Sustainable Urban Mobility Plan Zhytomyr

Sustainable Urban Mobility Plan for Zhytomyr (draft)

February 2019

The document was prepared within the framework of Project «Integrated urban development in Ukraine»

Commissioning party:

German Ministry for Economic Cooperation and Development (BMZ) and

Swiss Federation State Secretariat for Economic Affairs (SECO)

Implementing organisation: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

In cooperation with Zhytomyr City Council

Responsible for release: Dmytro Tkachuk, Deputy Mayor on Issues of Executive Bodies

Consultants:

Dornier Consulting International GmbH
Platz vor dem Neuen Tor 2
10115 Berlin, Germany

Rupprecht Consult GmbH
Clever Strasse 13-15,
50668 Köln, Germany

Table of Content

Resume

The Sustainable Urban Mobility Plan (SUMP) of the city of Zhytomyr was developed on the initiative of Deutsche Gesellschaft fur Internationale Zusammenarbeit (GIZ) GmbH in cooperation with the Zhytomyr City Council. The SUMP development process complies with the Guidelines on Developing and Implementing a Sustainable Urban Mobility Plan, and is developed in accordance with participatory planning principles and with the involvement of international and local experts (Chapter 1). In the course of professional discussions and interviews with main city stakeholders the following six priorities for the development of mobility in the Zhytomyr city (Chapter 2) have been defined:

1. Strengthening the role of public transport;
2. Road safety;
3. Encourage people to walk;
4. Cycling;
5. Parking management;
6. External accessibility of Zhytomyr.

According to the diagnostics of the current urban mobility situation (Chapter 3), the majority of all trips is carried out by public transport (45%) and walking (37.8%). Distribution of trips by non-motorised and motorised transport is respectively 39% and 61%. Public transport system in the city is characterised by a high coverage level of populated area and a well-developed e-transport system, but its infrastructure needs to be significantly improved and upgraded. The city has to further develop pedestrian and cycling infrastructure, road traffic organisation and parking space management.

In the result of working group discussions of priority 22 goals for the development of sustainable urban mobility were defined (Chapter 4). Four scenarios for the development of the Zhytomyr city were prepared in order to assess the options for achieving the set goals depending on the level of institutional capacity for the implementation and adoption of changes, as well as financial resources availability (Chapter 5).

In order to draw up the implementation plan a number of measures have been developed for each priority, based on the inventory of the current situation and the set goals of sustainable mobility development. All proposed measures fall onto five groups: infrastructure, management and organisation, monitoring and data collection, capacity building, promotion and awareness raising.

The key measures of the Sustainable mobility plan of the city of Zhytomyr are the creation of a centralised management system for the public transport network and a unified dispatch system, reorganisation of the route network, creation of dedicated public transport lanes, arrangement of road infrastructure for traffic calming measures, construction of safety islands and installation of bollards, creation and reconstruction of pedestrian infrastructure, construction of safe cycling infrastructure, development of the concept on parking management, creation of transfer hubs and others.

Chapter 6 explains the implementation measures for all priorities, and analyses the possibility of their implementation according to different scenarios. Defined scenarios were modelled afterwards, which allowed to evaluate quantitative and qualitative indicators of the impact of the implementation measures, which is provided in summary of scenarios (Chapter 7).

The monitoring system was proposed and developed in order to measure the level of achievement of the set goals (section 9), monitoring tools together with recommendations for further data collection and analysis were developed, and basic indicators for 2018 were identified.

Introduction

What is Sustainable Urban Mobility Plan

A Sustainable Urban Mobility Plan (SUMP) is a strategic plan that must meet the mobility needs of people and businesses in cities and their surroundings to achieve a better quality of life. It is based on the existing planning practices and principles of integration, participation and evaluation[1].

SUMP is a new form of strategic transport planning, proposed officially by the European Commission in 2009. "The main task of SUMP is to improve the accessibility of urban areas and ensure high-quality and stable mobility and transportation to, through and within the city's territory" [2]. Figure 1 shows the main characteristics of the development of a Sustainable urban mobility plan.

Figure 1. Main features of SUMP

Source: Guidelines – developing and implementing a sustainable urban mobility plan[1].

In contrast to the classic transport planning, the SUMP concentrates not on the organisation of the movement and the provision of infrastructure for certain types of transport, but on planning the movement of people in the city. Sustainable Mobility means providing the opportunity to move from point A to point B at a reasonable time and at an affordable price, using the most effective and sustainable forms of travel for the sake of securing the public interest. This means that any person, regardless of his/her physical or material abilities, should be able to move through the city comfortably, and therefore, planning should take into account individual characteristics, as well as general needs and interests.

The SUMP allows developing a long term strategy for the development of the city's mobility and linking the current status with long-term objectives for Zhytomyr. While evaluating the scenarios, the SUMP helps to identify and fill the gaps in the mobility structure of the city.

Table 1. Difference between sustainable urban mobility and traditional transport planning

Traditional Transport Planning	Sustainable Urban Mobility Planning
Focus on traffic	Focus on people
Primary objectives: Traffic flow capacity and speed	Primary objectives: Accessibility and quality of life, as well as sustainability, economic viability, social equity, health and environmental quality
Modal-focused	Balanced development of all relevant transport modes and shift towards cleaner and more sustainable transport modes
Infrastructure focus	Integrated set of actions to achieve cost-effective solutions
Sectorial planning document	Sectorial planning document that is consistent and complementary to related policy areas (such as land use and spatial planning; social services; health; enforcement and policing; etc.)
Short- and medium-term delivery plan	Short- and medium-term delivery plan embedded in a long-term vision and strategy
Related to an administrative area	Related to a functioning area based on travel-to-work patterns
Domain of traffic engineers	Interdisciplinary planning teams
Planning by experts	Planning with the involvement of stakeholders using a transparent and participatory approach
Limited impact assessment	Regular monitoring and evaluation of impacts to inform a structured learning and improvement process

Source: Guidelines – developing and implementing a sustainable urban mobility plan[1].

What is SUMP for Zhytomyr?

The Sustainable Urban Mobility Plan is a new way of planning urban mobility with the aim to create an urban transport system by addressing – as a minimum – the following objectives:

- Ensure all citizens are offered transport options that enable access to key destinations and services;
- Improve safety and security;
- Reduce air and noise pollution, greenhouse gas emissions and energy consumption;
- Improve the efficiency and cost-effectiveness of the transportation of persons and goods;
- Contribute to enhancing the attractiveness and quality of the urban environment and urban design for the benefits of citizens, the economy and society as a whole[1].

Vision of the City

The vision of the city is articulated in the Integrated Urban Development Concept of Zhytomyr 2030 (IUDC), which is a strategic document that defines spatial and socio-economic directions of the urban development for the next twelve years. The documents has been created through wide public involvement. The concept is a guiding document for further development and implementation of city policies, strategies, targeted programs and plans.

Vision of the city: Zhytomyr 2030 is a green, safe, sports city, combining modern design with natural landscapes. City where everyone feels comfortable. City where talents are born and grow. Centre for creative industries, entrepreneurship and organic products. Eurasian transport and logistics hub. City of equal opportunities for self-realization. City, you are proud of and admired.

The Integrated Urban Development Concept of the city of Zhytomyr until 2030 defines six priorities (Figure 2), one of which is "Comfortable City" that foresees the creation of modern infrastructure for the living of business people and city visitors. Among the strategic goals of this priority is the achievement of sustainable mobility in a compact city. One of the objectives for this goal is to develop a sectoral plan, namely, the Sustainable urban mobility plan.

Figure 2. Priorities of the city of Zhytomyr under the Integrated Urban Development Concept

Chapter 1 Development Process of the SUMP in Zhytomyr

The SUMP for Zhytomyr has been developed according to international best practices adapted to the local context. The overall process has followed the European guidelines on SUMP development and included a well-established participatory process. The SUMP development team consists of main stakeholders for mobility, local "Integrated Urban Development in Ukraine" project office and professional transport consultants. The complete list of participants is presented in Annex B.

Sustainable mobility plans foresee active involvement of experts and local residents. Joint work of external consultants and individuals, who understand the local context, enables the development of the efficient long-term strategy covering all phases of urban planning – from a general plan to more specific plans.

At the first stage a triple organisation structure was established to ensure the involvement of necessary experts or representatives of local communities with the most relevant experience and direct interest (Figure 3). The three main team types developing the SUMP Zhytomyr are as follows:

STEERING COMMITTEE – is a key project implementation group including key city decision makers, representatives of local "Integrated Urban Development in Ukraine" project office and international consultants. The Steering committee makes strategic decisions and monitors the SUMP development process.

FOCUS GROUP – representatives of the relevant city departments, academics, local experts, police and representatives of industry-specific public associations. The focus group is the main working format for the development of the plan. The group is flexible and can accommodate its structures to the needs of developing a particular section of the plan. The task of the group is to develop a framework for the plan, which should be based on the understanding of local needs, opportunities and vision of the future.

MOBILITY FORUM – is the widest group of participants. Its role is to maximise facilitate participation of the city's residents and professional associations. Forums are organised in the format of city-wide events (such as Maisternya mista Zhytomyr), every resident of Zhytomyr may contribute to the development of the plan, commenting on and specifying the concept submissions of the focus group.

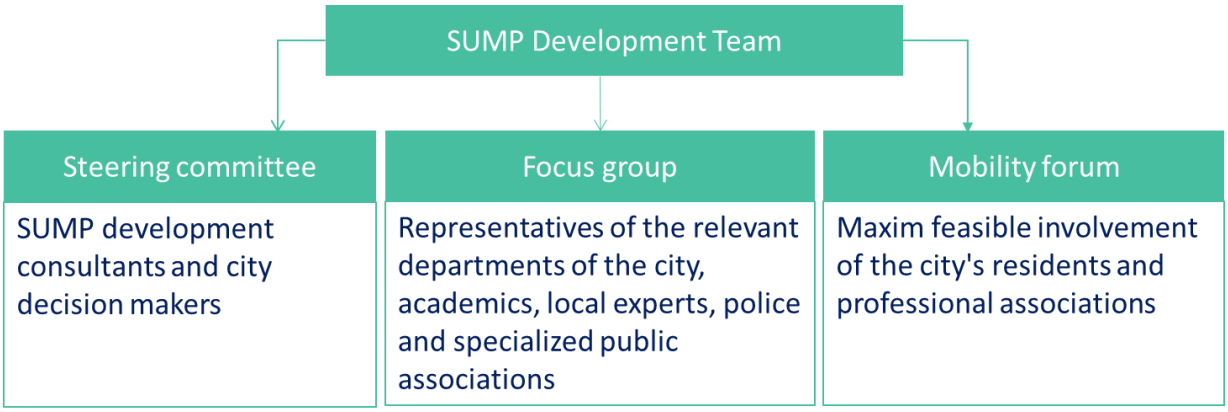


Figure 3. Organizational structure of SUMP development

The overall SUMP planning process in Zhytomyr included 6 stages.

STAGE 1 Determining the priorities of urban mobility

First of all, the priorities of urban mobility development were identified during discussions with key stakeholders. Priorities serve as a guideline for further processes and are the main focus areas for the improvement of mobility in Zhytomyr. The priorities are presented in Chapter 3.

STAGE 2 Diagnosis of the current state

According to the identified priorities, a diagnosis of the current state was performed, including the SWOT analysis of the system. At this stage, the road network, the public transport network, the corridors and directions of the largest passenger traffic and the state of infrastructure were analysed in detail. For the first time, a mobility study was conducted and travel behaviour of the city inhabitants were analysed.

STAGE 3 Formulating goals and performance indicators for urban mobility

At the third stage, each of the priorities was assigned a number of SMART goals, the achievement which is the main task of the plan. For each priority, three to six goals were identified. The achievement of set goals is the main precondition for the success of SUMP. In order to monitor the progress on their implementation, a set of key performance indicators (KPIs) has been developed, i.e. at least one KPI for each goal, as well as a system to monitor them. The goals of the sustainable mobility plan are presented in Chapter 5, SUMP Monitoring system in Chapter 10. Goals and KPIs were developed during workshops integrating different stakeholders important for the mobility in Zhytomyr.

STAGE 4 Complete list of measures

At the fourth stage, a comprehensive list of measures was developed, including various projects in the field of urban mobility. The complete list of measures was developed based on the set goas, city diagnosis s, expert discussions during working group meetings and analysis of city policies. The list of city documents analysed for this stage is presented in the Annex C. As a result a comprehensive database of mobility projects has been developed and combined into implementation scenarios. Description of the measures is presented in Chapter 6 followed by the list of particular projects aimed to contribute to the achievement of the goals of the city.

STAGE 5 Implementation Scenarios

At the fifth stage scenarios were developed that account for both natural demographic changes and city development strategies according to the Integrated Urban Development Plan. The scenarios assume four options of conditions that may occur and will affect the implementation of the abovementioned measures. Each scenario contains a combination of the projects developed at the previous stage. Depending on the scenario each project is evaluated regarding its priority for realisation and implementation period (5, 10 or 15 years). The scenarios were tested for qualitative and quantitate impacts. For quantitate analysis of the scenarios the transport model and analytical models were used.

STAGE 6 Implementation plan

The implementation plan is a list of measures to be implemented under each scenario within in the short run (5 years). Based on the tested scenarios, the implementation plan provides details of particular complex and interrelated activities.

Each measure is related to the goals of the SUMP and contains information on compliance with city programmes, type of measure (infrastructure, management and organisation, monitoring and data collection, capacity building, awareness and information).

Participation within the urban mobility planning in Zhytomyr

The development of the SUMP for the city of Zhytomyr takes place within the framework of the Project “Integrated Urban Development Project in Ukraine”. Primarily, the Integrated Urban Development Concept of Zhytomyr till 2030 was developed. The concept defines the key priorities for the city development. The SUMP is a strategic document of a lower-level, i.e. a sectoral plan meeting the strategic goal of the IUDC "Achievement of Sustainable Mobility in a Compact City". The key aspect of the development of Sustainable Urban Mobility Plans is the involvement of a wide range of stakeholders, ranging from the top city leaders, which form the strategic vision of urban mobility, to residents of specific city areas that are best informed about the shortcomings and benefits of mobility in their residence areas.

The most frequent forms of participation in the process of developing a mobility plan include thematic workshops, interdisciplinary working groups and individual interviews with experts. Local experts, city planners, police, representatives of civil society organisations and senior management of the city gathered together to determine the priorities of sustainable urban mobility, to set the targets and define indicators for achieving these targets. The list of participants and topics of the meetings are presented in Annex B.

The key platform to attract stakeholders and residents of Zhytomyr to the development of SUMP was the GIZ office in Zhytomyr as a place for meetings and holding discussions. A workshop organised during the “Maisternya Mista” event in Zhytomyr in June 2018provided additional opportunity to engage stakeholders and citizens.

Online communication and feedback collection took place across multiple channels:

- The website of the "Integrated urban development" project in Zhytomyr http://2030.zhitomir.ua/ became a discussion and dissemination platform.
- The website of the Zhytomyr City Council http://zt-rada.gov.ua/ informs residents about the outcomes of SUMP discussions.
- The Facebook page of the Integrated Urban Development in Ukraine www.facebook.com/insek.ua/ regularly provided the latest news on the development process and the decisions taken by the interdisciplinary groups.
- Within the framework of the project, an e-mail address was created in order to gather comments and proposals for strengthening the SUMP in Zhytomyr sump.zhytomyr@gmail.com

Figure 4. Participatory planning within SUMP development in Zhytomyr

Chapter 2 Priorities for Urban Mobility in Zhytomyr

The process of developing a Sustainable Urban Mobility Plan requires continuous consultation with key stakeholders. The first stage of participatory planning consisted of consultations and interviews with key parties to determine the most important strategic directions of the city development.

Based on the outcomes of the consultations, six priorities of sustainable urban development of Zhytomyr were identified, including:

1. Strengthening the Role of Public Transport

The availability of efficient public transport systems is one of the important indicators for city's performance and a development priority for many cities ensuring the accessibility of all areas of the city. The attractiveness of the public transport to the residents of Zhytomyr and the passenger satisfaction should be increased to ensure the mode shifting behaviour of private car users towards public transport.

2. Road Safety

Moving around the city should be convenient, comfortable and, of course, safe. The city of Zhytomyr faces important and urgent road safety challenges. The street and road network of the city of Zhytomyr should provide for high-quality public transport services and safer conditions for road users and movement of all residents.

3. Encourage to Walk

Conditions for pedestrians are directly associated with the quality of urban life. Urban residents must live in a safe, comfortable and attractive environment that takes into account their needs. A well-designed and organised urban space helps to increase the attractiveness for its residents. In the city of Zhytomyr comfortable and safe conditions for the free use of public space should be created. Walking routes should be safe and convenient, providing unimpeded access to the most important social infrastructure facilities of the city.

4. Cycling

The bicycle as a mode of transport becomes more popular on a daily basis because it is the fastest transport mode for distances less than 3 km ensuring time savings, and reduced congestion and, eventually, physical health. Popularisation of bicycles as the means of urban transport requires the creation and development of a comfortable and safe cycling infrastructure, which is an integral part of the modern city.

5. Parking Management

The level of motorisation in Zhytomyr is growing every year, which consequently, increases the load on the street and road network. Furthermore, cars parked on the roads and sidewalks become an obstacle to public transport and pedestrians. In this context, there is a need to organise the parking space, and create conditions for reducing the load on the street and road network of the city, and ensuring the free movement of pedestrians.

6. External Accessibility of Zhytomyr

The challenges of urban mobility and comfort include aspects of the accessibility of facilities outside the cities. For residents of the city it is important to have proper transport links with other cities, regional centres and transport hubs.

Chapter 3 Diagnosis of the City of Zhytomyr

General City Diagnosis

Zhytomyr is a city of regional importance with a population of 267 thousand inhabitants. The existing area of the city is 6083[3] hectares. The City is divided into 2 administrative areas: Bohunski and Koroliovski.

Among the main characteristics of the city it is important to highlight the unfavourable demographic situation due to low birth rate and high mortality. Thus, every year the population of the city decreases.

The general plan foresees an increase of 45.6% (2,773 hectares) in the urban area, which will determine the need to revise the city's routes to ensure an access to connected areas.

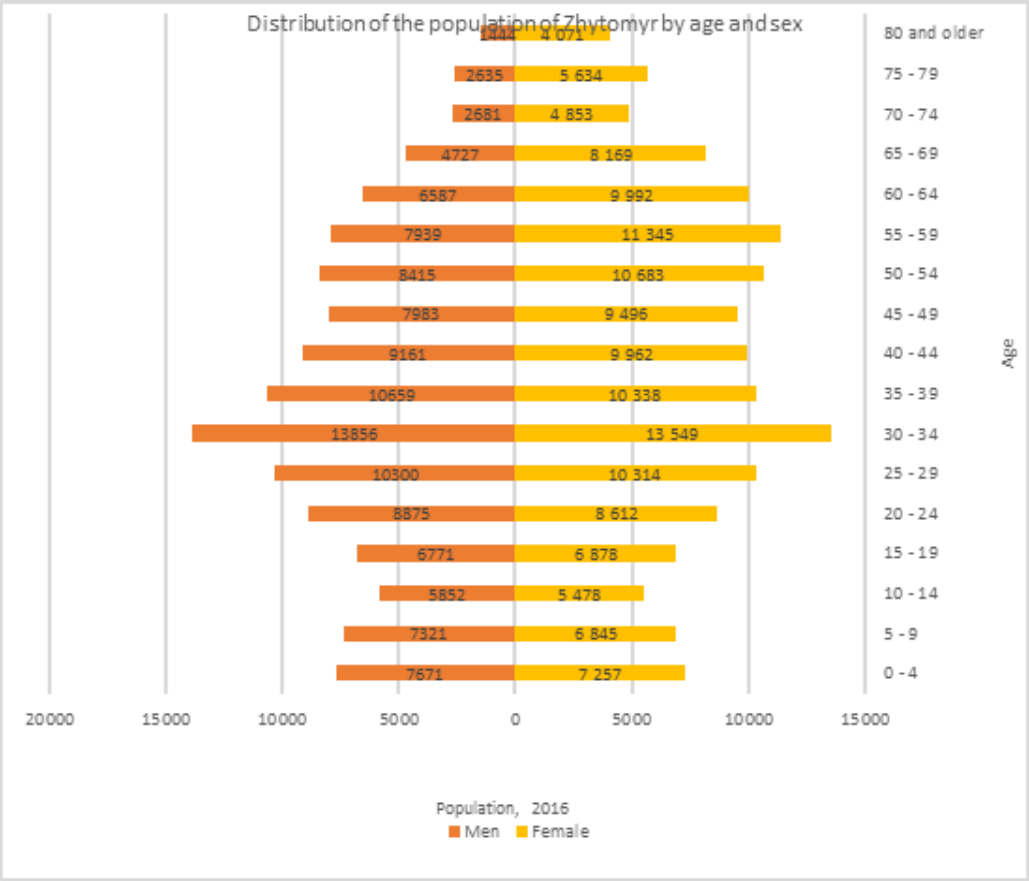


Figure 5. Distribution of the population in Zhytomyr by age and gender

Mobility of Zhytomyr

Mobility survey was carried out in May 2018 and provided a detailed picture of Zhytomyr citizens' transport behaviour.

Modal split by trips

The modal split was derived from the trips of the inhabitants within the city (Figure 6).The proportion of non-motorised (walking and cycling) and motorised travel (car and public transport) is 39 % and 61 %.

Public transport is the most often-used means of transport in Zhytomyr. The proportion of users of public transport is 46 %, but at the same time the share of walking in the city is very high, accounting for almost 38% of all journeys. The share of car users is relatively low. The percentage of male motorists is twice as high as the share of female users.

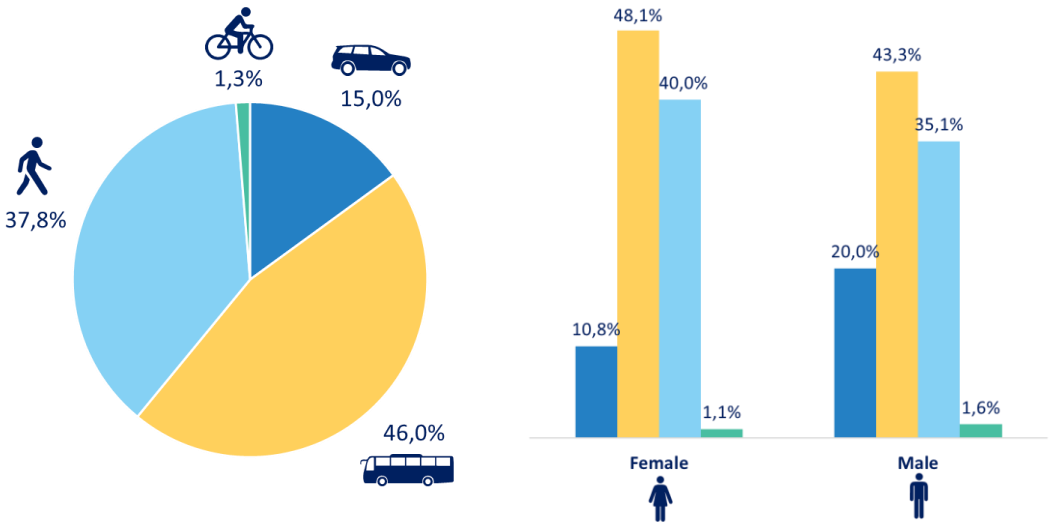
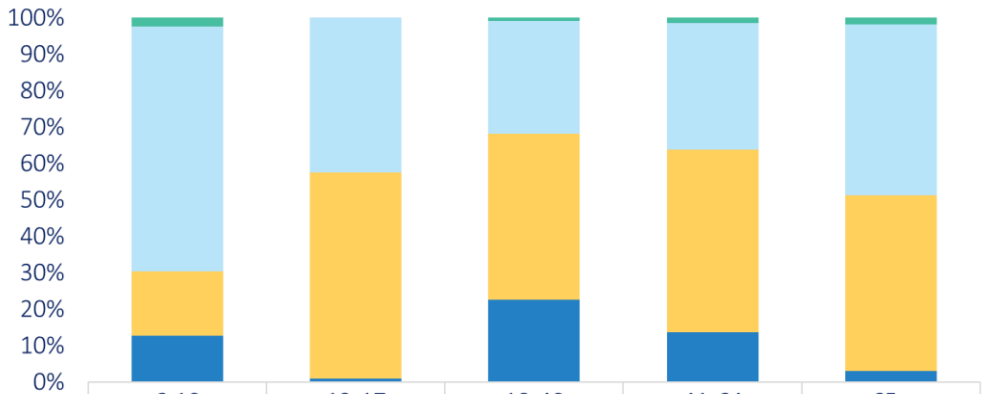


Figure 6. Modal split by trips

Figure 7 shows that the share of pedestrians and cyclists is the highest for the children up to 12 years. Public transport is most often used by adolescents and the share of car users is the highest for adults from 18 to 40 years old.



	6-12	13-17	18-40	41-64	65+
Bicycle	2,4%	0,0%	0,9%	1,4%	1,9%
Walking	67,3%	42,5%	30,9%	34,9%	46,9%
Public transport	17,6%	56,6%	45,6%	50,0%	48,1%
Car	12,7%	0,9%	22,6%	13,7%	3,1%

Figure 7. Mode choice by age

In comparison with German and Polish cities the number of trips per day in Zhytomyr is lower (Figure 8): the average number of trips per day reported is 2.3. Low mobility rate indicates that the vast majority of citizens carry out no more than two travels during the day. This indicator depends on the level of development of the transport system, economic and social factors.

