THE CHALLENGES OF SUSTAINABLE DEVELOPMENT FOR A COASTAL CITY: THE CASE OF KLAIPĖDA

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ABSTRACT
Increasing poverty, the intensive use of natural resources, the spread of diseases, air pollution, the loss of biodiversity, and other global and local problems in many areas of the world, have encouraged society to take concrete actions and initiatives. Coastal cities are particularly sensitive to anthropogenic impact, so it is necessary to combine a dynamic economy with social development, separating economic growth from environmental impact. This article analyses the problems of sustainable development in the coastal city of Klaipėda in three respects: economic, social and environmental. The economic activity in the port city ensures its multifunctionality, promotes the creation of jobs and the development of infrastructure, and is of great importance to the development of the entire region. However, the city faces various socio-economic challenges, as well as environmental problems (air pollution, unpleasant smells, noise, traffic problems). Intensive port activity increases the scale of these negative environmental problems. Therefore, the article presents the main problems of sustainable development in the city, which were identified after analysing statistical data, analysing city and port development documents, and interviewing experts. After systematising the obtained results, measures are proposed for the solution of each problem, which are differentiated according to the areas of the city of Klaipėda.
KEY WORDS: *sustainable development, coastal cities, Klaipėda.*

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Introduction

The growing importance of sustainability in a global and national context shows that countries must take bold measures that will contribute to the sustainable and harmonious prosperity of the world. The policy of coherence is also very relevant to the city of Klaipėda, as the city has a state seaport and many large industrial companies.

Every city needs a safe environment that allows it to develop and improve social life. As a result, the population increases and the economy develops. A coastal city has its own distinctive features, which are important to develop properly, without having a negative impact on either the residents or the coastal environment itself.

The city of Klaipėda is located on the unique coast of the Baltic Sea and the Curonian Lagoon. It has industry, various services, transport and logistics. The activity of the State Seaport is of exceptional importance for the country's economy. The port provides economic growth for the city and the entire region, contributes to job creation, promotes trade and attracts investment. The presence of the port also encourages the development of infrastructure in the city. A well-developed transport, logistics and energy infrastructure is necessary for servicing and managing the port, which has a positive impact on the economy of the entire city. On

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the other hand, environmental problems arise in the city, such as air pollution, unpleasant smells, noise and traffic problems. Intensive port activity increases the scale of these negative environmental problems. Both urban environmental and social problems require solutions in order to maintain the quality of life and living environment of the residents. This is very important in developing a good sustainable city strategy.

The object of the research is the sustainable development of the coastal city.

The aim of the article is to analyse the problems of sustainable development of the coastal city of Klaipėda, and to present the possibilities for its further sustainable development.

The following tasks helped us to achieve the goal:

1. To perform an analysis of scientific theories of sustainable development.
2. To compile SWOT matrices according to economic, social and environmental dimensions.
3. To conduct a survey of experts, and, based on the results, identify the problems that pose the greatest challenges to the harmonious development of the city of Klaipėda.
4. To present problem-solving measures to the city of Klaipėda, which could ensure sustainable development in the city.

Research methods. The following research methods are used in the work: analysis of literary sources, descriptive, statistical data analysis, comparative analysis, SWOT analysis, document analysis, expert surveys. The research is conducted at the territorial level of the city of Klaipėda. The chosen period is 2017 to 2023. The statistical data analysis method is used to analyse various statistical indicators available in the databases of the State Data Agency, the Ministry of Social Security and Labour of the Republic of Lithuania, and other institutions. For a deeper understanding of city planning, documents were analysed: the 2021-2030 Klaipėda City Municipality Strategic Development Plan (2021), the Klaipėda Seaport Activity Report (2022), and others.

To explore expert opinions on the sustainable development of Klaipėda city, a *qualitative study* was conducted through *expert interviews*. During this qualitative research, *five experts* in the field of Klaipėda city sustainability were interviewed:

1. The chairman of Klaipėda city communities.
2. The head of the Transport Infrastructure Department.
3. A researcher from Klaipėda University.
4. The chief specialist from Klaipėda's municipal Environmental Departmen.t
5. The chief specialist from Klaipėda's municipal Transport Department.

The work describes the results of a qualitative study/expert interviews. The content analysis allows for structuring the material received, evaluating the data, and highlighting the most important aspects. The insights obtained from the expert interviews are divided into categories and subcategories, as well as supporting statements that emerged during the interview research. Five sustainable development experts (one woman, four men) participated in the study, which analyses the situation of sustainable development in the city. Their average age was 40.2 years. These experts have extensive work experience in the field of Klaipėda city's sustainability. The experts participate in international programmes, prepare projects, assess the development of the city and district of Klaipėda, and its population movement, and plan the public transport system. They also participate in the implementation activities of the sustainable mobility plan.

1. Analysis of research on sustainable development

The rapidly growing number of people in the world, and the increasing needs of people, have caused problems such as poverty, the intensive use of natural resources, the spread of disease, air pollution, loss of biodiversity, etc. This has encouraged countries to take action and initiatives to start talking about sustainability, but also to take concrete actions combining economic, social and environmental needs.

H. Bruyninckx (2021) states that cities are complex systems that connect communities and their environment in a living and constantly changing space. Every European city is unique and has special characteristics, that can be shaped by history, geography, population, and social and political systems.

Coastal cities, especially on the northwest Atlantic, are at higher risk of storm surges and flooding, while southern cities may experience water shortages or wildfires. Certain communities of people living in coastal cities, especially older people, are more likely to suffer from air pollution and noise. Faced with challenges, cities must take action to reduce their impact on the climate.

D. Wang and J. Li (2020) studied 76 Chinese coastal cities, and analysed the relationship between economic indicators and environmental quality improvement. The authors argue that as wages rise, workers will be more compliant with environmental quality and pollution requirements, and contribute to a more sustainable environment. The political development of a city also has a significant positive impact on the environment, which promotes the sustainable development of the city (Wang, Li, 2020). The key is to maintain a sound financial system, as well as long-term investment in infrastructure, transport, population awareness, and workforce training (El Barmelgy, Rasheed, 2016).

