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# Forecasting the Socio-Economic Development of the Municipality: The Budgetary Aspect

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## ABSTRACT

The article considers the issues associated with the formation of a forecast for the socio-economic development of a municipality in the context of budgetary resources. **The relevance** of the study is due to the variety of theoretical and practical approaches to forecasting the socio-economic development of municipalities, which are used in the activities of local governments with different degrees of effectiveness, which has a negative impact on strategic planning at the municipal level as a whole. **The purpose** of the study is to develop an integrated approach to the formation of a forecast for a socio-economic development of a municipality with emphasis on the budgetary sphere. **The research methodology** is based on the use of complex and statistical analysis, methods of economic and mathematical modeling. Approbation was carried out on the example of the municipality "City of Kirov". Conceptual scheme for construction of economic and mathematical model of a municipal formation is substantiated and proposed, and also allow to form a forecast of socio-economic development of a municipality for long-term period, in which factors are identified and influence on the local budget parameters. To build an economic and mathematical model, a municipal statistical base for the city of Kirov was formed for a twenty-year period. On the basis of the collected statistical series, balance ratios and factor dependencies of the model parameters were identified and formalized in accordance with the logic of the relationship of indicators within the model of the socio-economic system of the municipal level by constructing a system of econometric equations and conducting a correlation-regression analysis. On the basis of the constructed economic and mathematical model, a scenario forecast was implemented and estimates of changes in the budget parameters of the city of Kirov for the period up to 2035 were obtained. It is **concluded** that the approach developed by the authors to the formation of the forecast for a socio-economic development at the municipal level is universal for various types of municipalities in the Russian Federation and can be applied as for municipal socio-economic system as a whole and for its individual subsystems and spheres.

***Keywords:*** municipality; socio-economic development forecast; local budget; strategic planning; economic and mathematical modeling

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## INTRODUCTION

Ensuring effective management of municipalities' socio-economic development is a key task of local self-government bodies, for which a wide range of administrative, legal, economic, and institutional instruments are used, of which strategic planning plays an important role as a set of strategic planning, forecasting, and management, including forecasting over different time periods [1–3].

The forecasting process itself is complex and rather complex, there are a large number of different methods and approaches to the construction of forecasting, the degree of formalization which can be divided into two aggregated groups: intuitive and formalized [4]. Intuitive forecasts are quite widespread in various areas, especially in the context of dynamic reality, as they are based on expert assessments obtained during interviews and questionnaires [5]. However, there are considerable risks involved with these methodologies, including a high level of subjectivity, which would significantly influence the quality of the forecast if experts are not competent. In this regard, most researchers use formalized methods to supplement the obtained predictive estimates of quality, the most common of which are economic and mathematical modeling, because they allow to evaluate the behavior of the object, causes and patterns of change, impacts, opportunities, and costs of influencing these changes [6].

Application of various economic and mathematical methods for forecasting the development of territories was considered by both domestic [7–14], and foreign scientists [15, 16].[1] Despite the diversity and unconditional benefits of the presented methodologies, as well as the practice of their implementation, a set of problematic elements inherent in projecting socioeconomic growth at the municipal level may be asserted:

- application of trend forecasting methods, especially when the developers are municipalities, which leads to insufficient accuracy of model results;
- low level of statistical information provision;
- individual indicator group forecasting is inconsistent, resulting in a poor balance of modeling results;
- high level of influence of the environment [17];
- fragmentation of long-term development priorities and operational decisions between levels of government, resulting in situational solutions to problems at the local level and insufficient integration of long-term priorities;
- limitations of scenario modeling tools [18].

The solution of these issues necessitates the development and implementation of integrated methodologies to forecasting the socio-economic growth of municipalities.

The municipality "Kirov of City", which is the administrative center of Kirov region, was chosen as the object of this study. Employees of the Financial University under the Government of the Russian Federation are members of the scientific team for the development of the "Strategy for the socio-economic development of the municipality "Kirov of City" for the period up to 2035" and the plan of measures for the implementation of the "Strategy economic development of the municipality "Kirov of City" for the period up to 2035",[2] which determines the choice of the object of research and confirms the successful approbation of the proposed approaches in the study.

## RESULTS

The complex structure and specific properties

[1] Amisano G., Geweke J. Prediction using several macroeconomic models. URL: http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1537.pdf (accessed on 04.06.2022).

[2] Decision of the Kirov City Duma No.39/1 from 28.10.2020 "On approval of the Strategy for the Socio-Economic Development of the Municipality "Kirov of City" for the period up to 2035". URL: https://docs.cntd.ru/document/570981689 (accessed on 07.06.2022).

