



Fusion analysis of factors determining sustainable development of automobile enterprises in Uzbekistan

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Abstract

The sustainable development of automobile enterprises in Uzbekistan is a topic that deserves our attention and analysis. In this study, we focus on utilizing fusion analysis to identify and understand the factors that play a crucial role in the sustainable growth of these enterprises. By examining and fusion, multiple dimensions, such as economic, environmental, social and technological factors, we aim to provide valuable insights and recommendations for promoting sustainable within the automobile industry in Uzbekistan. Through fusion analysis, we examine how economic factors, such as market demand, production efficiency, and financial viability, influence the sustainable development of the country and automobile enterprises.

Keywords: Uzbekistan; Sustainable development; Automobile industry; Uzavtosanoat JSC; Fusion analysis; Investments; Innovations

1. Introduction

Sustainable development has become more crucial aspect for industries worldwide, and the automobile sector is no exception. As the demand for vehicles continues to rise in Uzbekistan, it is imperative that automobile enterprises focus on sustainable practices to ensure the long-term viability of their operations. The fusion analysis of various factors aims to provide insights into the determinants of the sustainable development in this industry, and in this article, we tried to focus on all fusion analysis factors.

The automotive industry is of great importance for the sustainable development of the national economy for several reasons.

1. Job creation. The automobile industry is one of the largest job-creating industries. It includes the production of automobiles, spare parts, accessories, distribution and retail trade of automobiles. All this requires numerous workers, which helps reduce unemployment and improve the standard of living of the population.
2. The automobile industry is a key economic sector contributing to the growth of GDP and national income. It attracts external investment, stimulates the development of road infrastructure, the energy sector and other related industries. Increased production and sales of automobiles also contributes to an increase in tax revenues to the budget.
3. The automobile industry is an innovative and technologically advanced industry. It stimulates research and development of new technologies such as electric vehicles, autonomous systems, clean engines and others. This leads to the development of scientific and technical potential and increased competitiveness of the national economy in the global economy.

4. The automotive industry is an important source of export income for Uzbekistan. It promotes the development of international trade, enhances the country's image in the world market and strengthens its position in the global economic arena.

Thus, the automotive industry is a key sector for the sustainable development of the national economy, contributing to job creation, economic growth, innovation, exports and improving the quality of life of the population.

The share of the automotive industry in the country's GDP increased from 0.6% in 2017 to 1.1% in 2022, and the share in Uzbekistan's industrial output from 2.8% in 2017 to 4% in 2022. In 2017, this industry employed an average of about 23.5 thousand people, and by 2022 this figure increased by 24.3% and reached 29.2 thousand people [1,9].

According to experts' forecasts. The new concept will allow by 2030 to increase the domestic market for passenger cars from 300 thousand to 450-460 thousand units and the sales volume of buses from 1 thousand to 2 thousand units. The UN's adoption of the 2030 Agenda for Sustainable Development in 2015 set social, economic and environmental priorities for the next 15 years. In the modern world, conditions are emerging when social responsibility and sustainable development of the country's automotive complex acquire practical significance and become a real factor of competitiveness in world markets. In fact, to achieve global sustainable development goals, the task is to increase the sustainability of business models. Increasing the sustainability of business models in the automotive industry of

Uzbekistan in the context of sustainable development can be achieved through the implementation of a whole range of measures. The focus of the sustainable development of the automotive industry is to invest in research and development of new technologies that will reduce harmful emissions and improve the energy efficiency of vehicles.

In recent years, Uzbekistan has demonstrated a strong political commitment to innovation, which is reflected in the creation of a wide range of political institutions, strategies and support mechanisms that contribute to the development of the emerging national innovation system (NIS). The main task of state applied R&D is to solve problems associated with the activities of state-owned enterprises, including the adaptation of imported technologies to local conditions. Uzbekistan has a number of advantages, including high levels of education, especially in the natural and technical sciences, a well-preserved system of public scientific research with commercial potential, and a relatively diversified production structure, including in technically complex industries, including automobile assembly.

At the same time, a number of problems remain in the field of innovation, which are expressed in the low level of R&D expenditures (about 0.2%) of gross domestic product), the insignificant role of R&D and innovation in the private sector, as well as the gap between the qualifications of workers and the requirements of the labor market. For the sustainable development of the automotive complex of Uzbekistan, it is necessary to improve the innovation management mechanism (Figure 1).

In order to strengthen the connection between science and production in Uzbekistan in 2018-2022. 18 scientific organizations, 10 scientific centers and 4 technology parks were created, a new system for the commercialization of scientific developments was created, within the framework of which a large number of projects were prepared with a total value of 149.5 billion soums, and the volume of high-tech products produced exceeded 62 billion soums.

To improve the innovation management mechanism, the national innovation system of Uzbekistan (NIS) should strengthen ties with external partners, such as universities, startups, innovation centers, which provide the opportunity to develop new ideas and technologies. In addition, internal collaboration and information sharing between departments will also contribute to the innovation process.