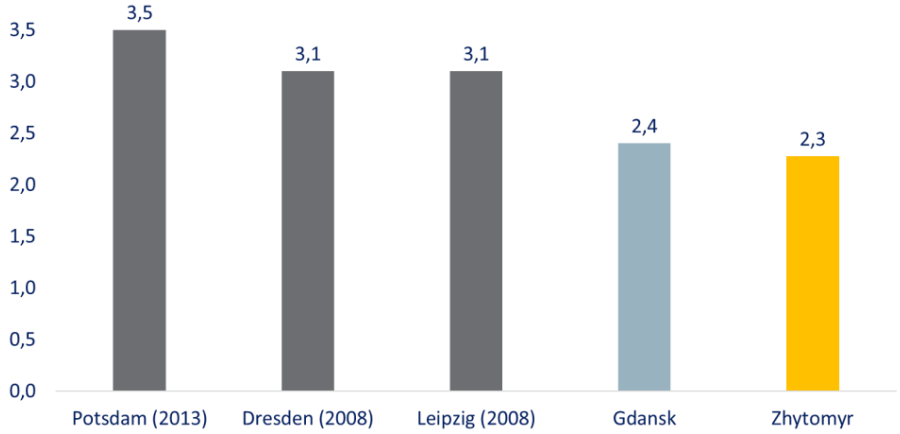


Figure 8. Average number of trips per day

Individual motorisation

The level of motorisation is determined by the number of vehicles per 1000 people. This indicator is determined by actually registered cars or by research results that is the actual ownership.

According to the police data, the motorisation rate was 311.5 cars/1000 inhabitants in 2014 and according to the results of the mobility survey conducted in 2018 – 116 cars/1000 inhabitants.

As for the results of the mobility survey 71.4 % of all households have no own vehicle, which is significantly higher than in Gdansk and German cities (Figure 9), and 26.1 % of the inhabitants own one car, which is also less in comparison with the mentioned European cities. Nowadays, there is a high risk of motorisation growth both in Zhytomyr and in other Ukrainian cities caused both by the improvement of economic situation and by the launch of the EU prohibition on diesel vehicles that has created a large flow of such vehicles to Ukraine.

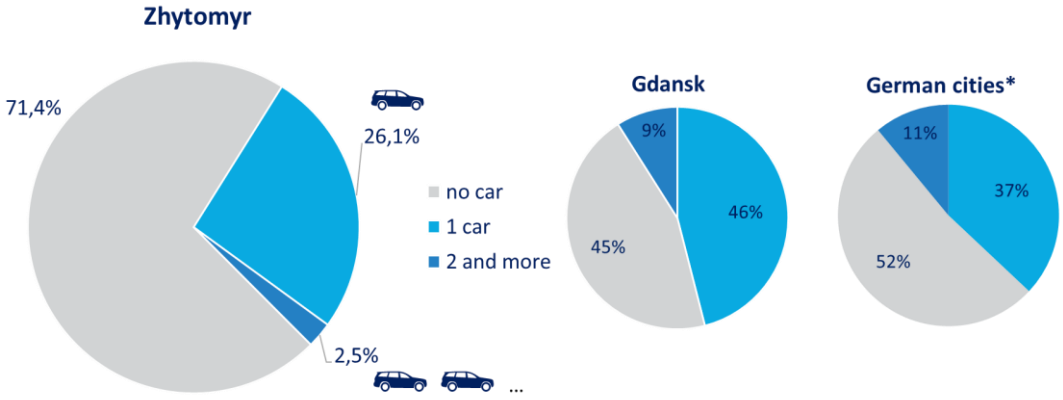


Figure 9. Motorisation with cars of households

*German cities are represented by the SrV-Städtepegel -a pool of East German cities of a size from approx. 80.000 -500.000 inhabitants from flat and hilly regions.

Among the motorists themselves, male drivers dominate, while among passengers female users dominate. (Figure 10).

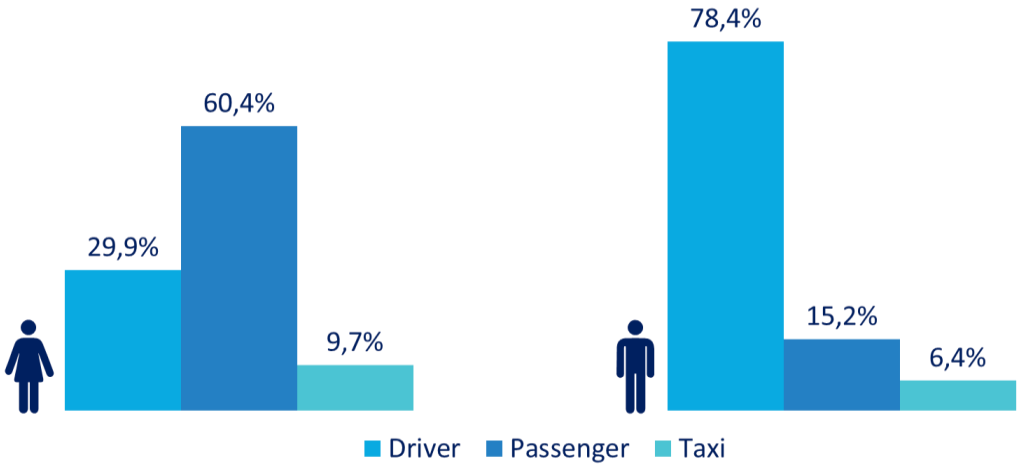
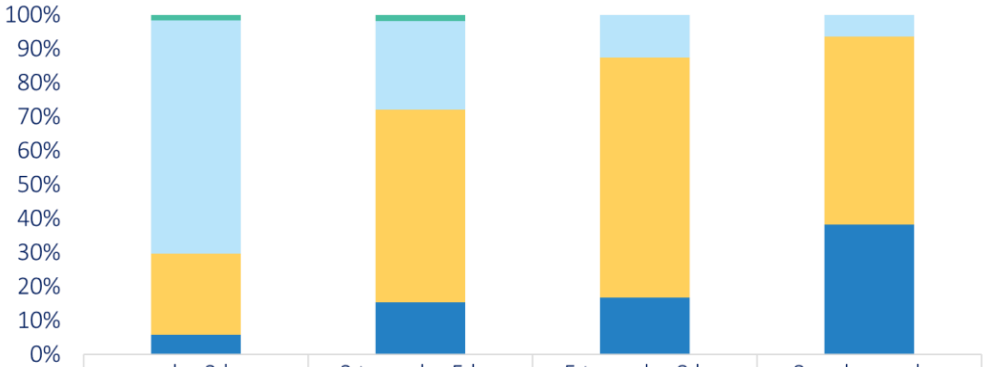


Figure 10. Categories of individual car users

Modal split by trip length

The figure below shows the modal split of inhabitants in Zhytomyr in four trip length classes (Figure 11). The share of car users increases with the increasing the trip length, while the share of walking simultaneously decreases. More than half of all trips from 2 and more km are carried out by public transport.

In general, riding under 6 km is very suitable for cycling; however, the share of cycling in Zhytomyr is very low. According to the mobility survey, the trips under 5 km are mainly carried out by motorised modes of transport; the share of public transport and car users is 56.6% and 15.6% respectively.



	under 2 km	2 to under 5 km	5 to under 8 km	8 and more km
Bicycle	1,7%	1,8%	0,0%	0,0%
Walking	68,7%	26,2%	12,7%	6,4%
Public transport	23,9%	56,6%	70,7%	55,5%
Car	5,7%	15,4%	16,7%	38,2%

Figure 11. Modal split by trip length

Modal split by purpose of trips

The graph below shows the modal split by the purpose of trips (Figure 12). For commuters, the share of public transport is the highest. For education purposes, walking and public transport are the most often-used modes of transport. The proportion of walking is the highest for shopping and leisure trips. Among all purposes the share of cycling is the highest for trips to work (1.7 %).

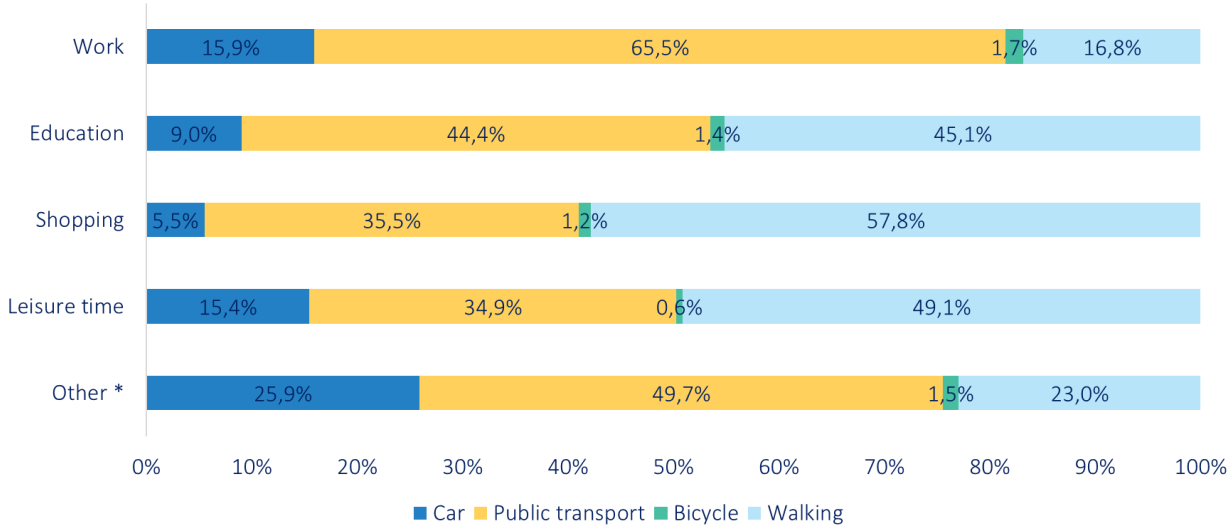


Figure 12. Modal split by purpose of trips

Figure 13 presents the comparison of purpose of trips in Zhytomyr with German and Polish cities. The share of trips for work and education, as well as leisure time activities is less in comparison with Gdansk and German cities. The share of trips for shopping is higher than in Gdansk but less than in German cities.

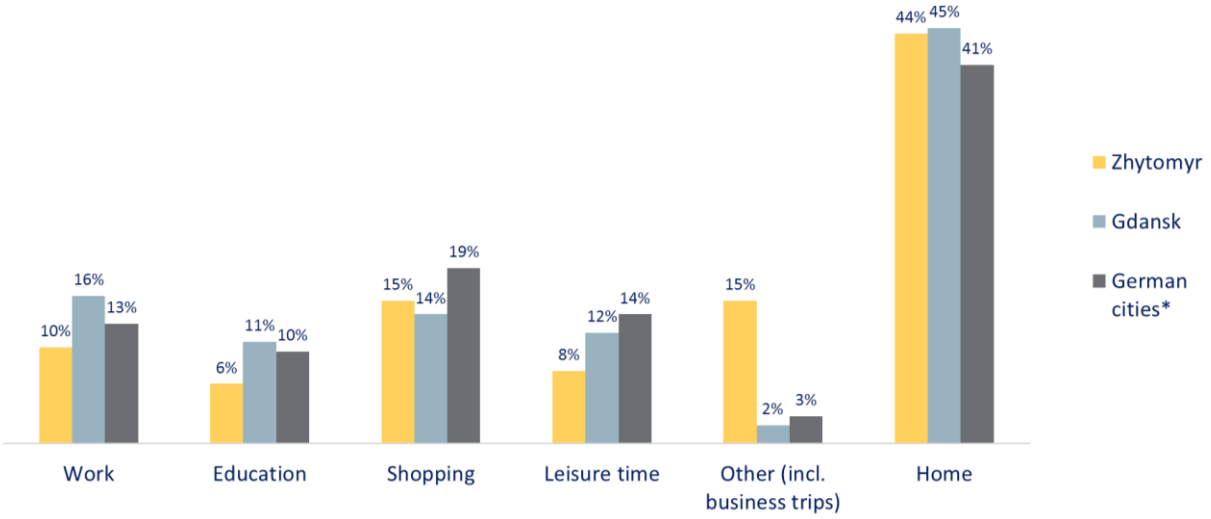


Figure 13. Purpose of trips in comparison to European cities

Public Transport System

Strengths

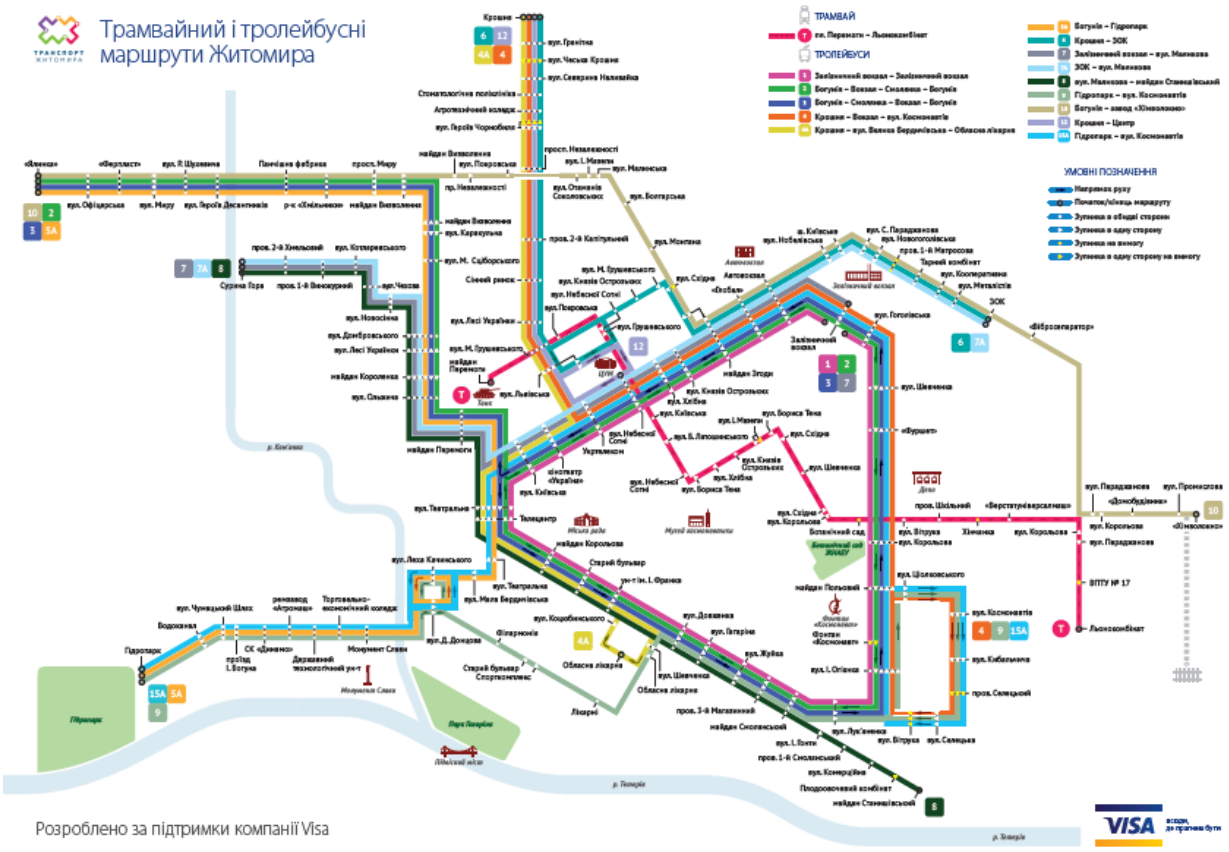


Figure 14. E-transport route network

An important element of Zhytomyr's public transport system is the presence of a developed urban electric transport, including 14 trolleybus and 1 tram route. There are 17 bus routes in Zhytomyr that are served by private operators and 2 municipal bus routes operated by the ME "ZhTTU" that were launched in June 2018 after the acquisition of 17 new MAZ buses.

Thus, 96.14 % of the population of the city of Zhytomyr live in the 500-meter zone of access to public transport (Figure 15). Started from June 2018, 5 night trolleybus lines are running connecting the Victory square and all micro districts of the city.

.

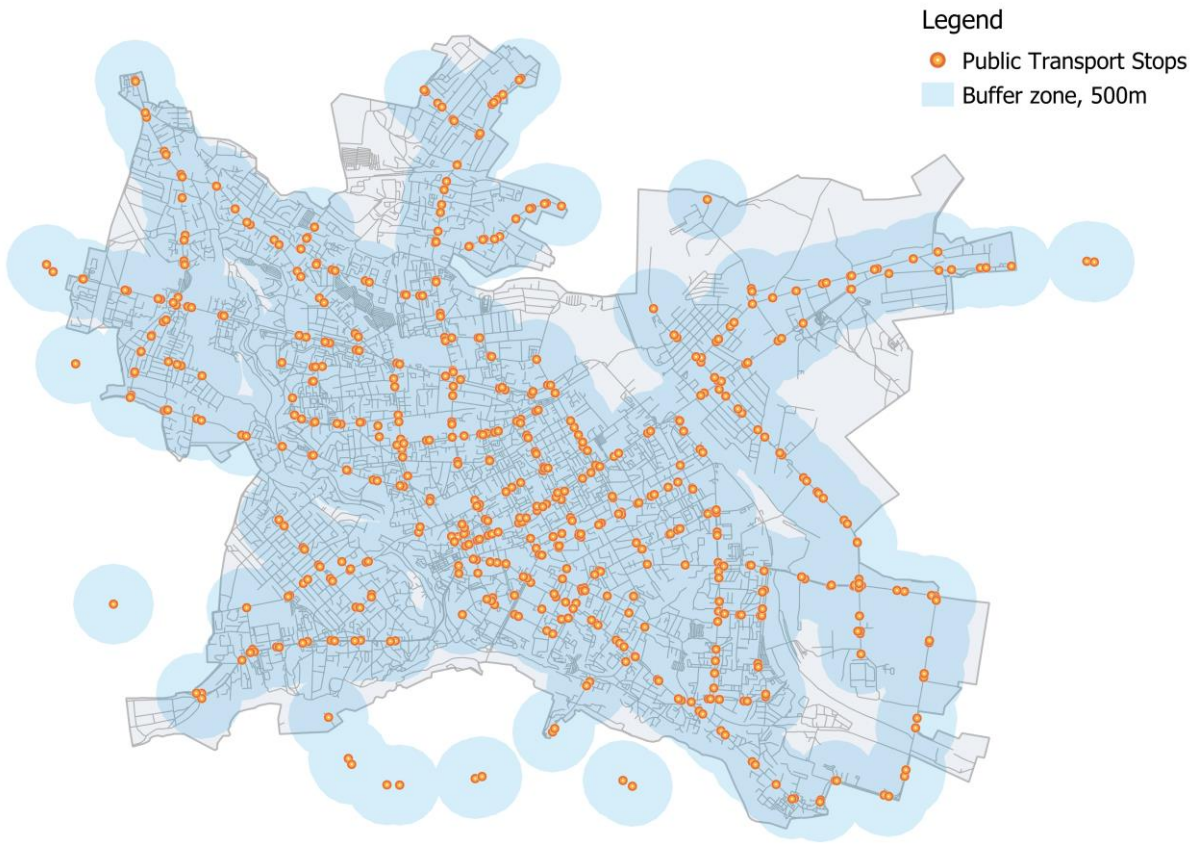


Figure 15. Zone of 500-meter public transport accessibility

According to the results of the mobility survey conducted in May 2018, women are more likely to prefer e-transport, while men prefer bus and marshrutkas (Figure 16). The following graphic shows the distribution of public transport among citizens.

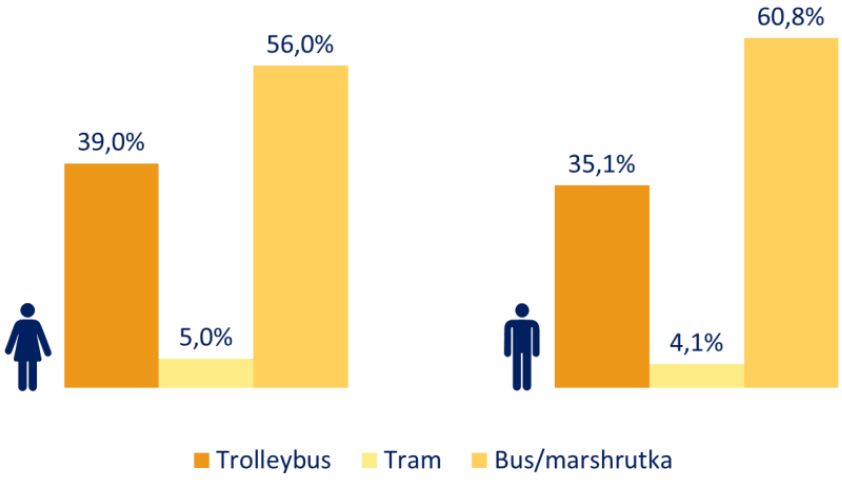


Figure 16. Modal split by public transport mode

Zhytomyr is one of the first cities in Ukraine to introduce the electronic ticket for public transport. Validators are installed on all electric means of transport.

On city public transport routes, Zhytomyr is available with a GPS-tracking system that allows to determine the online location of each vehicle using a web application or website. This GPS surveillance system in the city makes it possible to control the flow of municipal transport. The system of informing passengers in the city is also represented by installed electronic scoreboards for automatic prediction of public transport arrival time and stands with a schedule of trolleybuses at public transport stops.

As a result of passenger traffic flow survey the average daily transportation volume on bus routes is 130,846 passengers, on trolleybuses – 101,524 and trams - 24,174 passes. The figure below shows the passenger traffic flow on public transport systems (Figure 17).

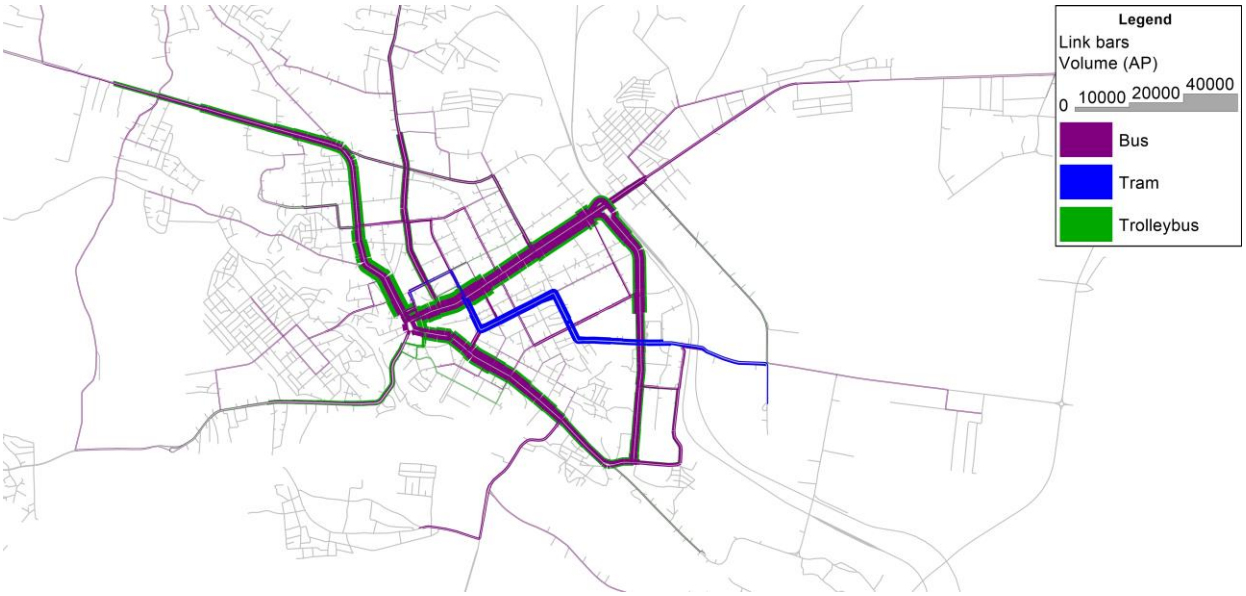


Figure 17. Passenger traffic intensity

The cost of travel in the city passenger public transport is 3.0 UAH on the city passenger electric transport and 5.0 UAH on the city bus routes.

The city has designated the promotion of preferential population groups during working hours on the urban e-transport routes, and on urban bus lines the preferred population of the public transport is set from 10:00 to 16:00.[4]

The transportation of citizens with reduced mobility is carried out by social Insurance Institution. People with disabilities have an opportunity to use the services no more than 5 times a month for particular trips to medical and governmental institutions.

Weaknesses

The fleet of public transport rolling stock needs to be updated. The average age of the trolleybus is 27.5 years, the tram is 32.5[5] years, while the standard period of operation is 10 and 15 years, respectively.

An important topic of the public transport system is the issue of the rational use of the rolling stock capacity on the city streets. During peak hours, public transport is overcrowded, as the hierarchy and the spatial layout of the route network do not meet the needs of the residents.

Only for urban traffic a high fee for travel through the e-ticket system is observed. The result is a very low proportion of payment through electronic ticketing system. Due to the e-ticket control system, the trip statistics of paying passengers is carried out only on the municipal transport. Data on the travel of privileged categories of the population on municipal and private transport are not recorded, but Zhytomyr citizen card is being implemented.

The city does not have a central control system for paying the public transport fare. Fines for using public transport without a ticket are channelled to the state budget rather. The GPS surveillance system in the city makes it possible to control the work of municipal transport, the control of private carriers in the city is absent.

Road Safety

Strengths

For the period 2015-2017, in the city of Zhytomyr a programme was set up for road and pedestrian safety. The programme has been approved for the time period of 2018 – 2020. During the 2015 – 2017 programme, a number of projects to improve the organisation of traffic safety were implemented. 16.2 % of traffic lights have been updated using LED lamps. About 19.5 thousand m2 of horizontal road markings were applied, but this satisfied the need to improve security only in the central streets of the city.

In 2017, 416 new speed reducers were purchased and 39 "speed bump" devices were installed. In 2018, a project to improve safety was implemented at the intersection of Klosovskoho and Malykova by raising the pedestrian crossing to the level of the sidewalk. In some parts of the city, hemispherical bullets are installed on the walkways to improve pedestrian safety.

In 2016, a pilot project to improve safety on unregulated crossings was implemented. Projects on the organisation of safety islands and lighting of subways have been developed in the Myru and Nezalezhnosti Prospects.

Due to the high rate of accidents in the city, there is a request of the population to increase the safety of traffic and residents. Therefore, an e-petition was launched to Zhytomyr city Council No. 2017-724 to 2017 "To install protective bollards and make stops and sidewalks safe", was formed reference to the Zhytomyr city Council to improve road safety regarding the installation of traffic signals, traffic signs and “lying policemen”.