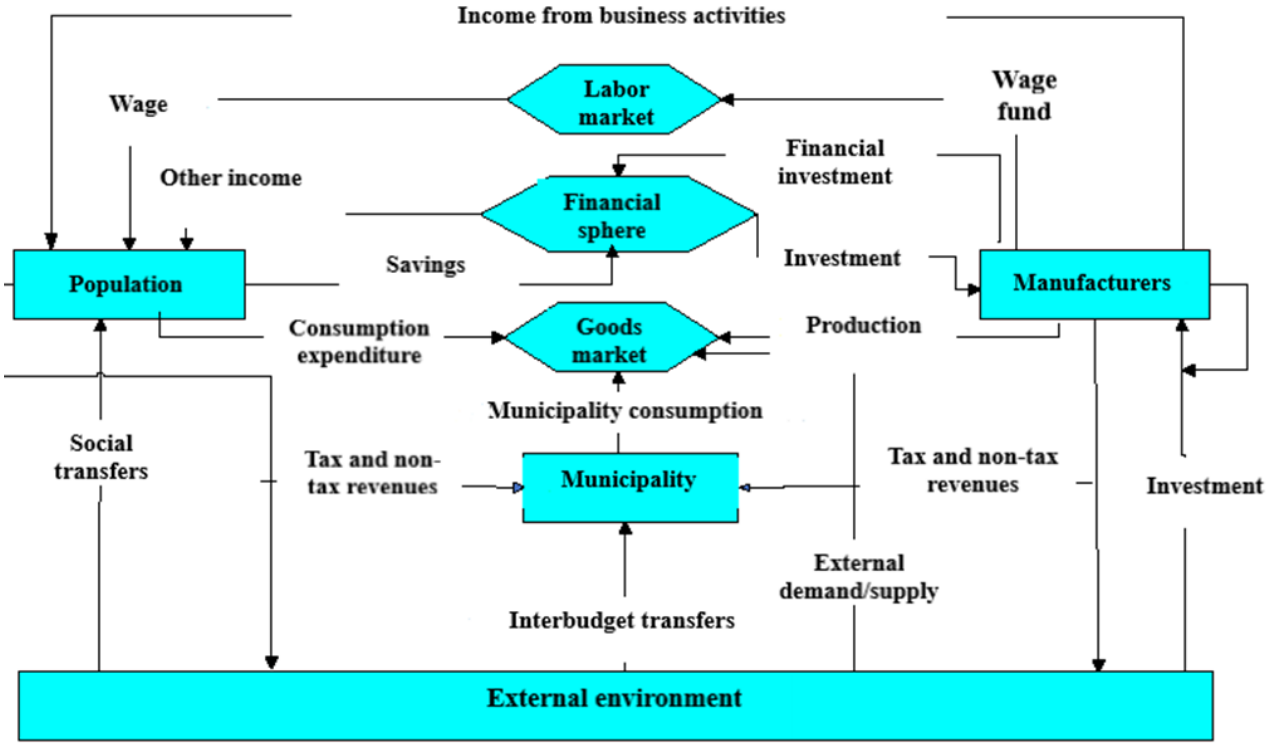


*Fig. 1.* **Socio-Economic System of the Municipal Level as an Object of Modeling**

*Source:* Compiled by the authors based on the materials [21].

of the social and economic system of the municipality, noted in the studies V.B. Zotov [19], D.B. Sergeev [20], predetermine the interconnectedness and interdependence of the system elements and spheres of activity of the municipality, which is expressed in various interactions of demographic processes, labor market, budget, financial and production spheres. Long-term influences on the municipal budget can be classified as demographic and economic. For example, the transformation of the demographic structure caused by population ageing leads, on the one hand, to an increase in expenditure on health and social services and, on the other — to a decrease in the proportion of the working population, slows both the growth rate of the economy and the growth rate of budget revenues. The birth rate and migration have an impact on budget factors. The formed structure of the municipal economy, labor productivity, and the level of growth of small and medium-sized firms, as well as investment activity, all have a substantial impact on the budget's tax revenues, prompting the inclusion of relevant data.

As a result of the systematic description of the socio-economic system of the municipality as a set of basic elements and interrelationships [21], the following main subsystems were identified and interconnected for modelling purposes (*Fig. 1*).

In order to determine the quantitative relationships between the indicators and the factors influencing them, a municipal statistical base for the 20-year period was established, containing reporting data on more than 250 indicators provided by the Kirov city administration, territorial body of the Federal Service of State Statistics on the Kirov region, as well as placed in other official statistical yearbooks.

