



WP 3 Urban Development

Summary of the Concept for Integrated Urban Development in the target areas of Šiauliai

2011.03.30

Concept for IUD in Lieporiai TA (Šiauliai)

The Territory Analysed in the Detailed Plan According to the Šiauliai City Strategic Development Plan

In 2006, the Council of the Šiauliai City Municipality approved the Šiauliai Strategic Development Plan (ŠSDP), which contained the analysis of the city's socio-economic situation and the vision of the city until 2025. The vision of the Šiauliai city: Šiauliai is the City of the Sun - open, bristling, and safe. The city's development priorities set for 2007-2016 are as follows:

- an open, creative and responsible community;
- the economic competitiveness of the city;
- the quality of the residential environment.

The drafting of the detailed plan of the area between Gegužių, Lieporių and S. Dariaus ir S. Girėno Streets was oriented towards the third priority under the ŠSDP - the quality of the residential environment. In order to improve the quality of the residential environment, major attention is paid to housing problems. The survey conducted among the residents of the Šiauliai city during the drafting of the ŠSDP revealed that one of the largest problems in the city was the outdated stock of dwellings, the refurbishment and upgrading of which, in the residents' opinion, should be one of the priority directions in the Strategic Plan. Therefore, the goals to be achieved in the field of housing improvement include the upgrading of the city's residential areas, improvement of the quality of the residential environment, and promotion of new housing development. The implementation of these goals should involve the balanced development of the stock of dwellings, promotion of the renovation and upgrading of apartment buildings, creation of favourable conditions for the development of the new stock of dwellings, solution of social housing problems, fixing of public spaces of residential areas, improvement of the municipal waste collection, management and processing system, and reduction of the noise and pollution levels in the residential environment.





One of the actions aimed at ensuring the sustainable development of the stock of dwellings indicated in the ŠSDP: the preparation of detailed plans for the existing apartment building areas, formation of land plots, and assignment of lands plots to apartment buildings. The legal registration of land plots would provide a possibility to develop the upgrading of apartment buildings, and thus the maintenance and use of the residential environment would be controlled more easily.

The ŠSDP provides for the drafting of the project for the fixing of the Lieporiai Park, including the construction of children's playgrounds, as a measure for the fixing of public spaces of the planned residential area. Currently, there is no formed land plot which would be assigned to the Lieporiai Park area, as provided in the Šiauliai City Master Plan. The adaptation of the environment to the needs of disabled persons is a very important aspect of the improvement of the residential environment.

Pursuant to the priorities and actions for the achievement of the set objectives provided in the Šiauliai City Strategic Development Plan and with a view to determine the possibilities and necessities, the following aspects are addressed in the current situation analysis of the detailed plan of the area between Gegužių, Lieporių and S. Dariaus ir S. Girėno:

- public spaces, green zones and common use areas;
- forms of ownership within the area, the social composition of the residents;
- adjacencies and different centres within the area and its surroundings;
- social infrastructure and adaptation of the environment for the disabled;
- parking spaces, use of other vehicles and alternative modes of transport;
- evaluation of the engineering infrastructure and waste management;
- creation of an energetically and ecologically sustainable environment;
- energy efficiency, energy supply infrastructure.

Conclusions:

- The solutions of the Šiauliai City Master Plan (2009) reflect the existing area density principles;
- Pursuant to the Šiauliai Strategic Development Plan, it is sought to balance the development of the stock of dwellings by forming land plots around the existing apartment buildings and carrying out the modernisation of the buildings;
- According to the Special Plan for the Establishment of Sanitary Zones of the Watering Places in the Šiauliai City, the planned residential area falls within the third buffer zone of the Birutė watering-place;
- According to the Bicycle Transport Development Scheme, a fairly dense bicycle network is planned to be built in the residential area;
- According to the Special Plan for the Selection and Use of the Type of Energy, the planned residential area is assigned to the centralised heat supply (district heating) system;
- There is a planned bulky waste site (Garažų St.), the sanitary buffer zone of which is 50 m, at a distance of approx. 300 m from the planned residential area;
- According to the Šiauliai City Special Plan for Water Supply and Waste Management, no new networks are being developed in the planned area; however, the plans are to upgrade the existing networks;
- According to the Special Plan for Secondary Raw Materials and Mixed Waste Container Sites in Šiauliai, it is projected to build mixed waste container sites and 24 secondary raw materials sites next to each apartment building in the planned area;
- The area planned in this detailed plan has been built according to the revision of the detailed planning of the Šiauliai Southern residential area, which provides for the planned buildings but there are no formed land plots;



- The planned area is complete as an urban complex, and currently only the improvement of the residential environment and adaptation to the current norms are necessary;
- Individual plots were formed by drafting detailed plans within the planned territory; however, not all of them have been registered with the Real Estate Register yet.

Description of the Planned Territory

The buildings in the Southern residential area, as the majority of the residential buildings in the Šiauliai city, were built after the Second World War. In this residential area, the main apartment and social infrastructure buildings were constructed between 1968 and 1982. This sleeping area located next to Tilžės Street, which is significant for the Šiauliai city, is distinguished for its urban consistency and completion of social infrastructure; besides, the planned area has a large green zone intended for public use - the Lieporiai Park.

In the urban aspect, the planned residential area (the territory planned in the detailed plan) is a complete complex with the developed social, engineering infrastructure. No designing of new large complexes is associated with this residential area; only individual new objects are possible.

The drafting of the detailed plan was oriented towards the improvement of the existing residential environment rather than the planning of new entities. The planned area was built forty years ago, under the former political system where different planning norms were applicable. Currently, one of the most important planning tasks is to make every effort to approximate the area to the modern design norms, taking into consideration the modern needs of its residents.

Public Spaces, Green Zones and Common Use Areas

Green zones, public spaces and common use areas constitute a very important urban component of each city, which influences the recreational and social environment of the public and generates the synthesis of urbanised areas and natural environment. The survey conducted among the residents of the Šiauliai city during the preparation of the Šiauliai Strategic Development Plan revealed that parks or green zones were considered by them as being among the most necessary objects in the residential environment. The unfixed environment and ecological problems were identified as one of the most painful problems of the city. Therefore, one of the main objectives in the improvement of the residential environment is the preservation of the natural environment in urbanised areas.

In terms of green zones, public spaces and common use areas, the planned area is evaluated ambiguously. Its strength would be the Lieporiai Park of almost 13 ha, situated in the north-eastern part of the planned area. Although the Park is currently maintained but it is not properly adapted for public use, there is no land plot formed for the Park, and its functional purpose has not been determined either. According to the Šiauliai City Master Plan, the Lieporiai Park is intended for recreation - peaceful and active rest. In compliance with the *Norms of Individual Green Zone Areas for Recreational Purposes*, the Lieporiai Park is a district green zone situated in the residential area of the city and limited by the main streets: S. Dariaus ir S. Girėno, Lieporių, Statybininkų and V. Grinkevičiaus.

According to the aforementioned norms, the maximum radius of accessibility of the Lieporiai Park is 800 m. Thus, the Lieporiai Park as a green zone of district-wide significance covers the entire planned area by its radius of accessibility, i.e. it fully serves its needs.