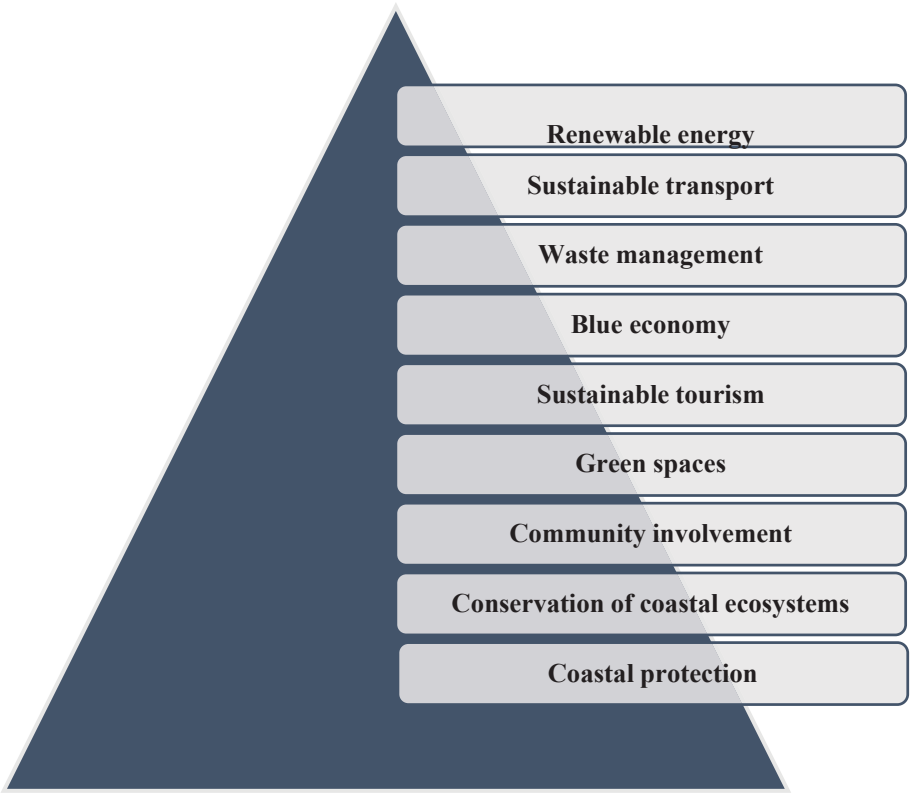

Fig 1. Characteristics of a sustainable coastal city

Source: Hegazy, 2021.

Globally, coastal regions account for 20% of the total land surface, and a large proportion of the population lives in major cities. Ports and the economic activities they develop (shipping and maritime transport), as well as activities that are generally based on ecosystem resources (tourism, fishing and aquaculture), are the main activities that depend on the coast and are a point of attraction for many workers and residents. These features provide coastal communities with many benefits based on the ecological, economic, scientific and aesthetic values of the coast (Hegazy, 2021).

A sustainable coastal city is located near a coast where environmental, economic and social sustainability is prioritised (Hegazy, 2021). A sustainable coastal city is characterised by several features. First of all, it is renewable energy, sustainable transport, waste management, sustainable tourism, and a blue economy that promotes sustainable fishing and aquaculture, and protects marine resources; also, green spaces, coastal protection and ecosystem conservation, and community involvement, whereby members are educated about the importance of coastal environmental protection (Fig. 1).

J. Boulos (2016) points out that the presence of a port in a coastal city makes the life of the city different from that of other cities.

M. Malakauskienė and V. Gerikienė (2014) conducted an environmental quality analysis of the city of Klaipėda, and found that the most water pollution is associated with activities in the port area. Greater visual pollution is recorded on the outskirts of the city, residential areas and industrial parts of the city.

Klaipėda State Seaport Authority prepared and started implementing the *Green Port concept* in 2022, so the port's activities will continue to be developed harmoniously. In this concept, the impact on the environment will be assessed, but measures will also be proposed to reduce this impact (Grauslytė, Žukauskienė et al., 2023).

One of the problems is the noise from the bulk fertiliser terminal in the port area. The findings show that the highest equivalent noise level is closest to the quay where the cranes operate. Noise is also caused by the busy street in the port area and the loading works of the port (Baltrėnas, Fröhner et al., 2007).

The highest noise level was recorded in Jūros, I. Kanto and Naujojo uosto streets. Cars make the most noise when driving on a cobblestone street. Noise also comes from the port during loading operations, and its level is also determined by the fact that residential buildings are located close to the street and create loud noise echoes. The equivalent permissible noise level is exceeded in the evenings on S. Šimkaus Street and Puodžių Street. This was influenced by the presence of bars and nightclubs on these streets (Vaišis, Januševičius, 2008).

At the beginning of 2020, the 'Grigeo' sewage scandal broke out, when it became clear that untreated sewage was being illegally discharged into the Curonian Lagoon. As a result, it was decided to adopt a package of five environmental protection laws, which was called the 'Klaipėda package'. Environmental monitoring and control requirements were tightened (Ragulskytė-Markovienė, 2020).

Loading processes carried out by UAB Klaipėdos konteinerių terminalas were analysed, and harmful effects on the environment and noise level were determined. The conclusions confirm that loading operations in the port area pollute the environment, create noise and dust, and have a negative impact on the natural ecosystem and human health. Ships operating in the port have a negative impact on water, air, and physical and chemical pollution.

The air quality of the city of Klaipėda is greatly influenced by mobile sources of pollution (road traffic, railways and shipping), and stationary sources of pollution (industry, energy and heat production) (Klaipėdos miesto savivaldybės Aplinkos oro kokybės..., 2020). The largest amount of solid particles in the city of Klaipėda is caused by pollution from industrial facilities, including activities carried out in the port area. In Klaipėda, the largest amount of nitrogen dioxide is produced by the gases emitted by several vehicles, which is influenced by both the transported goods and the resulting traffic jams towards the port. The main source of sulphur dioxide, solid particles and volatile organic compounds in the city are industrial facilities.

Thus, research data suggests that most of the problems arise in the environmental field. Residents face problems such as noise, bad smells, pollution, bad infrastructure, etc. All this harms both human health and nature, so we must take care of our present and our future.

The term 'sustainable development' was created in 1987 by the World Commission on Environment and Development. In 1987, the United Nations Commission on Global Environment and Development published a report in which it stated that the main goal of sustainable development is 'to make the world prosperous for all'. Since the beginning of this report, sustainable development has been joined together by three disciplines: economics, sociology and ecology.