Weaknesses

The implementation of a number of measures to improve road safety should lead to a decrease in road accidents, but the figures still remain high. Road markings are absent on a variety of secondary roads and alleys, where it is particularly important to replenish the markings.

It is worth noting that the inclusion of accidents in previous years does not allow for a qualitative analysis of the dynamics, since the reform of the law enforcement system was carried out in the period of 2015, including departments involved in the collection of statistical information on accidents in the city.

Since Zhytomyr has a convenient geographical location, high-speed routes of international and national importance pass through the city, where the organisation of road safety is extremely important. As statistics show, fatalities have been registered on the routes passing through the territory of the city. Fatal accidents occur along the output highways, where speed is higher, which is the factor most often affecting the severity of the accident.

In 2016, the Zhytomyr State Technological University carried out a study of vehicle speed and road safety monitoring. The study covered 14 points of vehicle speed monitoring in the city and the suburbs on the routes M-21, M-06, H-03 were allocated. As the analysis showed, the monitoring points of vehicle speed and the place of concentration of fatal road accidents for the period 2016 – 2017 coincide. The study revealed that about 80% of drivers exceeded the established speed limit.

The concentration of cases with injures as a result of road accidents has been observed in the central part of the city. Among the streets with a high level of accidents are Velyka Berdychivska, Kyivska, Peremohy, Pokrovska, Chudnivska, Kyivske highway, Myru and Nezalezhnosti Prospects.

There is a large number of cases of collision of the car with a pedestrian: about 40% of the accidents with victims falls on hitting a pedestrian. Cases of collisions with pedestrians are observed in the central part of the city on the following streets: Kyivska, Velyka Berdychivska, Peremohy and Pokrovska.

Places of occurrence of a road accident as a result of the collision with a pedestrian and a cyclist differ. Among the places of concentration of road accidents as a result of hitting a cyclist are the following streets: Myru Prospect, Peremohy St., Nezalezhnosti Prospect, Kyivska St. and Zhuiko St. (Figure 18).

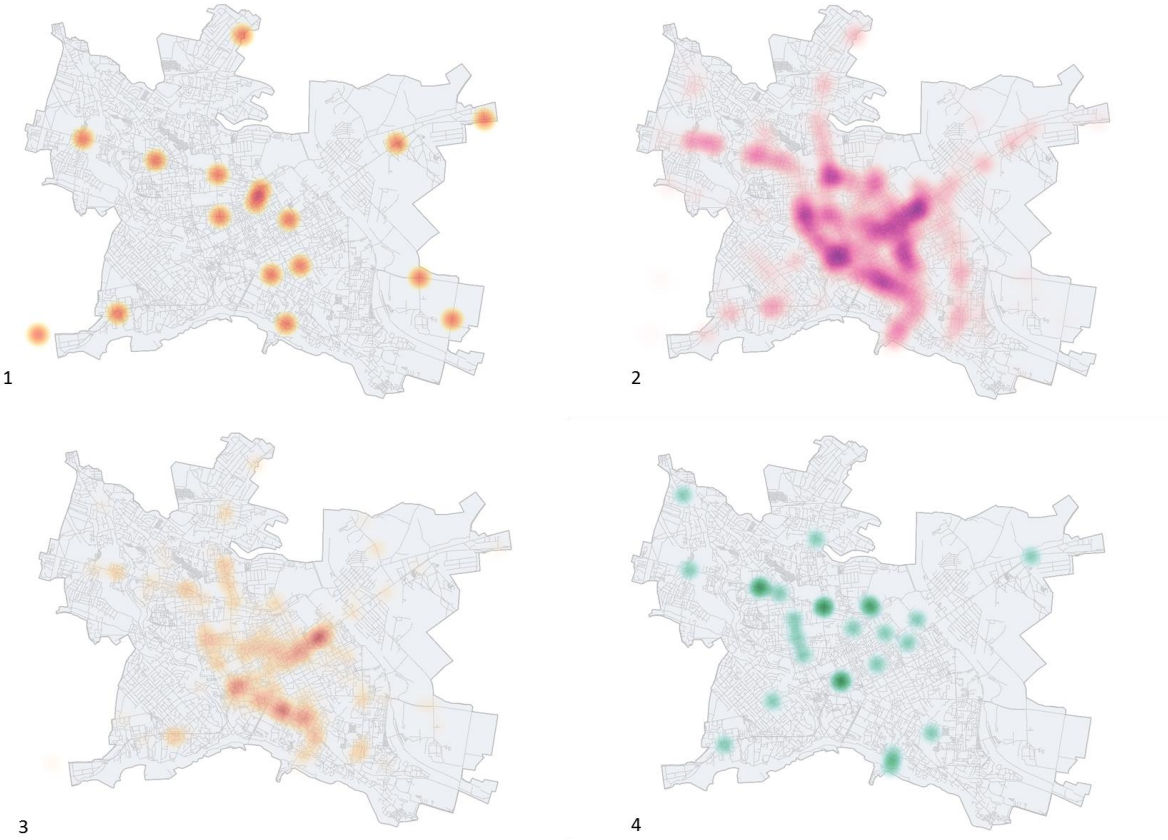


Figure 18. Heat map of the places of road accidents: 1 - with fatal accidents; 2 – with injuries; 3 – with head-on-crash with pedestrian; 4 – head-on-crash with cyclists

Walking

Strengths

The city Zhytomyr has a compact space structure with wide streets and many lawns. The city has 4 cultural and recreational parks, 8 landscape parks, 1 memorial and about 30 squares and boulevards[3], a pedestrian bridge is built over the Teteriv river in the Park named after Shoduar.

In Mykhailivska Street, there is a pedestrian zone with a length of 370 m. In addition to the existing zones, further pedestrian zones with the length of 700 m, Lyatoshynskoho str – 400 m, Novyi Boulevard St. – 350 m, Staryi Boulevard St. - 650 m and Starovilska St. – 550 m are planned[3]. The general plan also provides the reconstruction of the main square of the city, Koroliova square.

Weaknesses

The city of Zhytomyr has a problem of narrow pedestrian walkways, which are common in residential areas. Most traffic lights have no sound equipment. The street lighting focuses only on roads, which leads to insufficient lighting on the sidewalks. Marked crosswalks have no contrasting markings. The road network repair plan does not provide for the targeted repair of sidewalks and roadsides.

The city's pedestrian infrastructure has to be improved to meet the needs of people with reduced mobility. The vast majority of public spaces are not equipped with ramps and call buttons, and the existing pedestrian infrastructure does not meet the required standards for people with reduced mobility.

Some roads are uncomfortable and do not provide adequate security. As mentioned above, about 40% of traffic accidents involve pedestrians.

Cycling

Strengths

The planning structure of the city is characterised by compactness, short distances for trips. The city of Zhytomyr is dominated by plain relief, the slopes of the surface of the vast part of the city do not exceed 8-10%[3], which implies a significant potential for the development of cycling.–The Teteriv river passing through a large part of the city provides opportunities for the development of recreational and tourist cycling infrastructure.

Zhytomyr is situated on the route of Eurovelo, and is a member of the "Eurovelo in Ukraine". As part of the participation budget, a bike path was opened near the Kamianka river. The residents have a demand for the bicycle infrastructure and the petition with a request for the construction of bicycle paths gained the necessary number of votes and was considered by the City Council [6].

The city has 3 locations of bike rental: Hydro Park with a number of 25 bikes, the shop Hora -20 bikes and Internet rental-about 10 bikes[7]. The City actively installs parking racks for bicycles. In total, there are 76 bicycle parking places with different number of parking spaces in the city. The city is promoting bicycle use among young people. That is, most higher education institutions have established cycling parking racks and continue to develop cycling parking spaces near schools.

According to the mobility survey held in 2018, the percentage of cycling in the total number of trips in the city of Zhytomyr is 1.3%. According to the results of the mobility survey conducted with the use of the

Modalyzer application, the greatest number of bicycle trips was recorded on the following streets: Kyivska, Velyka Berdychivska, Pokrovska, 3d Chudnivskyi lane and Khlibna street.

In Zhytomyr, s a social organisation "VeloZhytomyr" promotes the bicycle as a mode of transport among the population.

Weaknesses

The city has not developed a sound strategy for the development and promotion of cycling. In 2017, the City Administration opened a position of Cycling Coordinator; however, the position has been vacant since 2018.

Despite the existing potential for cycling, the quality of the cycling infrastructure is not adequate. There is only one bicycle track with the length of 400 m. According to the assessment of the VeloZhytomyr community representatives, there is a high level of bicycle thefts in the city. In accordance with the police data, 234 statements on bicycle thefts were registered in 2016, 211 – In 2017 and 117 statements as of December 2018.

Parking Management

Strengths

In order to arrange parking in the central part of the city, the parking is partially prohibited and a navigation system to parking areas has been arranged on the central streets Kyivska and Velyka Berdychivska. Columns are installed in order to control the parking on the sidewalks, bollards are installed to restrict the traffic at the entrance to Mykhailivska Street. During 2017, special columns and "hemispherical balls"[8] for installation along the central roads were purchased.

The need to create parking spaces in the city centre and at the entrance to the city is under discussion. The possibility of introducing a parking control system as a municipal service and paid parking system is also being discussed.

In the field of parking space management, new opportunities for the city at the national level are opening up. The Verkhovna Rada of Ukraine adopted the law "On amendments to some legislative acts of Ukraine on reforming the sphere of parking of vehicles", according to which local authorities will have the right to create services of parking inspectors, and funds for payment of parking services will be transferred to local budgets.

Weaknesses

In general, the parking space in the city does not respond to the needs and the demand in the residential areas. The city centre is overloaded by individual transport. Parking of vehicles on the roadway creates obstacle and limits the movement of public transport, especially electro mobility.

Management of parking space in the city Zhytomyr is limited to passports for parking areas with road markings, road signs regulating parking, with a certain number of parking spaces and the place of installation of parking meters. According to passports in the central part of the city 1500 Parking spaces are defined.

The legal capacity of the city government is limited in terms of monitoring the implementation of parking regulations. The control over the implementation of parking bans is rather low, and the parking payment system has not been installed yet.

External accessibility of Zhytomyr

Strengths

The city of Zhytomyr has a favourable geographical location: Zhytomyr is a major transport hub of Ukraine. The distance from Zhytomyr to Kyiv is 131 km of roads.

Zhytomyr connects Kyiv and Lviv by road of international importance M06, also on the territory of the city there are roads connecting Warsaw and Kyiv, Minsk and Izmail. Furthermore, two promising international road corridors, i.e. "Europe – Asia" and the "Crete №3", pass through the city.

Suburban and intercity passenger services include 2 bus stations, 1 railway station and the airport[3]. The bus connection with the Ukrainian cities and abroad is well-developed.

The city's General plan envisages the establishment of bus stops on the main access roads of the city: Chudnivska, Pokrovska, Velyka Berdychivska, etc. and Myru Prospect[3]. It is planned to reconstruct the bus station on the Kyivska street, which in the future will serve only for long-distance and international trips.

The General plan of the Zhytomyr City for the period up to 2035 also provides for the establishment of a bus station near the airport. According to the General plan, it is envisaged to reconstruct the existing airport "Zhytomyr", i.e. the airport facilities and the runway.

Weaknesses

In the city Zhytomyr, many suburban routes pass through the Central streets of the city, which leads to congestions in the centre. As a junction station of Korosten Directorate of the South-Western railway, Zhytomyr has a low availability of passenger railway transport with other cities, especially with Kyiv. Regarding air services, as for 2018 there are no regular flights, and the airport does not operate as a passenger or cargo hub. The connection with other regional centres and regions is mainly possible only by road transport and interurban buses.

Existing participatory processes

SUMP development for the city of Zhytomyr takes place within the framework of the Project “Integrated Urban Development Project in Ukraine”. Primarily, the Integrated Urban Development Concept of Zhytomyr till 2030 was developed to define the key priorities of the city development. The SUMP is a strategic document of a lower-level; it is a sectoral plan that meets the strategic goal of the IUDC "Achievement of Sustainable Mobility in a Compact City".

Activities realised by GIZ project of Integrated Urban Planning

- Urban-cultural festival "Maisternya mista Zhytomyr"

Every year, since 2016, in the city of Zhytomyr is held urban-cultural festival "Maisternya mista", which aims, first of all, to encourage the residents to actively contribute to the sustainable development of the city. This platform brings together the city government, public organisations and socially active residents

to facilitate stakeholder communication.

- First Transport Forum

On March 1, 2016, the first transport forum was held in Zhytomyr. During the forum, the main problems of the city's transport system were discussed, and the concept of the programme of the transport and public space of the city was introduced to the residents.

- Second Urban Mobility Forum

On 31 of October 2017, the local administration together with the local “Integrated Urban Development in Ukraine” project office held a second Urban Mobility Forum. The forum gathered important transport sector stakeholders of the city. During the forum the current transport vision of the city was presented, and the main challenges of the transport system were summarised. Also the SWOT analysis and issues related to the development of transport were presented. The groups discussed important topics identified during workshops, e.g. development of the tram network and relocation of suburban bus station from downtown area. The results of the transport forum were considered during the analysis of the current state.

- First Forum on the Integrated Urban Development

On November 26, 2016, the First forum "Integrated urban development of Zhytomyr" was held. The forum discussed the strengths and weaknesses of the city, as well as threats and prospects for its further development. The residents had the opportunity to discuss and comment on the analysis of the leading sectors and priorities development of the city. The forum promotes a dialogue between the local authorities and residents of Zhytomyr.

- Second Forum on the Integrated Urban Development

On September 11, 2017, the Second forum "Integrated urban development of Zhytomyr" was held with the aim to establish the dialogue between the authorities and residents. The forum discussed the priority directions of the development of the city, the presentation of developments of the project "Integrated development of cities in Ukraine". The participants had the opportunity to work on the strategic goals of the priorities for the development of Zhytomyr until 2030.

- Third Forum on the Integrated Urban Development

The Third forum on the Integrated Urban Development was held on December 1, 2017. The forum was organised in two parts. During the first part participants discussed the methodology and developments of the project "Integrated urban development in Ukraine" in Zhytomyr. The second part of the forum was devoted to work on projects for the development of Zhytomyr until 2030. The participants developed about 250 projects, part of which was included in the Concept of the Integrated Urban Development of Zhytomyr till 2030.

SWOT

STRENGTHS

- The compact spatial structure of the urban bas-relief creates good conditions for the development of cycling and walking paths.
- The system of electronic ticket in public transport has been introduced, and public transport networks monitoring system has been launched.
- Strong market position of the public transport system in terms of network coverage and accessibility.
- Urban electric transport without emissions into the atmosphere.
- Some measures have been implemented to improve pedestrian safety, and positive cases have been created to follow.
- The pedestrian zone on Mykhailivska St and the potential of expanding the pedestrian space.
- Activities to promote the development of cycling and cycling routes.

WEAKNESSES

- Lack of parking, in particular, in the city centre and in the adjacent areas.
- Lack of a parking space management system and a strategy development for the parking space arrangement.
- Lack of a centralised system of fare payment control in public transport, particularly, in the field of private transport.
- Lack of a centralised system for data collection and insufficient monitoring of processes related to mobility and road safety.
- Municipal and private transport services are not coordinated: namely, non-synchronised schedules, non-integrated fares, duplicated routes, etc.
- Municipal transport is unprofitable and has additional financial burden on the city budget.
- Lack of strategy development for cycling promotion and development.
- Outdated rolling stock fleet and infrastructure.
- Low level of traffic safety, in particular, on the following streets: Velyka Berdychivska, Kyivska, Peremohy, Pokrovska, Chudnivska, Kyivske highway, Myru and Nezaleznosti Prospects.
- Low public transport and walking accessibility for people with physical disabilities.
- Limited railway connection with other regions of Ukraine, particularly, with Kyiv.
- Zhytomyr airport is not functioning.

OPPORTUNITIES

- Reorganising the route network and increasing the number of rolling stock can improve the comfort and attractiveness of public transport.
- Attracting funds from International Financial Institutions in order to improve the quality of public transport infrastructure.
- Use of road restraints to reduce traffic and increase road safety.

- Reduced transit traffic can increase road safety.
- Development of the cultural heritage and pedestrian areas in the central part of the city.
- Improving the quality of existing pedestrian infrastructure to promote active mobility.
- Promotion and development of cycling.
- The new law on Parking came into force in September 2018 and opens up opportunities for local authorities, e.g. the introduction of a Parking space management system in the city.
- The renewal of state norms in the field of construction, repair and reconstruction of streets will allow for designing safer streets and more efficient use of street space.

THREATS

- A blurred legal environment in the field of road safety control can decrease the effectiveness of measures implementation.
- Low level of political and social perception of changes towards transport sector development.
- Financial / budgetary constraints.
- Continued development of individual motorisation.
- The current national legislation does not enable the city to monitor the speed compliance or carry out reconstruction works to eliminate emergency areas of streets.
- Negative population growth can lead to a reduction in the profitability of public transport.
- Limited improvement of the external interface of the city, both railway and air transport.

Chapter 4 Goals for Sustainable Urban Mobility Development in the City of Zhytomyr

Each of the Sustainable Urban Mobility Plan priorities of the city of Zhytomyr is specified in a number of goals aimed at improving its current situation.

PRIORITY 1.
Strengthening the role of public transport

Goal 1.1 Improving the quality of public transport passenger service

Creation of a high-quality, efficient and passenger-friendly public transport system is the key element in urban development. The experience of public transport users in terms of comfort, convenience and safety is important in determining and meeting their demand, thus, increasing the level of their satisfaction with public transport services.

Improving the quality of public transport services implies reliable operation, punctuality and reliability of public transport vehicles, shorter headways, reduced journey time and accessibility for all users, especially for people with disabilities.

The city of Zhytomyr strives to achieve the European standards for the public passenger transport and defines the quality of public transport as:

AVAILABLE for all the residents of Zhytomyr with reasonable wait time, including at night.

ACCESSIBLE for all mobility groups, in particular, for people with disabilities, through the adequate design of the vehicle and public stops.

The systematic provision of **INFORMATION** about the public passenger transport system to assist the planning and execution of journeys.

Public transport is efficient in terms of **TIME**, including travel time, access to and waiting at transit stop point time.

The **COMFORT** level of public transport services provision to make passenger transport journeys relaxing and pleasant.

Delivering a high level of **SAFETY** by ensuring a sense of personal protection of every passenger both inside the vehicle and within the transport network.

Minimising the **ENVIRONMENTAL IMPACT** from public passenger transport service provision.

Achieving high quality of public transport is a top priority and the main goal for mobility in Zhytomyr.

Goal 1.2 The use of more environmentally friendly vehicles

Using greener vehicles reduces the negative impact on people and the environment. Transport is one of the biggest sources of pollutants affecting human health, the environment and the economy.

The older the fleet, the more harmful air pollutants are released into the environment. Moving to greener vehicles is an effective way to reduce carbon footprints and reduce traffic pollution.

One of the city's key environmental goals is to improve air quality, reduce greenhouse gas emissions and increase energy efficiency. Therefore, switching to environmentally friendly vehicles will have a sustainable positive impact on the environment, people and the air quality.

Goal 1.3 Integration of public transport into one integrated system

The transport system must be convenient and efficient for users. The integration of public transport services and modes in a city or a region contributes to the provision of attractive and user friendly mobility services. The core elements of integrated public transport are the following:

- It meets on the needs of consumers;
- Enables easy and accessible transfers across modes and routes through integrated transfer stations and improved node design;
- Offers an integrated tariff and ticketing system;
- Integrated passenger information and travel planning services;
- Coordinated schedules;
- and real-time information systems.

The integration of public transport does not mean the monopolisation of transport, but rather the establishment of public transport alliances at urban or regional level, which ensures the provision of coordinated transport services at a high level, while allowing individual operators to maintain their independent status.

A unified management system of public transport in Zhytomyr would mean that the city will monitor and coordinate operations, simplify traffic, optimise the public transport network, improve transport services and increase efficiency, etc.

Goal 1.4 Enhancing the financial efficiency of public transport

Financial efficiency of public transport represents the viability of the public transport system in terms of the operational and maintenance aspects by assessing the functional performance of the system against revenues. Financial efficiency shows the profitability of the system. There are 3 main components helping to measure the level of the efficiency of public transport: operational and maintenance expenditures, capital expenditures over the entire life-cycle of the vehicles, and revenues.

The key indicator of the financial performance and system viability is a fare box recovery ratio; it is the fraction of operation expenses, which are met by the fares paid by passengers. The ridership is an important factor affecting system's efficiency. Therefore, it is directly related to the social and urban aspects, e.g. the level of services, city coverage, network development, and has a significant impact on the daily ridership. Additionally, one of the key elements of the improvement of public transport efficiency is the balanced tariff structure, effective fare collection and monitoring mechanism (for example, e-ticketing system) and enforcement tools.

The operational and maintenance expenditures are directly depended on the appropriate public transport system management, well-organised network, efficient management of main assets and timely maintained vehicles. Therefore, the capital expenditures are efficient if newly assets are aimed to save operational costs, increase the level of services and make public transport more attractive.

Furthermore, public transport should be financed not only by fare revenues; other revenue sources, e.g. advertisement, rent of the assets, additional transportation services, etc., should be made available. These measures help to diversify the revenue sources and increase the profitability of the system.

The public transport system management requires an integrated approach, taking into account all external and internal factors, and aimed at strengthening the public transport system, its financial sustainability and quality of services.

Goal 1.5 Prioritisation of public transport in traffic

Almost 46% of daily journeys are made by public transport, and 12% of the trips are made by car. This means that 12% of users are causing traffic congestion, with almost half of them having to deal with the consequences.

Introducing the priority of public transport is one of the most effective ways of creating a modern, attractive, efficient and user-friendly public transport system. In response to the increasing volume of traffic on the city streets, it is important to give priority to public transport, which serves the users and ensures more efficient use of the public space. Driving on dedicated lanes ensures that public transport does not depend on general traffic and adheres to the schedule, which increases its reliability.

Prioritising public transport through application of customised traffic lights provides helps reduce the orbital period of a vehicle, which in turn increases the PT's movement frequency or reduces the number of required vehicles. The UK experience shows that bus lanes on a 10 km long clogged route can reduce bus travel times by as much as 7 to 9 minutes.

The prioritisation of public transport enables to achieve a better quality of public transport services and contributes to a more efficient use of public space and public resources.

PRIORITY 2.
Road safety

Goal 2.1 Enhancing the safety of vulnerable road users

Vulnerable road users are those “who are more susceptible to severe injury or death when involved in a traffic crash and who are not protected by the vehicle shell”. According to the Road Safety Report of World Health Organisation these are pedestrians, cyclists, and motorcyclists, as well as children and elderly people..

Traffic accidents may cause not only injuries or death of individuals but also the economic loss for the society. Moreover, traffic accidents decrease mobility and travel opportunities for socially disadvantaged and vulnerable groups. That is why protecting the most vulnerable users is a reasonable goal for each city.

We advocate for alternative mobility patterns and expect an increase in the share of pedestrians and cyclists in the modal split. Also, the issues of public transport safety need to be urgently addressed.

Goal 2.2 Mortality reduction on roads

According to the World Health Organisation, road accidents are the cause No. 1 for people deaths between the ages of 15 and 29. People in this category are in the risk group, they are gainfully employed population of the city and are the major city's labour force. The increase in mortality of people aged 15-19 years old reduces the reproductive function of the population, thereby reducing the natural increase.

The value of human life is too high to be easily lost in an avoidable traffic accident. Every citizen has the right to live and stay in good health for the upcoming journey.

By 2030, there should be no fatal accidents in the city of Zhytomyr. This shall be achieved through a number of hard and soft measures. Human life has the highest priority for Zhytomyr. Therefore, the city sets the goal to protect all lives in the best possible way.

Goal 2.3 Improvement of road safety awareness among the citizens

Recognising the problem is the first step to the solution. Every citizen of Zhytomyr may be affected by an unsafe traffic environment. The city of Zhytomyr aims to increase the attention of the target groups and user groups to traffic safety.

Road safety is about protecting yourself from an accident. Education and awareness raising activities, such as road safety campaigns, road safety information days and public relations programmes, continue to influence the attitudes and behaviours of all road users. The education of children and young people as future road users and drivers is a special concern of the city Zhytomyr.

The introduction of safety plans for schools shall help improve understanding of road safety among young people, and ultimately, make traffic safer.

In any case, the road safety education should not be seen as an instrument for the victimisation and shifting the responsibility to victims of traffic accidents. Rather, road safety education and advocacy should be considered as a support in mechanism aimed to ensure that all possible measures have been taken to save people's lives.

PRIORITY 3.
Encourage people to walk

Goal 3.1 Providing qualitative pedestrian infrastructure appropriate for moving of people with reduced mobility

Walking is an essential part of daily mobility. Walking infrastructure should provide high-quality walking environment. Pedestrian crossings and other facilities should be accessible for all citizens, as well as for people with disabilities. Users' perceptions are shaped by safety, convenience, crossing time, accessibility and personal security aspects.

Qualitative pedestrian infrastructure in the city of Zhytomyr means that pedestrian networks should be:

- Connected and Permeable

To be useful, sidewalks and pedestrian crossings must offer a continuous clear path. Even short stretches of sidewalks that are unpaved, uneven, obstructed, or that end abruptly, disincentives walking and create serious barriers for wheelchair users.

- Accessible and Comfortable

All streets should be universally accessible, accommodate different walking speeds, and be convenient for all users. Pay particular attention to the needs of children, the elderly, and people with disabilities.

- Safe

Pedestrian spaces must be safe for all users at different times of the day. They should be well-lit, provide accessible slopes and gradients, be free of obstructions, and ensure surveillance and crime prevention.

Intersections are critical nodes in a network, where pedestrians are exposed to the highest risk of fatality and injury. Provide visible, clear, short, and direct crossings at intersections. Crossings should always be marked, and when possible raised, for increased safety.

- Relevant to Context

Pedestrian networks should be engaging and interesting, and should provide comfortable walk. It should be relevant to the topography of the area and consider historical identity.

Providing qualitative walking infrastructure in the city of Zhytomyr means providing a basic human right for movement and increasing overall inclusivity and fairness for all residents.

