of the country is significantly higher and averages 41.1 per cent with significantly greater variability (the standard deviation is 2.7 per cent). These findings may indicate that the degree of retention of the indigenous population in the region remains low [6], [23-27].

Migration of skilled workers abroad is becoming a significant problem. It stipulates a loss of public funds invested in education of the graduates. It determines a lowering of quality and availability of

public services, for example, health and education, as well as deterioration of the business environment, which in turn limits the economic growth in future [5], [9], [24]. Every year, the universities of the region let out qualified specialties that take chances working abroad. These are skippers, mechanics, economists with knowledge of foreign languages and attitudes to work in China, the Republic of Korea, the USA, Australia, India and other countries. Having an internship abroad, they have finally got a job there after graduation, while remaining citizens of Russia in fact [8], [25].

### 3. Aim of Study, Method and Assumptions

The aim of study is measuring the highly skilled workers losses and evaluation of its consequences for the region's economy and labor market until 2021. Used a forecast-analytical method for evaluation of changes in structure of population engaged in economy, evaluation of the gross regional product losses, withdrawals of income tax revenues to the budget of region and slowing of retail sales and consuming turnover.

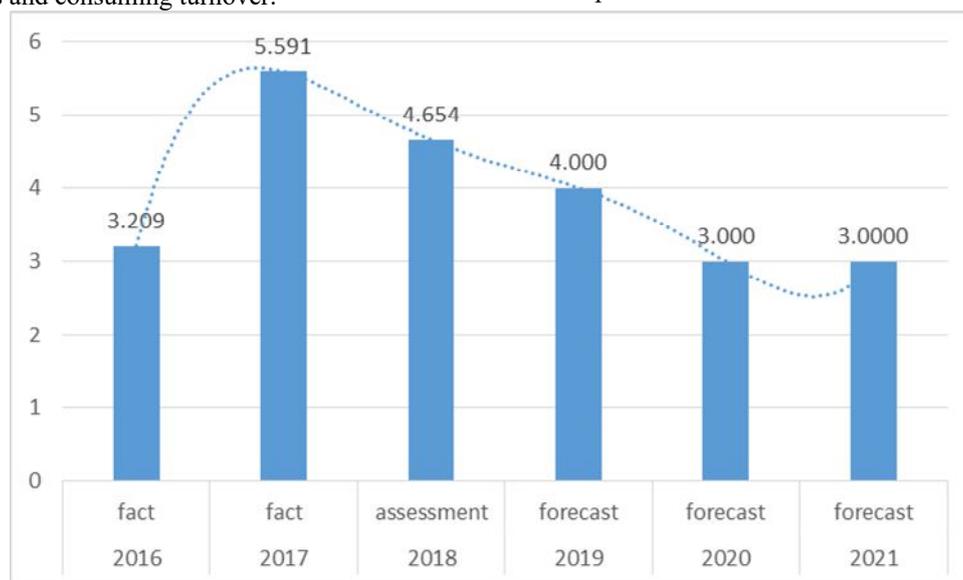


Fig. 2. Primorsky region migration losses assumption (thousand people)

Assumed that the migration decline will be continuing in the next parameters – 4.0 thousand people (2019); 3.0 thousand people (2020); 3.0 thousand people in 2021 (figure 2). The forecast based on results of calculation of the estimated population of Primorsky Krai, published by the statistic authorities, considering that the natural and migration decline will approximately affects the losses of population equally.