On the basis of the presented structure of the model of socio-economic development of the municipal formation and the formed statistical base of the city of Kirov, a

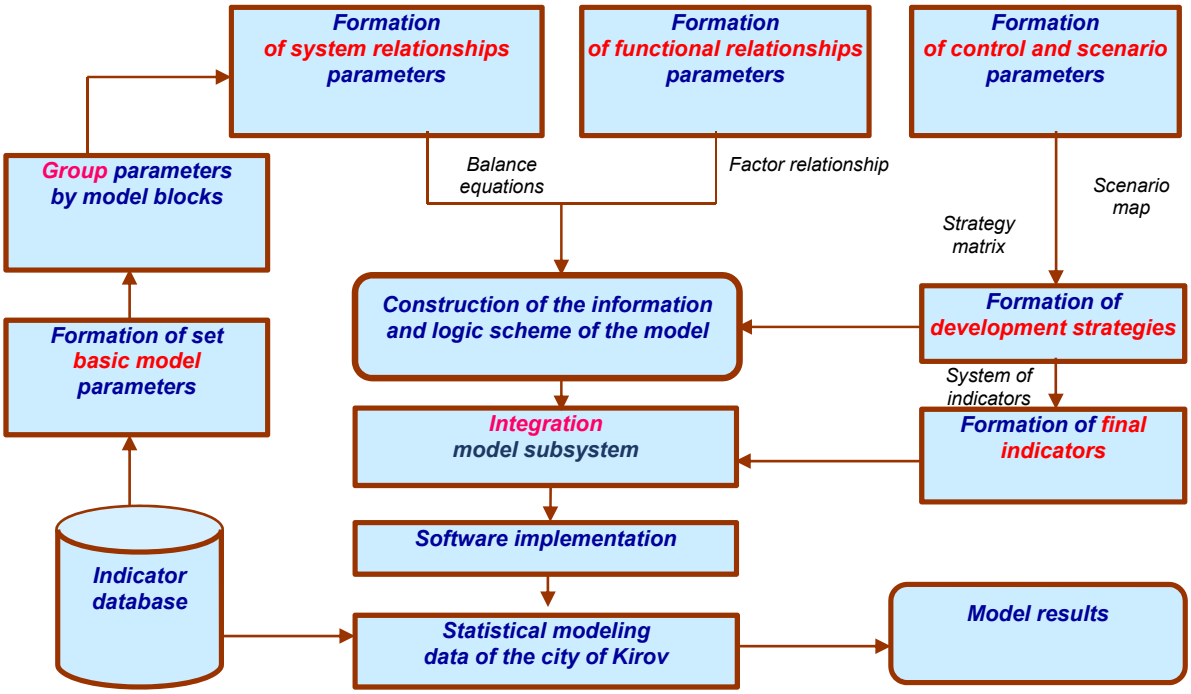


*Fig. 2.* **Conceptual Scheme for Construction an Economic and Mathematical Model of a Municipality**

*Source:* Compiled by the authors.

conceptual scheme for the construction of an economic and mathematical model of the municipality was developed, which includes the following main stages (*Fig. 2*).

The application of the suggested conceptual scheme results in the construction of a long-term projection of the socioeconomic growth of the municipality "Kirov of City", including financial parameters. Despite differences in the quantitative correlations of socio-economic indicators within each municipality, the application of the proposed conceptual framework of municipality economic and mathematical model development is universal for various types of municipalities. Over the years, the author's team has refined the approach to modeling various socio-economic sectors of municipalities which has been regularly tested in forecasting demographic evolution [22, 23], however, this is the first attempt to apply it to the budgetary sector, which is the scientific novelty of this work. To solve the tasks, the process of forecasting the development of the budget sphere of the city of Kirov is presented in detail.

Calculation of indicators of the socio-economic development model of Kirov was implemented using several approaches. Regression equations describing the dependence of this indicator on other indicators were developed for the main part of the indicators. At the same time, the mathematical criteria for equation adequacy and the actual correlation of the generated findings with retrospective data were examined. Other indicators are balanced and represent the difference of private indicators, including the amount of income and expenses of an economic agent. This calculates the deficit/surplus of the budget.

Population is forecast based on the movement of age for each individual age group. Thus, in order to forecast the size of the population of each age group in a municipality, a model of population replacement was built. There are some differences in the population composition in the under-one age group, where the birth rate is the most important factor.