Since 1997, sustainable development has become one of the main and most important goals in the European Union. Then the Treaty of Amsterdam was signed, which emphasised that sustainable development is one of the essential aspects of the European Union (Mikalauskienė, 2014).

This concept has caused many theoretical and practical disagreements in science, so it has been presented differently in science, politics, practice, etc. Thus, while the opinions of scientists differ on the presentation of the exact concept, sustainable development is still understood as a general qualitative concept that combines the environment, the economy and social improvement. Sustainable development seeks to harmonise a dynamic economy with social development, while separating economic growth from the environmental impact (Žičkienė, 2004).

The fourth, political, dimension is also important. The institutional (political) dimension is highlighted in the *UN Programme for the Further Implementation of Agenda 21* (2017), but is only used in some of the definitions of sustainable development (Staniškis, Kriaučionienė, 2012) (Table 1). For this reason, the institutional (political) dimension is not considered further in this article.

Table 1. A comparison of concepts of sustainable development

Dimension	Concept
Economic	Sustainable development recognises the importance of economic growth and development in improving the quality of life
Social	Promotes social equality and the well-being of all people, including addressing issues of poverty, education, health care and basic human rights
Environmental	Sustainable development recognises the limited use of the Earth's resources and the importance of environmental conservation. This includes responsible resource management, pollution reduction, and ecosystem protection
Institutional (political)	An effective management perspective is based on detailed and political decisions

Sources: Čiegis, Zeleniūtė, 2008; Feil, Schreiber, 2017; Jociūtė, 2013; Transforming our World..., 2015; Žičkienė, Guogis at al., 2019.

The dimensions of sustainable development connect and reinforce each other, so it is necessary to continue to develop them together.

In 2015, the United Nations adopted the 'Sustainable Development Agenda 2030', which sets 17 universal and interrelated Sustainable Development Goals (SDGs) which countries are expected to implement by 2030 (Transforming our World..., 2015; Europos Sąjungos oficialus..., 2018) (Fig. 2).

The government of the Republic of Lithuania approved the Sustainable Development Strategy on 11 September 2003. Lithuania had a long-term goal, to reach the average of European Union countries in terms of economic, social and population health, and the efficiency of consumption of natural resources, and to ensure a clean and healthy environment.

In the updated National Sustainable Development Strategy, more emphasis is placed on scientific progress, knowledge, corporate social responsibility, and the involvement of society in the process of sustainable development (Nacionalinė darnaus vystymosi strategija, 2011).

The main object of this work is the sustainable development of the city, which corresponds to the 11th sustainable development goal. It includes a wide range of various economic, social, environmental and political components, among which the following are distinguished: the provision of housing for the population, sustainable transport, the reduction of mortality of the population, the reduction of the negative impact of cities on the environment, the increase of universal access to safe and accessible green and public spaces, the integrated and sustainable planning and management of residential areas, etc (Transforming our World..., 2015).

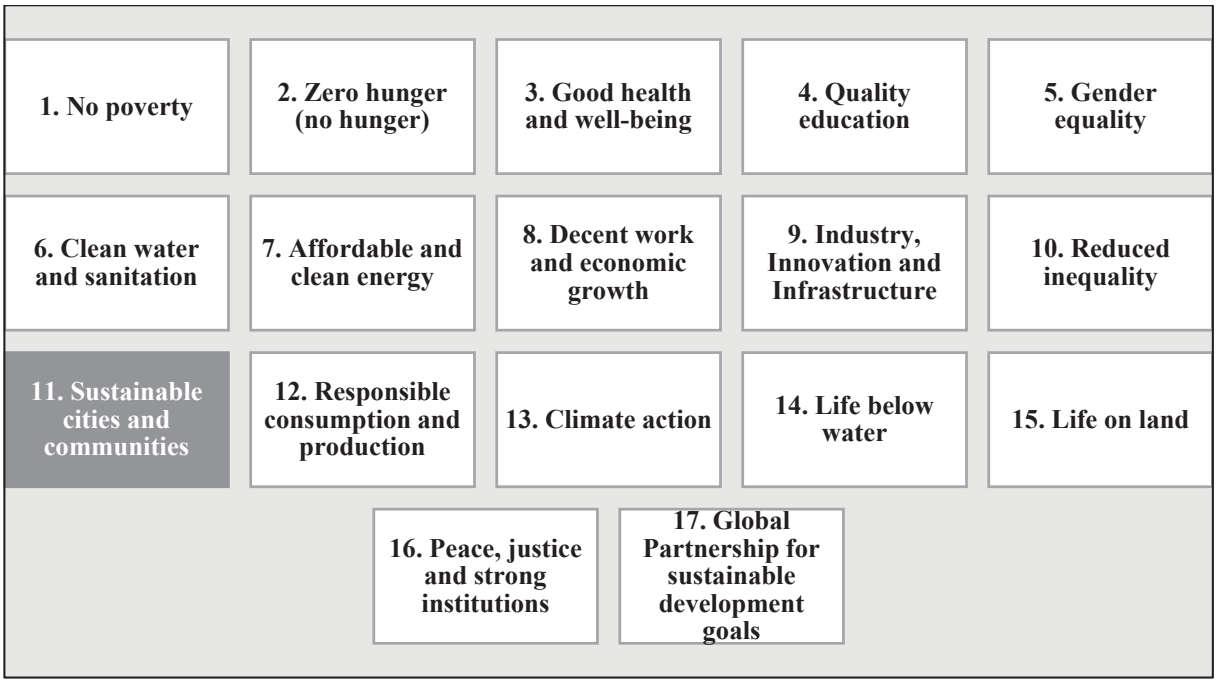

Fig. 2. The Sustainable Development Goals

Source: Transforming our World: The 2030 Agenda for Sustainable Development, 2015.

After analysing and summarising the research conducted by scientists, it can be concluded that sustainable development is a concept that includes a number of methods aimed at ensuring a better life for people now and in the future. It is a human activity that contributes to the overall development of society in a global environment.