### 4. Analysis of Studies and Publications on the Subject

The population outflow of Primorsky Krai is stipulated by slowing of economic processes in depressing municipalities, by inability to satisfy social and cultural needs, as well as by lack of opportunities for self-realization and professional development for the younger generation. A predominant motive for migration is the lack of well-paid work for 50 per cent of young people and for 36 per cent of a middle-age people. Identifying a level of mobility of residents it was noted that among the age group of 18-25 years and elder 56 year, a predominant number of respondents (48 and 100 percent, respectively) do not plan to move in the near future, and among the residents of the age

For the analysis purposes, it implied the inertial trends in the economy of the region. Assumed a variation of physical volume of the gross regional product index within 100.01-101.27 percent until 2021. This corresponds to a basic scenario of the economic forecast of the region. The forecast assumes a change in number of employed in the region's economy in the following parameters: 978.8 thousand people (2019); 981.6 thousand people (2020); 984.8 thousand people (2021). The employment rate is projected between 65.9 and 66.2 per cent.

group 26-37 years - 44.4 percent want to move, but do not have any opportunity [12].

In recent years, the factor of "potential difference" is beginning to play an increasingly important role in migration activity of the population in the Russian Federation. However, the "potential difference" between regions, primarily due to significant differences in the cost of dwelling, makes it difficult to move to regions with a higher standard of living. There are so-called "poverty traps". At the same time, the described situation is typical for both domestic and international migration [1].

Migration of skilled workers, or "brain drain", is a crucial factor for any national economy. In Primorsky region it is estimated that approximately 78 per cent of the migration outflow is set by younger generation under 35. Those are well-trained professionals with the higher and secondary education degree. According to Ministry of education in 2016, only 72 percent of local graduates were employed in Primorsky Krai, and number of graduates who have left the region amounted to 2,674 people. For small-size economies the outflow of the professionals stipulates a huge loss in budget revenues and gross regional product [3], [7], [26, 27].

The reason of the younger generation unemployment in Primorsky Krai is asymmetry in the labor market due to mismatch of the professional degree of young specialists to the vacancies declared by employers. The average time to find a job among the unemployed young people of age group 25-29 years has increased. For those who have already had a work experience and education, it is higher and averages more than 8 months. Often young people, without significant professional skills, impose excessive demands on wages, which also makes it difficult to find a job. Controversially, mobility of researchers and scientists to the advanced economies make it broader their opportunities both for getting much higher earnings and professional growth [15]-[17]. Public opinion surveys show that some part of the interviewed in Russia see positive the Russian Far East advances. According to the National Center for Social Studies and Monitoring in 2017 up to 12 percent of interviewed consider the Russian Far East to be one of the most advanced territory of the country. Almost 50 per cent of the population believe that the region will take an advanced position within 15-20 years. The advantages mentioned by the interviewed were opportunity to earn (40 percent) and career prospects (23 percent). At the same time, the results of another survey

reveal a significant number of those wishing to leave the region. The main reason for 50 percent of respondents called the "high living expenditure". High prices were previously compensated by high wages, but now the regions of the Far East of Russia are noticeably lagging a few central regions of the Russian Federation in per capita average income [8].

## 5. Research - Skilled workers outflow – The consequences

Estimation of Primorsky Krai's population (base at the beginning of 2018) according to basic version of the forecast indicates a decrease by 7.7 thousand in 2019. Thus, the population will be 1905.3 thousand people (in 2018 – 1913.0 thousand people). For 2020 and 2021, the population is projected to decline by 6.1 and 6.6 thousand people, respectively, which will be 1899.2 thousand people and 1892.6 thousand people, respectively. A slight increase in the gross regional product is projected. The gross regional product index will be 100.1 per cent in 2019; 100.02 per cent in 2020; and 101.27 per cent in 2021. It reflects the slowing of economic processes in the region (table 1).