The model forms a balance sheet, a

formalizing structure of the monetary income of the population, which consists of wages, social transfers, income from business, property and other income (1):

$$MP_t = MP_t^W + MP_t^B + MP_t^S + MP_t^P + MP_t^{Ot}, \quad (1)$$

where $MP_t$ — money incomes of the population in *t*-year; $MP_t^W$ — wage in *t*-year; $MP_t^B$ — income from business activity in *t*-year; $MP_t^S$ — social payments and transfers in *t*-year; $MP_t^P$ — property income in *t*-year; $MP_t^{Ot}$ — other money incomes of the population in *t*-year.

Directly the dynamics of these factor indicators is determined by the change of their components. Thus, income from wages depends on the number of employed in the economy and the average monthly wage, and social benefits depend on the number of pensioners and the average pension.

The population's monetary income determines the equivalent monetary spending. However, an analysis of historical data shows that the difference between these indicators is on average 1.5% per year. Within the financial flow model, a regression equation of the following type was created:

$$EP_t = 6595.12 + 0.95\ MP_t, \quad (2)$$

where $EP_t$ — the value of monetary expenditures of the population in *t*-year.

The assessment of the quality of the equation ($R^2 = 0.99$, $F = 2576.46$) demonstrates that it is acceptable to use it in the problem.

The production model includes, among other things, the measurement of the volume of goods shipped, the number of employed populations, the value of fixed assets, etc. Fixed investment is the most important determinant of economic development. Investments from both personal and generated funds are considered as part of the model's development. The first of these are determined by the formula:

$$I_t^o = 455.24 + 1.01 * (D_t + I_t^{pr}), \quad (3)$$

where $I_t^o$ — investments in fixed capital from own funds of enterprises in *t*-year; $D_t$ — depreciation volume in *t*-year; $I_t^{pr}$ — investment from the profit in *t*-year.

The determination factor for this equation was 0.96 and the Fisher criterion was 270.4, which is above the critical significance level.

Subsystem "Municipality" reflects budgetary component of territory functioning. The income part of the budget can be represented by the amount of tax revenues, non-tax revenues and inter-budget transfers (4):

$$BI_t = BI_t^{tax} + BI_t^{ntax} + BI_t^T, \quad (4)$$

where $BI_t$ — budget income of municipality in current period; $BI_t^{tax}$ — tax revenues to municipality budget in *t*-year; $BI_t^{ntax}$ — non-tax revenues to municipality budget in *t*-year; $BI_t^T$ — inter-budgetary transfers in *t*-year.

Tax revenues are defined in the model according to the most significant for the municipal level of taxes — personal income tax ($BI^{PIT}$), on total income ($BI^{TI}$) and property ($BI^P$). The first component was defined as a function of the income from wages ($MP^S$) according to the formula (5):

$$BI_t^{PIT} = -419\,585.98 + 55.69 * MP_t^W. \quad (5)$$

The determination coefficient was 0.84, the Fisher criterion value was 20.86, which is above the thresholds and indicates the quality of the resulting equation.

Total income tax revenue is determined based on the volume of goods shipped and previous period trends in this indicator. Property taxes are based on taxes on the property of individuals ($BI_t^{TPI}$) and land tax ($BI_t^{LT}$) according to the formula:

$$BI_t^P = 344\,326.29 + 1.04 * (BI_t^{TPI} + BI_t^{LT}). \quad (6)$$

The corresponding determination factor was 0.89 and the Fisher criterion — was 80.92.