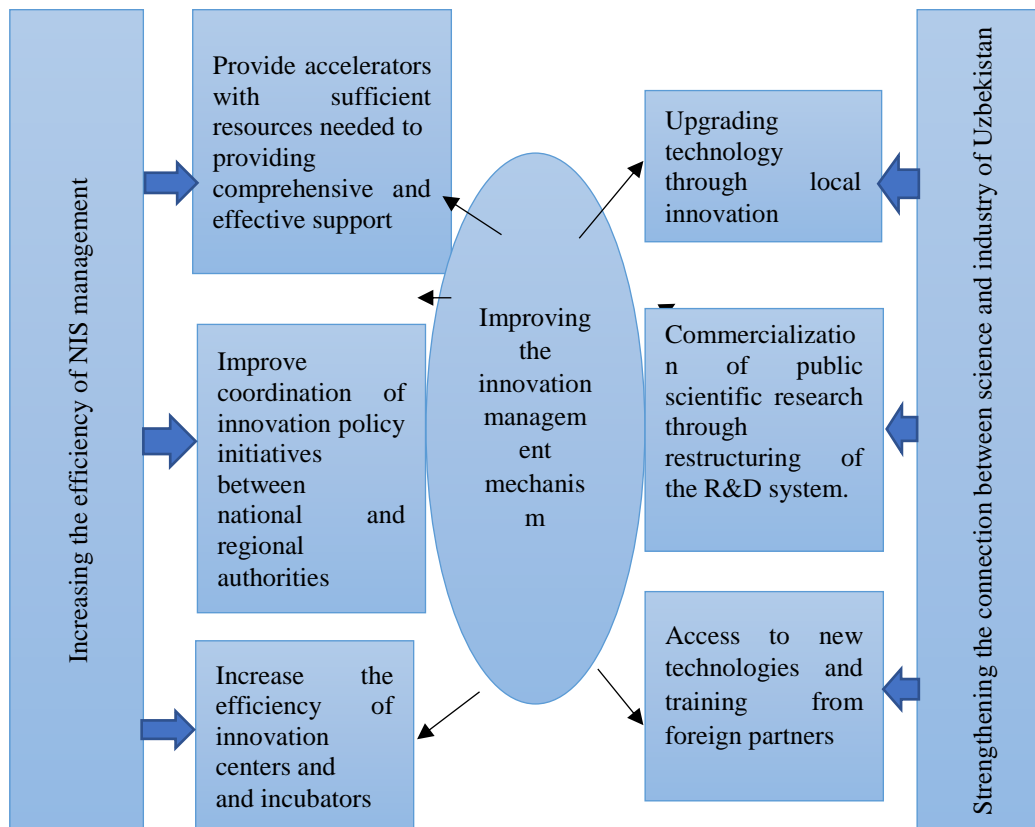


Figure 1. Methodology for improving the innovation management mechanism [9]

Studying trends and innovations in the automotive industry helps the automotive complex of Uzbekistan adapt to changes and stay aware of new opportunities for innovation.

However, according to international experts, Uzbekistan's innovation policy remains fragmented, and coordination mechanisms to ensure synergies and coherence between relevant policies and initiatives, as well as inclusive and systematic participation of the private sector, are extremely few.

2. Literature review

The International Commission on Environment and Development in 1987 introduced the concept of “sustainable development” into scientific circulation. According to Yu. Yu. Kovalev, within the framework of the concept of sustainable development, economic growth and social development must be accompanied by environmental protection and the use of natural resources sustainably. The goal is to achieve a balance between the needs of people and the capabilities of the ecosystem [3]. The concept of sustainable development is based on the principle of social justice, including combating inequality and ensuring access to basic needs for all people.

E.P. Kozlova notes that achieving sustainable development requires the interaction of various parties, including government and non-government organizations, the business sector, the public and individual citizens. This means taking policies and developing strategies that will ensure green and inclusive development is realized [4].

Therefore, the concept of sustainable development includes the desire to ensure that the needs of the current generation are met without harming the ability of future generations to meet their needs. It involves a balance between economic, social and environmental aspects of development.

Due to these features, the concept of sustainable development has become the basis for many global and national initiatives and programs aimed at achieving a sustainable future for the planet and all its inhabitants.

In the scientific literature, three hierarchically interrelated problems are identified, the solution of which is associated with sustainable development:

- Sustainable economic growth that does not harm the ecology of the planet;

- Fair distribution of resources and opportunities between current and future generations, as well as between humans and other biological species;
- Efficient allocation of resources over time, adequately taking into account natural capital [5].

The need for sustainable development is becoming increasingly relevant for the domestic economy. Since the automobile industry is one of its most important areas, it is proposed to consider the possibility of adapting the concept of sustainable development to the domestic automobile industry.

3. Results and Discussions

It is not secret that all country around the world try to get sustainable development in each sector, it is not only based on economic sectors, it is also based on social sectors. To get sustainability is important in automobile industries, for the reason that, everything is interactive with the development of automotive production. So, Uzbekistan also trying to be active to get sustainable development in automobile sector.

Currently, the automotive industry of Uzbekistan can be called a locomotive for the entire industry of our country, which has given a new impetus to the development of related industries and sustainable growth in employment. The industry represents a number of enterprises and organizations united under the joint-stock company Uzavtosanoat, providing more than 29.2 thousand jobs. Uzavtosanoat JSC is a vertically integrated three-level company uniting automobile manufacturing enterprises.

Currently, over 85 enterprises that are part of the company operate in the industry, and cooperation has been established with more than 200 foreign enterprises and organizations.

In addition, the full implementation of the concept will reduce the level of state participation in the economic activities of industry enterprises, increasing labor productivity and ensuring a transition to a qualitatively new level of development.