In the territory next to the intersection of Tilžės and Statybininkų Streets (on both sides of Statybininkų Street), there are two common use areas with green zones, the sizes of which are 0.61 ha and 1.04 ha. According to their size, they could be considered to be the green zones of local significance, the radius of accessibility of which is 300 m. These green zones serve only part of the planned area (its northern and north-eastern parts); however, implementing the *Norms of Individual Green Zone Areas for Recreational Purposes*, another two similar territories should be established in the planned area.

According to the *Description of the Procedure for the Determination of Dependent Green Zone Norms (Areas)*, dependent green zones in the plots of multistorey residential buildings should account for at least 30% of the total land plot area. As long as there are no land plots formed in the planned territory, it is impossible to objectively assess the need for dependent green zones. It is likely that it will be impossible to meet the aforementioned requirements in individual land plots where the compactness of the development is higher (along Tilžės St.). However, this Description is not applicable to land plots located in the development zone of the city centres, only the area of the existing green zones complying with the norms in these land plots should not be reduced.

According to the *Description of the Procedure for the Determination of Dependent Green Zone Norms (Areas)*, the percentage of dependent green zones set for kindergartens is 60%, and the norm set for general education schools, special schools, high schools, colleges, and higher education institutions stands at 50%. The need for dependent green zones in the land plots of the educational and preschool institutions is met.

Currently, the shortage of common use areas next to the apartment building in the planned territory is very distinct; there is a lack of quality children's playgrounds, recreational and sports grounds, and the existing common use areas are mainly associated with the educational and training institutions located between the residential buildings. There are stadiums built next to the schools in the planned area; the quite large land plots of the schools and kindergartens are planted with greenery, maintained and mostly fenced. However, the use of these areas is more oriented towards the children's needs while being at school or kindergarten. There is a lack of common use areas intended for extra-curricular and weekend activities.

When evaluating the green zones and common use areas between the apartment buildings, it can be stated that there is no consistency. As the planned residential area was started to be built forty years ago, the need for separate zones, which is very relevant nowadays, was not taken into account. Particularly, this can be said about the establishment of parking lots. Along with the increase in the level of automobilization, illegal parking lots have been established next to the buildings at the expense of common use areas.

In the territories between the apartment buildings, little attention is paid to the sensitive part of the society - children and the elderly; there is a lack of children's playgrounds, recreational and sports grounds.

Forms of Ownership in the Territory, Social Composition of the Residents

According to the data of the Department of Statistics, at the end of 2009, the stock of dwellings in the Šiauliai city comprised 2.74 million sq.m. of useful area; in Lithuania, (similarly in the Šiauliai city as well), private properties account for approx. 97% of the stock of dwellings, whereas the state-owned and municipal properties make up 3%.

When evaluating the planned area, it can be seen that the territory is dominated by apartment buildings. It is often the case that the apartment in apartment buildings is owned by the right of ownership, and the land on which the building was built is state-owned. The apartment buildings often have no formed land plot assigned to them. In the



residential area in question, there are 82 apartment buildings, 6 individual houses, 9 commercial objects, and 9 educational and training institutions.

When assessing the number of the formed and registered land plots in the area in question, the situation is very different in terms of ownership. In the case of individual dwellings, commercial and public objects, 100% of the land plots have been formed and registered. The apartment buildings have practically no formed and registered land plots; there is only approx. 4% of the formed and registered land plots of the apartment buildings in the entire residential area.

The Lieporiai Park could be the recreational centre of the planned area. For the establishment of a real recreational centre, the development of the recreational infrastructure, the selection of adequate measures that are relevant to the residents, and the fixing of the accesses must be provided for. In order to implement these actions, first of all, the formation of the land plot of the Lieporiai Park, the drafting of the infrastructure development project, and the allocation of the required financing would be needed. The Lieporiai Park as a recreational centre would slightly counterbalance the orientation of the planned area towards supermarkets.

Social Infrastructure, Adaptation of the Environment for the Disabled

The initial project of the Lieporiai area provided for schools, kindergartens, one service company and a supermarket (Krymo St. 28), and then subsequently new small trading companies and branches of central banks, pharmacies and municipal institutions (social service centres) would be established.

In the area in question, there are 9 educational and training institutions: 1 college, 2 gymnasiums, 1 basic education school, and 5 kindergartens. The institutions intended for the development of additional cultural or sports activities are established in the premises of the training institutions (the Avilys Theatre, the Children's Club Draugystė), or in the multi-functional building (the women's netball club Linas).

The radius of accessibility of nurseries-kindergartens is 600 m, and the normative need for them is calculated on the basis of the precondition that there must be one kindergarten per 2,000 - 4,000 residents. Calculating that there are approx. 11,600 residents in this area, the normative need for kindergartens is satisfied. The radius of accessibility of general education schools is 750 m; the calculation norm is one school per 4,000-15,000 residents. Calculating that there are approx. 11,600 residents in this area, the normative need for kindergartens and schools is satisfied.

There is no large complex health care institution (clinic) in the residential area in question; there is only a family doctor's office. The primary health care point must be located within a distance of 1,500 m. There are three pharmacies concentrated in a single location within the planned area. They could be more "scattered" across the area so that the broadest possible population is served.

Parking Spaces, Use of Other Vehicles and Alternative Modes of Transport

In 2009, the vehicle fleet of the Šiauliai city was comprised of 52,145 motor vehicles.

In 2009, the level of automobilization in the Šiauliai city stood at 416 cars/1,000 residents. Between 1999 and 2009, the level of automobilization grew by 30.5% in the Šiauliai city. The increased level of automobilization has an impact on the higher need for parking lots next to the apartment buildings, compared to the norms applicable when this area was designed and built. According to the most recent wording of the Technical Construction Regulation STR 2.06.01:1999, there is 1+0.2 parking space per apartment provided for



apartment buildings. In the apartment buildings located in this residential area, the number of apartments varies from 60 to 120. Pursuant to the applicable regulations, the area of a single parking space is 25 m²; thus, the parking lots by the apartment buildings should be of 1,800-3,600 m², or car storage units of the required size should be provided. Currently, the existing parking lots by the apartment buildings occupy 500-800 sq.m. During the survey, the residents indicated that one of the largest problems of the residential environment is the insufficient number of parking spaces. As the actual need for parking lots is not satisfied in the area, cars are parked everywhere, even in the prohibited places: the streets and driveways as well as the common-use green areas are obstructed by cars. It is obvious that the upgrading of the planned area by adapting the environment to the actual needs and ensuring the maximum approximation to the modern design norms is necessary. The need for parking spaces in the planned area is partly compensated by the masonry garages situated in eastern vicinity. However, they belong only to a certain part of the residents; besides, even if they own a garage, the owners do not necessarily keep their cars in the garage, they often tend to park their vehicles close to their homes.

Summing up the situation of public transport in this residential area, it is proposed to improve the public transport system. The measures provided in the Šiauliai City Strategic Development Plan, which are related to the area concerned, are as follows:

- a) to improve the quality of the services provided by public transport by upgrading the fleet of buses and adapting it for the disabled;
- b) to optimize the public transport route network;
- c) to establish modern bus parking, maintenance and production facilities.

During the survey, in most cases the residents indicated that public transport is not attractive to them due to the small number of routes.