2. An analysis of dimensions of sustainable development in the city of Klaipėda

2.1. Economic dimension analysis

Klaipėda strives towards sustainable development in the economic, social and environmental spheres. The city has formed its mission and vision until 2030. 'Klaipėda 2035 is vibrant, clever, inclusive' is the vision outlined in the strategic development plan of Klaipėda municipality for 2021 to 2030. Klaipėda is an ambitious, innovative city that openly accepts new people, ideas, business and culture (Klaipėdos..., 2021). However, the worsening state of the environment, the decline of natural resources and biodiversity, and health problems related to environmental pollution, encourage society to take effective measures, combining economic, environmental and social needs (Čiegis, Zeleniūtė, 2008).

Many economic indicators of Klaipėda (GDP, material and direct foreign investment, port activity indicators) are constantly improving. This helps to create jobs and contribute to increasing employment, which is an important goal of sustainable development for social inclusion and well-being. Also, economic growth can provide access to new technologies and knowledge, encouraging and creating innovation.

At the beginning of 2022, there were 5,067 small and medium-size enterprises operating in the city of Klaipėda. The number of employees in operating companies reached 59,523 (Number of employees..., 2023). Companies create jobs, residents receive income, and business owners pay taxes and thus supplement the city budget. Also, companies introduce innovations and thus contribute to the development of technology. All this strengthens the city's economic sector, and increases competitiveness in the international market (Table 2).

Table 2. SWOT analysis of the sustainability of the city of Klaipėda according to economic indicators

Strengths	Weaknesses
– The city's GDP per capita is growing. This means that the quality of life also improves and poverty decreases – The city's FDI per capita has risen rapidly over the past five years, indicating the creation of new jobs, innovation and technology development – Klaipėda port's overall handling results are increasing, which contributes to the growth of the city's economy	– The city's GDP per capita indicator is the lowest compared to Lithuania and the capital city, so the living conditions in Klaipėda city are worse, and the poverty level is higher than in the capital city – The indicator of the city's material investment per inhabitant is unstable, so the city may face problems in infrastructure development, as well as problems in improving the living environment and transport, and business development – FDI per capita is almost a third of Vilnius, so the city of Klaipėda should pay more attention to innovation, attracting foreign capital, etc
Opportunities	**Threats**
– It is important to attract foreign companies, by improving labour, infrastructure and legal measures – Favourable conditions for foreign businesses, which would encourage the creation of new jobs, opportunities for sustainable development partnerships, etc – The sea and port can attract logistics and manufacturing companies. This can further improve economic performance	– Frequently changing laws can create unfavourable conditions for investors and companies – The fast-growing economy of Vilnius may attract new companies to the capital. This would create serious competition for Klaipėda – The ongoing war in Ukraine may affect the decrease of the total cargo at Klaipėda port

Sources: Oficialiosios statistikos portalas, 2023; Klaipėdos miesto strateginis plėtros planas 2021–2030 m., 2021

Infrastructure is being installed in the city: the quality of the streets is being improved, bridges and viaducts are being built, energy networks are being built, etc. In addition, the possibilities for choosing various goods and services in the city are increasing, and the quality of life of the residents is improving.

It is necessary to emphasise the influence of Klaipėda State Seaport on the economy of the city and the country. It is one of the largest ports in the Baltic region, which ensures the movement of goods in the region. Klaipėda port's cargo volumes have reached record levels, and the port is becoming a leader among the sea ports of the Baltic countries. Fourteen large handling companies, shipbuilding and repair companies work in the port. More than 58,000 workers work there, and the port generates 6.13% of the total GDP created in Lithuania.

Another important group of companies is the Klaipėda Free Economic Zone (Klaipėda FEZ). The Klaipėda FEZ business community consists of more than 100 companies, and the total number of jobs created is more than 5,000. Klaipėda FEZ companies generate 2.5% to 5% of Lithuania's GDP every year (Klaipėdos..., 2021).

Thus, in Klaipėda, a large contribution to GDP from the port activity, industry and trade sectors can be observed. Companies in the city of Klaipėda are most densely concentrated in business centres and industrial parks.

After analysing the most important economic data, a matrix of strengths, weaknesses, opportunities and threats of the economic dimension of the city was compiled

Thus, although the economy of Klaipėda is growing, it is still necessary to attract foreign investment, and the city's companies should improve working conditions, introduce innovations and improve the state of the environment without polluting the environment. Improving the city's economic performance ensures the pursuit of the Sustainable Development Goals 'no poverty', 'no hunger', 'good health and well-being', 'good jobs and the economy', 'innovation and good infrastructure', 'responsible use of resources', 'sustainable cities', 'sustainable land use', and 'partnership for sustainable development'.

2.2. Social dimension analysis

The social sphere is one of the main aspects of sustainable development, which focuses on ensuring the well-being, justice and quality of life of all members of society. Social aspects aim to address various challenges and promote equitable development. Poverty reduction, quality education, health, labour rights and wages, cultural preservation, social services and other aspects are very important for sustainable development in the world.

Although the economic indicators are growing, the number of inhabitants in the city of Klaipėda until 2020 had a decreasing trend (in 2017 to 2020, the population decreased by 1.5%). However, the causes of the Covid-19 pandemic and the start of the war in Ukraine led to an increase in the population, thanks to migrants. Like many European cities, Klaipėda is experiencing demographic aging. In 2017 to 2021, the number of people of working age (15 to 64 years old) fell slightly by 1.9%, while the share of the population of retirement age (65 years and older) rose by 1.4% points; this indicates an aging population (Oficialiosios statistikos portalas, 2023).

The decrease in the number of the population is also determined by the higher mortality than the birth rate. In Klaipėda city the death rate of the population is higher than the birth rate (the death rate decreased from 15 to 13 per 1,000 inhabitants in 2018 to 2021). The number of births in Klaipėda grew in recent years, and rose from 8 to 11 per 1,000 inhabitants in 2018 to 2021. From 2017 to 2021, the natural population change in Klaipėda was negative, but in the last two years it remained stable (-2 persons per 1,000 inhabitants). Thus, analysing the relationship between these indicators and sustainability, we can say that the decreasing number of deaths and the increasing number of births may show an improving area of health and a high quality of life.

Rising birth rates in the future may have a positive impact on labour force growth, which is critical to achieving economic growth and sustainability goals. Sustainable development encourages improving the social sphere and solving the issues of an aging society and ensuring support for the population. It is important to balance demographic processes that can lead to long-term economic, social and ecological growth (Table 3).