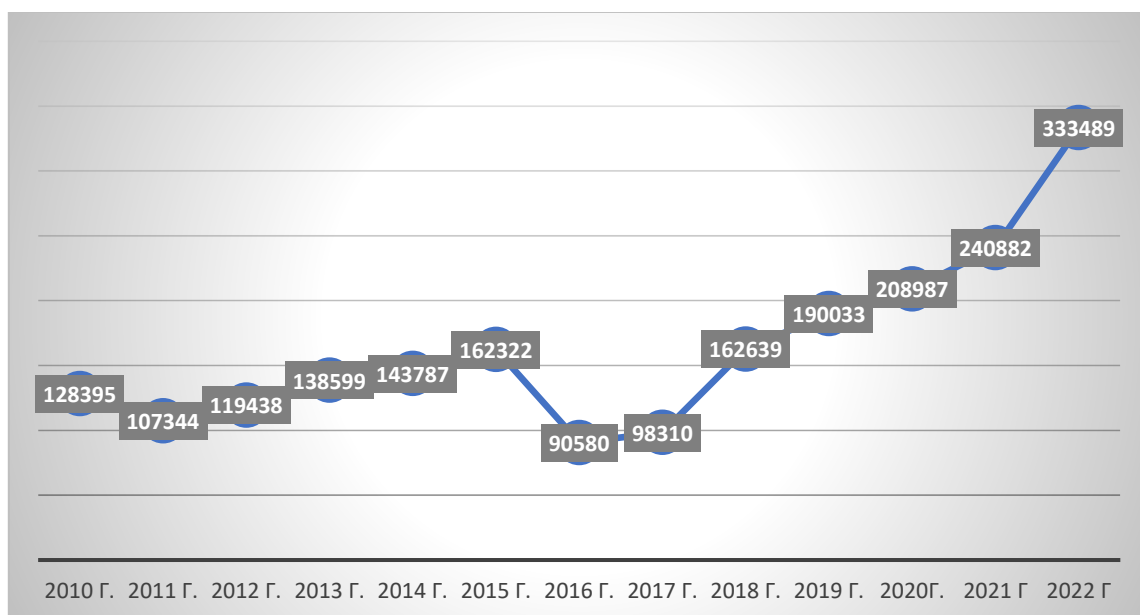


Figure 2. Dynamics of car production in Uzbekistan in 2010-2022, units [6]

The confident growth dynamics in the number of cars produced is because Uzbekistan has developed a concept that reflects the goals, objectives and main directions of a new model for the development of the automotive industry until 2030.

It is expected that because of the measures taken in the implementation of the new concept for the development of the automotive industry of the Republic of Uzbekistan, the following results will be achieved within the framework of the concept of sustainable development (Table 1).

Table 1: Results of the development of the automotive industry of Uzbekistan within the framework of the concept of sustainable development

Development direction	Contents of the direction
Technological	radical modernization of automotive industry enterprises; creation of new production facilities for the production of cars and automotive components; implementation of digital technologies in car production
Economic	increasing the investment attractiveness of the industry; development of internal competition in the industry; entering the global automotive market; achieving sustainable economic growth in the economy of Uzbekistan
Ecological	improving the environmental quality of cars produced in the country; reducing the environmental load from the impact of vehicles on the environment; Creating favorable conditions for the operation and production of electric vehicles, taking into account the global trend towards the transition to environmentally friendly modes of transport.
Social	increase in tax contributions to budgets of all levels and payments to extra-budgetary funds; creation of new jobs; increasing vehicle resources; Increase in the provision of the population with passenger cars by 2.3 times.
Political	An effective management system for economic, social and environmental activities.

In the first half of 2023, industry enterprises produced products worth 25.2 trillion sums, which is 13% more than in the same period last year. During this period, 160 thousand cars, 1.2 thousand buses and trucks, 1.3 thousand units of agricultural equipment and 105 thousand engines were produced from production lines [7].

Table 2: Main performance indicators of Uzavtosanoat JSC

Index	2017	2018	2019	2020	2021	2022	Growth rate, 2022 to 2017, %
Number of enterprises included, pcs.	77	73	75	74	72	72	93
Of these, manufacturing enterprises, pcs.	35	33	31	33	34	34	97
Production volume, a billion sums.	10792	26821	33534	34052	31185	49480	4.5 times
Passenger cars, a thousand units	140.2	220.7	271.1	280.1	235.8	327.6	2.3 times
Buses, pcs.	1057	949	1534	642	1002	1357	128
Trucks, pcs.	3743	4237	5320	4163	4462	4094	110

Despite a slight decrease in the number of enterprises included in Uzavtosanoat JSC in 2022 compared to 2017, the volume of products produced in 2022 increased by 4.5 times, including the number of passenger cars produced - by 2.3 times, buses - by 28%, trucks - by 10%.

With an increase in the volume of production and sales, the profit of the enterprise also increases, which allows the enterprise to generate more cash that can be used for investment in business development. By increasing production volume, economies of scale can be achieved, which reduces unit costs. This allows Uzavtosanoat JSC to increase its profitability and competitiveness in the market.

At the same time, it is necessary to take into account that the growth of production volume must be sustainable and balanced in order to avoid possible problems such as overproduction, lack of resources, deterioration in quality, etc. It is also necessary to pay attention to environmental sustainability and social aspects of the development of the enterprise in order not to damage to the environment and society.

To analyze the sustainable development of Uzavtosanoat JSC, we use various indicators (Table 3).

Table 3: Indicators for analyzing the sustainable development of Uzavtosanoat JSC

Group of indicators	The name of indicators	Calculation formula
Economic indicators	- level of revenue and profit	from financial statements
	- profitability;	$P = \frac{PE}{B} * 100\%$ PE – net profit B - revenue
	- long-term financial stability	Calculation of financial stability indicators based on financial statements
Social indicators	-salary satisfaction and availability of social benefits	Employee survey
Environmental indicators	- level of environmental pollution;	$I = \frac{Ci}{PDKi} * K$ Ci – average annual concentration of harmful substances PDKi – maximum permissible concentration of a harmful substance K – reduced coefficient depending on the hazard class of the substance
Innovation indicators	- volume of investment in research and development	Data from enterprise reporting
	- level of implementation of new technologies	$I = \frac{NF}{Npl}$ NF – actual level of implementation of new technologies NPL – planned level of implementation of new technologies
Components of a sustainable development strategy	Study of the product, target consumers, target markets, competitive advantages, enterprise mission, attitude towards employees	Data from the company's statutory documents

Let's analyze each group of indicators. Let's start with an analysis of economic indicators.