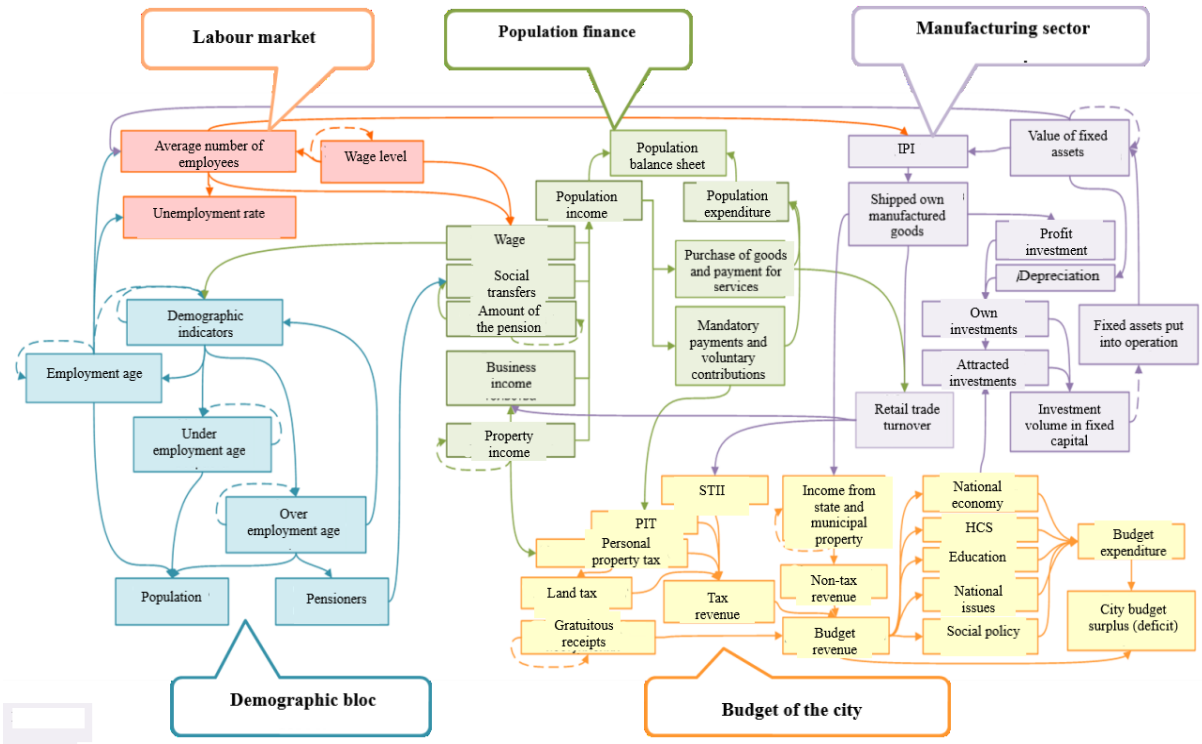


*Fig. 3.* **Aggregated Scheme of Interrelation of Indicators of the Socio-Economic System of the Municipality**

*Source:* Compiled by the authors based on the materials [24].

In turn, the value of taxes on property of individuals is determined by the formula:

$$BI_t^{TPI} = -660\,733.95 + 4.78 * BI_t. \quad (7)$$

For this equation, significant estimates of the determination coefficient (0.89) and the Fisher criterion (17.13) were found.

Non-tax revenue and inter-budget transfers are based on historical values, with appropriate conversion rates based on historical averages based on actual budget implementation reporting data.

Similarly, additional parts of the municipality model were formalized, allowing for the description of the key financial flows within the given system and the prediction of future changes. It should be noted that in the model construction all financial indicators were brought into comparable prices, which allowed to avoid the influence of the price factor.

The suggested system of balance and factor equations formalizes the major reproduction processes within the context of Kirov's complex model of the economy, which gives a balanced medium and long-term projection *(Fig. 3)*.

This model features a detailed description of the elements of the revenue and expenditure of the city budget.

Three different development scenarios get created.

1. The conservative scenario predicts that present trends and socio-economic development criteria of the municipality would be maintained.

2. The base scenario keeps critical performance metrics.

3. The target scenario includes the development of positive trends at all levels and a favorable external environment, along with the realization of the municipality's current potential parameters.

Scenario differences are determined in accordance with the parameters of the main strategic planning documents of the Kirov region and the Russian Federation. Based on the