Table 3. SWOT analysis of the sustainability of the city of Klaipėda according to social indicators

Strengths	**Weaknesses**
– The birth rate is increasing, while the mortality rate is decreasing, which indicates a developed area of health care and a good quality of life – Improving living conditions in the city – A very wide range of social services provided – The average number of social welfare recipients has decreased over five years, which shows that the standard of living in the city is improving – The employment rate of residents in the city has increased over the last five years, which indicates economic growth	– The number of residents aged 65 and older is increasing, the share of pensioners is higher than that of children (up to 14 years old), which indicates population aging processes – The number of people of working age in the city is decreasing, and correspondingly, the number of the workforce is decreasing – The unemployment rate in Klaipėda is higher than in the capital city, and it varies – Social problems are deepening and economic instability is emerging
Opportunities	**Threats**
– The growing number of jobs may attract young people from other areas – Increasing information about social services provided in the city – Pay more attention to long-term recipients of social benefits	– Rapid aging of the population – Due to the very rapid aging of the population, the need for social services will increase – High spending on social services – The number of recipients of long-term social care in institutions will increase

Sources: Oficialiosios statistikos portalas, 2023; Klaipėdos miesto strateginis plėtros planas 2021–2030 m., 2021; Socialinės pašalpos ir būsto šildymo..., 2018–2022; Klaipėdos jūrų uosto veiklos ataskaita, 2022.

The employment rate of the population in Klaipėda exceeded 70%, and was higher than the Lithuanian average by 3.1%. A high and stable employment rate indicates that most people have jobs, which contributes to lower social inequality and greater citizen engagement. Despite this, the unemployment rate in Klaipėda has always been lower than the national average. Due to the impact of the pandemic it increased significantly and reached 9.7%. The increased number of unemployed led to an increased need for social support.

Sustainable development is inseparable from improving the situation of socially excluded populations. One of the measures is social benefits, which are given to people experiencing financial difficulties. In addition, cash payments to residents can compensate them for part of their expenses and improve their standard of living. From 2018 to 2022, the average number of recipients of social benefits in Klaipėda decreased by 4.92%. This decrease was due to close inter-institutional cooperation in solving social security problems, the active participation of the local community, the reduced unemployment rate, etc.

It is important to monitor the dynamics of the population, promote the birth rate, attract more working-age residents, reduce the unemployment rate, and increase employment, which are very important for people's well-being and sustainable development. By improving the social situation in the city, the goals of sustainable development are also achieved: 'no poverty', 'no hunger', 'good health and well-being', 'quality education', 'gender equality', 'good jobs and economy', 'innovation and good infrastructure' and 'reducing inequality'.

2.3. Analysis of environmental condition dimension

Environmental protection in the world is extremely important to ensure the well-being of the population and the sustainability of the world. It is necessary to pay a lot of attention to green spaces and waste management, encourage the use of renewable energy sources, promote active modes of transport, develop and maintain sewage treatment plants, monitor air quality, protect biological diversity, conserve water resources, etc.

In the city of Klaipėda, the air is polluted by both stationary pollution sources and by transport. Solid particles, carbon dioxide, nitrogen oxide and other compounds are emitted into the environment. Stationary sources are located both in the city and in the State Seaport. Meanwhile, the increasing number of vehicles in the city causes congestion in the city, and emits a large amount of pollutants into the atmosphere, which harm the environment and human health. Congestion in the city is also increasing due to cargo transport to the port area (Table 4). Analysing the general trends in emissions of pollutants into the atmosphere from stationary pollution sources, we can see that the amount of pollutants in the city is increasing (Table 4). From 2017 to 2022, the total amount of pollutants increased by 23.8%. High concentrations of nitrogen dioxide are found close to busy streets. The deposition of solid particles is significantly influenced by the activities of the port and industrial enterprises and transport, and the heating of individual dwellings contributes to this. The companies pollute the environment the most are: Orion Global Pet, AB Grigeo Klaipėda, Klaipėdos energija, Klaipėdos mediena, Gren Klaipėda, etc (Klaipėdos..., 2021).

We need to limit water consumption in order to achieve the Sustainable Development Goals. High consumption of water can have a negative impact on ecosystems and water bodies, so the efficiency of water management and the management of its resources are very important, which will contribute to the mitigation of climate change.

In Klaipėda, water consumption is more than twice that of Vilnius city. The amount of water used increased by almost 14,000 thousand cubic metres in four years, and in 2021 the indicator reached 81,489 thousand cubic metres.

Surface and underground water is polluted by wastewater discharged into the environment. Between 2017 and 2021 the total volume of wastewater discharge in the city increased to 10,000 thousand cubic metres and was almost twice as much as in the capital city. The Sustainable Development Goals aim at the sustainable management and provision of water resources, and the discharge of wastewater can also have a negative impact on communities by harming the health of the population.

Table 4. SWOT analysis of sustainability according to environmental indicators

Strengths	Weaknesses
– The water of the city of Klaipėda meets the requirements of the hygiene standard, thus improving the health and well-being of residents, and ensuring clean water in the city – The city has a sewage treatment plant, thus contributing to the reduction of pollution	– The emission of pollutants into the atmosphere in the city of Klaipėda is increasing, which contributes to faster climate change and a deterioration in the population's health – The total amount of wastewater discharges into surface water is high and continues to increase, impacting negatively the environment and the health of the population – The total amount of water used is the highest compared to other big cities in Lithuania
Opportunities	**Threats**
– The use of efficient sources can lead to a reduction in environmental pollution – Development of the surface wastewater infrastructure – Education of the population in order to preserve nature – The implementation of modern technologies that would contribute to the improvement of the environment – Support for renewal and development of water supply and wastewater treatment	– Increasing air pollution due to the growing traffic of cars and goods – The number of residents and companies that protect the environment is not increasing – Established indicators in wastewater management will not be taken into account

Sources: Oficialiosios statistikos portalas, 2023; Klaipėdos miesto strateginis plėtros planas 2021–2030 m., 2021.

In the city of Klaipėda, noise foci are formed in various areas (intensive traffic flows, industry, service activities, construction works, port loading works). The equivalent noise reaches more than 70 dBA, and exceeds the permissible level in such places.