Table 4: Analysis of the dynamics of economic indicators of Uzavtosanoat JSC

Index	2017	2018	2019	2020	2021	2022	Growth rate 2022 to 2017, %
Revenue, thousand sums. a	66328286	154726382	958226282	314327102	252729772	2233379521	33 times
Net profit, thousand sums. a	24655002	103684660	431201827	160306822	136474077	871018013	35.3 times
Profitability, %	37.1	67.0	45.1	51.2	54.0	39.3	105
Return on authorized capital ratio	0.0407	0.068	0.2777	0.105	0.074	0.469	11.5 times
Total solvency coverage ratio	7,622	9,971	12,066	3,995	5,981	5,439	71
Absolute liquidity ratio	5,709	2,001	1,483	0,393	2,292	3,054	53
Fixed assets' renewal ratio	0.02	0.0075	0.17	0.009	0.157	0.264	13.2 times

Thus, the calculations indicate that in 2022, such indicators of Uzavtosanoat JSC as revenue, net profit and production profitability increased significantly.

The growth of profits and profitability of production at the enterprise is one of the main factors of sustainable development, as it allows Uzavtosanoat JSC to ensure financial stability and reliability, provides the enterprise with access to more capital for investing in new technologies, infrastructure, research and development, which contributes to increased production efficiency and competitiveness.

Indicators of long-term financial stability, in particular, the rate of return on authorized capital increased in 2022 by 11.5 times, and the rate of renewal of fixed assets by 13.2 times, which indicates timely technical re-equipment at the enterprise.

However, at Uzavtosanoat JSC there is a tendency for the total solvency coverage ratio to decrease, which indicates that outgoing cash flows are generated at the enterprise at a faster pace than incoming ones, which leads to an imbalance of payments. In this regard, it is necessary to take measures to improve solvency, such as reducing expenses, increasing income or renegotiating credit obligations.

The same trend is observed in connection with the decrease in the absolute liquidity ratio. A decrease in the absolute liquidity ratio contributes to an increase in the financial risks of the enterprise, that is, the enterprise may encounter difficulties in fulfilling its obligations to contractors and employees.

Employee job satisfaction is an indicator of the company's successful policy in the field of social responsibility and sustainable development, indicating that the organization creates conditions for comfortable and safe work, cares about the health and well-being of its employees, and pays attention to their professional and personal development. Such enterprises attract talented and highly professional employees, which contributes to their sustainable development and competitiveness in the market.

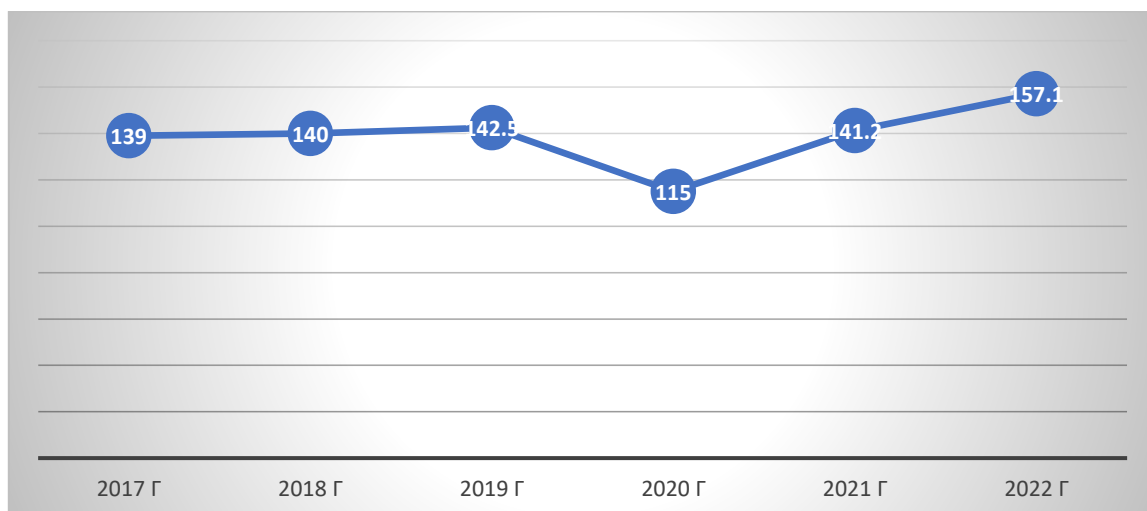
Table 5: Environmental indicators of sustainable development of Uzavtosanoat JSC [7]

Index	2017	2018	2019	2020	2021	2022	Maximum permissible concentration substances
Sulfur dioxide, mg/m ³ per day	0.04	0.05	0.05	0.05	0.04	0.04	0.05
Nitrogen oxides, mg/m ³ per day	0.03	0.03	0.04	0.03	0.02	0.03	0.03
Carbon monoxide, mg/m ³ per day	1.2	1.5	1.6	1.8	1.4	1.3	3.0
Hydrocarbons, mg/m ³ per day	1.3	1.2	1.5	1.3	1.4	1.4	1.5
Pollution level	0.56	0.61	0.70	0.76	0.61	0.60	-

Analysis of the indicators in Table 2.1.5 indicates that, despite the fact that emissions into the atmosphere by enterprises included in Uzavtosanoat JSC do not exceed the maximum permissible concentration, in 2019-2020. There was a tendency for the level of environmental pollution to increase, and in 2021-2022. Pollution levels have dropped slightly to 2018 levels. Sustainable development of an enterprise involves minimizing negative impacts on the environment and more responsible use of natural resources. In connection with Uzbekistan's accession to the Paris Agreement on climate change in 2015, the country committed itself to reducing greenhouse gas emissions and reducing its environmental impact.

However, accelerated industrialization and population growth significantly increase the need for resources and at the same time increase the negative anthropogenic impact on the environment and the growth of greenhouse gas emissions. It is necessary to develop technologies to reduce the negative impact on the environment: development of production and use of various types of biofuel, gas, electric and hybrid cars, achieving compliance of produced cars with modern environmental standards.