**Table 1.** Indexes of economic development and migration decline in Primorsky Krai

Indexes	2016 fact	2017 fact	2018 fact	2019 prognosis	2020 prognosis	2021 prognosis
Population, thousand	1929,0	1923,1	1913,0	1905,3	1899,2	1892,6
Gross regional product, billion rubles	736,886	802,053	861,447	894,829	920,914	967,083
GRP index, %	97,7	100,64	102,26	100,01	100,02	101,27
Employment, thousand	986,5	979,3	984,2	978,8	981,6	984,8
Employment ratio, %	65,9	65,9	66,0	65,9	66,1	66,2
Migration loss, thousand	3,209	5,591	4,654	4,000	3,000	3,000
GRP per employee, thousand rubles	747,3	819,2	875,4	914,9	938,1	982,8
Average monthly wages, thousand rubles	35677,1	38044,7	42080,3	44090,0	46380,0	49260,0

The number of employees will have changed slightly - to 978.8 thousand people in 2019; 981.6 thousand in 2020; 984.8 thousand in 2021. It follows to the economy slowing down in the next 3 - year period. According to calculation, the volume of gross regional product per one employee will be 914, 9 thousand rubles in 2019; 938,1 thousand rubles in 2020; 982,8 thousand rubles in 2021.

Thus, due to migration losses, the gross regional product may be lower in 2019 by 3.659 billion rubles; in 2020 – by 2.814 billion rubles; in 2021 – by 2.964 billion rubles (table 2). In fact, it is a non-produced gross added value. But it has a relatively

low share - 0.3-0.4 percent in the overall volume of gross regional product. It can be assumed that the losses can be compensated by the labor force high productivity and high outputs of the jobs in new industrial and servicing sectors. However, in the long-term period, the migration decline, increasingly becomes deterrent to implementation of the Russian Government's policy on the advanced economic growth of the Far East of Russia. Considering the projected indicators of the Russian Federation's economy in the medium-term period at rate of 102.0-103.1 percent, the growth of the economy of Primorsky Krai should not be lower this point.

**Table 2.** Migration impact on economic indexes in Primorsky region

Index	2018 assessment	2019 forecast	2020 forecast	2021 forecast
Gross regional product loss, billion rubles	4,074	3,659	2,814	2,964
Fiscal revenues losses, billion rubes	25,459	22,926	18,088	19,211
Retail trade and consumer services turnover losses, million rubles	139,104	126,720	99,360	95,000

According to basic version of the forecast of socio-economic development of the region, the average monthly nominal wages will be in 2019 - 44090.0 rubles; in 2020 - 46380 rubles; in 2021 - 49260 rubles. Considering the estimated parameters of migration loss, it can be assumed that the income tax revenues into the region's budget may be lower by 22,926 million rubles in 2019; by 18,088 million rubles in 2020; by 19,211 million rubles in 2021 (table 2). In total, in the 3 - year period, the budget system of the region may have a loss about 60.3 million rubles of income tax revenues due to migration outflow. In addition, it is probable a withdrawal of tax on corporates' profits as a result of the volume of GRP loss and retail trade turnover slowing down.

Surely this is an approximation. It has not been considered other payments to individuals which are the subjects to tax duties, the "shadow salaries" and other factors. It should be noted that the personal income tax revenues due to migration losses has a small share in the actual income of personal income tax in the budget system of the region. For example, in 2019, income from the tax on personal income is planned in the amount of 32 877.3 million rubles with an increase to the planned appointments of 2018 by 3 627.3 million rubles. During the planning period in 2020 and 2021, the proceeds of the tax to incomes of persons is expected in 2020 - 33282,5 million, and in 2021 - 33948,2 million.

The share of expenditure for goods and services in structure of household's consumption, according to estimates, amounted to 72 percent in 2018. Considering the forecast of migration loss, we could assume a decrease in volume of the retail trade and consumer's services in 2019 - 126,720 million rubles; in 2020 - 99,360 million rubles; in 2021 approximately 95-100 million rubles (table 2).

Migration decline implies a change in age and professional qualification of the labor force, which prospectively stipulates a structural imbalance in the labor market, constraining the economic development of Primorsky Krai.