Another priority provided in the ŠSDP which is vital for the transport system is the development of the bicycle and pedestrian network. The measures set for the achievement of the objectives are related to the reconstruction and new development of pedestrian and bicycle paths.

Thus, the prospective development of the bicycle network is sufficient; however, there are no defined deadlines for the implementation of the solutions. Upon development of the bicycle traffic infrastructure, it can be expected that people will more often choose bicycles as an ecological means of transport in the city during the hot season.

Engineering Infrastructure and Waste Management

The engineering infrastructure of the planned area is very well developed: there is a central water-supply, household waste and rainwater collection systems; there are well-developed electricity and gas supply networks; district heating and telecommunications are provided as well. The performance quality of all the engineering networks is aggravated by their age: all the engineering communications were laid around 1975; thus, currently they are already outworn and in need of upgrading.

Creation of Energetically and Ecologically Sustainable Environment

The maintained district heating system in Lithuanian cities has determined the low concentrations of sulphur dioxide and carbon monoxide in ambient air. Nuclear energy ensured that even as energy consumption grows and few renewable energy sources are used, the quantities of greenhouse gas have undergone no substantial changes during the entire period of the country's independence. However, quite large quantities of



greenhouse gas and air pollutants are emitted into air due to the still very inefficient thermal energy consumption, the outworn heat supply systems, and the poor thermal properties of the previously built homes.

When evaluating the links between the engineering infrastructure and ecology, it can be stated that the level of ecology in the planned area is quite high as the centralised infrastructure has been developed: the supply of heat energy, electricity and water, household waste and rainwater collection as well as the centralised collection of household waste. The whole centralised engineering infrastructure must be preserved and upgraded, the conditions of its use must be improved, and the costs must be reduced.

Based on the data received from AB Šiaulių Energija, the relative quantity of heat energy (kWh/m²) consumed to heat 1 m² in certain buildings was calculated. This indicator allows assessing the heat energy efficiency in the particular buildings. It was calculated by dividing the quantity of heat consumed in the building for the heating of the premises (kWh) by the total floor space of the building (sq.m.).

The calculated average heating costs in 2008-2010 fluctuate between 40 and 101 kWh/sq.m. The buildings are sorted in descending order of energy costs. The relative heat consumption in the apartment buildings does not depend on the age of the buildings but it depends on the height of the buildings. In terms of height, the largest relative heating costs in 2008-2010 were determined in the 9-storey buildings - approx. 80 kWh/sq.m., whereas the lowest costs were determined in the 5-storey buildings (approx. 71 kWh/sq.m.). Heating costs are subject to the number of apartments as well. The most inefficient heat consumers among the 5-storey buildings are the smallest apartment buildings with 45 apartments (76.1 kWh/sq.m.), whereas the lowest heat consumption was determined in the 5-storey buildings with 99-119 apartments (67.4 kWh/sq.m.). The 9-storey buildings with 54 apartments are the biggest heat wasters in the area (83.9 kWh/sq.m.), whereas the buildings with 106-108 apartments consume 74.8 kWh/sq.m.

The relative heat consumption in the masonry 12-storey buildings is slightly lower than that of the 9-storey buildings - 77.8 kWh/sq.m. The overall external inspection of the apartment buildings was carried out on 7 October 2010. The condition of the panel buildings is worse than that of the masonry ones. The roofs of the most of the buildings are not repaired; there are many old wood windows and open balconies. It is likely that due to these main reasons the panel apartment buildings consume relatively large amounts of heat energy. Six out of seventy nine apartment buildings were renovated, another six were only partially renovated.

Energy Audit of the Selected Apartment Buildings

In the planned area, three buildings of different types with the largest relative heat consumption indicators, namely, Sevastopolio St. 11, Grinkevičiaus St. 18 and Krymo St. 42, were selected for an energy audit. The average relative heating costs of the 9-storey apartment building at Sevastopolio St. 11 are the highest among the 9-storey buildings with 54 apartments, whereas the apartment building situated at Grinkevičiaus St. 18 is the biggest heat consumer among the 9-storey buildings with 106-108 apartments. The biggest heat consumer among the 5-storey buildings is the apartment building situated at Krymo St. 42.

The installation of heating energy-saving materials in external walls of buildings would not only allow for saving heat but also would improve the condition and aesthetics of the whole building. However, the implementation of such measures requires large investments, the return on which exceeds the period of 5 years.

Energy is supplied to the buildings at high parameters. The heat units of the buildings prepare hot water and supply energy to the heating system. The internal heating scheme



of the buildings in the area is of the independent connection (the heat carrier is separated by the heat transmission network from the heat carrier of the heating system of the building through the heat exchanger) vertical bottom distribution type. The old-type sectional - steel and cast iron heating devices without thermostatic vents are used.

There is a natural-traction channel ventilation system removing polluted air from toilets and kitchens installed in the buildings. Air inflow is provided through windows and doors. This ventilation system does not operate efficiently as it is almost always idle due to the same temperatures outside and in the premises, and it removes too much air in wintertime, thus increasing the loss of heat removed together with warm air.

Resident Survey

During the preparatory stage, when providing information about the commencement of the preparation of the detailed plan of the territory between Gegužių, Lieporių and S. Dariaus ir S. Girėno Streets, the planning organiser together with the originator presented the chairmen of the apartment buildings and companies administering these buildings with questionnaires (see Annex No. 2) in order to conduct a survey among the local residents on the form of ownership and social composition of the residents, the adaptation of the environment for the disabled, the use of parking spaces, other vehicles and alternative modes of transport as well as ecology and energy consumption in these buildings.

The survey was conducted from 19 September to 27 October 2010. The aim of the survey was to objectively and correctly assess the needs, priorities and problems of the area in question.

Conclusions:

- Only 8.64 % of respondents participated in the conducted resident survey;
- In terms of age, the area is dominated by retirement age residents;
- Families with children live only in every fourth apartment;
- The development of the social infrastructure in the area has been evaluated favourably by the residents;
- About 50% of the residents use public transport;
- The lack of parking spaces was indicated in the questionnaires - the parking lots should be twofold larger as currently they accommodate cars of only 50% of the residents;
- The household waste collection system has not been fixed, there are special sites equipped near each apartment building, and the residents expressed their wish to take this into consideration;
- During the survey, the residents requested to establish common use areas and to increase the existing parking lot zones.

Impact assessment of the solutions

I. Impact on the Sustainable Development and/or Planned Field of Activity in the Area

When forming land plots in the planned area and establishing the mandatory and additional regulations, the sustainable development of the territory is promoted. In principle, the formation of land plots around the existing objects does not have a very significant material impact on the development of the territory but the complex planning of the territory and formalisation of the current condition of the new construction open possibilities for the new development as well. The established boundaries of the land plots will be the landmarks of the new development. Having formed the land plots around the existing objects in the detailed plan, the possibility has opened to provide for a new object - the church, and following the formation of the land plot, conditions are created for the



establishment of the park infrastructure in the Lieporiai Park. Therefore, the impact of the solutions of the detailed plan on the sustainable development of the territory is projected to be positive and long-term.