A promising direction is the development and use of materials that do not contain toxic substances and do not harm the environment during production, use and disposal and the development of new production processes that minimize the consumption of water, energy and raw materials. Let's consider innovative indicators of sustainable development JSC "Uzavtosanoat" In accordance with the Resolution of the President of Uzbekistan; Uzavtosanoat JSC is implementing 51 innovative projects totaling \$834.9 million in 2017-2022.

**Figure 3:** Volume of investments in the innovative development of the automotive industry of Uzbekistan

Nine projects totaling \$157.1 million are aimed at modernizing and re-equipping the enterprises of Uzavtosanoat JSC. In addition, 35 projects will be implemented to localize automotive components and basic materials. The cost of these projects is \$244.1 million.

Innovative projects will be financed from the own funds of industry enterprises in the amount of \$172.1 million, loans from commercial banks - \$138.9 million, funds from targeted sources - \$381.8 million and foreign investments and loans - \$142.1 million [7].

Investment program of Uzavtosanoat JSC for 2017-2022. Includes the following aspects:

- Development of new models of vehicles and equipment;
- Modernization, technical and technological re-equipment of organizations of Uzavtosanoat JSC;
- Localization of auto components and basic materials.

Innovation helps JSC "Uzavtosanoat" be competitive in the market. They enable us to create new products and services, improve existing ones, and find new ways to meet customer needs. Innovation contributes to the sustainability of an enterprise in the long term, allowing the enterprise to diversify its activities and not depend on one source of income. Innovation can also help a business adapt to a changing environmental and social environment, thereby contributing to its sustainability.

The creation and implementation of technological innovations, in turn, necessitates the development of high-quality management processes in the organization, which will make it possible to obtain the maximum effect from the use of advanced technological developments. And in this regard, the ability of enterprises to develop and implement management innovations that have a direct impact on the implementation of the concept of efficient production in the automotive industry is becoming increasingly important in the competitive struggle in the global market.

For sustainable development JSC "Uzavtosanoat" needs a strategy for sustainable development of the enterprise, in which includes interaction with various stakeholders such as customers, suppliers, shareholders, government and society as a whole. This may include establishing long-term relationships, ensuring transparency and taking into account the interests of all parties.

Table 6: Analysis of the components of the sustainable development strategy JSC "Uzavtosanoat" [7]

Component	Component content
Product	Production of car models that meet the modern needs of society and business, with an affordable price for the population, low fuel consumption (about 7 liters per 100 km), a spacious trunk (more than 500 liters), and high ground clearance.
Target consumers	The main segments of the population, as well as representatives of small business and agriculture.
Target markets	Focus on the country's domestic market with gradual expansion export potential
Technologies	Introduction of technical and technological innovations: improving vehicle safety, standardizing manufactured units and components; development and mastery of technologies related to the use of alternative fuel sources and environmental protection
Competitive advantages	<ul style="list-style-type: none"> - attractive parameters of manufactured cars (reasonable price, low fuel consumption, increased maintainability); - economic effect from the introduction of technological and technical innovations; - cost reduction through the use of modern resource-saving technologies; - receiving preferences through the implementation of programs to reduce the negative impact on the environment
Enterprise mission	Focus on solving social and environmental problems, compliance with the principles of sustainable development
Public image	Active participation of enterprises in solving current environmental and social problems
Attitude towards staff	Enterprise employees should be considered one of the most valuable assets.

A sustainability strategy must take all of these components into account and balance their interactions to achieve long-term success. Thus, having considered Uzavtosanoat JSC as an object for implementing the concept of sustainable development, the following conclusions can be drawn.

The growth of profits and profitability of production at the enterprise is one of the main factors of sustainable development, as it allows Uzavtosanoat JSC to ensure financial stability and reliability, provides the enterprise with access to more capital for investing in new technologies, infrastructure, research and development, which contributes to increased production efficiency and competitiveness. However, a decrease in the value of some financial indicators increases the risks of the financial activity of the enterprise.

When studying the social aspect, a high level of job satisfaction was revealed, which plays an important role in the sustainable development of the enterprise, having a positive impact on productivity, quality of work, team spirit, as well as the attractiveness of the organization for employees.

The concept of sustainable development of the enterprise involves minimizing negative impacts on the environment and more responsible use of natural resources. Develop technologies to reduce the negative impact on the environment: Uzavtosanoat JSC is modernizing production to use various types of biofuels, gas, electric and hybrid cars, achieving compliance of produced cars with modern environmental standards.

A sustainability strategy must take all of these components into account and balance their interactions to achieve long-term success.

We have developed a regression-correction analysis model to study the influence of the volume of production in the automotive industry, the amount of investment for innovation, and the volume of research and development work.

Table 7: Input data for statistical analysis

Indicators	2017	2018	2019	2020	2021	2022
Performance indicator Y production volume, billion soums.	10792	26821	33534	34052	31185	49480
X1 - Volume of investments for the development of innovations, million dollars.	139	140	142.5	115	141.2	157.1
X2 - Volume of research and development work, billion soums.	588.1	602.3	724.6	853.4	896.2	905.4

Calculations were made using the Stata14 program (Figure 4).

As a result of the calculations, a multiple regression equation was obtained:

$$y = 59,598x_1 + 66,637x_2 \quad (1)$$

Let us interpret the factors influencing the performance indicator:

- with an increase in the volume of investment in innovation by 1 million dollars, the volume of car production increases by 59.598 billion soums;
- with an increase in the volume of research and development work by 1 billion soums, the volume of car production increases by 66.637 billion soums.