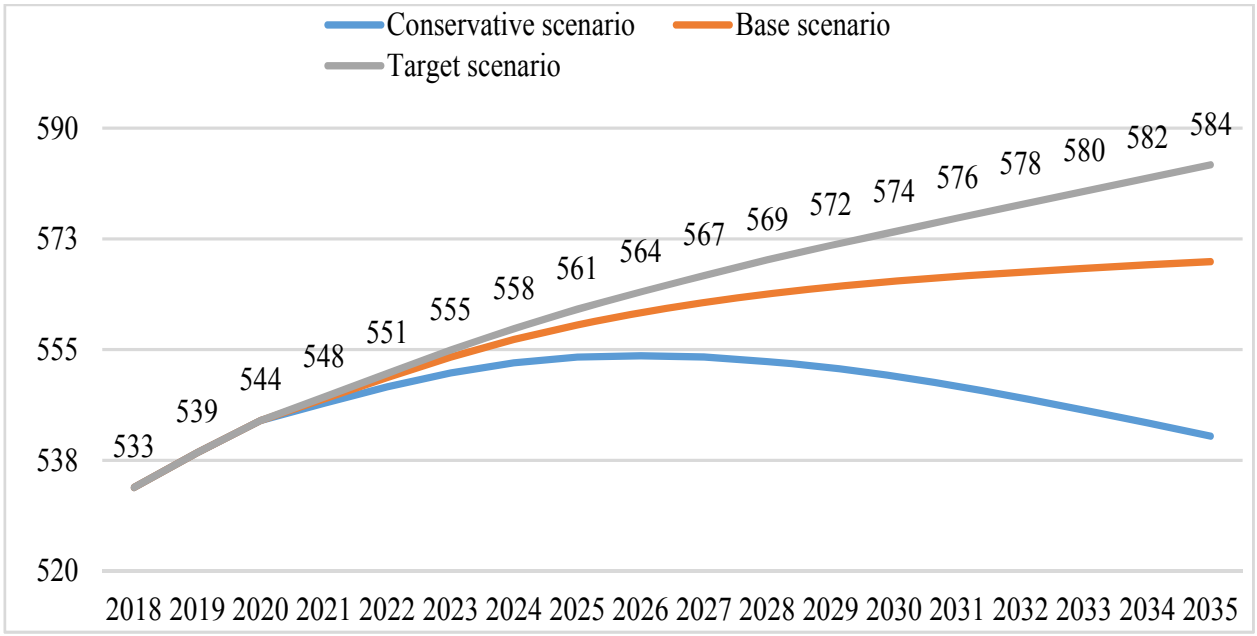


*Fig. 4.* **Forecast of the Population of the Municipality "City of Kirov" until 2035, in Thousand People**

*Source:* Compiled by the authors.

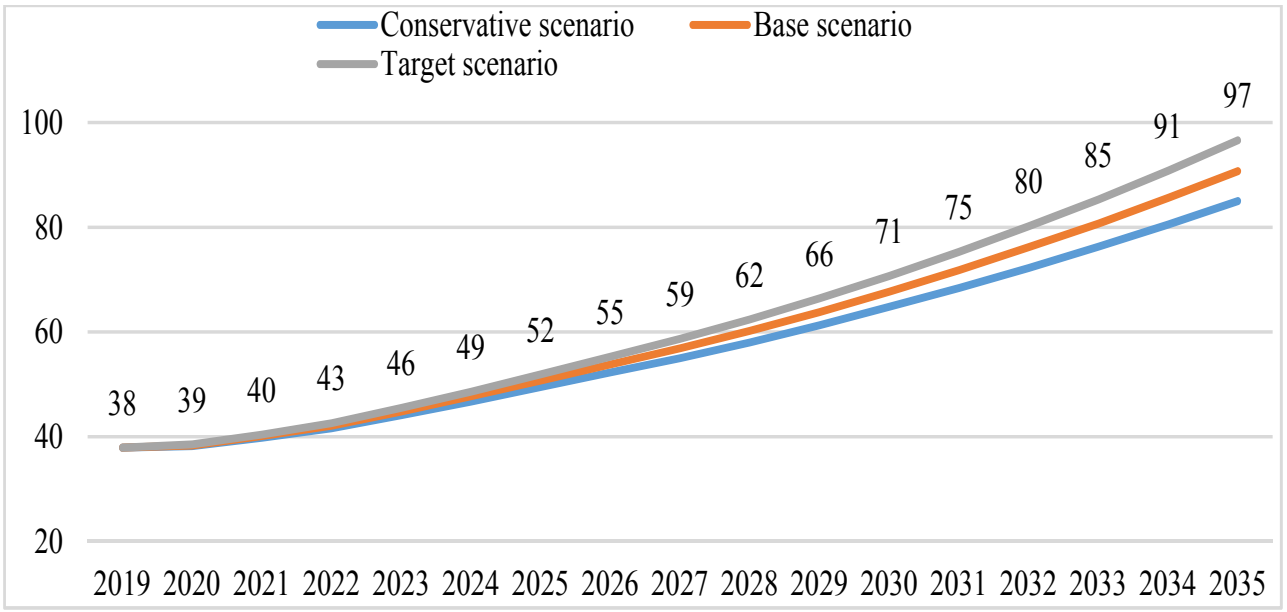


*Fig. 5.* **Forecast of Average Monthly Nominal Wages Per Employee (for Large and Medium-Sized Enterprises) of the Municipality "City of Kirov" Until 2035, in Thousand Rubles**

*Source:* Compiled by the authors.

analysis of the forecast of the Central Bank of the Russian Federation,[3] the influence of actions to prevent coronavirus infection and global financial and economic instability was evaluated.

As a result, a demographic forecast was created to project budget parameters up until 2035 (*Fig. 4*).