II. Impact on the Economic Environment

The implementation of the solutions of the detailed plan will have a minor impact on the economic environment as no new activities are sought to be carried out. The newly planned objects include the church and the Lieporiai Park, which, according to their nature, are not oriented towards economic benefit; however, even the emergence of such new objects has a slight impact on the economic development of the area as this involves the creation of new jobs. In this aspect, the planned impact is positive. All the other commercial objects of the area are already existing, and no additional development of them is provided.

III. Impact on the Social Environment

The implementation of the solutions of the detailed plan will have a very positive impact on the social condition and employment of the residents, the evolution and culture of the community. First of all, the sociality of the residents will be promoted when forming land plots for groups of buildings. As the infrastructure (children's playgrounds, common use areas) will be used commonly by several buildings, the residents will be able to communicate more among themselves. Another important factor which influences the occupancy, cultural and spiritual life of the residents is the origination of the church in the area and the development of the Lieporiai Park infrastructure. The projected impact on the social environment is positive and long-term.

IV. Impact on the Natural Environment and Landscape

Upon implementation of the solutions of the detailed plan, the impact on the natural environment and landscape is hoped to be positive and long-term. The solutions are associated with the preservation and fostering of the existing natural environment. In the detailed plan, it is proposed to maximally preserve the existing trees, to fix and develop the Lieporiai Park. In addition, following the formation of land plots for several groups of buildings, the expectations are to ensure aesthetic consistency in the fixing of the environment, thus making a positive impact on the landscape.

Concept for IUD in Miglovara TA (Šiauliai)

The Territory Analysed in the Detailed Plan According to the Šiauliai City Strategic Development Plan

In 2006, the Council of the Šiauliai City Municipality approved the Šiauliai Strategic Development Plan (ŠSDP), which contained the analysis of the city's socio-economic situation and the vision of the city until 2025. The vision of the Šiauliai city: Šiauliai is the City of the Sun - open, bristling, and safe. The city's development priorities set for 2007-2016 are as follows:

- an open, creative and responsible community;
- the economic competitiveness of the city;
- the quality of the residential environment.

The drafting of the detailed plan of the territory between Vytauto, Žemaitės, Miglovaros and M. Valančiaus Streets was oriented towards the third priority under the ŠSDP - the quality of the residential environment. In order to improve the quality of the residential environment, major attention is paid to housing problems. The survey conducted among the residents of the Šiauliai city during the drafting of the ŠSDP revealed that one of the



largest problems in the city was the outdated stock of dwellings, the refurbishment and upgrading of which, in the residents' opinion, should be one of the priority directions in the Strategic Plan. Therefore, the goals to be achieved in the field of housing improvement include the upgrading of the city's residential areas, improvement of the quality of the residential environment, and promotion of new housing development. The implementation of these goals should involve the balanced development of the stock of dwellings, promotion of the renovation and upgrading of apartment buildings, creation of favourable conditions for the development of the new stock of dwellings, solution of social housing problems, fixing of public spaces of residential areas, improvement of the municipal waste collection, management and processing system, and reduction of the noise and pollution levels in the residential environment.

One of the actions aimed at ensuring the sustainable development of the stock of dwellings indicated in the ŠSDP: the preparation of detailed plans for the existing apartment building areas, formation of land plots, and assignment of lands plots to apartment buildings. The legal registration of land plots would provide a possibility to develop the upgrading of apartment buildings, and thus the maintenance and use of the residential environment would be controlled more easily.

The ŠSDP provides for the drafting of the concept and development programme for the fixing of public spaces of residential areas and the organisation of its implementation as a measure for the fixing of public spaces of the planned residential area.

Pursuant to the priorities and actions for the achievement of the set objectives provided in the Šiauliai City Strategic Development Plan and with a view to determine the possibilities and necessities, the following aspects are addressed in the current situation analysis of the detailed plan of the territory between Vytauto, Žemaitės, Miglovaros and M. Valančiaus Streets:

- public spaces, green zones and common use areas;
- forms of ownership within the area, the social composition of the residents;
- adjacencies and different centres within the area and its surroundings;
- social infrastructure and adaptation of the environment for the disabled;
- parking spaces, use of other vehicles and alternative modes of transport;
- engineering infrastructure, waste;
- creation of an energetically and ecologically sustainable environment;
- energy efficiency, energy supply infrastructure.

Conclusions:

- The solutions of the Šiauliai City Master Plan (2009) reflect the existing area density principles;
- Pursuant to the Šiauliai Strategic Development Plan, it is sought to balance the development of the stock of dwellings by forming land plots around the existing apartment buildings and carrying out the modernisation of the buildings;
- According to the Special Plan for the Establishment of Sanitary Zones of the Watering Places in the Šiauliai City, the planned residential area falls within the third buffer zone of the Birutė watering-place;
- According to the Bicycle Transport Development Scheme, a fairly dense bicycle network is planned to be built in the residential area;
- According to the Special Plan for the Selection and Use of the Type of Energy, the planned residential area is assigned to the centralised heat supply (district heating) system;



- According to the Special Plan for the Water Supply and Wastewater Management in the Šiauliai City, the projections are to build a new water supply pipeline of 200 m and a new wastewater disposal pipeline of 300 m in the planned area;
- According to the Special Plan for Secondary Raw Materials and Mixed Waste Container Sites in Šiauliai, it is projected to build mixed waste container sites and 3 secondary raw materials sites next to each apartment building in the planned area;
- No parking spaces were provided within the area in question in the Šiauliai City Special Plan for Transport and Motor Vehicle Parking Spaces;
- The solutions of the detailed planning project of the Market Area in Šiauliai have been fully implemented.
- Individual plots were formed by drafting detailed plans within the planned territory; however, not all of them have been registered with the Real Estate Register yet;
- The planned area is complete as an urban complex, and currently only the improvement of the residential environment and adaptation to the current norms are necessary.

Description of the Planned Territory

The area in question is located in the central part of the city. In this area, the buildings, as the majority of the residential buildings in the Šiauliai city, were built after the Second World War. In this residential area, the main apartment and social infrastructure buildings were constructed between 1968 and 1982. This area is located next to Žemaitės Street, which is one of the transport connections in the Šiauliai city, as it runs in parallel to Tilžės Street and continues up to the southern district of the city. Žemaitės Street has great significance and impacts directly the removal of the growing transport flows from the central part of the city. The residential area situated next to the central part of the city is distinguished for its urban division into high-rise and low-rise density areas, the fixed green zone area located in the vicinity (Sukilėlių Hill) and used intensively, and the completion of the necessary social infrastructure located therein.

Density is quite even in the area in question, depending on the nature of the area density. According to the Šiauliai City Master Plan, the city's central zone (along Žemaitės Street) is distinguished for its high intensity of the development, which stands at 2.0. The intensity of the development in the area dominated by the residential single- and two-apartment buildings equals 0.8; meanwhile, the permissible intensity of the development is 1.2 in the part of the area where the territory is regulated as being of high intensity of the development. Density in the planned area is mixed but it is dominated by residential housing according to the Šiauliai City Master Plan and according to the existing condition.

In the urban aspect, the planned area is a complete complex with the developed social, engineering infrastructure. The drafting of the detailed plan was oriented towards the improvement of the existing residential environment rather than the planning of new entities. The planned area was built forty years ago, under the former political system where different planning norms were applicable. Currently, one of the most important planning tasks is to make every effort to approximate the area to the modern design norms, taking into consideration the modern needs of its residents.