Source	SS	df	MS	Number of obs	=	6
				F(2, 3)	=	3.30
Model	538305758	2	269152879	Prob > F	=	0.1748
Residual	244798950	3	81599649.9	R-squared	=	0.6874
				Adj R-squared	=	0.4790
Total	783104707	5	156620941	Root MSE	=	9033.3

var1	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
var2	59.5984	297.817	0.87	0.448	-688.1882 1207.385
var3	66.63686	28.02562	2.38	0.098	-22.55317 155.8269
_cons	-55896.54	45964.49	-1.22	0.311	-202176.1 90382.98

Figure 4. Calculation results in Stata 14 program

The results obtained indicate the importance of maintaining a high level of investment in innovation and the volume of research and development work.

To sustain economic growth and ensure sustainable development, Uzbekistan will need to identify and exploit the opportunities available to its economy by stimulating innovation, primarily by creating conditions for different sectors of the economy to regularly test and learn new methods of creating value.

Investment in R&D is a key enabler of innovation and is key to productivity growth and intra-economy value creation, product diversification and increased access to international value chains. They can provide high rates of return and stimulate long-term growth.

Innovation policy occupies a place at the intersection of various policy areas - from education to the development of the automotive industry. To ensure the effectiveness of innovation policies, it is essential that national strategies that include support for innovation have detailed action plans and the necessary means to achieve their objectives. As part of a unified policy effort, Uzbekistan has developed national strategies that define priorities and strategic goals, and describe policy mechanisms for the transition to a knowledge-based economy.

Existing policies do not fully address the main constraint of the private sector's underdeveloped absorptive capacity, so more needs to be done to support innovative entrepreneurship in all sectors.

The current low level of public expenditure on R&D is not only insufficient in itself, but also prevents this expenditure from serving as a catalyst due to ineffective allocation of funds for R&D. There is a need to improve coordination of innovation policy initiatives between national and regional authorities, and strengthen government capacity to effectively develop and implement these policies (Table 8).

Table 8: Strategic management of the national innovation system of Uzbekistan

Events	Priority	Time horizon
Implement an integrated approach to management innovation policy.	1	Medium term
Ensure greater representation private sector and relevant departments in Republican Council on Science and Technology.	1	Short
Provide investments and develop programs advanced training for systematic building up organizational, managerial and technological potential.	1	Medium term

Clarify and optimize credentials regional departments of ministries and departments khokimiyats.	2	Medium term
Introduce consultations with the private sector and civil society at key stages of the policy development cycle.	2	Medium term
Strengthen efforts to develop competencies in government institutions and agencies, involved in innovation	3	Short

The implementation of these activities is of particular importance before the start of the implementation of the medium-term Innovative Development Strategy for the period 2022–2030.

An important direction for achieving sustainable development goals is the cooperation of the automotive complex of Uzbekistan with other industries to develop products and services related to sustainable development. For example, the use of renewable energy sources to charge electric cars, the introduction of new low-emission materials.

When developing and implementing the proposed strategy for sustainable development of enterprises in the automotive complex of Uzbekistan, the following risks must be taken into account (Table 9).

Assessing and managing these risks is an important component of the successful implementation of the strategy for sustainable development of the automotive complex of Uzbekistan. This may include diversifying economic activities, increasing competitiveness, finding new markets and attracting investment.

Table 9: Risks in implementing the strategy for sustainable development of enterprises of the automotive complex of Uzbekistan

Type of risks	Contents of risks
Macroeconomic risks	Internal and external economic factors, such as inflation, devaluation of the national currency, and price instability on world markets can have a negative impact on the development strategy of the automotive industry. The domestic and global automotive market is subject to fluctuations in supply and demand. Changes in demand for vehicles or changes in the competitive environment may affect the implementation of the strategy.
Financial risks	A sustainability strategy may require additional costs for environmentally friendly equipment, staff training, and compliance with sustainability standards. These additional costs can reduce the profitability of the enterprise in the short term and require a long time to pay off. The sustainable development strategy requires significant investments in the modernization and technological renewal of the automotive complex. Lack of funding can be a serious barrier to strategy implementation.
Innovation risks	Implementing a sustainable development strategy may require significant investments in upgrading production facilities, introducing new technologies and training staff. Failure to attract sufficient investment or underestimation of costs can lead to financial problems and delays in implementing the strategy.
Social risks	Changing consumer tastes and preferences, a shift to more environmentally friendly modes of transport, or changes in demand for electric vehicles may jeopardize the implementation of the strategy.

To manage the risks discussed above in implementing the strategy for sustainable development of the automotive industry of Uzbekistan, it is recommended to conduct a thorough analysis, develop a flexible financial model, diversify sources of financing, determine reserve financial resources, establish a system for controlling and monitoring the implementation of the strategy, and assess risks in the early stages of the implementation process.

Constant monitoring and control of the implementation of risk management measures is required. This allows you to timely detect and respond to changes in the situation, as well as adjust the strategy and risk management measures if necessary.

Based on actual and forecast indicators of development of the automotive complex of Uzbekistan using correlation and regression analysis methods, We have calculated three scenarios for the development of the industry up to 2035 (Table 10).