Unpleasant smells in the city can come from various sources: industrial facilities, transport, disaster sites, natural phenomena, sewage, etc. This has a negative impact on the environment and the well-being of all people. The smells from heating oil, rapeseed, oil and cellulose are mostly felt in the city. This refers to industrial enterprises operating in the city or in the countryside, processing various materials. In the opinion of the residents, bad smells are mostly emitted by the following companies: LLC Mestilla (production of rapeseed oil, protein feed additives and biodiesel), JSC Grigeo Klaipėda (production of various types of paper, cardboard, wood fibre boards), LLC Klaipeda stevedoring company BEGA (loading of bulk and liquid cargoes), and others (Klaipėdos..., 2021).

Summarising the environmental dimension, it can be said that the city of Klaipėda has a large amount of water and emissions discharged into the environment. It is also characterised by unpleasant odours from processing companies and noise from production sites and transport. In order to reduce the amount of pollution and noise, it is necessary to educate the population, install modern technologies, and update the infrastructure in production and in public utilities.

3. Results of the survey by Klaipėda city experts

After conducting an analysis of Klaipėda's strategic city plan according to the dimensions of sustainability, the economic, social and environmental conditions emerged which are the basis for the sustainable development of the coastal city. However, statistical data cannot fully reveal the process of the sustainable development of the city, so the second stage in the study includes expert assessment and its analysis.

After analysing the opinions and experiences of Klaipėda experts about the problems and development opportunities of the city, the five most important categories are distinguished:

1. Problems of sustainable development of the city (15 statements).
2. City infrastructure assessment (15 statements).
3. Development opportunities for the sustainable development of the city (seven statements).
4. The most important aspects of the sustainability of the (22 statements).
5. A successful sustainable coastal city (four statements).

1. Problems of the sustainable development of the city of Klaipėda. The research participants highlighted the most important problems of sustainable development that the city of Klaipėda is facing. The biggest problems are named: inadequate urban planning, urban infrastructure problems, air pollution, low involvement of communities. These aspects were named by all five informants. The problem of noise in the city was noted by five informants, and the problem of the quality of the education network and services by one informant.

Klaipėda is a coastal city that has its own distinctive features, but at the same time faces challenges that are typical of coastal cities. Among the challenges mentioned, the port activity is the most emphasised.

The study also wanted to find out in which parts of the city the most sustainable development problems are observed. Klaipėda's sustainable development experts singled out problem areas such as: the northern part (neither communication nor educational infrastructure and the areas required for it are planned, high air pollution, lack of educational institutions and kindergartens); the southern part (social segregation, boring residential areas, uncontrolled pollution, a lack of parking spaces, difficult transport of children to educational institutions due to traffic jams, unpleasant smells); the Old Town (low population activity, pollution caused by cars, noise); port access (priority is given to cargo transport, economic profit is more important than environmental and social sustainability, air pollution when loading bulk cargo).

2. Klaipėda city infrastructure assessment. The experts presented an assessment of the current infrastructure of the city according to the following areas: *transport system, energy, water supply and sewage disposal, educational institutions, health care institutions, planning of living spaces, green spaces.*

The experts evaluated the infrastructure in a five-point system from 1 to 5 (Fig. 3).

The areas of water supply and sewage disposal, as well as communications, were rated the best. The planning of living spaces and buildings and educational institutions were rated the worst. In evaluating the transport system, experts believe that there are too many private cars on the streets in Klaipėda, and it is still difficult to reach desired places in the city by public transport. There are behavioural problems for public transport bus drivers. The possibilities for the development of the electric vehicle infrastructure have not yet been fully exploited. The area of water supply and sewage disposal is problematic. In the field of energy, it is noticeable that biofuel production is not planned, and energy-saving systems are not enough. In the field of education, experts note the uneven quality of the educational network and services: there are too few educational institutions in the northern part of the city, and too many in the southern part; some schools and kindergartens are in a worse condition than the business infrastructure. Schools and kindergartens lack safe access and good-quality pavements, and traffic is chaotic during peak hours. There is too much administration and related costs in health-care institutions, it is a complex service system. The planning of living spaces is chaotic and without a concept, efforts are being made to insert new constructions into public spaces. Deficiencies in greening buildings are singled out, all the potential green spaces of the city are not fully utilised.

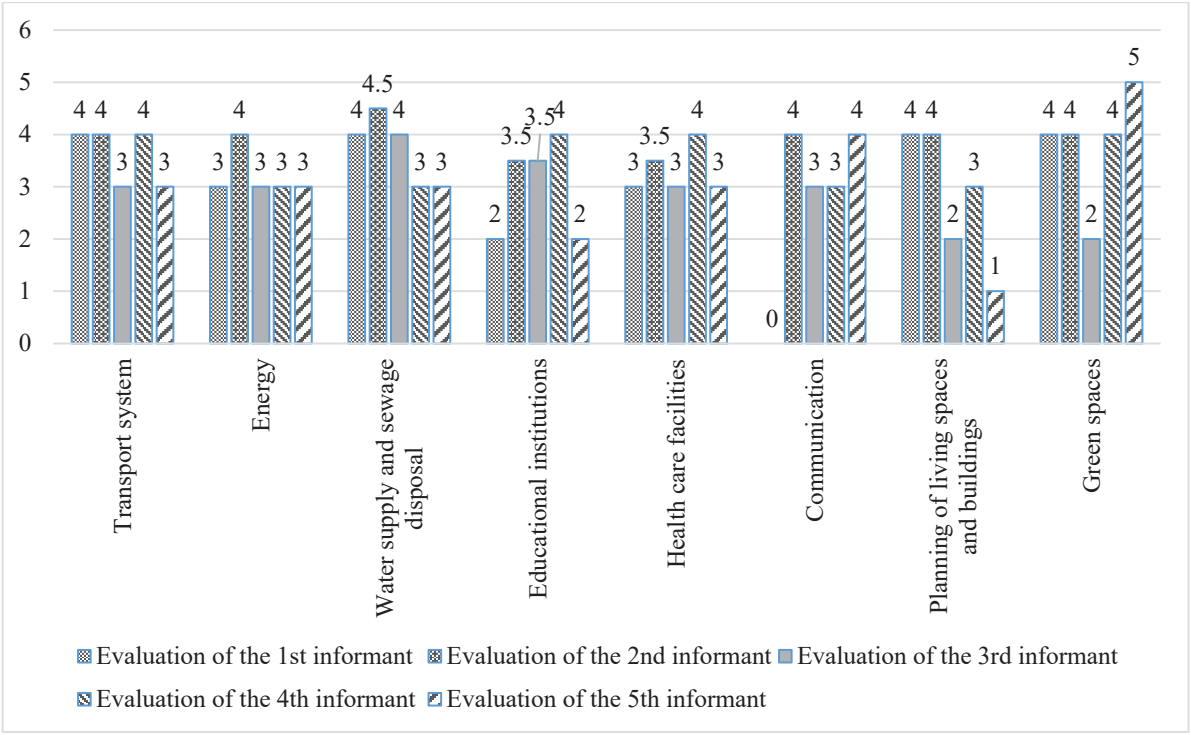

Fig. 3. Expert assessment of infrastructure in the city of Klaipėda, compiled according to the results of the expert evaluation, 2023.