Public Spaces, Green Zones and Common Use Areas

Green zones, public spaces and common use areas constitute a very important urban component of each city, which influences the recreational and social environment of the public and generates the synthesis of urbanised areas and natural environment. The survey conducted among the residents of the Šiauliai city during the preparation of the Šiauliai Strategic Development Plan revealed that parks or green zones were considered by them



as being among the most necessary objects in the residential environment. The unfixed environment and ecological problems were identified as one of the most painful problems of the city. Therefore, one of the main objectives in the improvement of the residential environment is the preservation of the natural environment in urbanised areas. In terms of green zones, public spaces and common use areas, the area in question is evaluated favourably. Its strengths include the nearby square called Sukilėlių Hill, the Central Park, and the Old Didždvaris Park. There are no parks in the territory of the area, except for the green zones by the residential buildings.

The existing square Sukilėlių Hill adjoins the residential area - the area is maintained and adapted for public use, there is a land plot formed for this territory, and its functional purpose has been determined. According to the Description of the Procedure for the Determination of Dependent Green Zone Norms (Areas), the radius of accessibility of the local green zone equals 300 m.

The closest objects of the planned area are two parks: the Central Park and the Old Didždvaris Park.

The planned area includes the green zones next to the residential buildings which, pursuant to the Description of the Procedure for the Determination of Dependent Green Zone Norms (Areas), fall within the category of dependent green zones. Dependent green zones (including lawns and flower gardens) occupy 1.3 ha of the total planned area and this accounts approx. for 35% of the area. According to the Description of the Procedure for the Determination of Dependent Green Zone Norms (Areas), dependent green zones (including lawns and flower gardens) in the plots of multistorey residential buildings should account for at least 30% of the total land plot area. As long as there are no land plots formed in the planned territory, it is impossible to objectively assess the need for dependant green zones. It is likely that it will be impossible to meet the aforementioned requirement in individual land plots due to their density. There are no common use areas within the territory of the residential area in question. The adjacent common use areas are mainly associated with the educational and training institutions located between the residential buildings. The land plots of the (sports, speech-therapy, secondary) schools and kindergarten situated nearby the planned area are planted with greenery, maintained and mostly fenced. However, the use of these areas is more oriented towards the children's needs while being at school or kindergarten. There is a lack of common use areas intended for extra-curricular and weekend activities. The sports school and the football stadium fitted out within the territory of this school are intended for this activity of the residents. The territory of the football stadium is located at a distance of approx. 150 m from the territory of the residential area in question.

Forms of Ownership in the Territory, Social Composition of the Residents

The area in question is dominated by the low-rise and high-rise residential buildings: there are 19 apartment buildings, 30 individual houses, and 1 private medical treatment facility (based in one of the apartment buildings). The majority of the land plots of individual houses has been formed and registered. Apartment buildings have practically no formed and registered land plots; the land plots have been formed and registered only for two apartment buildings (Vytauto St. 154 and Žemaitės St. 45). Land plots for another three apartment buildings have been formed but the boundaries of these parcels have not been registered yet (Vytauto St. 134, Žemaitės St. 41 and M. Valančiaus St. 4A). A few apartment buildings have established apartment building owners' associations (MABOA), other buildings are administered by the company - UAB Ūkvedys.



During the preparatory stage of the drafting of the detailed plan, the planning organiser together with the originator presented the chairmen of the apartment buildings and companies administering these buildings with questionnaires in order to conduct a survey among the local residents on the form of ownership and social composition of the residents, the adaptation of the environment for the disabled, the use of parking spaces, other vehicles and alternative modes of transport as well as ecology and energy consumption in these buildings. The aim of this survey is to objectively and correctly assess the needs, priorities and problems of the area in question. A total of 17 questionnaires were sent and 9 completed questionnaires were received. The overall activity level - 53%. Based on the received answers, certain preconditions can be made in respect of the area in question.

There are approx. 1,403 people residing in the apartment buildings located in the planned area. When assessing the composition of the area residents in terms of age, it can be seen that the majority, i.e. even 33.3%, is comprised of senior citizens. This age group is dominant in the area.

The answers received during the survey revealed that the disabled account for approx. 5% of the total number of the residents in the planned area. Also, the residents were asked a question about the adaptation of the residential environment for the disabled. Almost 100% of the chairmen indicated that the environment was not adapted for disabled people (except for the apartment building M. Valančiaus St. 2).

Social Infrastructure, Adaptation of the Environment for the Disabled

There are one municipal entity (the Controller of the Municipality, the Environmental Division, vacant premises) and one private doctor's office in the residential area in question. There are no other social purpose objects; however, these objects are situated nearby this area.

There is one nursery-kindergarten in the area being analysed and another two kindergartens are located in the surroundings. According to the generally accepted planning norms ("Planning Norms for Cities, Town and Villages (Residential Locations", 2009, volume I), the radius of accessibility is 600 m. The Planning Norms indicate that the standard need for nurseries-kindergartens is one kindergarten per 2,000-4,000 residents. Calculating that there are approx. 1,403 residents in the area, the standard need for kindergartens is satisfied. According to the planning norms, the radius of accessibility of general education schools is 750 m, the computer norm is one school per 4,000-15,000 residents. Calculating that there are approx. 1,403 residents in the area, the standard need for schools is satisfied.

Larger (daily service) supermarkets located next to the residential area include IKI, RIMI, Cento, Norfa, and Maxima. The radius of their accessibility is 1,000 m (according to the planning norms). The dislocation scheme of these stores is good, the stores are not concentrated at a single location and can conveniently (while being close to home) service quite a large number of the residents. The primary health care service delivery point must be located at a distance of 1,500 m (according to the planning norms). This requirement is also met. The entities providing various services situated nearby the area in question include the post office, the bank, pharmacies, cafes, the cinema, hotels, the police, the museum, the sports club, and the stadium. The accessibility of these institutions should not exceed 1,000 m (according to the planning norms). All of the aforementioned entities are located at a distance of up to 1,000 m. The radius of accessibility of the institutions providing daily services to the residents is 1,000 m (according to the planning norms); therefore, there is no necessity to establish additional institutions in this area as the needs of the residents of the entire area are fully satisfied.



The development of the social infrastructure objects is good as there are institutions intended for carrying out pre-school education, education, medical treatment and cultural activities.

The church constitutes a significant part of the social infrastructure for the modern society. Next to the area in question, there are two churches located at a distance of 1,000 m and 1,100 m from Žemaitės St. According to the planning norms, the radius of accessibility of the church is 1,500 m. This requirement is also met.

One of the problems related to social adaptation which is very painful in modern society and which has not been resolved fifty years ago is the integration of disabled persons into society. The time when the area was built was distinguished for the total ignorance of a very sensitive part of the society, i.e. disabled persons, when contemplating the development of the social infrastructure and designing of apartment buildings. Thus, the adaptation of the environment for the disabled has not been resolved in the area in question; the area does not have even the simplest means such as lowered curbs or ramps, and the parking lots near the apartment buildings do not contain spaces for the disabled. This is one of the weakest links in the social infrastructure of the area in question.