[3] Bank of Russia press release dated 24 April 2020. URL: https://cbr.ru/press/pr/?file=24042020_133000Key.htm (accessed on 15.10.2020).

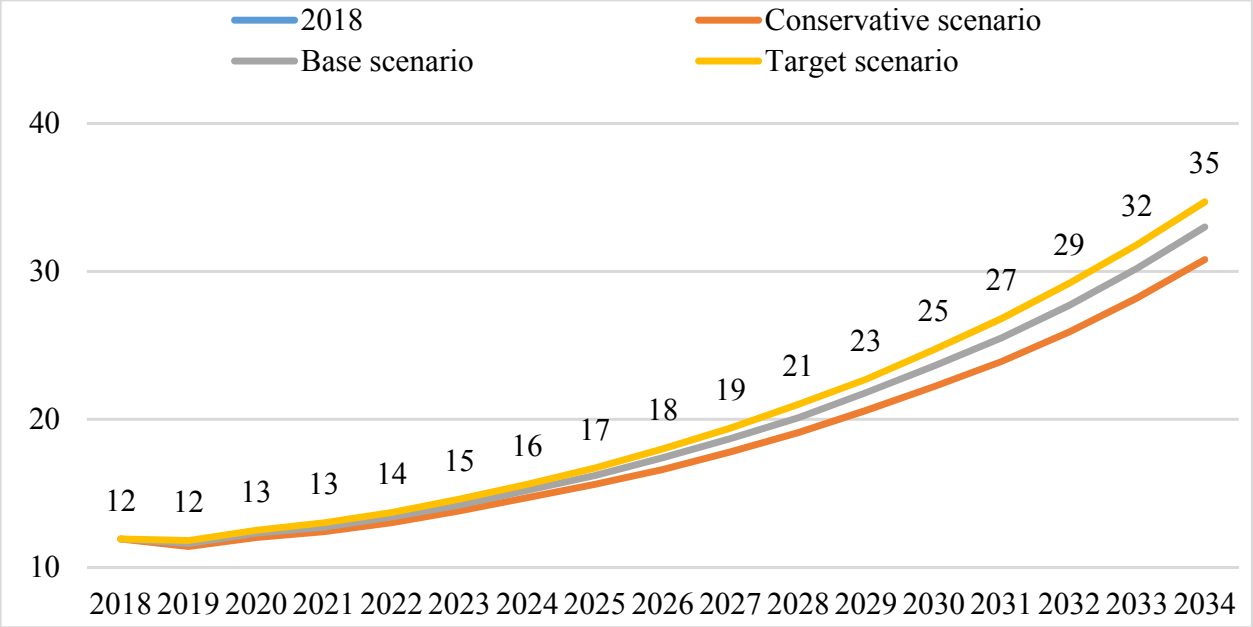


*Fig. 6.* **Forecast of Tax and Non-Tax Revenues of the Budget of the Municipality "City Of Kirov" Per Capita Until 2035, in Thousand Rubles**

*Source:* Compiled by the authors.

Based on statistical data characterizing the labor market and production volumes in Kirov city, a forecast of wage growth was formed, which has a significant impact on budget parameters (*Fig. 5*).

Dynamics of average per capita incomes of the population of Kirov in general corresponds to the forecast of dynamics of wages. In the base and target scenarios, the share of social transfers in the income structure of urban residents decreases, indicating that the growth rate of wages exceeds the growth rate of total incomes of the city's population. In a conservative scenario, average per capita incomes increase by a factor of 2.3, but a relatively high consumer price index will allow only 12.6% of real growth. The base and target scenarios suggest an increase in average monthly incomes to 70.3 and 72.4 thous. rubles respectively, i.e. 29.5 and 46.8% in comparable prices.

These changes in the economic parameters of the development of the municipality "Kirov of City" will entail an increase in the revenue part of the municipal budget by 2035 under the relevant scenarios: conservative — up to 17.3 bln rubles (24.7% increase in comparable prices), base — up to 20.0 bln rubles (37.6% growth), target — up to 22.8 bln rubles (52.4% growth). Simultaneously, a significant amount of budget income will continue to be used for inter-budget transfers. Dynamics of tax and non-tax revenues of the budget of Kirov is presented on *Fig. 6*.

However, it is expected that the growth of tax and non-tax revenues, as well as fiscal security, will be somewhat slowed in the first three years of the projection period due to the effects of coronavirus infection.

In addition to the pandemic's impact, risks associated with current developments in macroeconomic and geopolitical situations should be considered. Once the relevant information is available, iterative adjustments to the model parameters will be required, but the methodological approach to its development remains relevant, so a common tools and base forecast can be applied to management decisions.