3. Development opportunities for the sustainable development of the city. Innovation, education, green transport, renewable energy sources, environmental protection, business ethics, and the efficiency of raw materials could be encouraged, and this would further contribute to sustainable economic development.

The experts also expressed their opinions on how businesses could contribute to the implementation of the Sustainable Development Goals. The experts made suggestions such as: invest in renewable energy sources, pay all established taxes, cooperate with educational institutions; if a business lacks qualified labour, it is possible to cooperate with educational institutions and help promote special education. The experts emphasise that it is necessary to implement innovations, expand the infrastructure, abandon unnecessary trips, use resources responsibly, and implement environmental improvement projects.

The study revealed that the involvement of communities in the development of sustainable development is also very important, but it needs encouragement.

During the interviews, the experts shared their thoughts and examples of the application of innovation and new technologies that would contribute to the solution of sustainable development problems. Possible innovations in green public transport are: the installation of smart traffic lights, smart pedestrian crossings, traffic surveillance cameras, the use of artificial intelligence, transport electrification and the development of hydrogen technologies, and the transformation of the urban transport system.

Sustainable development experts also confirmed that the efficient use of sustainable transport and energy sources would reduce environmental pollution in the city, and improve the quality of life and the living environment. First of all, the modernisation of the infrastructure is very important, as is the improvement of the infrastructure for cyclists and pedestrians, the development of electric vehicles, the development of public transport, and the renovation of residential buildings.

4. The most important aspects of the sustainability of the city. A unanimous opinion of the experts emerged that the most important aspect of the sustainable urban development of the education

programme is related to the sustainable economy, environment and society. Education and environmental awareness change from generation to generation. Educational events such as seminars are needed. The survey also asked what main priorities should be important for the city in the field of sustainable development. Here, the opinions of experts differed. Some said that the most important thing right now is environmental protection and innovation; others said that we now need to work on social issues and education. In addition, the efficiency of the use of renewable resources and economic sustainability is important.

5. A successful sustainable coastal city. Informants were asked to provide an example that would represent a successful case of implementing sustainability principles in coastal development. The experts pointed to coastal states such as Copenhagen, the tri-city of Gdańsk-Sopot-Gdynia in northern Poland, and Helsinki. The non-coastal territory of Vaxjo in Sweden was also indicated.

Summarising the results of the research, it can be said that the main problems of sustainable development in Klaipėda are the following: inadequate urban planning, urban infrastructure problems, air pollution, low community involvement, noise, and quality problems in the educational network and services. According to the experts, the development opportunities for sustainable development are very wide and necessary. The adequate promotion and development of innovation, education, green transport, business ethics, environmental protection and other areas are important. The most important aspect of sustainable development is educational programmes, but the environment, innovation, the economy and social areas must also be properly developed.

4. Measures for solutions to the sustainable development problems of Klaipėda

After analysing the problems of sustainable development, it is possible to single out measures that would help solve the most important problems in sustainable development in Klaipėda and in different parts of the city (Table 5).

Table 5. Problems in the sustainable development of Klaipėda, and tools for solving them

Problem and area	Problem-solving measures
Air pollution (all of Klaipėda city)	Promotion of green vehicles Development of public transport Creation of green areas Air quality monitoring programmes Education and information Regulation of industrial enterprises
Bad smells (southern part of the city)	Identification of sources A stricter regulatory system Informing residents Installation of pollution control systems Business cooperation City planning
Noise (northern and southern parts of the city, city centre-Old Town)	Traffic flow management Development of public transport Green areas Construction of sound barriers Tightening of requirements
Social inequality (southern part of the city)	Improving educational opportunities Development of social programmes Community development Housing policy Development of employment opportunities Health care

Problem and area	Problem-solving measures
Low population activity (city centre-Old Town)	Youth projects Engaging communities Innovative technologies Public space development
Lack of educational institutions and kindergartens (northern part of the city)	Creation of new educational institutions and kindergartens Development of existing educational institutions Finding temporary solutions Improving transport options Merger of educational institutions Cooperation with private institutions
Unattractive areas (southern part of the city)	Urban development Investment in infrastructure Cultural projects Development of services Engaging communities
Congestion and difficult access to educational institutions (southern part of the city)	Student transport Development of public transport Creation of safe pedestrian and bicycle paths Modernisation of the traffic management system Education of the population about alternative means of transport
Insufficient development of educational institutions (the entire area of the city)	Educational programmes Improving teachers' knowledge Social media and the Internet Participation in projects Partnership with companies Sustainable development days and events

Source: Compiled on the basis of the results of the research conducted, 2023.

In summary, priority attention should be paid to the areas of Klaipėda where the number of problems is the highest. The biggest problems in sustainable development are: air pollution, noise, bad smells, low involvement of the population, etc. It is necessary to solve these problems in the city, taking into account the specifics of their occurrence, and applying specific solutions. In order for the city to develop harmoniously, the joint involvement of the city's municipal administration, port companies, other industrial entities, educational institutions and residents is required.

Conclusion

The aim of sustainable development is to ensure that resources are used wisely, with minimal impact on the environment, and taking into account the well-being of present and future generations. Sustainable development is a concept that includes a series of methods aimed at ensuring a better life for people now and in the future. It is a holistic and long-term vision of a better, fairer future. Sustainable development covers three main areas: economic, social and environmental. In 2015, the United Nations adopted the 2030 Agenda for Sustainable Development, which includes 17 goals, covering poverty, inequality, health, sustainable consumption and production, growth, employment, infrastructure, and other areas.