Parking Spaces, Possibilities of Using Other Alternative Vehicles

As the development of the residential area being analysed was started forty years ago, the need for separate zones had not been taken into account, whereas nowadays it is very relevant. This is particularly the case with the establishment of parking lots. As the level of automobilization has increased, especially in the central part of the city where there is a large concentration of jobs, the yards of the apartment buildings are congested with cars of people commuting to the city's centre for business and/or studies.

The increased level of automobilization has an impact on the higher need for parking lots next to the apartment buildings, compared to the norms applicable when this area was designed and built. According to the most recent wording of Technical Construction Regulation STR 2.06.01:1999, there is one parking space per apartment provided for apartment buildings. In the apartment buildings located in this residential area, the number of apartments varies from 22 to 60. Pursuant to the applicable regulations, the area of a single parking space is 25 m²; thus, the parking lots by the apartment buildings should be of 525-1,500 m², or car storage units of the required size should be provided. Taking due account of the aforementioned norms of the Technical Construction Regulation, it has been preliminary calculated that there are currently approx. 100 parking spaces fitted out in the planned area. During the survey, the residents indicated that one of the largest problems of the residential environment is the insufficient number of parking spaces. As the actual need for parking lots is not satisfied in the area, cars are parked everywhere, even in the prohibited places: the streets and driveways as well as the common-use green areas are obstructed by cars. It is obvious that the upgrading of the planned area by adapting the environment to the actual needs and ensuring the maximum approximation to the modern design norms is necessary.

The increase in the number of parking spaces is only one part of the solutions aimed at improving the quality of the residential environment. It is very important to strategically change the existing circumstances. When evaluating the transport system in the city, one of the most important objectives is to promote the use of public transport and ecological vehicles, thus reducing the overall level of automobilization. The most important reason for the residents' transport need is the territorial scattering of entities satisfying the interests of the residents, companies, institutions and firms; thus, public transport must ensure the satisfaction of the transport need which is considered to be the desire to have the means of transport that do not restrict their lifestyle or social and economic activities.



The city's public transport network must be well developed; the means of public transport must be fast, convenient, and attractive. The Technical Construction Regulation STR 2.06.01:1999 "Transport Systems of Cities, Towns and Villages" provide that the maximum walking distance to the public transport lines must be 600-800 m.

During the survey, when asked about the number of parking spaces in the yard, the respondents indicated that only approx. 33% of the cars owned by the residents are parked near the building, and it was mentioned in all cases that there is too little parking available. On average, 32% of the area residents use public transport.

The measures for the improvement of public transport provided in the Šiauliai City Strategic Development Plan, which are related to the area concerned, are as follows:

- a) to improve the quality of the services provided by public transport by upgrading the fleet of buses and adapting it for the disabled;
- b) to optimize the public transport route network;
- c) to establish modern bus parking, maintenance and production facilities.

Another priority provided in the ŠSDP which is vital for the transport system is the development of the bicycle and pedestrian network. The measures set for the achievement of the objectives are related to the reconstruction and new development of pedestrian and bicycle paths. In the area concerned, the bicycle paths are currently built only in Žemaitės Street, up to the crossroads with Vytauto St. According to the Bicycle Transport Development Scheme of the Šiauliai City, the proposal for the immediate future is to establish a bicycle route in Žemaitės St., and bicycle routes are also planned to be established in the future in: S. Daukanto and Vytauto Street.

The prospective development of the bicycle network is sufficient; however, there are no defined deadlines for the implementation of the solutions. Upon development of the bicycle traffic infrastructure, it can be expected that people will more often choose bicycles as an ecological means of transport in the city during the hot season.

Engineering Networks and Waste Management

The planned area and its surroundings are located in the urbanised part of the Šiauliai city; therefore, the engineering infrastructure is well developed:

- there are two transformer stations providing electricity to the entire planned area built in this area;
- the buildings of the area are connected to the Šiauliai city district heating network;
- the area is supplied with liquefied gas;
- there are centralised water-supply, household waste and rainwater networks;
- there are the telecommunication (AB TEO) lines built in Vytauto and Žemaitės Streets.

The Master Plan provides for the development of the gravity sewerage system along Vytauto, Klevų and Miglovaros St. and the development of the water-supply network along Miglovaros St.

Conclusions:

- The territory planned in the detailed plan is a complete complex of the former system with the developed social and engineering infrastructure;
- There are no parks within the territory of the area, except for the green zones around the residential buildings. The intensively used green zone area, which is called Sukilėlių Hill, adjoins the residential area but this area is of a cultural nature rather than the area intended for the recreation of the residents - peaceful and active rest. The Central Park and the Old Didždvaris Park, which are located closest to the area in question, service



almost the entire area concerned (these parks are situated at a distance of approx. 1,000 m from the most remote buildings);

- As there are no formed land plots in the planned area, it is impossible to objectively assess the need for dependent green zones (dependent green zones (including lawns and flower gardens) account for approx. 35% of the planned area);
- The area being analysed is dominated by low-rise and high-rise residential buildings;
- The major part of the land plots of individual dwellings has been formed and registered; meanwhile, the apartments in the apartment buildings are owned by the right of ownership, whereas the land on which the building has been built is state-owned;
- The distribution of the residents of the planned area by age groups differs from the general indicators of the Šiauliai city - there is a larger number of senior citizens (even 33.3%) residing in the area;
- The development of the social infrastructure objects is good; therefore, there is no necessity to establish additional institutions;
- The area of the area in question is not adapted to the disabled;
- The number of parking spaces available near the apartment buildings in the area in question is insufficient;
- Public transport is developed in the area in question and used by approx. 32% of all the area residents;
- The bicycle network has not been developed in the area concerned; however, the proposals for the future are to establish bicycle paths in the main streets of the planned area;
- The engineering infrastructure in the area in question is very well developed; however, the majority of the pipelines are outworn and thus it would be expedient to upgrade them;
- The household waste collection and management system works poorly as the required number of household waste container sites has not been established.

Creation of the Energetically and Ecologically Sustainable Environment

The maintained district heating system in Lithuanian cities has determined the low concentrations of sulphur dioxide and carbon monoxide in ambient air. Nuclear energy ensured that even as energy consumption grows and few renewable energy sources are used, the quantities of greenhouse gas have undergone no substantial changes during the entire period of the country's independence. However, quite large quantities of greenhouse gas and air pollutants are emitted into air due to the still very inefficient thermal energy consumption, the outworn heat supply systems, and the poor thermal properties of the previously built homes.

The area in question is no exception as well; it was built more than forty years ago. During the life cycle of the area, the energy supply infrastructure and the apartment buildings have become worn out; besides, the design and construction norms and requirements have changed and new technologies reducing energy losses and improving the thermo-insulation properties of buildings have emerged. Currently, due to the too low thermal resistance of the walls and windows of buildings a lot of energy (approx. 200 kJ for one degree per 1 sq.m.) is consumed for heating: 2-2.5 times more than in the majority of the Northern EU countries. With a view to improve the supply of thermal energy and reduce heat losses in the main pipelines, the heat pipelines are gradually renovated.

When evaluating the links between the engineering infrastructure and ecology, it can be stated that the level of ecology is quite high as the centralised infrastructure has been developed: the supply of heat energy, electricity and water as well as the centralised



collection of household waste but there is a lack of containers for sorting out household waste.