Goal 3.2 Development of the green corridors system for pedestrian walking around the city

The quality of life in urban areas is increasingly becoming a competitive factor for a city. The sustainable urban environment is the key factor to ensure a high life quality in the city.

Everyone, wherever they live, should have accessible natural greenspace for at least 2 hectares in size within no more than 300 meters (5 minutes' walk) from home; and at least one accessible 20-hectare site within 2 kilometre of home.

The green corridor network is a public space that connects the entire city and provides alternative walking and cycling routes and comfortable movement, thus, enhancing the interaction of citizens with the nature, and supporting the environmental sustainability of the city. Apart from the provision of alternative to usual modes of travel, green corridor network also increases the attractiveness and liveability of cities, and expands the opportunities for urban recreation.

In terms of urban sustainability, green corridors have environmental, economic, recreational and transportation benefits including enhanced environmental quality, limitation of urban growth, development of tourism, increase of the value of real-estate property, provision of scenic routes for walking and cycling, promoting non-motorised transportation, contributing to healthier lifestyle, improvement of the quality of life, reduction of flood hazard, bank erosion and downstream sedimentation, etc.

Zhytomyr is willing to develop a green corridor system, thus, enhancing its walking infrastructure and increasing the quality of life for its residents.

Goal 3.3 Development of pedestrian spaces and improvement of the quality of public space

Public spaces are areas that are open to all residents in public areas and are intended for public use. Public spaces should be accessible to all citizens - there are no physical and psychological barriers. These are streets, squares, parks, embankments, open spaces, squares, etc. Public spaces are not private and commercial spaces, they are managed and administered by the City Council or other public bodies.

A well-designed and functioning public space with good accessibility for all is crucial for the city's identity. Public spaces provide a public utility and recreational function, as well as opportunities for walking, going out, sitting, playing, socialising, observing the world, etc., and are accessible, isolated, safe, and free to use, accessible, convenient and comfortable. A high-quality public space should ensure an urban environment that offers opportunities to all citizens.

The city of Zhytomyr stands for the development of an accessible, comfortable and pleasant urban environment that meets the needs of the population and provides the opportunity to walk from the starting point of the journey to the destination, protects people from crime and traffic, determines the priority of pedestrian traffic and minimises physical discomfort while walking.

Goal 3.4 Raising public awareness of opportunities and the motivation to walk

Information is a key element in making the travel decisions. The provision of relevant information provides an easy access to different city destinations.

The behaviour of citizens is influenced by public awareness. Public awareness is important to provide the citizens and visitors of Zhytomyr with the information on travel and leisure options.

Raising public awareness of the opportunities the city provides makes the urban environment more accessible to the public. This leads to an increase in the share of pedestrian traffic, which is influenced by both available options and the quality of services provided.

The city of Zhytomyr is going to create an attractive urban environment by providing sufficient information about all opportunities the city offers and motivating people to walk.

PRIORITY 4. Cycling

Goal 4.1 Creation of safe and comfortable conditions for cyclists

Cyclists are among more vulnerable road users, who require a high level of safety. Safety and comfort, as well as the accessibility and connectivity are among the most significant characteristics taken into consideration when choosing the mode of transport.

Every cyclist in the city must be able to move safely and comfortably. By comfort we understand the following:

- The route has to be the most **direct** way to reach the destination without many detours;
- **Safety** as basic requirement. Cyclists themselves do not cause much danger but are vulnerable road users;
- All routes should be **cohesive**, every place and building should have the possibility to be reached by bicycle;
- Comfortable movement is complete when it is **attractive**. Cyclists will be more satisfied when their way is well integrated into surroundings.

An extensive and high-quality cycling infrastructure helps to make the cyclist feel safer and more comfortable when driving along the road network. If women and children feel safe enough to cycle in the city, we can say that the city is bike-friendly. At long last if cyclists are satisfied with their journey, they will choose the same mean of transport again.

Goal 4.2 Increasing the attractiveness of cycling

Cycling is good for health, environment, economy and mobility. It is the most efficient mode of urban transport. Traveling by bicycle is three times faster than walking for the same amount of energy used. For the distances under 7 km it is faster than using public transport, it consumes 20 times less space than a car, and only 5% of the energy and materials needed to build a car are enough to build a complete bike. Compared to non-cyclists, cyclists are less likely to get a heart disease or cancer.

Shifting trips from motorised transport to cycling contributes to the sustainability of the city. Zhytomyr sets a goal to increase the attractiveness of cycling for all purposes, and in particular, to encourage cycling for non-recreational purposes (e.g. work, shopping, socialising, business, etc.).

Goal 4.3 Creating conditions for safe storage of bicycles

If potential cyclists know that it is difficult to find good places to park their bicycle, they probably choose another mode of transport.

In order to boost cycling in Zhytomyr, the city will create convenient and secure conditions for bicycle storage, both short and long term. By convenient we define an ability to leave a bicycle as close to the destination as possible. Care will be taken to ensure safe parking so that cyclists can safely park their bicycles without risking their bicycle being stolen, soiled or damaged.

This goal is focused on both creating high quality bicycle parking facilities as well as providing it in a proper quantity.

PRIORITY 5. Parking management

Goal 5.1 Reducing the number of cars on the roadways and sidewalks in the city centre

The city centre is the most attractive area in the city, which has the highest concentration of social activities, work places, and businesses, and thus, generates a significant number of trips, including car trips. A high number of cars parked illegally on the sidewalks and roadways prevent the movement of pedestrians and forms traffic congestion, which is especially troubling for electric public transport.

The city centre has to be particularly user friendly and convenient for walking. Removing cars from the road and sidewalk network shall improve the accessibility and ease of travel.

Goal 5.2 Parking management in residential areas

Street parking in residential areas is becoming a major problem for the city as chaotic parking conditions make it more difficult for emergency vehicles to access buildings, disturb pedestrians when walking, especially young parents, the elderly and people with disabilities. The parked cars often obstruct the view of other road users and increase the traffic hazard.

There are 2 approaches defined in the city of Zhytomyr to manage parking in residential areas:

- On-street parking organised properly with a focus on safety and attractiveness.
- Off-street parking facilities that allow to keep cars out of sight and keep the environment attractive and safe.

The city of Zhytomyr sets a goal to develop and implement efficient parking management in residential areas in order to avoid unfavourable effects from parked vehicle simultaneously provide citizens with reasonable parking facilities.

Goal 5.3 Organisation of commercial and municipal transport logistics

The city of Zhytomyr sets a goal of reloading transport network from parked vehicles. However, it is required to provide a plan for the organisation of commercial and municipal transport logistics. Oversized vehicles cause disturbance in traffic and safety, and overweight vehicles cause damage to road facilities. At the same time, vehicles carrying small consignments and urban transport (such as snow cleaning, sweepers, garbage trucks, etc.) must have access to the locations where they provide services. This issue may be solved by allocating a separate parking space for large vehicles outside the city, in particular, outside the city centre and replace them with smaller vehicles. The operation of medium-capacity commercial and communal transport within the city will ensure the timely delivery of goods to their destinations.

The integration of cargo transportation in sustainable urban planning shall significantly contribute to the improvement of the Zhytomyr transport system.

Goal 5.4 Improving parking attitude among the citizens

The city of Zhytomyr strives to ensure that all public transport users show respect to each other. In terms of parking, this implies not only adherence to traffic rule, but also respectful treatment of other people.

The improved parking attitude means that:

- People without disabilities do not park on specially reserved parking places for people with disabilities;
- Drivers respect others and do not park on sidewalks or driveways preventing other people from moving safely;
- Drivers respect other drivers and use parking place in the most efficient way allowing for full capacity use of parking place.

PRIORITY 6.
External accessibility of Zhytomyr

Goal 6.1 Providing high-speed railway service

Providing high-speed railway services will expand travel choices and improve mobility. For Zhytomyr as a regional centre, it is crucial that it is linked by high-speed connections with other economic centres of Ukraine (such as Kyiv, Lviv, Odessa and others).

The rail electrification is significant for introducing faster and more environmentally friendly train routes.

This shall increase the speed of trains, comfort of passengers, protect the environment and improve reliability compared to diesel trains. Along with improving the comfort and quality of passenger service as a whole, rail electrification allows for the operation of heavy vehicles. That being said, the city of Zhytomyr supports the possibility of providing high-speed rail services for both passenger and freight transportation.

Goal 6.2 Implementation of freight and passenger services through Zhytomyr airport

The availability of airspace is one of the key factors of the city's development and competitiveness, and is also an integral part of the city's economic functioning. Air transportation facilitates tourism, contributes to the international trade and sustainable development. Today, air transport is seen as a fundamental pillar of our global society, offering significant economic and social benefits and contributing to the sustainable development. Air transport services have a direct impact on the social and economic development of the city, air transport generates economic growth, increases revenue from taxes and offers employment opportunities. The improved air connectivity is a key element to the economic growth and development of the city through cargo and passenger transportation.

The air connectivity provides a worldwide transport network that is essential for tourists and business travellers. Air transport is an efficient international business cooperation. Aviation improves the quality of life and the standard of living.

The city of Zhytomyr is ready to establish an international and national air connection and to become a perspective aerial node.

Goal 6.3 Development of integrated bus stations

Being a regional centre it is important for Zhytomyr to stay well connected to its sub-centres and surrounding areas. Suburban bus service is one of the available and most efficient ways to ensure such connectivity. Bus stations play a crucial role and are important elements in the provision of bus services. Their locations affect the efficiency of the whole transport system all road users.

The city centre of Zhytomyr is overburdened with suburban traffic operated by suburban bus stops in the centre. Integrated bus stops outside the city provide road relief and meet the needs of passengers. Integrated bus stations are interchange terminals where passengers can transfer between different bus routes and continue their trip using public transport.

Integrated bus stations are located in convenient locations with easy access from other areas and areas outside the central part of the city to ensure convenient transfer between routes. They are located close to the lines served groups of routes. The bus stations are located in the areas, where the routes are logically connected or end up close to the points of high demand, which ensures maximum convenience for the passengers. This minimises the number of buses crossing the city centre and reduces traffic congestion, thus, providing high quality services to passengers.

The development of integrated bus stations will allow to:

- Ensure efficient and seamless travel for commuting public;
- Reduce road congestions;
- Reduce transfer distances;
- Harmonise and coordinate timetables;
- Provide convenient transfer and the movement of passengers within the terminal;
- Provide better integration of facilities.

The city of Zhytomyr sets a goal to develop integrated bus stops outside the city centre that will solve a number of problems and allow for comfortable travel and transfer within the city.

Chapter 5 Overview of Scenarios

A scenario is a description of the likely development of a situation that may occur in a given future. Scenarios support multi-variant diagnosis and policy making for different changes in the environment.

Since the 1980s, scenarios have been used in developing the transport policy in highly developed countries, although enterprises have used them before - the first comprehensive scenarios created for the strategic management of Shell were developed in the first half of the 1970s. Scenario methods are used more and more often due to the complexity of the long-term forecasting.

Scenario methods acknowledge that it is impossible to predict the future with certainty. Instead of projecting current trends into the future in a linear manner and then expecting that this is the only way the situation can develop, they allow planners to prepare for different possible future pathways. The main advantage is that if less likely scenarios become reality, for example due to unexpected political or technological changes, planners do not stand unprepared, but have already thought about suitable reactions and measures. Thinking in scenarios necessarily includes evaluation of future trends, which are open to various interpretations. Therefore the assumptions of scenarios always have to be made transparent.

In order to identify the most probable future situation in the city of Zhytomyr, the method based on level of limitations was used for the development of scenarios. Implementation of the policy will require further organisational, institutional, financial resources as well as public support, which are preconditions for the successful application of measures. A matrix based on the availability of financial resources and the level of organisational capacities and acceptance of change was applied, which have been assessed as the two most important factors limiting policy making for sustainable transport.

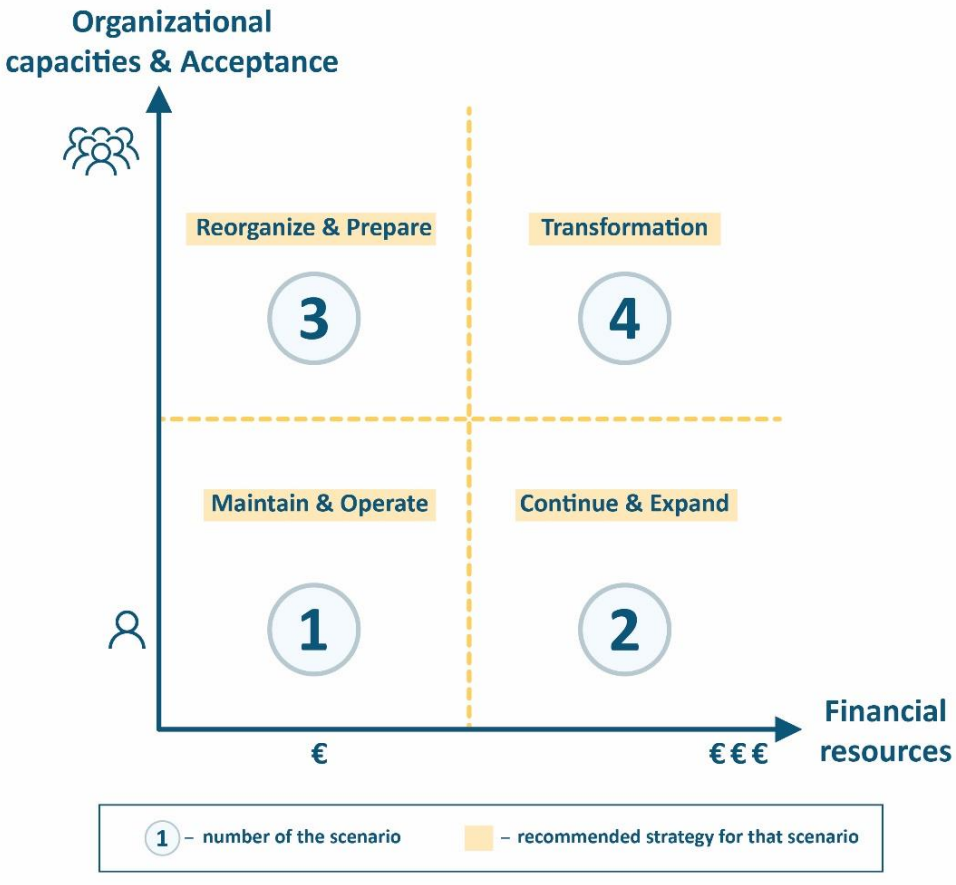


Figure 19. Restraint matrix of scenario assumptions

Organisational capacities and acceptance of changes reflect the extent, to which policy implementation efforts need to be institutionalised with the involvement of stakeholders and the public; and the extent, wo which the decision making process requires a political will or additional administrative resources to implement measures for the sustainable development of urban mobility.

The availability of financial resources means the level of financial allocations to the transport sector, for example, current investments in the transport sector from the budget of development of Zhytomyr are a starting point and are considered sufficient to support the sector. If the city continues to carry out measures aimed to optimise the management system, improve fiscal policy and modernise assets, the transport sector will become more efficient and revenue and city savings will increase. Also, strengthening of already established cooperation with donors, international financial institutions and participation in state development programmes will increase investments in the transport sector. In this case, the volume of financial resources will increase, which will enable the introduction of additional measures.

Based on the matrix above and limitations, four different scenarios have been developed:

Scenario 1 - Business as usual

ASSUMPTIONS: The assumption is that due to the unstable and inconsistent management of the sector there will be no significant investments available and also continually low organisational capacities and acceptance for change.

POLICY RECOMMENDATIONS: In this case, the city would have to concentrate on "maintain and operate" strategy, which means that the focus will be on maintaining the system and avoiding the threat of its weakening. More often, new measures should be limited to less costly, which does not require strong political support.

Scenario 2 – High resources and low capacities

ASSUMPTIONS: This scenario assumes that thanks to the active and successful investment strategy, there are financial resources available for the development of the sector in a form of combination of loans, private investments, national and international support. However, the scenario does not foresee any changes in the planning strategy and is characterised by limited political and administrative decision making on sector development due to low public and political will, as well as insufficient organisational capacity.

POLICY RECOMMENDATIONS: The important focus of this scenario is to prevent the development fails to meet the priorities of the city due to the lack of coordination of hard measures. Effective planning is necessary to ensure the implementation only of those projects that are in line with the priorities of Zhytomyr. For instance, there are opportunities for beneficial investments into the modernisation of the public transport system.

Scenario 3 – Low resources and high political and public support

ASSUMPTIONS: This scenario assumes that the city has low access to financial resources to be allocated to transport infrastructure but high political support for the reformation of mobility sector.

POLICY RECOMMENDATIONS: The implementation of hard measures, such as rebuilding infrastructure, will be similarly limited as in the business as usual scenario, but there are good opportunities for cost-effective soft measures. The main focus should be on management and organisation of the mobility sector, promotion of sustainable transport behaviour and awareness campaign among the population and stakeholders, surveys for data collection and its analysis for monitoring of the system, as well as capacity building to improve the skills of the authority representatives and service personnel of the transport sector.

Scenario 4 – High resources and high capacities

ASSUMPTIONS: This is the most optimistic scenario, which assumes that the city will have access to the financial resources, as well as enough political and public support to implement the strategies. It offers the best opportunities for the breakthrough.

POLICY RECOMMENDATIONS: In this scenario, Zhytomyr should focus on taking maximum advantage of the available opportunities by both enhancing the strength of the system and overcoming weaknesses. Infrastructure and administrative measures should be integrated into effective packages. It is recommended to first concentrate on improving the environmentally friendly transport modes (pull measures), such as by building cycling and walking infrastructure and modernising the public transport system. Once those are in place, also push measures, e.g. development of parking zones with higher parking fees, car lane and speed limit reductions, should be implemented to promote a modal shift.

Chapter 6 Measures

This chapter contains information on measures that should be taken by Zhytomyr to achieve the goals set in previous sections. The chapter is divided into priority areas. It indicates the objectives of the actions and discusses the specific actions and their main impact. In the end of each priority a detailed table with actions (projects) to be implemented within the priority is presented and rated according to the scenarios explained in the previous chapter. Each action is identified by a measure type. There are five types of measures:

Infrastructure

Providing effective and inclusive infrastructure and ensuring secure access to the infrastructure is crucial for the sustainable development of the city in the long run. Infrastructure measures are comprehensive list of actions that need to be implemented to improve the city's infrastructure, which include construction of new buildings, rebuilding or modernising the existing infrastructure to support and improve the accessibility of urban facilities and services to the residents. This category of measures is the most cost-effective.

Management and organisation

An effective system for the management, organisation and operation of local self-government bodies helps to ensure the achievement of relevant priorities and goals, and ensures the development, implementation and promotion of concepts, standards, programmes and plans, and the achievement of the desired results. Management and organisation measures aim to meet the overall need for efficient governance systems in local government, and to develop the necessary strategic documents aimed to support high-quality urban environment and mobility.

Monitoring and data collection

The lack of quality data and data collection system limits the analysis of the urban situation. Regular monitoring is an efficient way to identify problems, monitor trends, and identify pressing issues. While planning urban mobility, it is important to set up a monitoring system to regularly collect data, maintain the overall system and ensure long-term performance measurement and assessment. This category includes the development of monitoring systems, carrying out regular surveys, database development, etc.

Capacity building

In the process of development of sustainable urban mobility plans it is recommended to improve awareness and knowledge of sustainable mobility among politicians, planners, and others stakeholders involved in the urban mobility planning process. This shall be achieved through capacity building activities. Lack of strategic planning practice and the low level of competence in the field of integrated development in relevant city administration units is a problem of Ukrainian cities today. This category includes a series of regular training and capacity building measures.

Promotion and awareness

Promotion and dissemination activities are aimed at raising awareness of the residents about various opportunities offered by the city, e.g. the use of urban infrastructure, development of sustainable modes of transport and other issues related to sustainable urban mobility.

Promotion and dissemination aimed at awareness raising and behaviour shift. This component includes organisation of public events, public consultations and participatory dialogue, social advertising, etc.

Public Transport

Almost half of all trips in the city of Zhytomyr are carried out by public transport (46%); therefore it is extremely important to provide passengers with timely, high-quality and affordable services. This requires the implementation of a number of specific measures aimed to achieve the following goals

1.1 Improving the quality of public transport passenger services

1.2 The use of more environmental friendly vehicles

1.3 Development of the integrated public transport system

1.4 Enhancing the financial efficiency of public transport

1.5 Prioritisation of public transport in traffic

In order to achieve the set goals, the city of Zhytomyr should develop and implement a comprehensive public transport development concept.

Concept of public transport development

Key provisions of the concept of public transport development in Zhytomyr are the following:

- Integration of routes into a unified network;
- Redirecting suburban public transport routes to the city's periphery and the construction of transfer hubs;
- Free transfer within 30 minutes of travel;
- The transition to an integrated public transport network management system.

The concept of public transport development in Zhytomyr defines three levels of the route network:

- Main urban;
- Urban agglomeration network;
- Suburban.

Main urban network is a network of key routes passing through the corridors of key passenger flow. The maintenance of this network should be limited to vehicles of high passenger capacity. The dedicated public transport lanes will be created on such corridors, where possible.

Urban agglomeration network is a network of routes serving the territory of the Zhytomyr agglomeration, integrated into the urban network, i.e. it can pass through the city streets along main urban network. The urban agglomeration includes the city of Zhytomyr and settlements located within a radius of up to 15 km from the city boundary.

Suburban network consists of public transport routes connecting Zhytomyr with settlements within a radius up to 50 km from the city boundary. According to the concept, these routes should provide the direct and fastest connection with the city and end at the integrated public transport stations located on key entry highways. Integration of stations is provided by the arrangement of the so-called transfer hubs.

The following types of routes are defined for the city route network development:

Main routes are public transport routes that link areas with high demand for transportation, run through arterial streets and provide direct and fastest connections.

Secondary routes are public transport routes that provide passengers transportation from low-intensity areas and pass through secondary streets of the city.

Transfer hub

An interchange or transfer station is a public transport system station that enables passengers to change from one route to another without having to leave the station or pay an additional fare. The city of Zhytomyr implements transfer hubs on key points of suburban entrance (5 hubs) and in the area of Peremohy Square as a key point of city's transport link.

Among the elements of transfer hubs are the following:

- A unified platform, or a complex for different modes of transport (bus, trolleybus, tram) or traffic systems (urban, suburban);
- Smooth pedestrian paths;
- Comfortable stay zones designed with urban facilities (places for sitting, washing rooms, etc.);
- Ticket offices, electronic ticket replenishment terminals;
- Car parking places for the purpose of transfer on public transport;
- Information boards and other means of informing the passengers.

Implementation of the concept of transfer hubs requires the implementation of an electronic payment system on all routes of the traffic system and the realisation of the possibility of free transfer. Integration with suburban transport requires the introduction of a zone charge.

Organisation of dedicated public transport lanes

A dedicated public transport lane is a lane on the roadway allowed only for public transport vehicle movements; the ride of private cars is possible only for rotation. According to STD B.2.3-5:2018 such lanes should be arranged on main streets and roads with 3 or more traffic lines in one direction or 2 lines in one direction under the reconstructions on the streets, where there is historical and /or existing construction. These lanes should be marked and if necessary have delineators.

Figure 20. Dedicated public transport lanes arrangement scheme

In the context of limited space on the streets where it is necessary to organize both cycling, and priority traffic of public transport, it is recommended to allow cyclists to drive along public transport lanes. This is possible with a dedicated lane width of more than 4.75 m (pass is permissible) or for a width of up to 3.5 m and with an assumed intensity of cyclists of 200 cyclists / hour (passing is prohibited). With a medium width, there is a likelihood that the safety intervals will be insufficient. The paths of the common motion should be marked with appropriate signs and markings. This solution is effective for Kyivska St.

Figure 21. Dedicated public transport lane with the permission to ride a bicycle, Washington, USA (2016) Photo: Dan Malouff

Figure 22. Dedicated public transport lane with the permission to ride a bicycle, Kyiv (2018). Photo: Roman Materuhyn

Integrated public transport network management system

The functions of the transport company-administrator should include management of the system of electronic payments, accumulation and redistribution of income, dispatching and monitoring of transport, analysing and optimising the operation of the transport system, forming the conditions of the competition for transportation and providing the body of the executive committee with information for the conclusion / termination of contracts.

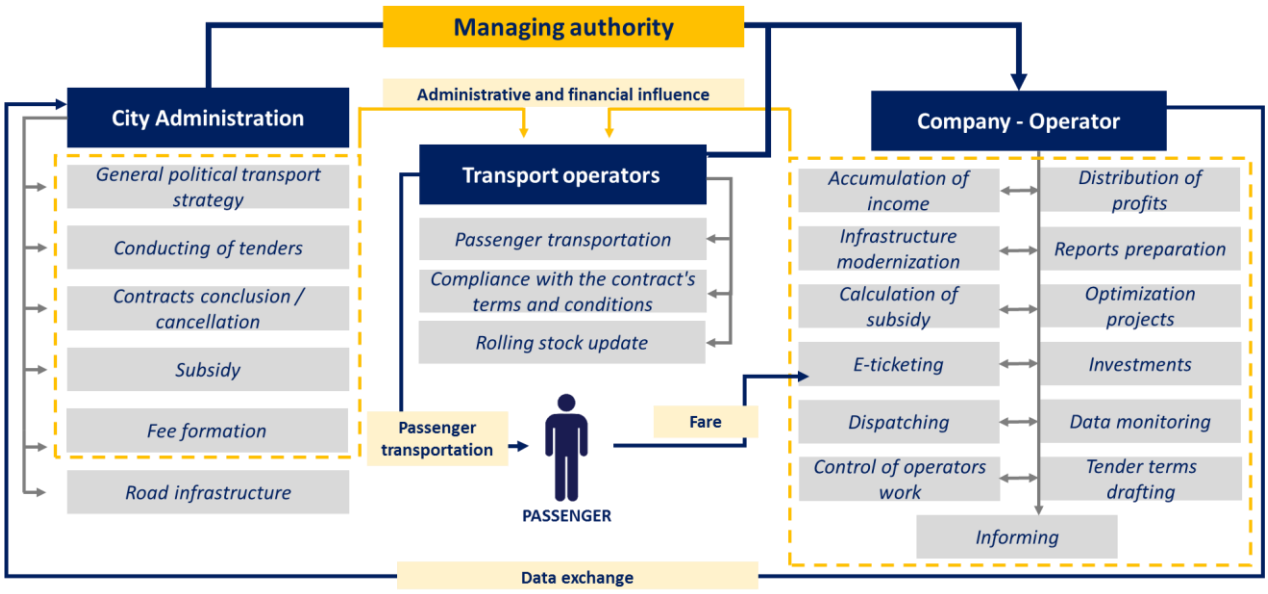


Figure 23. Unified public transport management system structure

Capacity building in public transport management

Personnel development is a set of soft measures of transport system improvement. These inexpensive but necessary measures should be conducted regularly and included into the city budget. One of the options for capacity building and gaining international experience in the field of public transport management is joining the International Association of Public Transport (UITP).