The analysis of the strategic plan and statistical data of the city of Klaipėda allows us to identify the most relevant economic, social and environmental problems in the period 2017 to 2021. The economic situation in the city was relatively good: at the beginning of the period, the poverty rate decreased and living conditions improved. The increasing volume of direct foreign investment and material investment leads to the creation

of new jobs, and the development of innovations and technologies. Although the Covid-19 pandemic led to an increase in the unemployment rate (4.3%), and, as a result, an increase in the share of recipients of social benefits, the employment rate of the population also increased slightly during the period analysed. So, it can be said that the economy grew in the city of Klaipėda (except for a short period of the pandemic). Some environmental indicators are also improving, such as water quality, sewage treatment system, etc. However, the emission of pollutants and effluents in the city has increased significantly. This has a negative impact on the health of the population, and, in a broader sense, negatively affects the processes of climate change.

During the survey of experts, the main problems in the sustainable development of the city of Klaipėda were identified: inappropriate planning (the whole city), urban infrastructure problems (the whole city), air pollution (individual areas), low community involvement (the whole city), noise (individual areas), and quality problems in the education network and services (the whole city). According to experts, the development opportunities for sustainable development are very broad. Proper promotion and improvement of innovation, population education, green transport, business ethics, environmental protection and other areas are important.

In order to solve the problems of sustainable development, first of all it is necessary to pay more attention to reducing unemployment, to promote the upgrading of the population's qualifications, and to create new jobs. It is also necessary to monitor the population's birth rate, mortality and other demographic indicators, allocate the necessary social support to socially vulnerable population groups, expand employment opportunities, and implement a residential housing policy. Also, greater attention should be paid to improving the state of the environment, by regulating the activities of industrial enterprises, promoting 'green' vehicles, improving the development of the public transport system, creating green areas, and implementing an air quality monitoring programme.

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PAKRANTĖS MIESTO DARNAUS VYSTYMOSI IŠŠŪKIAI: KLAIPĖDOS ATVEJIS

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Santrauka

Klaipėdos miestas yra įsikūręs unikalioje Baltijos jūros ir Kuršių marių pakrantėje. Jame plėtojama pramonė, įvairių rūšių paslaugos, transportas ir logistika. Išskirtinę reikšmę šalies ekonomikai turi Valstybinio jūrų uosto veikla. Uostas lemia ekonominį miesto ir viso regiono augimą, prisideda prie darbo vietų kūrimo, skatina prekybą ir pritraukia investicijas. Uosto artumas skatina ir infrastruktūros plėtrą mieste. Aptarnaujant ir valdant uostą būtina išvystyta transporto, logistikos ir energetikos infrastruktūra, teigiamai veikianti viso

miesto ekonomiką. Kita vertus, mieste kyla eismo ir aplinkos problemų, tokių kaip oro užterštumas, nemalonūs kvapai, triukšmas. Intensyvi uosto veikla didina šių neigiamų aplinkos problemų mastą. Ekonominės, socialinės bei aplinkos problemos – tai miesto darnaus vystymosi iššūkiai, kurie skatina ieškoti sprendimų.

Siekiant ištirti šių problemų mastą, užsibrėžtas tikslas – analizuoti pakrantės miesto Klaipėdos darnaus vystymosi problemas ir ieškoti jų sprendimo būdų, miesto tolesnio darnaus vystymosi galimybių. Kad šis tikslas būtų įgyvendintas analizuojama Klaipėdos miesto ekonominė, socialinė bei aplinkos būklė 2017–2021 m.

Darbe taikomi šie tyrimo metodai: aprašomasis, literatūros šaltinių, statistinių duomenų, lyginamosios, stiprybių, silpnybių, galimybių ir grėsmių (SSGG), dokumentų analizės, apklausos (ekspertų).

Pasirinktu tyrimo laikotarpiu ekonominė situacija mieste buvo santykinai gera: laikotarpio pradžioje mažėjo skurdo rodiklis, gerėjo gyvenimo sąlygos. Didėjanti tiesioginių užsienio investicijų bei materialinių investicijų apimtis lemia naujų darbo vietų kūrimą, inovacijų ir technologijų plėtrą. Nors COVID-19 pandemija lėmė nedarbo lygio augimą (4,3 %) bei socialinių pašalpų gavėjų dalies didėjimą, šiek tiek per analizuojamą laikotarpį padidėjo ir gyventojų užimtumo rodiklis. Taigi galima teigti, kad Klaipėdos mieste ekonomika auga (išskyrus neilgą pandemijos laikotarpį). Gerėjo ir kai kurie aplinkosaugos rodikliai: vandens kokybės, nuotekų valymo ir kt. Tačiau teršalų ir nuotekų išmetimas Klaipėdos mieste gerokai išaugo.

Statistiniai duomenys negali visapusiškai atskleisti darnaus vystymosi problemų specifikos, tad papildomai vykdyta ekspertų apklausa. Gautų rezultatų pagrindu išskirtos Klaipėdos miesto problemos, darniai miesto plėtrai keliančios didžiausius iššūkius. Ekspertai akcentavo šias pagrindines problemas: netinkamas miesto planavimas (visas Klaipėdos miestas), miesto infrastruktūros problemos (visas Klaipėdos miestas), oro užterštumas (paskiros teritorijos), menkas bendruomenių įsitraukimas (visas Klaipėdos miestas), triukšmas (paskiros teritorijos), švietimo tinklo ir paslaugų kokybė (visas Klaipėdos miestas).

Norint spręsti darnaus vystymosi problemas, pirmiausia reikėtų rūpintis gyventojų nedarbo mažinimui, skatinti jų kvalifikacijos kėlimą ir kurti naujas darbo vietas. Be to, būtina stebėti gyventojų gimstamumo, mirtingumo ir kitus demografinius rodiklius, skirti reikiamą socialinę paramą socialiai pažeidžiamoms gyventojų grupėms, didinti užimtumo galimybes, įgyvendinti gyvenamojo būsto politiką. Didesnį dėmesį reikėtų skirti aplinkos būklės gerinimui, reguliuojant pramonės įmonių veiklą, skatinant žaliąsias transporto priemones, vystant viešojo transporto sistemą, kuriant žaliuosius plotus ir vykdant oro kokybės stebėsenos programą.

PAGRINDINIAI ŽODŽIAI: *darnus vystymasis, pakrantės miestai, Klaipėda.*

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