Based on the data received from AB Šiaulių Energija, the relative quantity of heat energy (kWh/m²) consumed to heat 1 m² in certain buildings was calculated. The results show that the average heating costs in 2008-2010 fluctuate between 46 and 138 kWh/m².

Energy Audit of the Apartment Buildings

The overall external inspection was carried out on 7 October 2010. The roofs of the most of the buildings are not repaired; there are many old wood windows and open balconies. It is likely that due to these main reasons the apartment buildings consume relatively large amounts of heat energy. Four out of seventeen apartment buildings were renovated.

The largest amount of heat energy in the area is consumed by the apartment building located at Vytauto St. 156.

Heating Energy Savings Following the Installation of Energy Saving Materials in External Walls

The installation of heating energy-saving materials in external walls of buildings would not only allow for saving heat but also would improve the condition and aesthetics of the whole building. However, the implementation of such measures requires large investments, the return on which exceeds the period of 5 years.

The heating and household hot water preparation systems supply energy to the buildings at high parameters. The heat units of the buildings prepare hot water and supply energy to the heating system. The internal heating scheme of the buildings in the area is of the independent connection (the heat carrier is separated by the heat transmission network from the heat carrier of the heating system of the building through the heat exchanger) vertical bottom distribution type. The old-type sectional - steel and cast iron heating devices without thermostatic vents are used.

Ventilation Systems

There is a natural-traction channel ventilation system removing polluted air from toilets and kitchens installed in the buildings. Air inflow is provided through windows and doors. This ventilation system does not operate efficiently as it is almost always idle due to the same temperatures outside and in the premises, and it removes too much air in wintertime, thus increasing the loss of heat removed together with warm air.

Conclusions

It has been determined that the heat insulation of the old-type pipelines in the district heating system in question does not correspond to the design data. The completed calculations allow making a precondition that the existing insulation is either mechanically damaged or moistened (around 10-15%). Upon completion of the analysis, no system users which could experience any disruptions in the supply of heat energy due to insufficient pressure drop in the inlets of the buildings were identified; on the contrary, certain zones of the network where the reduction in pipeline diameters is possible were determined.

In order to fully reconstruct the heat supply networks of both areas in question, approx. LTL 2,180,000 would be needed, LTL 913,000 of this amount would be investments into the reconstruction of the main loop pipelines, which could not be directly attributed to the



area in question only. The maximum reconstruction of the network would reduce heat losses by approx. 555 Mwh/year. It is likely that after the preparation of the technical heat route reconstruction projects the length of the district heating network will be reduced, thus decreasing investments in the reconstruction of the network and even more reducing heat losses. It is recommended that during the preparation of the technical project a repeated thermo-hydraulic calculation is carried out, taking into consideration any potential changes in the network configuration.

Determination of the concept

The concept of the detailed plan of the area between Vytauto, Žemaitės, Miglovaros and M.Valančiaus Streets in Šiauliai is prepared on the basis of the relevant topographical photograph.

The main objectives of the concept of the detailed plan are as follows:

- to analyse the planning and parcel formation possibilities of the area in question and present conceptual solutions;
- to assess the need for parking spaces and common use areas;
- to evaluate the possibilities of construction of annexes and extensions;
- to analyse the use of innovations, renewable energy sources, etc. within the planned area.

The current situation analysis of the detailed plan revealed that there are low-rise and high-rise residential buildings in the area concerned: there are 30 apartment buildings, 25 individual houses, 1 private medical treatment institution (based in the apartment building), and 2 masonry non-residential buildings (the municipal premises at Vytauto St. 152 and commercial premises at Vytauto St. 136). The major part of the land plots of individual dwellings has been formed and registered; the apartment buildings practically have no formed and registered land plots. Only the land plots of two apartment buildings have been registered with the Real Estate Register (Vytauto St. 152, together with the masonry non-residential building at Vytauto St. 152 and Žemaitės St. 45); the land plots for another two apartment buildings have been formed but the land plot boundaries have not been registered yet (Vytauto St. 134 and Žemaitės St. 41).

There is one common use land plot (Sukilėliu St. 26A), the boundaries of which overlap with the existing passage, registered in this area.

The planned area is limited to the following four streets of the Šiauliai city: Vytauto, Žemaitės, Miglovaros and M. Valančiaus. Connection between the area and the city is very good.

When drafting the detailed plan of the planned area, the main task involves the formation of land plots around the existing apartment buildings, whereas the planning of new objects is not feasible due to the high density of the area.

When analysing the land plots of the apartment buildings in the planned area, it should be observed that the regulations provided in the detailed plan do not correspond with the actual current situation. Following the formation of land plots during the concept stage, it is obvious that the requirement related to the intensity of the development is not met. While forming land plots, maximum efforts are made to approximate the intensity of the development provided in the Master Plan.

During the drafting of the concept, not only new land plots around the residential buildings, the land plot boundaries of which have not been determined and registered, are formed, but also the boundaries of the land plot at Sukilėliu St. 26A are changed because the boundaries of the formed and registered land plot encompass the streetway (the driveway of the commercial building at Vytauto St. 136) as well; moreover, the boundaries of the registered land plot in Žemaitės St., which cross the existing buildings and the



boundaries of the formed land plots, are also changed. In the detailed plan, the engineering infrastructure land plots are formed for the streets situated in the middle of the area, namely, Klevų and Sukilėlių Streets, having regard to the set regulation and the existing situation.

When forming land plots around the apartment buildings, due account is taken of the current density, the need for parking spaces and common use areas and every effort is made to implement the requirements of the legal acts and norms that are currently applicable in the Republic of Lithuania. This objective is complicated as the planned area was built 40 years ago, when totally different requirements were applied. At that time, no land plots were formed and there was a very low level of automobilization. According to the currently applicable norms, the need for parking spaces is 1 parking space/apartment. In total, there are 592 apartments in the planned area. It is calculated that the space required for one parking space comprises 25 sq.m., thus, the total need for the parking space available to the cars of the entire planned area would be approx. 1.5 ha, i.e. almost half of the planned area. It is noteworthy that, when establishing above-ground parking lots next to the existing apartment buildings, there are no possibilities of maintaining the sanitary buffer zones provided for parking lots. The theoretical proposal, which requires large amounts of financial funds and would cause major problems with the underground engineering networks but would improve the aesthetic view, is the establishment of underground car storage units between the apartment buildings. In case a used roof is fitted out, sports grounds, playgrounds and other common use areas could be built in the above-ground part instead of the extended parking lots. Only a minor part of the parking lots would be provided for in the above-ground part of the land plot, mostly intended for disabled persons.

Green zones and common use areas should be designed in compliance with the *DESCRIPTION OF THE PROCEDURE FOR THE DETERMINATION OF DEPENDENT GREEN ZONE NORMS (AREAS)*, pursuant to which, the green zones in the land plots of multistorey residential buildings should account for at least 30% of the land plot area. When forming land plots around the existing surrounding apartment buildings, it is sought to implement these norms. In pursuit of the optimal territory planning solution, two territory planning options have been prepared during the determination of the concept.