Monitoring and audit

The achievement of a quality management system is only possible if the appropriate monitoring system is used. To implement a monitoring system will include both infrastructure projects (e.g. installation of equipment) and management and administrative tasks (e.g. introduction of official duties, reporting).

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
PT1	Creation of an unified centralized management system for public transport in the city	Management and organisation			1 – 2*	1 – 2
PT2	Development and update of transport model	Monitoring and data gathering	1 – 3	1 – 3	1 – 3	1 – 3
PT3	Creation of unified public transport dispatch system	Monitoring and data gathering			1	1
PT4	Reorganisation of the route network of trolleybuses	Management and organisation			1	1
PT5	Reorganisation of the route network of city passenger buses	Management and organisation			1	1
PT6	Reorganisation of the route network of suburban passenger transport	Management and organisation			1	1
PT7	Development and approval of Quality Standards for public passenger transport services in the city of Zhytomyr	Management and organisation	1	1	1	1
PT8	Introduction of the Zhytomyr resident card and its integration with other systems	Management and organisation	1 – 2	1 – 2	1 – 2	1 – 2
PT9	Organisation of events informing the public on e-ticket operation	Promotion and awareness	1	1	1	1
PT10	Integration of new housing areas into the public transport network at the planning level of the territories	Management and organisation			1 – 3	1 – 3
PT11	Trolleybus rolling stock and network update	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
PT12	The purchase of buses of environmental standard Euro-5	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
PT13	Technical re-equipment of contact, cable networks, street railways and traction substations	Infrastructure	1 – 2 *	1	1 – 2	1
PT14	Creation of dedicated public transport lanes	Infrastructure			1	1
PT15	Updating and technical re-equipment of the production facility of tram and trolleybus depot	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
PT16	Arrangement of key trans-shipment units of public transport (for example, bus station, railway station) with a table showing traffic data	Infrastructure	2	1	2	1
PT17	The purchase of electric buses infrastructure	Infrastructure		1	3	1
PT18	Construction trolley line on Maliovanka district	Infrastructure		1		1
PT19	Development of tram network "The short-lines" by the laying of additional branches from the existing tram line to the Synnyi Market and Polova city district	Infrastructure				2 – 3
PT20	Renovation and commissioning of the trolleybus depot on Pokrovska St.	Infrastructure		2	3	2
PT21	Development of the site for monitoring system of the operation and informing of communal services (public transport traffic, snow removal, traffic restrictions, etc.) in real time	Management and organization			2	2
PT22	Carrying out mobility survey of the population	Monitoring and data gathering	1 – 3	1 – 3	1 – 3	1 – 3
PT23	Carrying out public transport customer satisfaction survey	Monitoring and data gathering	1 – 3	1 – 3	1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
PT24	Conducting an audit of stopping points in the city	Monitoring and data gathering			1 – 3 *	1 – 3
PT25	Formation of system of monitoring of transport emissions (air pollution)	Monitoring and data gathering			2	2
PT26	Conducting regular professional development trainings for executive staff in the field of management and development of public transportation, data collection and analysis by employees of relevant local government body	Capacity Building	1 – 3	1 – 3	1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

Road safety

First of all, traffic safety should be provided for comfortable movement for all road users. It affects not only the number of road accidents, but also the general willingness of citizens to go out and stay outdoors, and use public spaces. Implementation measures in the field of road safety has to achieve the following goals:

2.1 *Enhancing the safety of vulnerable road users*

2.2 Mortality reduction on roads

2.3 Improvement of road safety awareness among the citizens

3.1 Providing qualitative pedestrian infrastructure appropriate for moving of people with reduced mobility

3.3 Development of pedestrian spaces and improvement of the quality of public space

4.1 Creation of safe and comfortable conditions for cyclists

5.1 Reducing the number of cars on the roadways and sidewalks in the city centre

5.2 Parking management in residential areas

5.3 Organisation of commercial and municipal transport logistics

In order to achieve the goals set up by traffic safety priority of the city of Zhytomyr, it is necessary to implement the Zero mortality concept. The Zero mortality concept means that the city sets the priority of preserving human life above all. For the development of traffic safety improvement solutions traffic safety audit is carried out, infrastructure solutions and detailed implementation plan are developed, a responsible person is identified, and a special commission is set up to investigate every fatal road accident.

Priority measures on traffic safety improvement in the city of Zhytomyr are presented in the table at the end of this section.

Speed limit zones of 30 km/h

Road traffic analysis in the city of Zhytomyr has showed that speeding is the most common cause of road accidents, and pedestrian collision is the most common type of road accident. According to statistics, if a pedestrian collision happens at a speed of up to 30 km/h, the probability of death is only 10%. At the same time at a speed of 50 km/h, that is the official speed limit in Ukraine, the probability of death is 50%. Considering that the majority of roads are designed for higher speeds (design), and road traffic regulations (regulation) allow exceeding within +19 km/h, the probability of pedestrian death in road accident is more than 90%. A fundamental change in the design of the road space at the level of regulation and design is necessary in order to eliminate this situation. Such regulatory tool is the creation of zones with a speed limit of 30 km / h. Usually, areas with speed limitations are created in residential areas and in the central part of the city. In many German cities, almost for all interquartile streets, which are no highways, have a 30 km speed limit.

This measure allows to reduce the number of road accidents on the streets, saving lives of the citizens. Also, this speed reduces noise pollution, emissions of combustion products, thus, improving air, which in turn affects the overall health of the citizens. Such zones are a common area, where all road users have equal conditions, i.e. the distribution of the roadway is conditional. Speed in the zones of 30 km / h speed limit is regulated not only by the establishment of the corresponding signs, but also by special traffic calming measures.

Figure 24. 30 km/h speed limit zone in Geneva, Switzerland (2014) Photo: Pascal Frautschi

Infrastructure measures in the field of traffic safety

Priority decisions for the city of Zhytomyr are the implementation of traffic calming measures, which will allow to reduce the risk of road accidents or at least reduce its consequences. Among the measures that should be necessarily implemented in the city of Zhytomyr are the creation of safety islands, raised medians, raised pedestrian crossings and intersections to the level of the pavement and tighten corner curbs.

Safety islands

The safety islands define the areas on road that should be free from vehicles. They increase pedestrian safety by reducing the distance between the roadways and allow people to concentrate on one direction of the trip rather than two at the same time. In addition, the safety island takes space, thus, narrowing the road, which makes drivers subconsciously reduce the speed.

Raised medians

The raised median is a barrier in the middle of the street or the road that divides traffic flows of different or related directions. Such measure is important at high speeds, as it prevents overtaking, which in turn prevents a collision. In addition, the raised median limits the possibility of a left turn allowing it in safer places. It can also serve as a safety island for pedestrian crossing.

Tight corner curbs

A corner curb radius is formed by two sidewalks on perpendicular streets that come together at a corner. Making this radius tighter shortens distances of pedestrian crossings, reduces traffic speed while turning and increases the pedestrian visibility to divers.

Raised crosswalk and crossroad

A raised crosswalk consists raises the roadway to the level of pedestrians at pedestrian crossings or crossroads. This is one of the introduced traffic calming measures, it reduces vehicle the speed but also enables convenient movement of pedestrians.

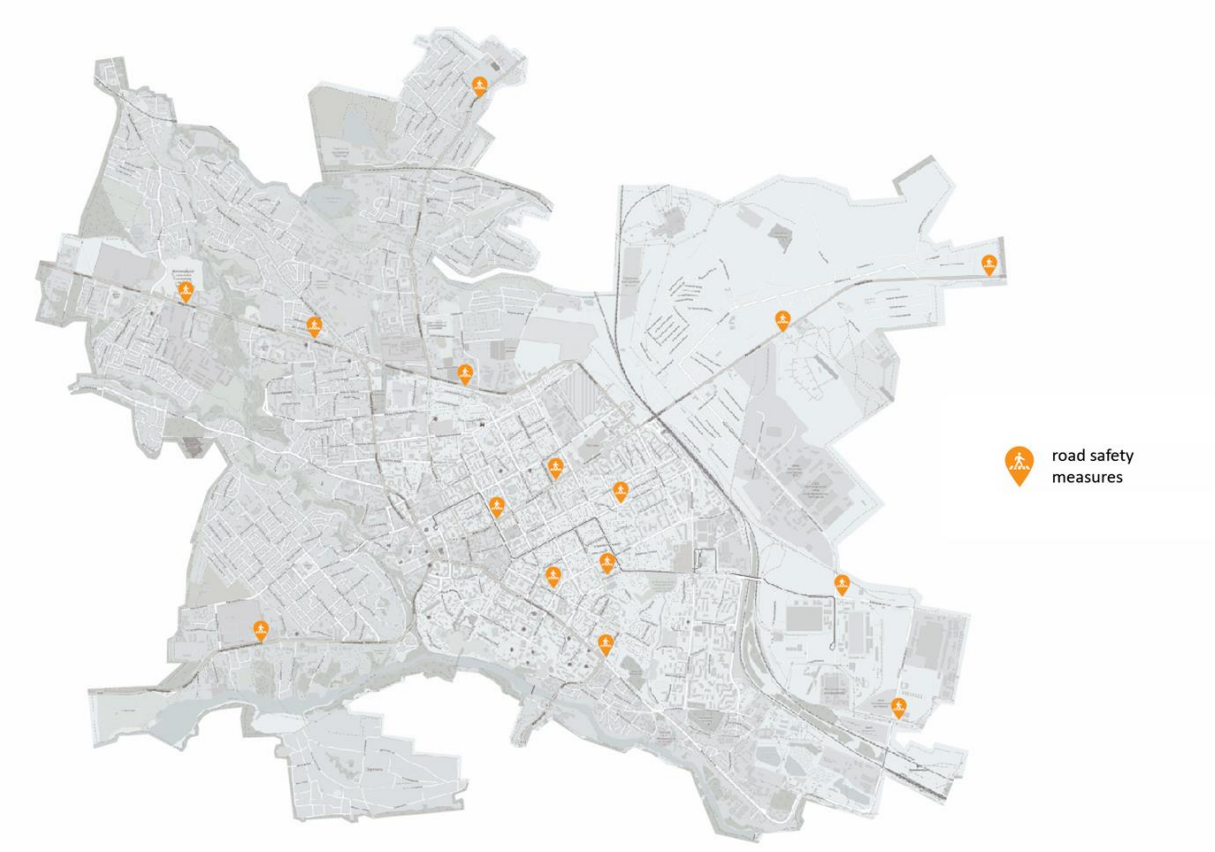


Figure 25. Top-priority measures in the field of traffic safety

Organisation of two-way streets

Initially, one-way streets were created to increase roadway capacity, but this led to an increase in speed. . Currently, to improve road safety, these streets are redesigned on the two sides. This measure also helps to reduce the mileage of vehicles and reduces cycling distance.

In the case of one-way traffic organisation, in order to use the space more efficiently or to change the profile of the street for the purpose of organising cycling infrastructure or priority public traffic, it is not necessary to increase the number of lanes in one direction, but rather to use the road space for the construction of cycling counter lanes. Counter lanes shall then be physically separated from motorised transport.

Widening sidewalks/narrowing streets and traffic lanes

In fact, much more people move by walking then in cars. According to Zhytomyr mobility survey 2018, 37.8% of all trips are carried out by walking and 15% by car. And even drivers and passengers should still use the sidewalk. That is why the widening makes pedestrians' movement more comfortable, calms traffic and can even revitalise the economic life of the street. The majority of traffic lanes are planned for the speed much higher that is allowed there, narrowing streets makes drivers move more slowly without any additional restrictions.

Speed Bump

These are the most popular elements of speed calming and are used for 30 km/h zones. Speed bumps are vertical obstacles on the road. They are established to enforce drivers to reduce speed when approaching to pedestrian crossings or intersections.

Pedestrian crossings lighting

In order to increase pedestrian safety, crossings should be well and properly illuminated. One of the ways to draw attention to pedestrian crossing is to highlight the sign with a yellow reflective coating. However, this measure draws attention to the sign itself rather than to the approaching pedestrian.

An effective measure is to highlight the pedestrian crossing area with contrasting light, usually, white. Against the background of the general yellow street lighting, it does not only increase the attention of drivers, but also contains a certain psychological component – a sudden situation change on the road contributes to more careful driving and reducing speed. The lighting system can also be equipped with detectors that capture the approaching pedestrian and turn on the bright light at the crossing.

Bollards at public transport stops

Public transport stops should be physically bounded, which will prevent vehicles from parking there. In addition, this measure will increase the safety of passengers waiting for public transport at stops. Bollards reduce or eliminate the direct impact of vehicle on people. Usually, in such places the bollard is arranged as static (metal, concrete). They are marked with reflective elements that improve the visibility of stops at night.

Road Safety Audit

Research shows that there are three contributing factors to road crashes:

- human factors (involved in about 95% of crashes)
- road and road environment factors (involved in about 28% of crashes)
- vehicle factors (involved in around 8% of crashes)

However, urban environment can be altered to minimise the human factor and encourage road users to behave safely.

The road safety audit is a formal procedure to check safety aspects of the roads before it is built or redesigned. There are five main audit stages:

1. Feasibility Study Audit.
2. Preliminary Design Audit.
3. Detailed Design Audit.
4. Pre-opening Audit.
5. Monitoring of the road in use.

In order to ensure the high standardы for safety at all of those stages, it is necessary to identify a person in the administration who will be responsible for the management of the auditing process, develop a number of protocols for the road audit and a clear monitoring system with the defined scope and timeline.

Figure 26. Bollards at public transport stop, Singapore. Photo: Jamie Koh

Figure 27. "Golden Hour"

"GOLDEN HOUR"

In the context of emergency medicine, "Golden Hour" refers to the immediate post-traumatic injury time period during which there is a high chance of saving a life by providing emergency medical care. According to many studies the main cause of death due to road traffic accidents is blood loss, mainly because the victim was not provided with timely medical care. Providing the necessary care within an hour requires a very high level of coordination and mobility management of different institutions and organizations in the city. In order to provide full and effective medical care within the first hour after the accident, it is necessary to develop traffic accident protocols for hospitals, police, communal services, etc.

School mobility and safety

Children are the most vulnerable road users. First, they often walk to school, and secondly, they are less noticeable to drivers, and their behaviour is less predictable. At the same time, it is easier to develop a traffic safety attitude in children than in adults. One of the most effective non-infrastructure methods for raising the safety of schoolchildren is the creation of mobility and road safety plans in schools. Such mobility plans imply the creation of working groups on safety including representatives of students, parents and teachers.

A school developing mobility a plan conducts a mobility survey, recognises the modes of transport, students' and teachers' mobility patterns, conducts audit of school routes for convenience and safety, and develops recommendations for the improvement of safety of the routes.

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
S1	Establishment of traffic management centre	Management and organization			1*	1
S2	Speed decrease on separate streets up to 30 km / h	Infrastructure			1	1
S3	Construction of road infrastructure by traffic calming measures	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
S4	Implementation of the road safety educational campaign on traffic safety and adherence to traffic rules for schoolchildren, drivers and cyclists	Promotion and awareness	1 – 3	1 – 3	1 – 3	1 – 3
S5	Installation of bollards at public transport stops	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
S6	Reconstruction of the road section R-18	Infrastructure			3	2
S7	Full repair of networks of external lighting and replacing lights with led lights	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
S8	The adjustment and placement of traffic signs, road marking, organization of traffic according to the established norms	Infrastructure	1	1	1	1
S9	Construction of traffic lights at the crossroads	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
S10	Certification of streets of Zhytomyr and creation of a geo-information system and road infrastructure database	Management and organization	1	1	1	1
S11	The sustenance and maintenance operation of traffic control devices	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
S12	Development of a police reported accident database with access for local authorities	Monitoring and data gathering			1	1

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
S13	Procurement of road equipment for traffic control and parking space arrangement	Infrastructure	1 – 3*	1 – 3	1 – 3	1 – 3
S14	Additional lighting of crosswalks, streets and alleys	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
S15	Construction of safety islands for pedestrians on Myru and Nezalezhnosti Prospects	Infrastructure			1	1
S16	Carrying out a Road Safety Week	Promotion and awareness	1 – 3	1 – 3	1 – 3	1 – 3
S17	Dissemination of social advertising on traffic safety of vehicles and pedestrians	Promotion and awareness	1 – 3	1 – 3	1 – 3	1 – 3
S18	Raising pedestrian crossings to the sidewalk level	Infrastructure	1	1	1	1
S19	Taking into account the truck traffic while planning the development of new territories	Management and organization			1 – 3	1 – 3
S20	Carrying out overhaul and reconstruction of streets, roads and overpasses	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
S21	Carrying out of overpass overhaul on Kyivska St. (above the railways)	Infrastructure	2	1	2	1
S22	Regular training in the field of road safety management for representatives of local government institutions and police	Capacity Building	1 – 3	1 – 3	1 – 3	1 – 3
S23	Development of Complex Road Traffic Management Scheme	Management and organization	1	1	1	1
S24	Road safety audit, especially on road accident concentration zones	Monitoring and data gathering	1 – 3	1 – 3	1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

Encourage people to walk

Walking is basic every day movement and is a natural non-motorised mode of transport. A well-designed and maintained walking infrastructure and network can satisfy the basic people needs in transportation and encourage them to walk.

Measures in the field of walking are aimed to encourage people to walk, thus providing attractive comfortable and barrier-free walking environment. These measures mainly contribute to the achievement of the following goals:

3.1 Providing qualitative pedestrian infrastructure appropriate for moving of people with reduced mobility

3.2 Development of the green corridors system for pedestrian walking around the city

3.3 Development of pedestrian spaces and improvement of the quality of public space

3.4 Raising public awareness of opportunities and the motivation to walk

1.1 Improving the quality of public transport passenger service

2.1 Enhancing the safety of vulnerable road users

5.1 Reducing the number of cars on the roadways and sidewalks in the city centre

The benefits of walking as a mode of transport are widely recognised. It is environmentally friendly, sustainable and has health benefits. The city of Zhytomyr has a very good compact structure and a great potential to create liveable walking environment thus encourage people to walk.

Development, maintaining and upgrading of walking infrastructure

Barrier-free, comfortable infrastructure without any damages is a basic condition for the liveable walking environment. In order to ensure that the pedestrian infrastructure comfortable, convenient, safe, accessible and passable (Figure 28), the infrastructure should be developed, maintained and upgraded on the regular basic.

Among the basic measures to be implemented regarding the walking priority in the city of Zhytomyr are:

- major repairs, rehabilitation and further maintenance of sidewalks and public transport stops space accessible for all people, including people with reduced mobility;
- reconstruction and arrangement of pedestrian crossings, sidewalks and sideways, taking into account the needs of people with disabilities;
- development of high-quality pedestrian infrastructure in new residential areas and its integration with the existing network;
- maintenance and repair of sidewalks.

Walking infrastructure should be maintained every year according to the street renovation plan.

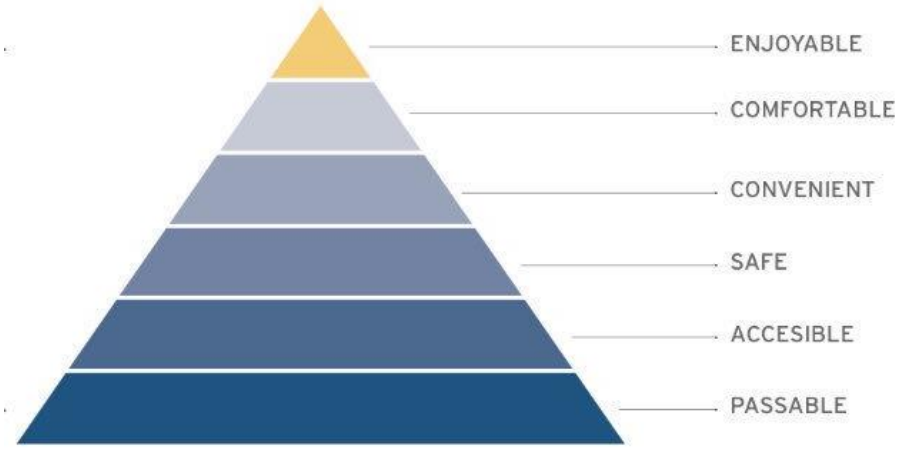


Figure 28. Walkability Hierarchy of Needs Pyramid

Pedestrian zones

Pedestrian zones considered as a public space intended exclusively for pedestrians, where cars are forbidden, play a crucial role in sustainability of urban spaces. Usually, residents want to live in urban environments with high-quality public spaces intended only for pedestrians.

In order to develop a pedestrian-friendly and attractive urban environment, it is foreseen to create pedestrian zones on the following streets of the city of Zhytomyr: Mala Berdychivska, Lyatoshynskoho, Novyi Boulevard, Staryi Boulevard, Pushkinska Streets and on Skorulskoho by-street.

The above-mentioned streets to be pedestrianised, which means that traffic and parking will be prohibited, and a high quality accessible pedestrian infrastructure will be designed. The development of the pedestrianised Zhytomyr city centre will benefit citizens, tourists and also local economy. High quality urban environment allows to:

- ensure better accessibility and mobility for all pedestrians, including women, children, elderly people and people with disabilities;
- decrease the traffic in city centre;
- encourage walking;
- safer streets for everyone to interact;
- decrease harmful emissions and reduce noise;
- improve attractiveness of public spaces for citizens and tourists;
- encourage communication and social interactions;
- increase the level of satisfaction with walking infrastructure;
- encourage the development of local businesses.

Figure 29. Pedestrianization of Zhytomyr city center

These measures on pedestrianisation allows to prioritise urban space and reduce physical space for cars on the streets in the city centre. By prioritising space for non-motorised transport modes walking is both encouraged and more enjoyable.

Apart from measures on the pedestrianisation of the city centre, it is proposed to create temporary pedestrian zones that will make Zhytomyr's urban environment more attractive and comfortable. Such temporary measures allow to observe and test people's behaviour and make future decisions on space reorganisation with the aim to enable comfortable walking.

Campaigns to temporarily restrict traffic and determine the priority of pedestrian traffic on weekends, public holidays or public events create conditions for space use and stimulate walking. As a result of the implementation of such measures, the quality of urban environment will improve, thus, increasing the attractiveness of urban space and the share of walking.

Pedestrian crossings

In order to ensure liveable and attractive walking environment, it is necessary to provide high-quality pedestrian crossings on all city roads, including in residential areas. Safe and comfortable pedestrian crossings support a walkable environment. Minimum requirements to safe pedestrian crossings in the city of Zhytomyr accessible to all users:

- provide street crossings every 150 - 300 m according to state building standards STD B.2.3.5:2018, since if there are no available crossings within 3-5 minutes of walking distance, a person is more likely to choose a more direct and dangerous way of crossing the road.
- arranging crossings at all intersections and on the segments preferred for crossing the street (e.g. near the points of interests, close to PT stops, etc.).
- pedestrian crossings should be always marked, regardless paving material;
- equip pedestrian overpasses with signalisation on the street with a speed limit of 50 km/h and

uncontrolled overpasses on the streets with 30 km/h limit;

- ensure the shortest crossing distance by installing additional facilities to decrease the risk of traffic accidents;
- arrange traffic island on multiple lane roads in one direction according to State building standards STD B.2.3.5:2018 to create two-stage safer crossings for pedestrians;
- ensuring good visibility in the areas before the pedestrian crossing so that a pedestrian can see the oncoming traffic and increase the visibility for drivers;
- provide day and night lighting on crossings, sidewalks and waiting areas;
- arrangement of pedestrian crossings at one level; except for the sections of high-speed roads passing through the city and the main lines of the continuous traffic;
- ensuring raised pedestrian crossings at the level with the sidewalk, where necessary to increase the safety level of the crossing and not prohibited by the category of roads.

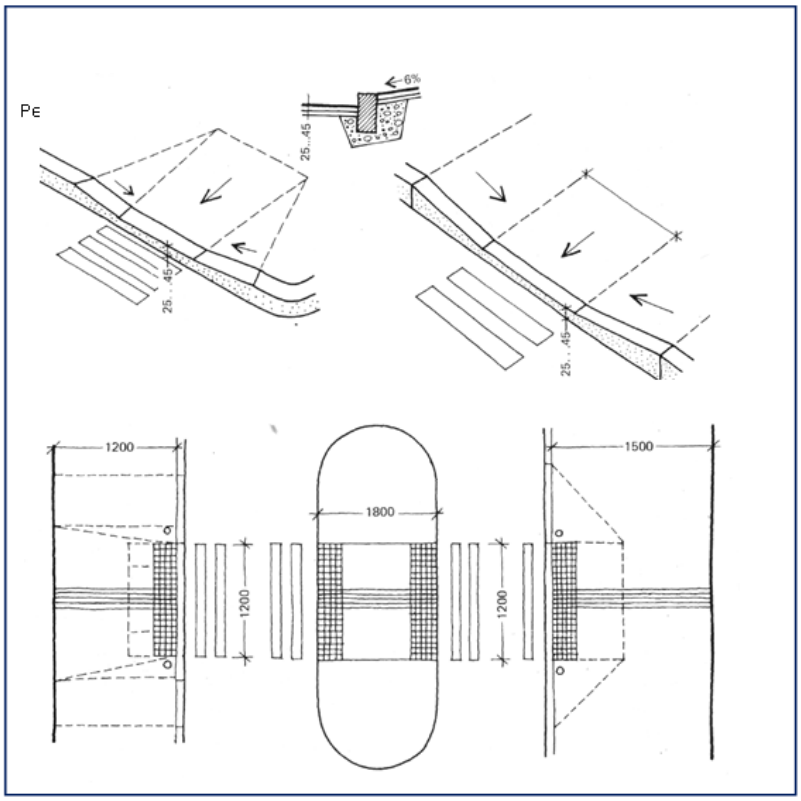


Figure 30. Pedestrian crossing requirements

In order to create accessible comfortable walking and a sustainable urban environment, it is also required to reconstruct and redesign the existing underground crossings into ground level pedestrian crossings. One of the advantages of ground level crossings is that contrary to the underground crossings they allow barrier-free movement for pedestrians, including people with reduced mobility.