Forecast of budgetary parameters of the municipality "Kirov of City" for three scenarios is presented in the *Table*.

*Table*

**Forecast of Budgetary Parameters of the Municipality "City of Kirov" for the Period up to 2035**

| Indicator name | 2020 | 2022 | 2024 | 2027 | 2030 | 2033 | 2035 |
|---|---|---|---|---|---|---|---|
| Growth of tax and non-tax revenues (in comparable prices), % to the previous year | | | | | | | |
| – Conservative | 91.8 | 99.6 | 101.6 | 102.1 | 102.8 | 103.3 | 104.2 |
| – Base | 94.2 | 100.6 | 102.8 | 103.5 | 104.3 | 104.7 | 105.3 |
| – Target | 96.5 | 101.5 | 103.7 | 104.6 | 105.5 | 105.8 | 106.3 |
| Fiscal capacity by income, thous. rubles / people | | | | | | | |
| – Conservative | 24.8 | 27.4 | 30.6 | 36.8 | 44.9 | 55.4 | 64.3 |
| – Base | 26.2 | 28.7 | 31.8 | 37.9 | 45.8 | 56.0 | 64.4 |
| – Target | 27.4 | 29.9 | 33.0 | 39.0 | 46.7 | 56.6 | 64.8 |
| Tax and non-tax revenues per capita, thous. rubles | | | | | | | |
| – Conservative | 11.4 | 12.4 | 13.8 | 16.6 | 20.6 | 25.9 | 30.8 |
| – Base | 11.6 | 12.7 | 14.2 | 17.4 | 21.8 | 27.7 | 33.0 |
| – Target | 11.8 | 13.0 | 14.6 | 18.0 | 22.7 | 29.2 | 34.7 |

*Source:* Compiled by the authors.

Results indicate that the long-term financial parameters of the municipality "Kirov of City" are heavily influenced by demographic and economic variables. And the level of wages and incomes of the population determines the economic factors. Despite unfavorable macroeconomic and geopolitical situations, the prediction reveals that the city's socioeconomic development is usually positive purposes. It should be noted, that the growth rate of tax and non-tax revenues of the local budget is low and does not exceed 7% even in the target development scenario.

Such a resource budget requires, on the one hand, the revitalization of local government activities in order to participate in federal projects and programs, which will help to attract additional resources from higher budgets, and, on the other hand, the development of a set of measures to increase extrabudgetary sources of financing, which include stimulating investment activity in the territory of Kirov.

## CONCLUSION

The analysis of existing approaches to forecasting the socio-economic development of municipalities, as well as their application, allowed for the identification of issues affecting the quality of forecasts and, as a result, the effectiveness of municipal management decisions, among which: application of trend forecasting methods, low level of statistical information support, uncoordinated forecasting for individual groups of indicators, high influence of the external environment, mismatch of long-term and short-term development priorities, limitations of scenario modeling tools.

To reduce the negative impact of the identified problem aspects, the authors substantiated, proposed, and characterized a conceptual scheme for the development of an economic and mathematical model of a municipality, allowing for the formation of a forecast of the municipality's social and long-term economic development. The proposed approach differs from the existing systematization and interconnection of the main subsystems, elements and interrelations of the municipal socio-economic system, as well as consideration of external externalities at various levels, which allows through the application of economic-mathematical modeling methods to determine the key factors influencing the predicted socio-economic parameters.

The author's approach has been evaluated in the formulation of a socio-economic development prediction for the municipality of "Kirov of City" for the period up to 2035. Given the special significance of the budgetary sphere within the municipal socioeconomic system, the authors developed a list of minimum requirements and a set of statistical indicators for the assessment, in addition to a detailed presentation of the process of forecasting budgetary parameters for the city of Kirov under three scenarios: conservative, base and target. The collected results served as the basis for the "Kirov City" municipality' socio-economic development strategy.

The authors presented an integrated strategy to developing a forecast of the municipality's socioeconomic development with an emphasis on the budgetary aspect, proposals for the formation of the Unified Interdepartmental Statistical and Information System are universal for different types of municipalities and can be used by state and municipal administration bodies.

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**R. V. Fattakhov** — scientific management of research, formation of scientific and methodological apparatus.
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**V.V. Oreshnikov** — calculations; verification of scientific conclusions of the paper.
**P.V. Stroev** — development of the research concept, formation of the article structure, selection of indicators for analysis, formulation of conclusions and their verification.

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