In the case of the first concept, 4 land plots are formed between the existing streets, including the boundaries of the registered and formed but not registered land plots.

In the case of the second concept, land plots are formed for 1, 2 or 4 apartment buildings and individual land plots are formed for the engineering infrastructure objects.

In both cases, green zones and common use areas as well as parking lots are integrated into the formed land plot. The detailed plan does not provide for separate land plots for common use areas and parking lots as the formation of separate land plots would aggravate the existing situation even more and the intensity of the development as provided in the Master Plan would be even higher.

In the case of the first concept, the sizes of the formed land plots vary from 0.54 to 1.8 ha. After the formation of the land plot, the theoretical calculations showing the balance of the land plot - whether the size of the land plot is sufficient for the existing building and establishment of parking lots and green zones - were made. These calculations allow concluding that in certain cases there is a shortage of land in the land plots, whereas in other cases there is a surplus of land; however, there is no possibility to increase land plots as there are the land plots intended for low-rise construction formed already nearby, or the land plot is limited by the streets. Taking due account of these circumstances, it is concluded that it is necessary to give up the implementation of certain norms. No density enhancements are provided, as the intensity of the development exceed the permitted indicators as provided in the Šiauliai City Master Plan already. The projections are to fit



out parking spaces within the boundaries of the land plots, without distributing how many parking spaces will be equipped next to each building but calculating the total ratio of parking space to the number of apartments of the buildings situated on the particular land plot.

The need of each building for parking spaces is determined by the Technical Construction Regulation STR 2.06.01:1999, which provides that the norm applicable to the apartment buildings is 1 space/apartment. According to this concept, the shortage of parking spaces equals -264. Having regard to the existing parking spaces, additional 127 spaces would be equipped in the red line zones of the streets. The total shortage would equal approx. -93 spaces.

In the case of the second concept, each apartment building is evaluated individually. There are one, two or four apartment buildings within the boundaries of one land plot. The parking lots and dependent green zones (theoretically 30% of the planned land plot area) are integrated into the boundaries of the land plots. When forming land plots, due account has been taken of the red lines of the streets, the boundaries of the adjacent registered land plots, the need for the land plot depending on the size of the building, the normative distances from the building to the boundary of the land plot (by keeping the distance of at least 3 m) and natural landmarks: the boundaries of grounds and pavements. The sizes of the land plots formed for the apartment buildings vary from 0.17 to 0.83 ha. The intensity of the development fluctuates between 1 and 1.48. Following the formation of the land plots, the theoretical calculations showing the balance of land plot - whether the size of the land plot is sufficient for the existing building and for the establishment of parking lots and green zones. The made calculations allow concluding that in separate cases there is a shortage of land and in some cases there is a surplus of land; however, it is not always possible to move the boundary of the land plot by optimising the sizes of the land plots. In certain cases, there is no possibility to join more buildings as the land plots have already been formed nearby, or the buildings are built too densely and the distance between them is too small to have the boundary of the land plot moved. Taking due account of these circumstances, it can be concluded that it is necessary to give up the implementation of certain norms. In the case of this concept, no density enhancements are provided as the intensity of the development exceeds the permissible norm provided in the Šiauliai City Master Plan already. In the case of the concept being prepared, the need for green zones is compliance with the currently applicable norms (theoretically 30% of the planned land plot area). Parking spaces are projected to be established within the boundaries of the land plots. The need of each building for parking spaces is determined according to the Technical Construction Regulation STR 2.06.01:1999, where the norm applicable to apartment buildings is 1 parking space/apartment. According to this concept, the shortage of parking spaces is equal to -171. Having regard to the existing parking spaces, additional 127 parking spaces would be established in the red line zones of the streets. The total deficit of parking spaces would be equal to 0.

Conclusions and Recommendations

The main concept drafting principles are as follows:

- The regulations are established on the basis of the current condition as the solutions of the Master Plan do not correspond to the actual situations;
- No density enhancements are provided as the intensity of the development exceeds the permitted norm provided in the Šiauliai City Master Plan already;
- During the determination of the concept, it is sought to implement the requirements of the legal acts and norms currently applicable to the land plots of apartment buildings in the Republic of Lithuania by providing parking lots and green zones;



- The detailed plan does not provide for separate land plots for the establishment of common use areas and parking spaces as the formation of separate land plots would aggravate the current situation even more and the intensity of the development provided in the Master Plan would be even higher;

- In the case of the first concept:

- a) the formed land plots vary from 0.54 to 1.8 ha, the intensity of the development is between 1.21- 1.39;

- b) the calculations of the balances of the land plots revealed that such planning is not balanced as in one case there is a shortage of land and in other cases there is a surplus of land;

- c) the shortage of parking spaces in the land plots within the area is -264, taking into consideration the existing parking spaces in the red line zones of the streets and having established additional parking spaces in the expansions of the streets, the overall shortage would be equal to approx. -93.

- In the case of the second concept:

- a) the formed land plots vary from 0.17 to 0.83 ha, the intensity of the development is between 1.00-1.48;

- b) based on the calculations of the balance of the land plots, the distribution of land plots is more even than in the case of the first concept; the land plots include the areas of the required size for green zones with common use areas;

- c) the shortage of parking spaces stands at -171 in the entire area, having regard to the existing parking spaces in the red line zones of the streets and having established additional parking spaces in the expansions of the streets, the overall shortage would be equal to 0.

In the case of the first concept, where four land plots are formed between the existing streets and the boundaries of the registered and formed but not registered land plots are reviewed, it becomes obvious that the following main objectives would not be achieved:

- the requirement regarding dependent green zones is not met (green zones account for approx. 25% of the formed land plot area);

- there is no sufficient area for the establishment of parking lots; therefore, the currently applicable norms are not met.

In the case of the alternative second concept of the detailed plan, where land plots are formed for 1, 2 or 4 apartment buildings and separate land plots are formed for engineering infrastructure objects, the calculations of the land plot balances for building groups revealed that in certain cases there is a shortage of land in the land plots and in other cases there is a surplus of land, and it is not always possible to move the boundary of the land plot by optimising the sizes of the land plots. However, this concept is more advantageous as the distribution of the land plots is more even, compared to the first concept, and the following main objectives are achieved:

- the average intensity of the development in the formed land plots is approximate to the intensity of the development provided in the Master Plan (UI-1.26);

- parking spaces can be established in compliance with the requirements of the currently applicable norms of the Republic of Lithuania (the parking issue is fully resolved by allowing to park cars along the streetway of Klevų and Sukilėlių St.);

- green zones can be established in compliance with the currently applicable norms of the Republic of Lithuania (the requirement related to dependent green zones is met in all the land plots).

The second concept is more advantageous than the first concept as it has obvious advantages: the intensity of the development is approximate to the intensity provided in the Master Plan; parking lots and green zones can be established in compliance with the



requirements of the currently applicable norms of the Republic of Lithuania; there is more even distribution of the land plots.

Having regard to the current situation and the prevailing problems, and with a view to meet the requirements of the currently applicable laws and norms of the Republic of Lithuania, the second concept has been approved.

The area may be divided for the groups of buildings situated on the formed land plots inside these groups and parts of the land plots, which may be easily changed in the course of the use thereof (should there be any requests from the residents to that effect), could be leased to the apartment buildings.