Sidewalks

Sidewalks are an integral part, essential component of urban infrastructure and the main component of the walking infrastructure in the city. In order to promote walking as a sustainable mode of transport and encourage people to walk more, high-quality sidewalks should be arranged on all streets in urban areas. Below are the basic requirements for the sidewalks for the city of Zhytomyr:

- dedicated and protected from traffic and atmospheric precipitation;

- quality smooth surface material;
- attractive space with visually active facades;
- universal accessibility for all users;
- safe and continuous connection and integration with city transport network;
- adequate lightening to provide permanent safe;
- clear obstacle free path.

Figure 31. Example of high-quality sidewalk arrangement, Berlin, Germany. Photo: Damir Frkovic

Green corridors

The existing potential of the green corridors of the city of Zhytomyr should be used not only for recreation and rest; they can also serve as high-quality transport routes for non-motorised transport. In order to strengthen sustainable urban mobility planning in the city of Zhytomyr and improve the existing green araes and public spaces, it is necessary to develop green corridors in the city.

Green corridors are public spaces with intensive greenery combining parts or the whole city. Green corridors are used for slow pleasant walking or cycling and provides alternative routes for pedestrians and cyclists to motorised transport.

Green corridors can be streets, hiking or cycling trails, converted railways, banks of rivers or canals, ravines, green areas.

The development of green corridor system in Zhytomyr will improve the ecological, economic, recreational and transport spheres of the city. The development of green corridors system in Zhytomyr will benefit ecological, economic, recreational and transport sectors of the city:

ECOLOGICAL BENEFITS

- Reduction of flood hazard
- Reduction of bank erosion and atmospheric condensation
- Protect the natural environment
- Increase air quality
- Increase environmental quality
- Limit urban growth

ECONOMIC BENEFITS

- Increase real-estate property values
- Attract tourism

RECREATIONAL BENEFITS

- Provide routes for walking and cycling
- Provide opportunities for outdoor active rest

TRANSPORT BENEFITS

- Provide alternative routes for walking and cycling trips to work and leisure activities
- Provide non-motorised transport development
- Increase the attractiveness of non-motorised transport
- Embrace healthy lifestyle
- Increase quality of life

In order to develop green corridors system as part of urban transport infrastructure, efficient tool for health and sport, a natural habitat in the city, tourist and recreational walking and cycling areas and public space for recreational and educational activities, it is necessary to use the existing green and recreational potential of the city by high-quality public space organisation, including the development of high-quality pedestrian and cycling infrastructure in the corridor by:

- development of high-quality pedestrian and cycling paths;
- development of barrier-free space for pedestrian and cycling mobility;
- prioritizing pedestrian flow;
- ensuring a high level of safety at crossings with roadways;
- ensuring green corridor network connectivity;
- creation of zones and places for rest;
- arrangement of public washrooms, etc.

Thus, during the development of green corridors in the city of Zhytomyr, it is necessary to tap into the existing potential of the city and connect it with the centre, providing comfortable link and mobility to the city centre. In order to create a green corridor network in the city of Zhytomyr, it is necessary to ensure sustainable links between the districts and with the city centre.

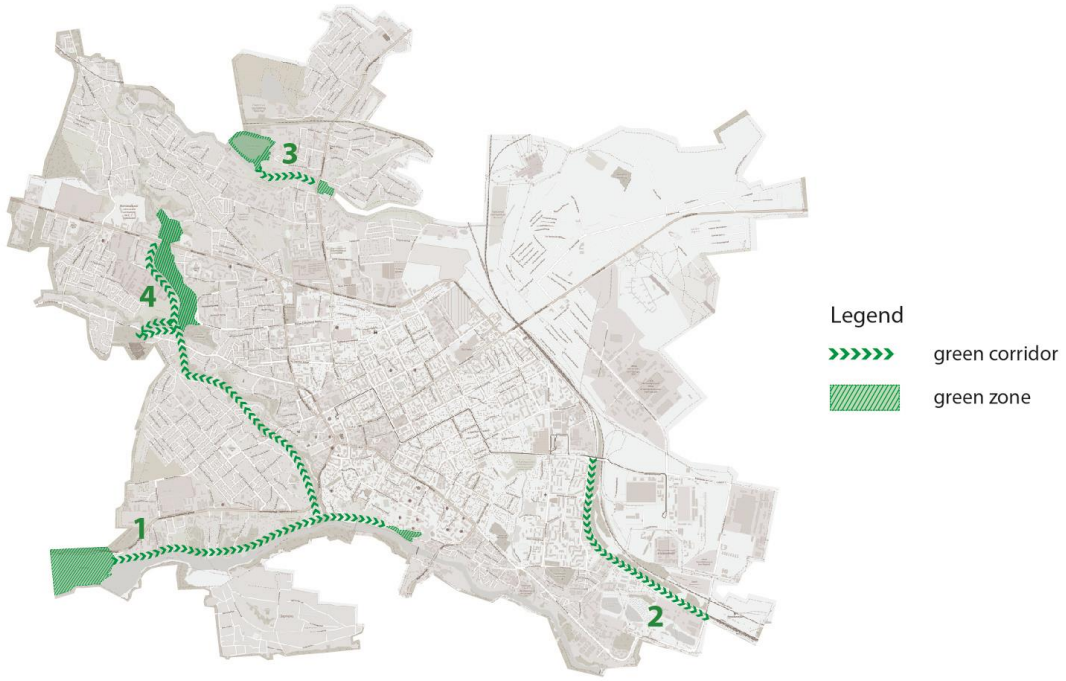


Figure 32. Green corridors development scheme

The more green corridors are created in the city of Zhytomyr, the friendlier and more comfortable it becomes. The green corridor system in the city Zhytomyr will create new opportunities for urban mobility, thus, encouraging people to walk and spend more time outdoors. Developed green corridors system in the city of Zhytomyr will affect all spheres of urban life, providing a high-level quality of public space, improving pedestrian infrastructure and the quality of urban life in general.

Figure 33. Green corridor ("Skyline route") in New York, USA. Photo: Stuart Shield

Public spaces

The public space is essential for well-being of each city and plays an important role in the organisation of the urban system. Development of high-quality public spaces in the city of Zhytomyr is important for offering opportunities for relaxing, recreation and communication activities outdoors, thus encouraging residents to walk.

First of all, the focus should be given to the improvement of the quality of existing public spaces in Zhytomyr that should meet the following criteria:

- Accessibility – ensuring all pedestrians have convenient access to and through the public space;
- Comfort – ensuring comfortable and enjoyable stay;
- Social acceptability – provision of social interactions between people.

Quality public space in the city of Zhytomyr should foresee buildings and spaces not as isolated elements but as a part of the whole city design that should be connected to each other and should

- reflects the unique identity of the city;
- ensures urban environment provide opportunities to all people;
- encourages walking activities and walking as a mode of transport;
- ensures and improves accessibility of public spaces to all pedestrians including women, children, elderly people and people with reduced mobility;
- creates safe, barrier-free and attractive pedestrian infrastructure (seating facilities and public restrooms arrangement in public spaces, etc.).

Urban navigation system

Information is the basis for decision making. An urban navigation system is a useful tool for exploring the city both for citizens and tourists. Easy-to-understand information about possible walking directions and city opportunities can motivate people to walk.

In order to reach goals towards the prioritisation of walking, it is essential to develop the urban navigation system that will provide general urban information on city opportunities and possible directions and places to visit, or instance:

- Information on city sightseeing and points of interest, important city locations and organisations;
- Map with recreational zones and sightseeing areas;
- Navigation information on how to visit places of interest by foot;
- Street design signs;
- Details on surface quality and accessibility of the routes;
- Access to local services, including public catering places.

Promotional events

The promotion of walking promotion is a top goal for the development of sustainable urban environment. Regular promotional activities should be organised to raise awareness of the benefits of walking.

One of such activities is a public event within the European Mobility Week called "car-free day". It displays information campaigns by local communities, holding activities to involve people to walk (e.g. walking challenge), carrying out walk-to-school campaigns, etc. The organisation of such promotional activities is a

very effective way to encourage people to walk, especially, if combined with infrastructure measures, e.g. development of pedestrian zones or reconstruction of the pedestrian infrastructure.

Urban policy development

In order to achieve the goals of prioritisation of walking, it is necessary to introduce an efficient management system dedicated to the pedestrian infrastructure and traffic in the city, and to develop the relevant regulatory document, The concept for the development of barrier-free pedestrian infrastructure should be developed and approved by the City Council and certainly address all infrastructure facilities such as pedestrian crossings, sidewalks, green corridors, lightening, public spaces, etc. and include the following:

- development and maintaining high-quality pedestrian infrastructure;
- plans on the provision of pedestrian infrastructure in new residential development areas with its integration into the network at the territory planning level;
- green corridor development concept;
- clear urban navigation system;
- extension of pedestrian zones.

The concept on the development of barrier-free pedestrian infrastructure offers ideas for further development and improvement of urban environment. The concept should be implemented in the city of Zhytomyr in order to achieve the following:

- ensure high-quality pedestrian infrastructure over the city;
- provide the efficient management principals in walking sector;
- encourage people to walk.

In order to ensure the implementation of urban design concept in the city of Zhytomyr, it is necessary to ensure the relevant in the executive body of the Zhytomyr City Council, which will be in charge for::

- implementation of the concept for the development of barrier-free pedestrian infrastructure;
- development of annual programmes on the maintenance and development of walking infrastructure;
- data collection and monitoring;
- promotion of walking.

In order to establish an effective pedestrian infrastructure management system, it is important to implement soft measures, including, *inter alia,* capacity building. These measures aim to improve the level of knowledge of city planners and transport engineers, as well as public authorities in the field of pedestrian space planning and organisation, development of barrier-free attractive environment accessible for all people, including women, children, the elderly and people with reduced mobility. This type of measures should be conducted on a regular basic and be included in annual budget of the city.

Monitoring and audit

The effectiveness of i measures aimed to encourage people to walk can only be achieved through systematic monitoring and audit.

The monitoring and audit system for pedestrian infrastructure is an effective tool to monitor walking infrastructure, to timely identify problems, which will allow maintaining a sustainable walking environment available for all people. Monitoring and audit allow to evaluate the process of implementation and to maintain pedestrian infrastructure in good condition. Monitoring in the form of

regular site inspections is required to ensure the maintenance of walking infrastructure at the affordable and safe level for people.

The Data gathered during monitoring are the basis strategic decision making. The pedestrian infrastructure database will allow to carry out detailed analysis and efficient planning in short- and long-term.

For monitoring of pedestrian infrastructure, it is necessary to create, *inter ali*a, the following databases:

- Database of places to be adapted for people with reduced mobility;
- Database of sidewalks network and repair works, including absent and existing sidewalks, driveways, ramps and crosswalks;
- Database with detailed information about all public spaces in the city including of diagnosis of all pedestrian facilities.

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
W1	Development and approval of the program or concept for development of barrier-free pedestrian infrastructure in the city	Management and organization			1*	1
W2	Creation of management department and appointing a responsible person for the pedestrian infrastructure development in the city	Management and organization			1	1
W3	Development of mobility plans and traffic safety for schools and other educational institutions	Management and organization			1	1
W4	Implementation of pedestrian infrastructure monitoring and audit system	Monitoring and data gathering			1 – 3	1 – 3
W5	Carrying out major repairs, reconstruction and further maintenance of public transport stops and sidewalks	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
W6	Establishment of proper pedestrian infrastructure in new residential development areas and its integration into the network of current pedestrian infrastructure in the city of Zhytomyr at the territory planning level	Infrastructure			1 – 3	1 – 3
W7	Creation of recreational zones, tourist routes and sightseeing areas maps	Promotion and awareness	1	1	1	1
W8	Development and placement of navigation signs in the city	Promotion and awareness			1	1
W9	Development of Concept of green corridors that links city districts	Infrastructure	1	1	1	1
W10	Development of green corridor #1	Infrastructure	1	1	1	1
W11	Development of green corridor #2	Infrastructure		1		1

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
W12	Development of green corridor #3	Infrastructure		1 – 2*		1 – 2
W13	Development of green corridor #4	Infrastructure				1 – 2
W14	Reconstruction of Sobornyi and Peremohy Squares with the organization of barrier-free pedestrian movement	Infrastructure		1	1	1
W15	Creation of pedestrian zones on Mala Berdychivska, Lyatoshynskoho, Novyi Boulevard, Staryi Boulevard, Pushkinska streets and on Skorulskoho by-street	Infrastructure			1 – 3	1 – 2
W16	Carrying out park and recreation areas improvement works in the city	Infrastructure			1 – 3	1 – 3
W17	Equipment of safe pedestrian crossings, sidewalks and sideways for all especially for people with disabilities	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
W18	Accessibility provisions to public transport stops and designating places for people with disabilities	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
W19	Seating arrangement in public spaces	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
W20	Public restrooms arrangement in public spaces	Infrastructure	1 – 2	1	1 – 2	1
W21	Establishment of smart crosswalks	Infrastructure			3	3
W22	Organisation the event "Car-free day"	Promotion and awareness	1 – 3	1 – 3	1 – 3	1 – 3
W23	Temporary restrictions on the movement of vehicles and the organization of temporary pedestrian spaces (e.g. during “Maisternya mista Zhytomyr”)	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
W24	Creation a database of places that should be adapted for people with disabilities	Monitoring and data gathering			1 – 2*	1 – 2
W25	Equipment of pedestrian crossings with sound signals of support for people with disabilities	Infrastructure		1	1	1
W26	Conducting regular competence development trainings for city planners and transport engineers on planning and organization of pedestrian space and its barrier-free	Capacity Building	1 – 3	1 – 3	1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

Cycling

In order to promote cycling, Zhytomyr should take a number of measures aimed to increase the share of cycling in the overall distribution of travel by way of travel. The cycling priority measures are aimed at achieving these goals:

4.1 Ensuring of safe and comfortable conditions for cyclists

4.2 Increasing the attractiveness of cycling

4.3 Creating solutions for a safe storage of bicycles

2.1 Enhancing the safety of vulnerable road users

Urban cycling policy and standards

In order to achieve the objectives set by the cycling priority of the SUMP, it is important to provide a clear and efficient mechanism for the development of cycling ensuring the implementation and control of all actions in this field. Therefore, the city of Zhytomyr should develop and approve the relevant documents:

- Concept for the development of cycling infrastructure is a strategic policy document setting priorities, principles and key goals of the development cycling in the city. It explains the features of the high-quality infrastructure and the expected results from its implementation.
- The city target programme on bicycle infrastructure development is a strategic document that defines and explains in detail the implementation plan for achieving the objectives of the concept, including the responsible entities. The document includes the expected cycling network scheme with the terms of its phased construction, and a list of promotional measures and activities to be implemented.

National Standards for the Development of Bicycle Infrastructure that should be guided during the development and implementation of the above-mentioned documents are as follows:

- SBN V.2.3-5:20XX “Streets and roads of settlements”;
- SBN B.2.2-12:2018 “Planning and building of territories”.

In addition, there is an advisory document NSoU (National Standards of Ukraine) “Planning and designing cycling infrastructure” (in the process of development). The Guidelines for the organisation of bicycle traffic (ERA) for Germany is available in Ukrainian; it was translated by the German Society for International Cooperation (GIZ) in collaboration with the Kyiv Cycling Association. This document can become a basis for the development of modern Ukrainian standards in the field of cycling infrastructure.

Types of cycling infrastructure

There are different types of infrastructure for a comfortable cycling:

- One-way cycle lane on both sides of the street – a mark-up or delineator roadway space designed for cycling;
- One-way cycle lane on both sides of the street – physically separated and marked roadway space with a ban on motorized traffic;
- Two-way cycle lane on one side of the street – is equipped on the side where there are buildings;
- A common bicycle and pedestrian path – can be used at low intensity cycling and pedestrian flow;
- Permission for cyclists to ride the lane dedicated for public transport;

- Counter-lane – lane for a countercyclical flow on one-way streets;
- Recommended lane - is marked with dotted markings on the roadway for cycling, but it is allowed to ride motorised transport on it.

Cycling navigation

Cycling navigation signs are available at intersections, so that cyclists can orient themselves efficiently on the way. It is convenient, when navigation signs differ from others by the colour. They provide information about the direction of further movement along the route, the distance, the street name or the route number.

Figure 34. Cycling navigation in Netherlands. The red one indicates the direction for bicycles and motorbikes, while green one – only for bicycles. Photo: Holland-Cycling.com

In order to create a complete cycling route network in Zhytomyr, it is proposed to lay eight routes connecting the central part of the city with the periphery. Based on the prospective volume analysis, it is defined an attractive rate for each route that is a function of the number of potential users. According to the obtained data, the priority order of the infrastructure arrangement of these routes is proposed.

Priority ranking of cycling routes implementation

The table below shows the implementation priority of cycling routes in Zhytomyr (Table 2). Cycling route scheme is presented on Figure 35.

Table 2. Prioritization of cycling routes

Ref. No.	Route	Attraction rate	Priority
1	Kyivska St. (Sobornyi Square – Paradzhanova St.)	8.5	2
2	Velyka Berdychivska St. (Sobornyi Square – Seletska St.)	9.5	1
3	Chudnivska St. (Sobornyi Square – Korbutyvskyi Hydropark)	2	8
4	Peremohy St. – Myru Prospect (Sobornyi Square – Generala Vsevolods Petrivs St.)	6.5	3
5	Pokrovska St. (Velyka Berdychivska St. – Tarnovskogo St.)	3.5	7
6	Shidna St. – Nezalezhnosti Prospect (Myru Prospect – Koroliova St.)	5	5
7	Vitruka St. – Vokzalna St. (Kyivska St. – Honty St.)	5	6
8	Velyka Berdychivska St. – Shevchenka St. – Koroliova St.	5.5	4

Figure 35. Cycling route scheme

Cycling parking and storage

Short-term parking

For **short-term bicycle parking**, it is necessary to provide parking in the immediate vicinity of the cycling destinations. Such short-term parking should be convenient, quick to use and accessible. The installation will not restrict other road users in their mobility. The advantage of it is the visibility of the parking lot from the building near which it is located.

Long-term parking

When traveling to work or university, the bikes are parked for a longer time. Therefore, long-term parking should be located near educational institutions and places of employment (offices, factories) in the city of Zhytomyr. One of the most wide-spread examples is the enclosed grid space, which is locked and accessed only by its users. Long-term cycling parking should be covered, with increased security level (individual cells, bicycle garages, buildings space, etc.), guarded and / or equipped with video surveillance.

Figure 36. Bicycle garage in Minsk (2014) Photo: Yevheniy Kharuzhyi

Cycling racks

Cycling racks should meet a number of requirements: provide two points of contact, allow the frame to be attached to at least one of the wheels, be fixed to the ground and be compatible with conventional bicycle locks (especially with u-shaped locks). There is now a good example of branded racks in Zhytomyr, but all of them are set up at funds of the state budget. Local business should be encouraged to set up cycling racks near their locations.

The simplest cycling rack is an arched (n-shaped) steel tube. The structural dimensions are shown in the following figure (Figure 37).

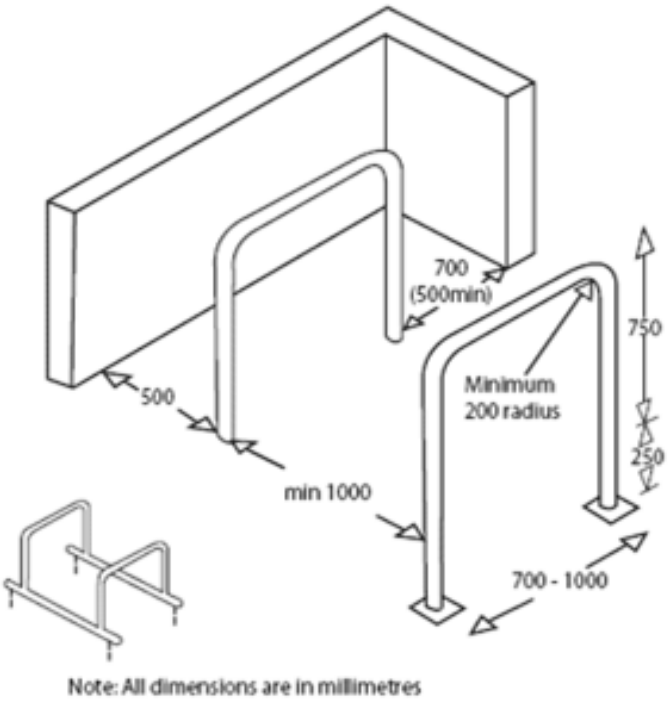


Figure 37. Constructive dimensions of arched (n-shaped) rack, "Parking Standards", 2005

Bike sharing system

Bike sharing system can be a good alternative for the short distances for citizens and tourists of Zhytomyr. This system is very convenient for those who have no place to store their own bikes at home. For example, students of the Zhytomyr State Ivan Franko University may reach the university by bicycle in 10-15 minutes, while it would take them 20-25 minutes by public transport and almost 30 minutes walking.

In addition, the bike-sharing system will strengthen the priority of the city's external communications. To reach Sobornyi Square from the railway station or bus station will be possible in 20 and 15 minutes accordingly.

The introduction and use of the bicycle sharing system will make it possible to promote public transport and the road network. Bike-sharing system development should meet the following requirements:

- Minimum System Coverage Area: 10 km^2;
- Station Density: 10–16 stations per km^2;
- Bikes/Resident: 10–30 bikes for every 1,000 residents (within coverage area);
- Docks per Bike Ratio: 2–2.5 docking spaces for every bike.

The map represents the possible locations of bike-sharing stations, but the final locations should be agreed with the customer and contractor. Following is the list of possible bike-sharing stations:

1. Zhytomyr Military Institute named after S.P. Korolyiov;
2. Intersection Myru Prospect – Peremohy St.;
3. Intersection Shidna St. – Nezalezhnosti Prospect;
4. Koroliova Square;
5. Sinnyi market;
6. Sobornyi Square;

7. Zhytomyr State Technological University;
8. Zhytnyi market;
9. City Council;
10. Tower;
11. Shoduarivskyi park;
12. Zhytomyr Ivan Franko State University;
13. Zhytomyr Institute of Medical Nursing;
14. Serhiy Pavlovych Koroliov Museum of Cosmonautics;
15. Botanical Garden of Zhytomyr National Agroecological University;
16. Dorm rooms # 4, Zhytomyr Ivan Franko State University;
17. Shopping center Global UA;
18. Bus station;
19. Zhytomyr railway station.

Figure 38. Possible bike-sharing stations

Cycling sport infrastructure

Cycling sport infrastructure is being created for all age groups in order to promote youth and children's cycling, a healthy lifestyle among young people, further development of cycling and improvement of the quality of life, as well as in order to increase the tourist attractiveness of the city.

One of such measures on the development of cycling sport infrastructure in Zhytomyr is the creation of a relief cycling track for all types of wheels (bicycles, scooters, rollers and runbike) on Maidan Zhody. It is expected that the implementation of this measure will contribute to the promotion of health and active lifestyle among the young generation as well as adults.

Together with the development of cycling sport infrastructure, it is necessary to create a children training base and training grounds where trainings will be conducted. Such training facilities can be bicycle schools that should be opened in each of the 7 identified centres in Zhytomyr.

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
C1	Development and approval a concept or target program for development of cycling with developed Cycling Route Network	Management and organization	1*	1	1	1
C2	Creating a management department and appointing a responsible person for the cycling development in the city	Management and organization	1	1	1	1
C3	Including works for ensuring safe movement of cyclists while construction planning and maintaining of streets and roads	Management and organization			1 – 3	1 – 3
C4	Construction of a bicycle route Velyka Berdychivska St. (Sobornyi Square – Seletska St.)	Infrastructure	1	1	1	1
C5	Construction of a bicycle route Kyivska St. (Sobornyi Square – Paradzhanova St.)	Infrastructure	1	1	1	1
C6	Construction of a bicycle route Peremohy St. – Myru Prospect (Sobornyi Square – General Vsevolod Petriv St.)	Infrastructure		1		1
C7	Construction of a bicycle route Velyka Berdychivska St. – Shevchenka St. – Koroliova St.	Infrastructure		2		2
C8	Construction of a bicycle route Shidna St. – Nezalezhnosti Prospect (Myru Prospect – Koroliova St.)	Infrastructure		2		2
C9	Construction of a bicycle route Vitruka St. – Vokzalnaya St. (Kyivska St. – Honty St.)	Infrastructure				2
C10	Construction of a bicycle route Pokrovska St. (Velyka Berdychivska St. – Tarnovskoho St.)	Infrastructure				3
C11	Construction of a bicycle route Chudnivska St. (Sobornyi Square – Korbutyvskyi Hydropark)	Infrastructure				3
C12	Construction of a bicycle route in Hydropark	Infrastructure		2		2

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
C13	Construction and arrangement of a relief bicycle track on Maidan Zhody	Infrastructure	2*	1	2	1
C14	Arrangement of bicycle parking stations for short-term storage	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
C15	Street and road network construction for charging electric bicycles	Infrastructure				3
C16	E-bikes popularisation	Promotion and awareness			1 – 2	1 – 2
C17	Implementation of the bike-sharing system	Management and organization		2	2 – 3	2
C18	Navigation arrangement for the cycling route network in the city	Promotion and awareness	1 – 3	1 – 3	1 – 3	1 – 3
C19	Arrangement of bicycle parking stations for long-term storage	Infrastructure			2	2
C20	Conducting a cycling survey in key point locations of the city	Monitoring and data gathering	1 – 3	1 – 3	1 – 3	1 – 3
C21	Development of monitoring and audit system of the cycling infrastructure in the city	Monitoring and data gathering			1	1
C22	Integration of new housing areas into the cycling network at the planning stage of the territories	Management and organization			1 – 3	1 – 3
C23	Integration of cycling with public transport system	Management and organization				2 – 3
C24	Conducting bike tours	Promotion and awareness			1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
C25	Conducting European Mobility Week	Promotion and awareness	1 – 3*	1 – 3	1 – 3	1 – 3
C26	Conducting Bikeday	Promotion and awareness	1 – 3	1 – 3	1 – 3	1 – 3
C27	Conducting event "Cycling to work"	Promotion and awareness	1 – 3	1 – 3	1 – 3	1 – 3
C28	Conduction regular competence development activities for city planners and transport engineers in the field of organization and planning of cycling traffic	Capacity Building	1 – 3	1 – 3	1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

Parking Management

Inefficient parking management system negatively affects not only the comfort of private cars users, but also public transport, since parked cars occupy the space in the traffic area and restrict public transport flows. Furthermore, parking on sidewalks and cycling paths creates obstacles for pedestrians' and cyclists' movement. Measures in the field of parking are aimed at creating a comfortable parking system in the city:

5.1 Reducing the number of cars on the roadways and sidewalks in the city centre

5.2 Parking management in residential areas

5.3 Organization of commercial and municipal transport logistics

5.4 Improving parking behaviour among the citizens

Parking management policy and standards

According to the law On changes to legal acts of Ukraine regarding reforms on vehicles parking as of 21.12.2017, city municipalities are now able to take over the control function of parking and establish a municipal organization that will control parking and is allowed to fine or evacuate vehicles of for illegal parking. This opportunity to better manage space area comes with responsibility and requires a well-developed concept for parking management.