The consequence is a negative impact of migration processes on the age structure of the labor force, considering a fact that the major part of migration losses, some about 70 %, is due to outflow of the working age population. The population of Primorsky Krai over the working age as of January 1, 2018 amounted to 472 517 people (467 437 people as of January 1, 2017). This is 24.5 percent of the population of the region, and about 43 percent of the population engaged in the economy. Thus, the factor of migration decline, along with the natural decline (5677 people in 2018, 4488 people in 2017), will cause a "senility process" of the labor force.

Consequently, the migration decline causes a reducing of employed in the economy and, accordingly, reduces the supply of labor force in the labor market. The projected staff demand is about 35,267 people to be employed in the announced investment projects until 2024. Thus, it is probable a deficit of labor force at construction sites and in the agriculture sector. For "new" industrial sectors such are the large-tonnage shipbuilding and petrochemicals, the special professional training programs are required which will consume time and finance.

Primorsky region has announced investment projects until 2025 such are large territorial industrial clusters with new technology specialization in large-capacity shipbuilding, engine and automotive assembling, petrochemicals and refinery. It has been announced the investment projects in areas adjacent to international transshipment routes Primorye-1 and Primorye-2, near the back-service zones at sea ports Zarubino, Vostochny, Koz'mino and Vladivostok. According to the forecast, an overall requiring of skilled labor force for large projects in the "new economy" will annually amount to 44.0-46.0 thousand people in the period 2019-2023, and approximately 60.0 thousand people in 2024.

At optimistic background for labor market in the Primorsky region, there is a steady downward trend in the output of higher education specialists (table 3).

**Table 3.** Number of higher and secondary education graduates

Education level	2013	2014	2015	2016	2017
Higher professional	15,7	15,2	13,9	14,9	12,0
Secondary vocational	5,8	5,6	6,3	5,9	8,8
Total	21,5	20,8	20,2	20,8	20,8

Statistics data show that graduation of higher education specialists in the Primorsky territory for five years has decreased by 3.7 thousand, from 15, 7 thousand in 2013 to 12, 0 thousand in 2017 (by 23.5 percent). The data indicate an increase in quantity of trained specialists of secondary vocational education from 5, 8 thousand (2013) to 8, 8 thousand (2017). It allows to maintain the relative symmetry of supply and demand in the labor market of skilled working professions. In total, in 2017, graduation of qualified specialists of higher and secondary degree by state universities amounted to 20, 8 thousand people.

Considering the negative trend of reducing the population of the region, the quantity of graduates is likely to remain within 20.0-21.0 thousand people in the period up to 2024, according to the most optimistic scenario. For reference, according to basic version of the forecast, the population of Primorsky Krai will decrease by 7.7 thousand

people in 2019 and will amount to 1905.3 thousand people (in 2018 – 1913.0 thousand people). For 2020 and 2021, the population is projected to decline by 6.1 and 6.6 thousand people, respectively. Which will be 1899.2 and 1892.6 thousand people respectively.

Data of the Department of labor and social development of Primorsky Krai indicate the demand of employers for qualified specialists, especially for skilled worker. That is a paradox, against this background, there is a problem of employment of the universities' graduates both secondary and higher education degrees. According to the Ministry of education and science, only 71-75 percent of the graduates are employed in Primorsky Krai, and number of graduates leaving the region is about 2.6-3.3 thousand people annually (table 4). The ratio of number of universities' graduates who left the region and employed in the region is about 0.4-0.47.

**Table 4.** Employment and migration of graduates of higher education

Показатель	2013/2016	2014/2016	2015/2016
Number of graduates	14091	13969	13 068
Hired graduates in the region	10277	10424	9538
Share of hired in the region graduates, %	73,0	75,0	71,0
Number of graduates who left the region	2943	3336	2674
Hired to left ratio	0,4	0,47	0,39

The share of employed graduates with secondary vocational education is 63 percent (2016), and the number of graduates who have left is 224 (the ratio of those who left to the remaining 1.06). Graduates have constraints with employment in a professional sphere related to degree's occupation. In addition, an employer is interested in advanced professional competencies and skills, which has not often possessed by graduates. There are difficulties in the process of adaptation of the young professionals, especially workers. In addition, the graduates in process of labor migration outside the region can expect a higher level of wages [18-21]. According

to the Ministry of education and science in 2016, the average amount of payments to graduates who left was 42 924 rubles, the remained graduates the average amount of payments was 33 034 rubles (ratio 1.47).