Table 10: Forecast for the development of the automotive complex of Uzbekistan under various development scenarios

Indicator name	Actual figures			Forecast indicators			Trend equation
	2017	2019	2022	2025	2030	2035 g	
Business as usual scenario							
Volume of production, billion soums	10792	33534	49480	62000	81000	86500	$Y=34956\ln(x)+10391$ $R^2 = 0.9976$
Investment volume, million dollars	139	142.5	157.1	190	210	250	$Y=9.05x+128.1$ $R^2 = 0.8986$
Volume of research and development work, billion soums.	588.1	724.6	905.4	1100	1700	2200	$Y=158.65x+422.07$ $R^2 = 0.9935$
Basic scenario							
Volume of production, billion soums	10792	33534	49480	81000	100000	115000	$y=40077\ln(x)+9434$ $R^2 = 0.9795$
Investment volume, million dollars	139	142.5	157.1	210	480	600	$Y=5.55x^2-13.15x+146.6$ $R^2 = 0.9999$
Volume of research and development work, billion soums.	588.1	724.6	905.4	1500	2000	2500	$Y=158.65x+422.07$ $R^2 = 0.9935$
Optimistic scenario							
Volume of production, billion soums	10792	33534	49480	145000	220000	270000	$Y=24344x-14086$ $R^2 = 0.9986$
Investment volume, million dollars	139	142.5	157.1	400	800	1000	$Y=10x^2-26.5x+155.5$ $R^2 = 0.9996$
Volume of research and development work, billion soums.	588.1	724.6	905.4	2000	6000	10000	$Y=448.56e0.2553x$ $R^2 = 0.9893$

The inertial scenario assumes the further development of the automotive complex of Uzbekistan, based on the continuation of current trends and factors influencing it. This means that changes in the industry occur slowly and predictably, and new factors have little impact on its development. It is assumed that the level of competition remains stable, consumer demand for the industry's goods and services remains at the same level, and technological innovation and changes in industry policy are introduced slowly and have little effect on overall development.

Under the inertial scenario, the volume of investments in the automotive complex in 2035 will increase by 1.59 times compared to 2022, the volume of research and development work in 2035 will increase by 2.4 times compared to 2022; the volume of car production in 2035 will increase by 1.75 times compared to 2022, which is clearly not enough to meet the needs of the domestic market, not to mention the volume of car production for export.

The industry baseline scenario provides a general picture of how the industry may develop and change in a competitive market environment. In the base scenario, the industry is in a state of stability. The number of competing companies reaches a certain level, and those who failed to gain a foothold in the market are forced to leave. Companies are beginning to focus on improving product quality, expanding product range and meeting consumer needs.

If the base scenario is implemented, the volume of output in 2035 will increase by 2.32 times compared to the level of 2022. At the same time, the volume of investments will increase by 3.8 times, the volume of research and development work will increase by 2.76 times compared to the level of 2022 Y.

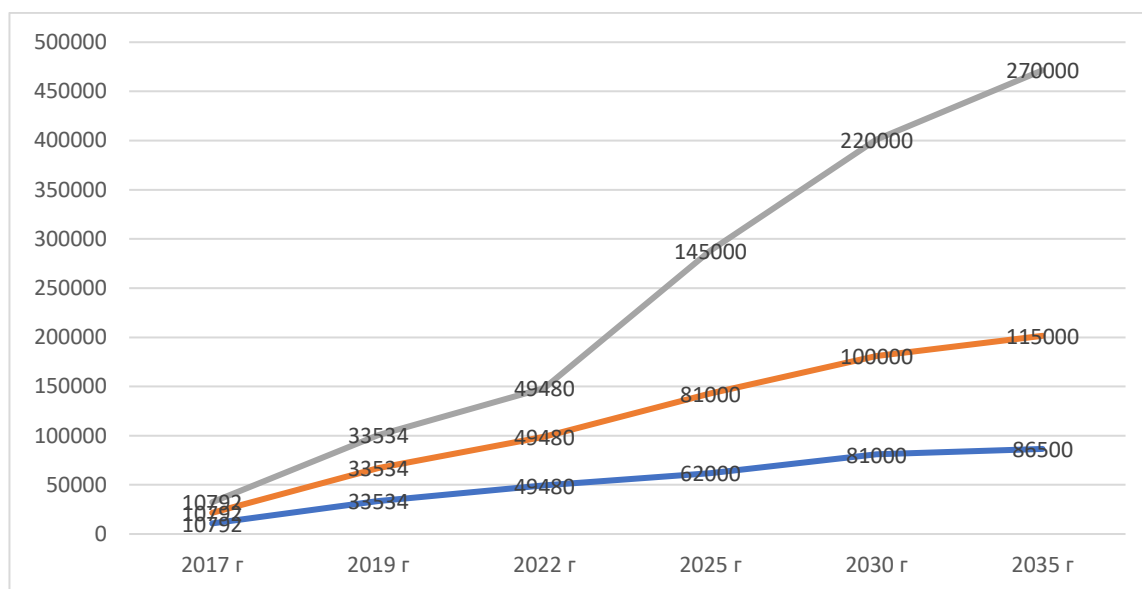


Figure 5. Dynamics of the volume of output of the automotive complex under various scenarios of its development, billion soums.

An optimistic scenario for the development of the automotive industry in Uzbekistan may look like this:

1. Technological progress. New and improved production and processing methods can increase productivity and operational efficiency, leading to lower costs and improved product quality.
2. Sustainable development of the industry. The development of green technologies and alternative energy sources will help the industry become more sustainable and environmentally friendly.
3. Growth of international cooperation. Globalization and trade developments are creating new opportunities for the industry. International partnerships and collaborations in research and development can facilitate the exchange of knowledge and experience, strengthen competitive advantages and contribute to the growth of the industry as a whole.
4. Export development. The development of new markets and export opportunities can enable companies to expand their markets and increase their share of international trade.

In general, the optimistic scenario for the development of the industry represents an opportunity for the growth and prosperity of enterprises in the automotive complex of Uzbekistan, which, in turn, contributes to the economic development of the country as a whole.

If the optimistic scenario is implemented, the volume of products produced by enterprises of the automotive complex of Uzbekistan in 2035 will increase by 5.46 times compared to 2022.

If the optimistic scenario is implemented, the volume of investments will increase by 6.37 times in 2035 compared to 2022, the volume of research and development work will increase by 11 times by 2035 compared to the level of 2022.