The parking management concept should be developed and approved by the city council, and must include:

- the city policy regarding Parking (Parking will be used as a tool to curb the use of private cars in the city);
- parking zoning;
- delivery vehicles and trucks movement and loading / unloading policy;
- tariff policies;
- the location and capacity of parking areas in terms of street and off-street parking;
- the organisational and institutional structure of the parking management system;
- the structure of the distribution of funds from fees for parking;
- implementation plan.

A special attention should be paid to the delivery vehicles movement. The target programme of the heavy vehicle movement should consider a specific area for parking, loading and unloading. The choice of the area should be a function of the following factors:

- Type of loading;
- Land use and its occupation;
- Geometric designs of roads;
- Freight vehicles flows.

Effective management system establishment

The introduction of the system of paid parking in the city requires the development of parking management institutional structures. The changes in parking management require the establishment of a

municipal company that will operate parking spaces and ticketing infrastructure, collect fees, enforce fines for violating parking rules, carry out monitoring and analysis of historic data, and develop recommendations for the city council on the parking management policy.

Parking pricing

The parking management system includes a parking fee collection scheme. It usually focuses on the central area of the city, where the demand for parking space is high (mixture of different functions, i.e. residential, business, retail, leisure & tourism). The parking fee scheme could generate additional revenue, which should be spent on measures aimed to improve sustainable mobility in the city (walking, cycling, and public transport).

Goals of pricing:

- Demand management

An optimised parking system helps prevent the extensive use of the public space by cars, and increase the value and attractiveness of urban public space making it safer and more comfortable. Parking fees could also decrease demand for cars, and to contribute to the user mode choice shift towards alternative transport modes.

- Collect funds

Revenue generation cannot be the main purpose of the introduction of parking fees. Parking funds should be allocated to finance measures aimed at the improvement of urban mobility, e.g. public transport, cycling or walking infrastructure.

In order to reduce the negative political effect of parking, it is important to ensure that parking pricing leads to the significant improvement in quality, and that high prices are only charged at busiest places. Moreover, the visual improvement of the area should be also ensured.

Residential parking

Since the public space is limited, special attention in the city is given to the development of the adequate on-street parking management system, as well as setting up parking zones to reduce the number of cars on roadways and sidewalks in the city centre. Effective on-street parking management benefits urban environment.

- Managed parking management improves the parking behaviour. The most obvious benefit is the reduction in obstructive and chaotic parking. Better parking management significantly reduces traffic congestions.
- Conflict over parking can be considerably reduced.
- On-street parking management ensures that the whole parking system functions better.
- On-street parking management can be improved.

Residents parking

The city has to provide the residents with sufficient parking space in residential districts to park their cars close to their houses. Well-organized residential parking is fundamental to the development of a viable residential areas since it requires a lot of space to provide enough parking slots/ On the other hand, residents should have dedicated places to park their cars in residential areas close to their buildings.

Long-term parking near buildings as well as at adjoining area creates obstacles to the accessible residential environment, as well as safety risks, and it is recommended to organize off-street parking facilities (underground and overground parking) for residents that can be both indoors and outdoors.

According to State sanitary rules of planning development and human settlements approved by the Order No. 173 of the Ministry of Health of Ukraine dated on June 19, 1996 it is allowed to construct underground and semi-underground parking space in the pediment and substructure of residential buildings for cars owned by the residents of that building with the provision of noise protection and emission protection according to hygiene standards. Entrance and exit to underground parking and vehicular access to should be located not closer than 15 m from the window of residential units.

Guest parking

Visitors are eligible for a guest parking unless it is not forbidden by territory use and the size of adjoining territory allows to arrange it. There are organized locations available to provide quest parking service close to main city institutions and authorities. Development of quest parking zones improves the comfort of visitors as well as improves general environment and reputation of the institute with available guest parking slots.

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
P1	Development and approval of the concept or city dedicated program on parking space organization	Management and organization	1*	1	1	1
P2	Development of the concept of transportation, parking and unloading of freight transport within the city	Management and organization	1	1	1	1
P3	Establishment of a local parking inspection	Management and organization	1	1	1	1
P4	Organisation of municipal parking areas in the city districts	Infrastructure		1	1 – 2	1
P5	Creating ordered parking space in places where new buildings are constructed	Infrastructure	1 – 3	1 – 3	1 – 3	1 – 3
P6	Arrangement of special parking places for vehicles of people with disabilities in the parking slots, in the parking areas on the streets	Infrastructure	1 – 2	1	1 – 2	1
P7	The creation of parking spaces near transport hubs on the periphery of the city	Infrastructure			3	1 – 2
P8	Installation of a paid parking system on specially designated territories	Management and organization	2	2	1	1
P9	Implementation of the regulation of the traffic schedule, parking for the transportation of goods to shops by freight transport within the central part of the city	Management and organization			1	1
P10	Design of platforms for loading / unloading of commercial transport within the city	Management and organization			1	1
P11	Determination of streets and roads, where truck traffic is allowed	Management and organization			1	1

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
P12	Arrangement of four platforms for parking freight transport at the town's exit	Infrastructure			3*	2
P13	Traffic prohibition in the city on certain time periods of the day	Management and organization			1	1
P14	Development and implementation of a system of monitoring the use of parking spaces in the city	Monitoring and data gathering			2	2
P15	Development and introduction of electronic navigation information system on the availability of free parking places	Infrastructure			2	2
P16	Establishment of informing boards of the availability of free parking spaces	Infrastructure				2 – 3
P17	Dissemination of social advertisement regarding maintaining and enhancing the culture of parking	Promotion and awareness			1 – 3	1 – 3
P18	Regular competence development activities for city planners and transport engineers in the field of parking space planning and organization	Capacity Building	1 – 3	1 – 3	1 – 3	1 – 3

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

External accessibility of Zhytomyr

Transport accessibility is one of the main factors of socio-economic development of the city. In the context of sustainable urban mobility planning, the transport accessibility level affects the welfare of the city and the living standards. Transport accessibility level determines the attractiveness of the city for living as well as for tourism.

Measures in the field of external accessibility of Zhytomyr are aimed at improving the city's transport accessibility, creating opportunities for people to get to any part of the region, oblast, country and the world, as well as ensuring the delivery of goods by rail, road and air. These measures mainly contribute to the achievement of the following goals:

6.1 Providing high-speed railway service

6.2 Implementation of freight and passenger services through Zhytomyr airport

6.3 Development of integrated bus stations

1.2 The use of more environmentally friendly vehicles

1.3 Integration of public transport into one integrated system

2.1 Enhancing the safety of vulnerable road users

2.2 Mortality reduction on roads

3.1 Providing qualitative pedestrian infrastructure appropriate for moving of people with reduced mobility

5.1 Reducing the number of cars on the roadways and sidewalks in the city centre

Provision of external accessibility of Zhytomyr will strengthen its significance as a regional centre.

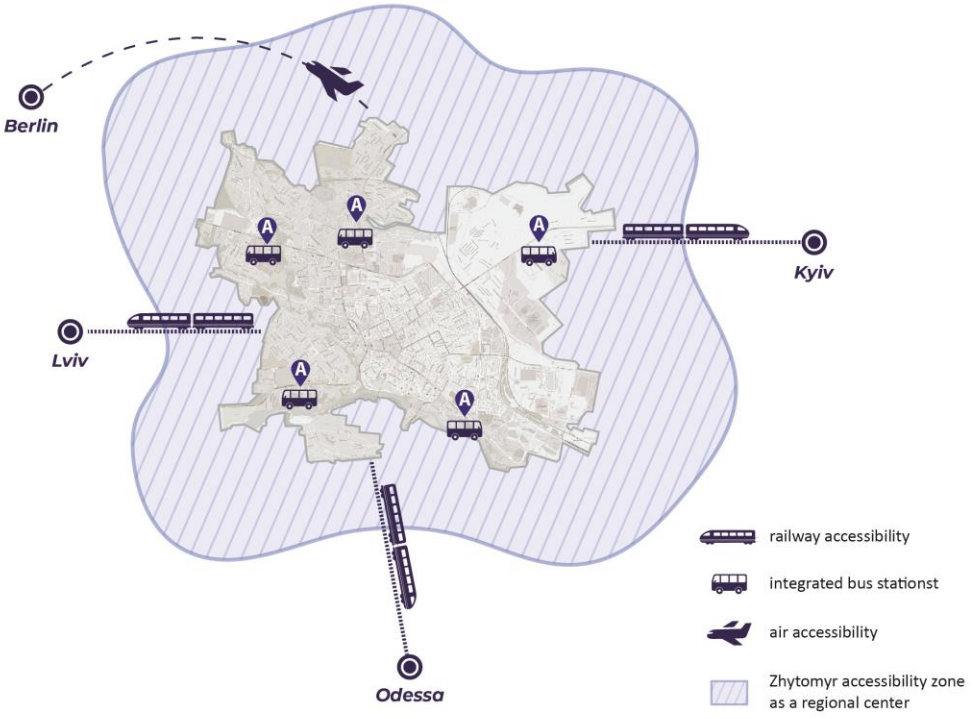


Figure 39. External connection of the city of Zhytomyr

Railway accessibility

Railway accessibility of Zhytomyr is an extremely important component of the transport system and its availability. Railway transport operation is provided by the transport infrastructure, that includes a rolling stock, transport routes, etc. Major problem of Zhytomyr railway is its electrification. First of all, in order to ensure an efficient rail operation and to ensure high-speed railway services, it is necessary to electrify railway sections Zhytomyr-Novograd-Volynskyi.

As for the economic development perspective for Zhytomyr as a regional centre, it is extremely important to provide direct regular railway service with the capital of Ukraine.

Air accessibility

The existence and operation of an airport plays an important role in the transport system of the city. Air accessibility is important not only for tourist attraction, but also for the economic development of the city.

In order to create air accessibility as well as freight and passenger air service operation by the Zhytomyr airport, it is necessary in the first place to re-establish operations and complete the construction of the airport and take-off runway.

In order to ensure an efficient airport operation, it is important to increase the service regulation and attractiveness for Ukrainian and international airlines to operate by the airport "Zhytomyr", opening daily regular flights as well as performing charter flights. In order to create a competitive environment in airport “Zhytomyr”, it is necessary to launch air service with other countries, as well as to develop domestic transportation.

Bus accessibility

In order to strengthen Zhytomyr as a regional centre, it is necessary to ensure the provision of high-quality passenger bus services, and to create affordable and comfortable passenger bus connections with adjoining areas, developed cities, regional centres and the capital.

In order to improve the provision of bus passenger services in the city of Zhytomyr and to improve the transport situation in the central part of the city, it is necessary to create integrated bus stations at the main entrance of the city. It will allow to reduce the traffic load on the central part of the city of Zhytomyr.

Development of integrated bus stations is possible through the efficient integration of suburban bus transport operations with public transport system of the city that will allow people to efficient plan the trips and make convenient transfers.

Road accessibility

One of the most sustainable measures to ensure the external road accessibility of the city and to create a comfortable and safe urban environment, in particular in the central part of the city, is to reduce the traffic flow by reducing the attractiveness of the city central part for transit transport and the withdrawal of transit transport from the central part of the city.

№	Measures	Category	Scenario 1	Scenario 2	Scenario 3	Scenario 4
EC1	Hub development "Sinnyi Market"	Infrastructure				2 – 3*
EC2	Electrification of the line Zhytomyr-Novograd-Volynskyi	Infrastructure				2 – 3
EC3	Completion of reconstruction of the airport and take-off runway	Infrastructure		2 – 3		2 – 3
EC4	Creation of suburban bus stations on the main output highways of the city on the following streets: Chernyakhivsky, Shchorsa, Kyivske highway, Velyka Berdychivska and Myry Prospect	Infrastructure				2 – 3
EC5	Liquidation of a bus station on Khlibna St	Infrastructure			3	2
EC6	Transfer hub development "Stations", reorganization of road traffic in the area of the railway station	Infrastructure			2	2
EC7	Reconstruction of bus station-1 on 93 Kyivska St in order to serve only interurban and international routes	Infrastructure			3	1

* Number of Phase: 1 – 1-5 year of implementation (2018-2023), 2 – 6-10 year of implementation (2024-2028), 3 – 11-15 year of implementation (2029-2033); 1-2 or 1-3 means the measure should be implemented gradually each phase

Chapter 7 Summary of Scenarios

Scenario 1 – Maintain and Operate

Assumption

This is a baseline scenario, which suggests that no significant changes in financing and organisational structure will occur in the near future. The city does not have significant investments, and the current situation in the city is characterised by a lack of readiness to accept changes and lack of organisational capacity.

Composition

- The public transport infrastructure is maintained to ensure sustainability and, if possible, to improve operating conditions;
- A card of Zhytomyr citizen is introduced;
- bicycle routes of first priority are built and safety of intersection crossings are improved;
- Parking racks for bicycles and navigation are installed along the major cycling routes.
- Specific city development programmes for the development and maintenance of street, bicycle infrastructure and parking space are developed;
- Pedestrian infrastructure is maintained at an appropriate level and updated to provide barrier-free movement and comfort, expanded the car free zones and created green corridors are developed taking into account the needs of low mobility populations;
- Road safety has been enhanced by creating safe, inclusive pedestrian crosswalks, and road safety awareness programs;
- A local parking control service has been established, parking at new building areas is organized and parking places for the disabled are arranged in the city;
- City-wide events are organized to increase awareness of sustainable urban mobility;
- Capacity development activities are organized for transport specialists, city representatives, and transport authorities.

Rough cost of implementation first phase of the scenario (2019 – 2023):

345.5 mln. UAH

Quantitative indicators:

Parameter	Value
Average travel time, min	23 min 37 s
Average waiting time, min	2 min 56 s
Average distance, km	4.17
Average speed, km / h	10.60
Average speed of public transport, km/h	20.36
Average number of transfers	0.108
Total number of passengers	255 000
Vehicle-kilometres	83 870.9
Passenger-kilometres	838 318
Passenger hours	41 182 h 7min

Qualitative indicators:

- Improved mobility of pedestrians and cyclists;
- Increased safety on the roads;
- Refined conditions for people with limited mobility;
- Increased reliability of public transport;
- Enhanced viability of the public transport;
- More attractive public spaces;
- Higher awareness of sustainable urban mobility.

Map of Zhytomyr city: Scenario 1 – Maintain and Operate

Scenario 2 – Continue and Expand

Assumption

The City will implement the investment strategy and will have access to sufficient financial resources available for the development of the sector. No significant changes are expected in organisational or institutional structure.

Composition

- The public transport infrastructure is constantly maintained, the trolleybus fleet is updated, municipal bus fleet is enlarged with low-floor buses and electric buses. The conditions of public transport operation are improved due to the development of infrastructure; a card of Zhytomyr citizen is introduced;
- A trolleybus network is maintained, a new trolleybus line is being constructed to the Malovinki district and a trolleybus depot is reconstructed;
- Construction of the airport has been started and the runway construction is completed;
- Specific city development programs for the development and maintenance of street, bicycle infrastructure and parking space are developed;
- Bicycle routes of first priority with parking racks and navigation are built; the bike-charring system is launched;
- Pedestrian infrastructure is maintained at an appropriate level and updated by an energy-efficient lighting network, walking routes and public spaces are equipped taking into account the needs of low-mobility population groups;
- Green corridors have been created and the Sobornyi and Peremohy Squares have been renovated with the organization of barrier-free movement;
- Road safety has been enhanced by creating safe, inclusive pedestrian crosswalks, and road safety awareness programs;
- A local parking control service has been established, parking at new building areas is organized and parking places for the disabled are arranged in the city;
- City-wide events are organized to increase awareness of sustainable urban mobility;
- Capacity development activities are organized for transport specialists, city representatives, and transport authorities.

Rough cost of implementation first phase of the scenario (2019 – 2023):

783.6 mln. UAH

Quantitative indicators:

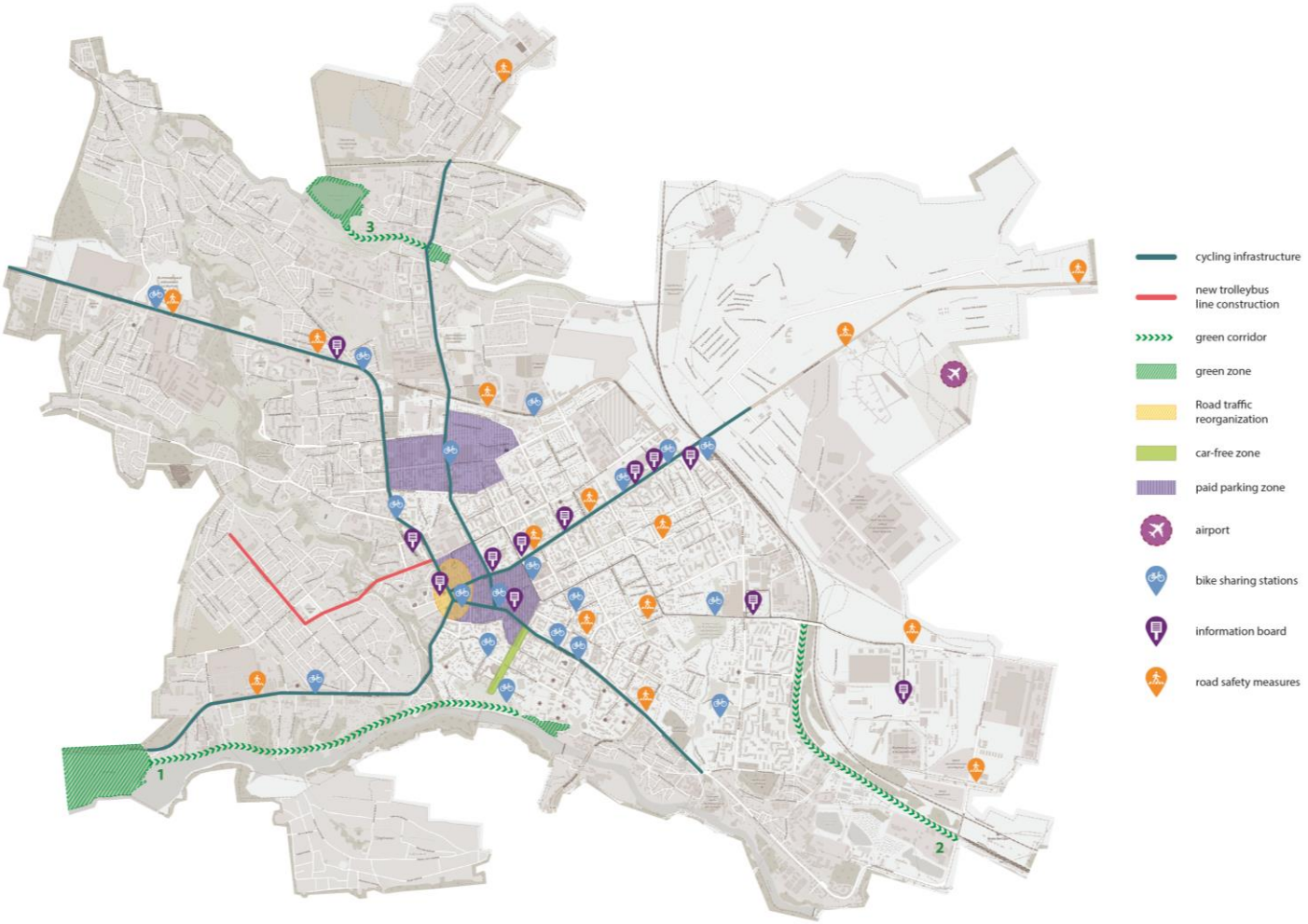
Parameter	Value
Average travel time, min	20 min 49 s
Average waiting time, min	2 min 58 s
Average distance, km	4.23
Average speed, km / h	12.19
Average speed of public transport, km/h	27.41
Average number of transfers	0.085
Total number of passengers	249 000
Vehicle-kilometres	67 184.9
Passenger-kilometres	854 505
Passenger hours	31 171 h 47 min

Qualitative indicators:

- Improved mobility of pedestrians and cyclists;
- Increased safety on the roads;
- Refined conditions for people with limited mobility;

- Increased reliability of public transport;
- Enhanced viability of the public transport;
- Decreased number of large-sized vehicles in the city centre;
- More attractive public spaces;
- Improved image of the City;
- More comfortable touristic sites and recreational zones;
- Higher awareness of sustainable urban mobility.

Map of Zhytomyr city: Scenario 2 – Continue and Expand



Scenario 3 – Reorganise and Prepare

Assumption

This scenario assumes that no significant changes in funding, but organisational structure will improve in the near future. The City has low access to financial resources to be allocated but high political and public support with organizational capacities for the reformation of sector.

Composition

- A unified centralised system for managing and dispatching public transport has been introduced, reorganization of the route network has been carried out; research on population mobility and satisfaction with the level of transport services provision are regularly conducted;
- Liquidation of the bus station on the street Khlibna is started and bus station-1 on the street Kyivska is reconstructed;
- The hub "Vokzaly" is developing with the reorganization of road traffic in the area of the railway station;
- A system for monitoring the operation and emissions from public transport is launched; stops audit has been conducted;
- Main and touristic bicycle routes with navigation, parking and safe crossings are built; long-term parking for bicycles is created; proven innovative budget solutions for securing pedestrian and cycling is tested;
- Green corridors have been created, pedestrian zone in the city centre was expanded and the Sobornyi and Peremohy Squares have been renovated with the organization of barrier-free movement;
- Concepts for the development of barrier-free pedestrian infrastructure of the city and plans for mobility and road safety for educational institutions are developed;
- Pedestrian infrastructure is maintained at an appropriate level and updated by introducing a management and monitoring system, an energy-efficient lighting network; walking routes and public spaces are equipped taking into account the needs of low-mobility population groups;
- Road safety has been increased by creating traffic islands, speed limits of 30 km /h are adopted in residential areas, and awareness raising programs have been developed;
- A traffic management centre and a database for the registration and analysis of road accidents are established;
- The municipal service of parking control and system monitoring and navigation are launched, paid parking areas, parking free and out-of-street parking zones are arranged; parking zones near transport hubs are created;
- The parking areas for cargo transport at the main entrance to the city are arranged; movement, parking and unloading of freight transport within the city is organized;
- City-wide events are organized to increase awareness of sustainable urban mobility;
- Capacity development activities are organized for transport specialists, city representatives, and transport authorities.

Rough cost of implementation first phase of the scenario (2019 – 2023):

402.7 mln UAH

Quantitative indicators:

Parameter	Value
Average travel time, min	19 min 52 s
Average waiting time, min	2 min 34 s
Average distance, km	4.17
Average speed, km / h	12.61
Average speed of public transport, km/h	28.9
Average number of transfers	0.135
Total number of passengers	260 000
Vehicle-kilometres	67 184.9
Passenger-kilometres	841 213.1
Passenger hours	29 104 h 21 min

Qualitative indicators:

- Improved mobility of pedestrians, cyclists and people with limited mobility;
- Increased safety on roads and in the city;
- Increased reliability and viability of public transport and better integration with other modes;
- Centralized decision-making in urban mobility that is based on reliable data;
- Improved quality of parking space and decreased traffic in the city;
- More comfortable and attractive public spaces and recreational zones;
- Improved image of the City;
- Higher awareness of sustainable urban mobility.

Map of Zhytomyr city: Scenario 3 – Reorganize and Prepare

Scenario 4 – Transformation

Assumption

This is the most optimistic scenario, which offers the best opportunities for breakthrough. The City has access to mobilize the significant financial resources as well as sufficient organizational capacities and public support to implement the strategies for innovation.