The results of analysis make it possible to assume - along with the asymmetry of supply and demand following to professional mismatch, the trend of graduate's quantity reduction, especially qualified specialists, disrupt a structural balance of the labor market. As a result, prospectively the region will be just partially able to procure demand in highly skilled specialists (table 5).

Table 5 – Skilled employees requiring until 2024 Level of degree	2018	2019	2020	2021	2022	2023	2024
Secondary vocational – skilled workers	16408	18786	19091	20845	18260	21240	23832
Bachelors' degree	17921	18746	19142	18694	19389	22582	26205
Specialist's degree	2937	3218	3071	3487	3138	3826	4329
Master's degree	3894	4255	4126	3683	3837	4645	5716
Total	41160	45005	45430	46709	44624	52293	60082

The processes of population decline and labor migration of specialists outside the region may squeeze the skilled workers offering in the labor market. Self-provision with qualified specialists

will not exceed 40 percent following to the graduation's forecast on specialists of higher and secondary vocational education - 21.0 thousand annually.

Considering migration, the actual offering of qualified specialists will be 18.0-18.2 thousand annually, if the applicants actively represent themselves to a prospective employer. That is, actively seek a job and there will be no obstacles to

finding and getting the desired job (table 6). In this situation, the "gap" between supply and demand in the labor market is probably occurred as a result of deficit of specialists in the medium-term period.

**Table 6.** Offering and requiring of skilled specialists and market adequacy  
people

Index	2020	2021	2022	2023	2024
Quantity of specialists required	45430	46709	44624	52293	60082
Forecast for qualified specialists' graduation	21000	21000	21000	21000	21000
Forecast for migration of specialists' off the region	2800	2800	2800	2800	2800
Actual offering of qualified specialists	18200	18200	18200	18200	18200
Qualified specialists' inadequacy	27230	28509	26424	34093	42000
Market adequacy ratio, %	40,0	39,0	41,0	35,0	30,0

## 6. Conclusions

The research is presented the impact of the human resource management for workers in the Russia based on the supply chain strategies. The impact of losses of highly skilled workers on the economy due to the migration decline is an approximation. It is upon assumption that the region will continuously be facing a negative trend of population squeezing and inertial trends in the economy. It is obvious that the migration decline, along with the natural decline, is a limiting factor for development of any economy [10]. For advanced development growth of the gross regional product should not be lower 102.0-103.0 percent, that is, higher than average Russian's index. We could imply that a labor productivity will make up losses of the gross regional product, however, new jobs and low unemployment rate are not the only factors, which might to minimize the migration losses. The reasons for mobility of the population are deeper and include the deterioration of the socio-economic situation in some municipalities of the region, inability to satisfy socio-cultural needs, as well as the lack of opportunities for self-realization and professional prospects for young people.

The problem solution, both unemployment and staff offering, could probably become the government's programs aimed at support of external and internal labor migration of the Russian Federation's residents to the points of economic growth in Primorsky region. It would not only feed the economy with labor resource but concentrate the population at the border line with China, that rise density in the southern and south-eastern macro zones of Primorsky Krai. It implies erasing

asymmetry of the population allocating throughout the region and stipulate a balanced spatial emergency. The inflow migration due this scenario must be 22-25 thousand annually until 2025, that secure the total population over 2 million in 2030 . That is a general agenda that ensure the migration inflow assuming that the state should "hold" the economic space of Primorsky Krai. It is important for maintaining competitiveness and important geopolitical status of the Russian Federation in the Far East.

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