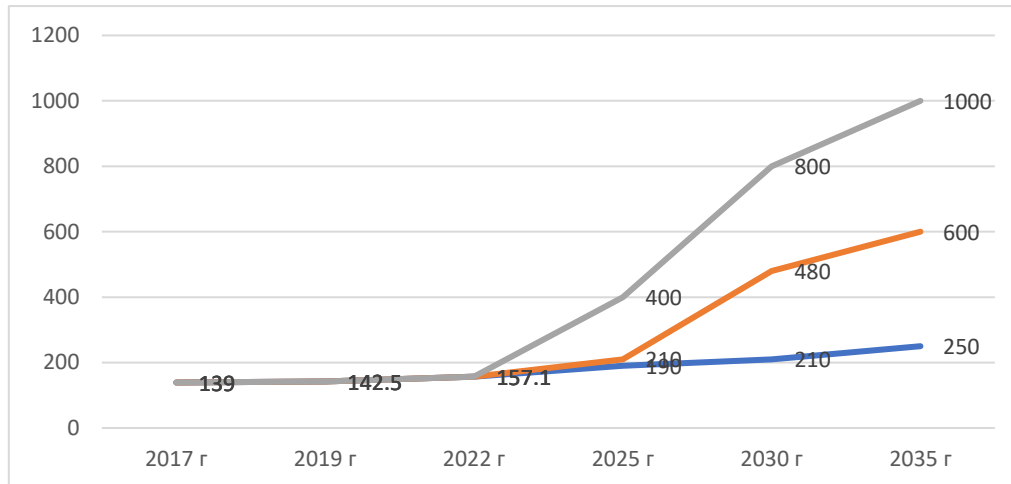


Figure 6. Dynamics of investments in the development of the automotive complex of Uzbekistan under various scenarios for its development, million dollars.

Thus, to maintain economic growth and ensure sustainable development, Uzbekistan will need to identify and use the opportunities that its economy has by stimulating innovation, primarily by creating conditions so that different sectors of the economy can test and explore new ones on regular basis methods of value creation.

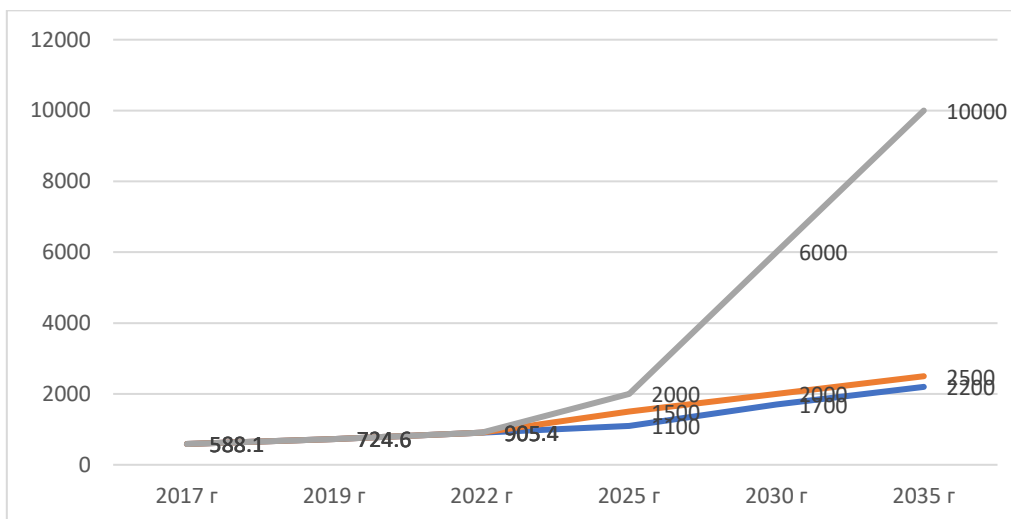


Figure 7. Dynamics of the volume of research and development work performed for the innovative development of the automotive complex of Uzbekistan under various scenarios for its development, billion soums.

The connection between the factors of sustainable development of enterprises of the automotive complex and scenarios for the development of the industry is that the effective implementation of factors of sustainable development can contribute to the development of scenarios for growth, innovation and social orientation of the industry, while their lack or incorrect implementation can lead to the development of scenarios of decline and pollution environment and social issues.

The calculations indicate that the optimistic scenario for the development of the industry represents an opportunity for the growth and prosperity of enterprises in the automotive complex of Uzbekistan, which, in turn, contributes to the economic development of the country as a whole.

The obtained results of econometric modeling indicate the importance of maintaining a high level of investment in innovation and the volume of research and development work.

4. Conclusion

Meanwhile researching this article, we conducted a fusion analysis to determine the factors that contribute to the sustainable development of automobile enterprises in Uzbekistan. The findings provide valuable insights into the various aspects that influence the growth and sustainability of this industry in Uzbekistan.

Firstly, we identified the economic factors that play a crucial role in the sustainable development of the economy and automobile enterprises. These factors include the overall economic environment in Uzbekistan, including factors like GDP growth, inflation rate, and foreign direct investment, unemployment rate and so on. Our analysis on this article revealed that a stable and growing economy positively affects the automobile industry by creating a conducive business environment and increasing consumer purchasing power.

Secondly, by examining the investment and innovation side of the automobile industry in Uzbekistan, exactly "GM Uzbekistan" company, renewable energy used automobiles should be increased, not only to decrease the emissions rate of CO₂ rate, but also to decrease the electricity consumption rate by the industry.

Third, international cooperations, globalization is lack of in automobile industry, so there is a monopoly by one organization GM Uzbekistan, so to create better environment to increase the economic development, we should have better international cooperation, not only selling, but also importing the automobiles from other countries will help us to create competition in this field.

Overall, this fusion analysis sheds light on the multiple factors that determine the sustainable development of the automobile enterprises in Uzbekistan. It underscores the significance of a holistic approach that consider economic, technological, regulatory, and social factors in driving growth, competitiveness, and sustainability in the industry.

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