Composition

- A unified centralised system for managing and dispatching public transport has been introduced, reorganization of the route network has been carried out; research on population mobility and satisfaction with the level of transport services provision are regularly conducted;
- Liquidation of the bus station on the street is started. Bread and reconstruction of AC-1 on Kyivska Street;
- A trolleybus network is maintained, a new trolleybus line is being constructed to the Malovinki district and a trolleybus depot is reconstructed;
- Construction of the airport has been started and the runway construction is completed;
- The formed and developed transport hub "Sinnyi rynok" is integrated into the public transport network by new tram line “Short lines";
- Reorganisation of road traffic in the area of the railway station;
- Transport interchange nodes were created on the main city highways with well-equipped parking spaces for bicycles, trucks and cars;
- A system for monitoring the operation and emissions from public transport is launched; stops audit has been conducted;
- Main and touristic bicycle routes with navigation, parking and safe crossings are built; long-term parking for bicycles is created; proven innovative budget solutions for securing pedestrian and cycling is tested;
- Green corridors have been created, pedestrian zone in the city centre was expanded and the Sobornyi and Peremohy Squares have been renovated with the organization of barrier-free movement;
- Innovative solutions for cycling and walking are implemented; the pedestrian infrastructure is maintained, renovated and expanded; cycling infrastructure is included in the planning of construction and repairs of new districts / zones, streets and roads; The rules of landscaping and maintenance of pedestrian infrastructure are updated;
- Concepts for the development of barrier-free pedestrian infrastructure of the city and plans for mobility and road safety for educational institutions are developed;
- Road safety has been increased by creating traffic islands and safe and inclusive crossings; speed limits of 30 km /h are adopted and awareness raising programs have been developed;
- A traffic management center and a database for the registration and analysis of road accidents are established;
- The municipal service of parking control and system monitoring and navigation are launched, paid parking areas, parking free and out-of-street parking zones are arranged; parking zones near transport hubs are created;
- The parking areas for cargo transport at the main entrance to the city are arranged; movement, parking and unloading of freight transport within the city is organized;
- The concept of the movement, unloading and parking of freight transport within Zhytomyr is implemented and managed by created cargo hubs on the periphery of the city;
- Promotion and capacity building as in the previous scenarios.

Rough cost of implementation first phase of the scenario (2019 – 2023):

449.9 mln UAH

Quantitative indicators:

Parameter	Value
Average travel time, min	20 min 21 s
Average waiting time, min	2 min 55 s
Average distance, km	4.26
Average speed, km / h	12.55
Average speed of public transport, km/h	28.9
Average number of transfers	0.087
Total number of passengers	250 000
Vehicle-kilometres	51 919.8
Passenger-kilometres	861 120.3
Passenger hours	29 716 h 52 min

Qualitative indicators:

- Improved mobility of pedestrians, cyclists and people with limited mobility;
- Increased safety on the roads and in the city;
- Increased reliability and viability of public transport and better integration with other modes;
- Centralised decision-making in urban mobility that is based on reliable data;
- Improved quality of parking space, better organization of freight traffic and decreased traffic in the city;
- More comfortable and attractive public spaces and recreational zones;
- Improved image of Zhytomyr that becomes known as a city with high traffic culture and modern urban environment.

Map of Zhytomyr city: Scenario 4 – Transformation

Chapter 8 Implementation Plan

This chapter presents the grouping proposed measures for Zhytomyr's sustainable urban mobility development into 4 scenarios. The limitations as time horizon, availability of financial resources and level of organisational capacities have considered while measures are grouping. Some of the measures are included in several phases of scenarios based on the sequential approach of its implementation.

Scenario 1 – Maintain and Operate

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT2	Development and update of transport model	■	■	■	Monitoring and data gathering
PT7	Development and approval of Quality Standards for public passenger transport services in the city of Zhytomyr	■			Management and organization
PT8	Introduction of the Zhytomyr resident card and its integration with other systems	■	■		Management and organization
PT9	Organization of events informing the public on e-ticket operation	■			Promotion and awareness
PT11	Trolleybus rolling stock and network update	■	■	■	Infrastructure
PT12	The purchase of buses of environmental standard Euro-5	■	■	■	Infrastructure
PT13	Technical re-equipment of contact, cable networks, street railways and traction substations	■	■		Infrastructure
PT15	Updating and technical re-equipment of the production facility of tram and trolleybus depot	■	■	■	Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT16	Arrangement of key trans-shipment units of public transport (for example, bus station, railway station) with a table showing traffic data	■	■		Infrastructure
PT22	Carrying out mobility survey of the population	■	■	■	Monitoring and data gathering
PT23	Carrying out public transport customer satisfaction survey	■	■	■	Monitoring and data gathering
PT26	Conducting regular professional development trainings for executive staff in the field of management and development of public transportation, data collection and analysis by employees of relevant local government body	■	■	■	Capacity Building
S3	Construction of road infrastructure by traffic calming measures	■	■	■	Infrastructure
S4	Implementation of the road safety educational campaign on traffic safety and adherence to traffic rules for schoolchildren, drivers and cyclists	■	■	■	Promotion and awareness
S5	Installation of bollards at public transport stops	■	■	■	Infrastructure
S7	Full repair of networks of external lighting and replacing lights with led lights	■	■	■	Infrastructure
S8	The adjustment and placement of traffic signs, road marking, organization of traffic according to the established norms	■			Infrastructure
S9	Construction of traffic lights at the crossroads	■	■	■	Infrastructure
S10	Certification of streets of Zhytomyr and creation of a geo-information system and road infrastructure database	■			Management and organization
S11	The sustenance and maintenance operation of traffic control devices	■	■	■	Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
S13	Purchase of road equipment for traffic control and parking space arrangement	■	■	■	Infrastructure
S14	Additional lighting of crosswalks, streets and alleys	■	■	■	Infrastructure
S16	Carrying out a Road Safety Week	■	■	■	Promotion and awareness
S17	Dissemination of social advertising on traffic safety of vehicles and pedestrians	■	■	■	Promotion and awareness
S18	Raising pedestrian crossings to the sidewalk level	■			Infrastructure
S20	Carrying out overhaul and reconstruction of streets, roads and overpasses	■	■	■	Infrastructure
S21	Carrying out of overpass overhaul on Kyivska St. (above the railways)		■		Infrastructure
S22	Conduction of regular training for representatives of local government institutions and police in the field of road safety management	■	■	■	Capacity Building
S23	Development of Complex Road Traffic Management Scheme	■			Management and organization
S24	Road safety audit conduction, especially on road accident concentration zones	■	■	■	Monitoring and data gathering
W5	Carrying out major repairs, reconstruction and further maintenance of public transport stops and sidewalks	■	■	■	Infrastructure
W7	Development of recreational zones, tourist routes and sightseeing areas maps	■			Promotion and awareness
W9	Development of Concept of green corridors that links city districts	■			Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
W10	Development of green corridor #1	■			Infrastructure
W17	Equipment of safe pedestrian crossings, sidewalks and sideways for all especially for people with disabilities	■	■	■	Infrastructure
W18	Accessibility provisions to public transport stops and designating places for people with disabilities	■	■	■	Infrastructure
W19	Seating arrangement in public spaces	■	■	■	Infrastructure
W20	Public restrooms arrangement in public spaces	■	■		Infrastructure
W22	Organization the event "Car-free day"	■	■	■	Promotion and awareness
W23	Temporary restrictions on the movement of vehicles and the organization of temporary pedestrian spaces (e.g. during “Maisternya mista Zhytomyr”)	■	■	■	Infrastructure
W26	Conducting regular competence development trainings for city planners and transport engineers on planning and organization of pedestrian space and its barrier-free	■	■	■	Capacity Building
C1	Development and approval a concept or target program for development of cycling with developed Cycling Route Network	■			Management and organization
C2	Creating a management department and appointing a responsible person for the cycling development in the city	■			Management and organization
C4	Construction of a bicycle route Velyka Berdychivska St. (Sobornyi Square – Seletska St.)	■			Infrastructure
C5	Construction of a bicycle route Kyivska St. (Sobornyi Square – Paradzhanova St.)	■			Infrastructure
C13	Construction and arrangement of a relief bicycle track on Maidan Zhody		■		Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
C14	Arrangement of bicycle parking stations for short-term storage	■	■	■	Infrastructure
C18	Navigation arrangement for the cycling route network in the city	■	■	■	Promotion and awareness
C20	Conducting a cycling survey in key point locations of the city	■	■	■	Monitoring and data gathering
C25	Conducting European Mobility Week	■	■	■	Promotion and awareness
C26	Conducting Bikeday	■	■	■	Promotion and awareness
C27	Conducting event "Cycling to work"	■	■	■	Promotion and awareness
C28	Conduction regular competence development activities for city planners and transport engineers in the field of organization and planning of cycling traffic	■	■	■	Capacity Building
P1	Development and approval of the concept or city dedicated program on parking space organization	■			Management and organization
P2	Development of the concept of transportation, parking and unloading of freight transport within the city	■			Management and organization
P3	Establishment of a local parking inspection	■			Management and organization
P5	Creating ordered parking space in places where new buildings are constructed	■	■	■	Infrastructure
P6	Arrangement of special parking places for vehicles of people with disabilities in the parking slots, in the parking areas on the streets	■	■		Infrastructure
P8	Installation of a paid parking system on specially designated territories		■		Management and organization

№	Measures	Year of implementation			Category
		2023	2028	2033	
P18	Conduction regular competence development activities for city planners and transport engineers in the field of parking space planning and organization	■	■	■	Capacity Building

Scenario 2 – Continue and Expand

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT2	Development and update of transport model	■	■	■	Monitoring and data gathering
PT7	Development and approval of Quality Standards for public passenger transport services in the city of Zhytomyr	■			Management and organization
PT8	Introduction of the Zhytomyr resident card and its integration with other systems	■	■		Management and organization
PT9	Organization of events informing the public on e-ticket operation	■			Promotion and awareness
PT11	Trolleybus rolling stock and network update	■	■	■	Infrastructure
PT12	The purchase of buses of environmental standard Euro-5	■	■	■	Infrastructure
PT13	Technical re-equipment of contact, cable networks, street railways and traction substations	■			Infrastructure
PT15	Updating and technical re-equipment of the production facility of tram and trolleybus depot	■	■	■	Infrastructure
PT16	Arrangement of key trans-shipment units of public transport (for example, bus station, railway station) with a table showing traffic data	■			Infrastructure
PT17	The purchase of electric buses infrastructure	■			Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT18	Construction trolley line on Maliovanka district	■			Infrastructure
PT20	Renovation and commissioning of the trolleybus depot on Pokrovska St.		■		Infrastructure
PT22	Carrying out mobility survey of the population	■	■	■	Monitoring and data gathering
PT23	Carrying out public transport customer satisfaction survey	■	■	■	Monitoring and data gathering
PT26	Conducting regular professional development trainings for executive staff in the field of management and development of public transportation, data collection and analysis by employees of relevant local government body	■	■	■	Capacity Building
S3	Construction of road infrastructure by traffic calming measures	■	■	■	Infrastructure
S4	Implementation of the road safety educational campaign on traffic safety and adherence to traffic rules for schoolchildren, drivers and cyclists	■	■	■	Promotion and awareness
S5	Installation of bollards at public transport stops	■	■	■	Infrastructure
S7	Full repair of networks of external lighting and replacing lights with led lights	■	■	■	Infrastructure
S8	The adjustment and placement of traffic signs, road marking, organization of traffic according to the established norms	■			Infrastructure
S9	Construction of traffic lights at the crossroads	■	■	■	Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
S10	Certification of streets of Zhytomyr and creation of a geo-information system and road infrastructure database	■			Management and organization
S11	The sustenance and maintenance operation of traffic control devices	■	■	■	Infrastructure
S13	Purchase of road equipment for traffic control and parking space arrangement	■	■	■	Infrastructure
S14	Additional lighting of crosswalks, streets and alleys	■	■	■	Infrastructure
S16	Carrying out a Road Safety Week	■	■	■	Promotion and awareness
S17	Dissemination of social advertising on traffic safety of vehicles and pedestrians	■	■	■	Promotion and awareness
S18	Raising pedestrian crossings to the sidewalk level	■			Infrastructure
S20	Carrying out overhaul and reconstruction of streets, roads and overpasses	■	■	■	Infrastructure
S21	Carrying out of overpass overhaul on Kyivska St. (above the railways)	■			Infrastructure
S22	Conduction of regular training for representatives of local government institutions and police in the field of road safety management	■	■	■	Capacity Building
S23	Development of Comlex Road Traffic Management Scheme	■			Management and organization
S24	Road safety audit conduction, especially on road accident concentration zones	■	■	■	Monitoring and data gathering

№	Measures	Year of implementation			Category
		2023	2028	2033	
W5	Carrying out major repairs, reconstruction and further maintenance of public transport stops and sidewalks	■	■	■	Infrastructure
W7	Creation of recreational zones, tourist routes and sightseeing areas maps	■			Promotion and awareness
W9	Development of Concept of green corridors that links city districts	■			Infrastructure
W10	Development of green corridor #1	■			Infrastructure
W11	Development of green corridor #2	■			Infrastructure
W12	Development of green corridor #3	■	■		Infrastructure
W14	Reconstruction of Sobornyi and Peremohy Squares with the organization of barrier-free pedestrian movement	■			Infrastructure
W17	Equipment of safe pedestrian crossings, sidewalks and sideways for all especially for people with disabilities	■	■	■	Infrastructure
W18	Accessibility provisions to public transport stops and designating places for people with disabilities	■	■	■	Infrastructure
W19	Seating arrangement in public spaces	■	■	■	Infrastructure
W20	Public restrooms arrangement in public spaces	■			Infrastructure
W22	Organisation of the event "Car-free day"	■	■	■	Promotion and awareness

№	Measures	Year of implementation			Category
		2023	2028	2033	
W23	Temporary restrictions on the movement of vehicles and the organization of temporary pedestrian spaces (e.g. during “Maisternya mista Zhytomyr”)	■	■	■	Infrastructure
W25	Equipment of pedestrian crossings with sound signals of support for people with disabilities	■			Infrastructure
W26	Conducting regular competence development trainings for city planners and transport engineers on planning and organization of pedestrian space and its barrier-free	■	■	■	Capacity Building
C1	Development and approval a concept or target program for development of cycling with developed Cycling Route Network	■			Management and organization
C2	Creating a management department and appointing a responsible person for the cycling development in the city	■			Management and organization
C4	Construction of a bicycle route Velyka Berdychivska St. (Sobornyi Square – Seletska St.)	■			Infrastructure
C5	Construction of a bicycle route Kyivska St. (Sobornyi Square – Paradzhanova St.)	■			Infrastructure
C6	Construction of a bicycle route Peremohy St. – Myru Prospect (Sobornyi Square – General Vsevolod Petriv St.)	■			Infrastructure
C7	Construction of a bicycle route Velyka Berdychivska St. – Shevchenka St. – Koroliova St.		■		Infrastructure
C8	Construction of a bicycle route Shidna St. – Nezalezhnosti Prospect (Myru Prospect – Koroliova St.)		■		Infrastructure
C12	Construction of a bicycle route in Hydropark		■		Infrastructure
C13	Construction and arrangement of a relief bicycle track on Maidan Zhody	■			Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
C14	Arrangement of bicycle parking stations for short-term storage	■	■	■	Infrastructure
C17	Implementation of the bike-sharing system		■		Management and organization
C18	Navigation arrangement for the cycling route network in the city	■	■	■	Promotion and awareness
C20	Conducting a cycling survey in key point locations of the city	■	■	■	Monitoring and data gathering
C25	Conducting European Mobility Week	■	■	■	Promotion and awareness
C26	Conducting Bikeday	■	■	■	Promotion and awareness
C27	Conducting event "Cycling to work"	■	■	■	Promotion and awareness
C28	Conduction regular competence development activities for city planners and transport engineers in the field of organization and planning of cycling traffic	■	■	■	Capacity Building
P1	Development and approval of the concept or city dedicated program on parking space organization	■			Management and organization
P2	Development of the concept of transportation, parking and unloading of freight transport within the city	■			Management and organization
P3	Establishment of a local parking inspection	■			Management and organization

№	Measures	Year of implementation			Category
		2023	2028	2033	
P4	Organization of municipal parking areas in the city districts	■			Infrastructure
P5	Creating ordered parking space in places where new buildings are constructed	■	■	■	Infrastructure
P6	Arrangement of special parking places for vehicles of people with disabilities in the parking slots, in the parking areas on the streets	■			Infrastructure
P8	Installation of a paid parking system on specially designated territories		■		Management and organization
P18	Conduction regular competence development activities for city planners and transport engineers in the field of parking space planning and organization	■	■	■	Capacity Building
EC3	Completion of reconstruction of the airport and take-off runway		■	■	Infrastructure

Scenario 3 – Reorganize and Prepare

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT1	Creation of unified centralized management system of public transport in the city	■	■		Management and organization
PT2	Development and update of transport model	■	■	■	Monitoring and data gathering
PT3	Creation of unified public transport dispatch system	■			Monitoring and data gathering
PT4	Reorganization of the route network of trolleybuses	■			Management and organization
PT5	Reorganization of the route network of city passenger buses	■			Management and organization
PT6	Reorganization of the route network of suburban passenger transport	■			Management and organization
PT7	Development and approval of Quality Standards for public passenger transport services in the city of Zhytomyr	■			Management and organization
PT8	Introduction of the Zhytomyr resident card and its integration with other systems	■	■		Management and organization
PT9	Organization of events informing the public on e-ticket operation	■			Promotion and awareness

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT10	Integration of new housing areas into the public transport network at the planning level of the territories	■	■	■	Management and organization
PT11	Trolleybus rolling stock and network update	■	■	■	Infrastructure
PT12	The purchase of buses of environmental standard Euro-5	■	■	■	Infrastructure
PT13	Technical re-equipment of contact, cable networks, street railways and traction substations	■	■		Infrastructure
PT14	Creation of dedicated public transport lanes	■			Infrastructure
PT15	Updating and technical re-equipment of the production facility of tram and trolleybus depot	■	■	■	Infrastructure
PT16	Arrangement of key trans-shipment units of public transport (for example, bus station, railway station) with a table showing traffic data	■	■		Infrastructure
PT17	The purchase of electric buses infrastructure			■	Infrastructure
PT20	Renovation and commissioning of the trolleybus depot on Pokrovska St.			■	Infrastructure
PT21	Development of the site for monitoring system of the operation and informing of communal services (public transport traffic, snow removal, traffic restrictions, etc.) in real time		■		Management and organization
PT22	Carrying out mobility survey of the population	■	■	■	Monitoring and data gathering
PT23	Carrying out public transport customer satisfaction survey	■	■	■	Monitoring and data gathering

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT24	Conducting an audit of stopping points in the city	■	■	■	Monitoring and data gathering
PT25	Formation of system of monitoring of transport emissions (air pollution)		■		Monitoring and data gathering
PT26	Conducting regular professional development trainings for executive staff in the field of management and development of public transportation, data collection and analysis by employees of relevant local government body	■	■	■	Capacity Building
S1	Establishment of traffic management centre	■			Management and organization
S2	Speed decrease on separate streets up to 30 km / h	■			Infrastructure
S3	Construction of road infrastructure by traffic calming measures	■	■	■	Infrastructure
S4	Implementation of the road safety educational campaign on traffic safety and adherence to traffic rules for schoolchildren, drivers and cyclists	■	■	■	Promotion and awareness
S5	Installation of bollards at public transport stops	■	■	■	Infrastructure
S6	Reconstruction of the road section R-18			■	Infrastructure
S7	Full repair of networks of external lighting and replacing lights with led lights	■	■	■	Infrastructure
S8	The adjustment and placement of traffic signs, road marking, organization of traffic according to the established norms	■			Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
S9	Construction of traffic lights at the crossroads	■	■	■	Infrastructure
S10	Certification of streets of Zhytomyr and creation of a geo-information system and road infrastructure database	■			Management and organization
S11	The sustenance and maintenance operation of traffic control devices	■	■	■	Infrastructure
S12	Creation of a police reported accident database with access for local authorities	■			Monitoring and data gathering
S13	Purchase of road equipment for traffic control and parking spaces arrangement	■	■	■	Infrastructure
S14	Additional lighting of crosswalks, streets and alleys	■	■	■	Infrastructure
S15	Construction of safety islands for pedestrians on Myru and Nezalezhnosti Prospects	■			Infrastructure
S16	Carrying out a Road Safety Week	■	■	■	Promotion and awareness
S17	Dissemination of social advertising on traffic safety of vehicles and pedestrians	■	■	■	Promotion and awareness
S18	Raising pedestrian crossings to the sidewalk level	■			Infrastructure
S19	Taking into account the truck traffic while planning the development of new territories	■	■	■	Management and organization
S20	Carrying out overhaul and reconstruction of streets, roads and overpasses	■	■	■	Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
S21	Carrying out of overpass overhaul on Kyivska St. (above the railways)		■		Infrastructure
S22	Conduction of regular training for representatives of local government institutions and police in the field of road safety management	■	■	■	Capacity Building
S23	Development of Complex Road Traffic Management Scheme	■			Management and organization
S24	Road safety audit conduction, especially on road accident concentration zones	■	■	■	Monitoring and data gathering
W1	Development and approval of the program or concept for development of barrier-free pedestrian infrastructure in the city	■			Management and organization
W2	Creation of management department and appointing a responsible person for the pedestrian infrastructure development in the city	■			Management and organization
W3	Development of mobility plans and traffic safety for schools and other educational institutions	■			Management and organization
W4	Implementation of pedestrian infrastructure monitoring and audit system	■	■	■	Monitoring and data gathering
W5	Carrying out major repairs, reconstruction and further maintenance of public transport stops and sidewalks	■	■	■	Infrastructure
W6	Establishment of proper pedestrian infrastructure in new residential development areas and its integration into the network of current pedestrian infrastructure in the city of Zhytomyr at the territory planning level	■	■	■	Infrastructure
W7	Creation of recreational zones, tourist routes and sightseeing areas maps	■			Promotion and awareness

№	Measures	Year of implementation			Category
		2023	2028	2033	
W8	Development and placement of navigation signs in the city	■			Promotion and awareness
W9	Development of Concept of green corridors that links city districts	■			Infrastructure
W10	Development of green corridor #1	■			Infrastructure
W14	Reconstruction of Sobornyi and Peremohy Squares with the organization of barrier-free pedestrian movement	■			Infrastructure
W15	Creation of pedestrian zones on Mala Berdychivska, Lyatoshynskoho, Novyi Boulevard, Staryi Boulevard, Pushkinska streets and on Skorulskoho by-street	■	■	■	Infrastructure
W16	Carrying out park and recreation areas improvement works in the city	■	■	■	Infrastructure
W17	Equipment of safe pedestrian crossings, sidewalks and sideways for all especially for people with disabilities	■	■	■	Infrastructure
W18	Accessibility provisions to public transport stops and designating places for people with disabilities	■	■	■	Infrastructure
W19	Seating arrangement in public spaces	■	■	■	Infrastructure
W20	Public restrooms arrangement in public spaces	■	■		Infrastructure
W21	Establishment of smart crosswalks			■	Infrastructure
W22	Organization the event "Car-free day"	■	■	■	Promotion and awareness

№	Measures	Year of implementation			Category
		2023	2028	2033	
W23	Temporary restrictions on the movement of vehicles and the organization of temporary pedestrian spaces (e.g. during “Maisternya mista Zhytomyr”)	■	■	■	Infrastructure
W24	Creation a database of places that should be adapted for people with disabilities	■	■		Monitoring and data gathering
W25	Equipment of pedestrian crossings with sound signals of support for people with disabilities	■			Infrastructure
W26	Conducting regular competence development trainings for city planners and transport engineers on planning and organization of pedestrian space and its barrier-free	■	■	■	Capacity Building
C1	Development and approval a concept or target program for development of cycling with developed Cycling Route Network	■			Management and organization
C2	Creating a management department and appointing a responsible person for the cycling development in the city	■			Management and organization
C3	Including works for ensuring safe movement of cyclists while construction planning and maintaining of streets and roads	■	■	■	Management and organization
C4	Construction of a bicycle route Velyka Berdychivska St. (Sobornyi Square – Seletska St.)	■			Infrastructure
C5	Construction of a bicycle route Kyivska St. (Sobornyi Square – Paradzhanova St.)	■			Infrastructure
C13	Construction and arrangement of a relief bicycle track on Maidan Zhody		■		Infrastructure
C14	Arrangement of bicycle parking stations for short-term storage	■	■	■	Infrastructure
C16	E-bikes popularization	■	■		Promotion and awareness

№	Measures	Year of implementation			Category
		2023	2028	2033	
C17	Implementation of the bike-sharing system		■	■	Management and organization
C18	Navigation arrangement for the cycling route network in the city	■	■	■	Promotion and awareness
C19	Arrangement of bicycle parking stations for long-term storage		■		Infrastructure
C20	Conducting a cycling survey in key point locations of the city	■	■	■	Monitoring and data gathering
C21	Development of monitoring and audit system of the cycling infrastructure in the city	■			Monitoring and data gathering
C22	Integration of new housing areas into the cycling network at the planning stage of the territories	■	■	■	Management and organization
C24	Conducting bike tours	■	■	■	Promotion and awareness
C25	Conducting European Mobility Week	■	■	■	Promotion and awareness
C26	Conducting Bikeday	■	■	■	Promotion and awareness
C27	Conducting event "Cycling to work"	■	■	■	Promotion and awareness
C28	Conduction regular competence development activities for city planners and transport engineers in the field of organization and planning of cycling traffic	■	■	■	Capacity Building

№	Measures	Year of implementation			Category
		2023	2028	2033	
P1	Development and approval of the concept or city dedicated program on parking space organization	■			Management and organization
P2	Development of the concept of transportation, parking and unloading of freight transport within the city	■			Management and organization
P3	Establishment of a local parking inspection	■			Management and organization
P4	Organization of municipal parking areas in the city districts	■	■		Infrastructure
P5	Creating ordered parking space in places where new buildings are constructed	■	■	■	Infrastructure
P6	Arrangement of special parking places for vehicles of people with disabilities in the parking slots, in the parking areas on the streets	■	■		Infrastructure
P7	The creation of parking spaces near transport hubs on the periphery of the city			■	Infrastructure
P8	Installation of a paid parking system on specially designated territories	■			Management and organization
P9	Implementation of the regulation of the traffic schedule, parking for the transportation of goods to shops by freight transport within the central part of the city	■			Management and organization
P10	Design of platforms for loading / unloading of commercial transport within the city	■			Management and organization
P11	Determination of streets and roads where truck traffic is allowed	■			Management and organization

№	Measures	Year of implementation			Category
		2023	2028	2033	
P12	Arrangement of four platforms for parking freight transport at the town's exit			■	Infrastructure
P13	Traffic prohibition in the city on certain time periods of the day	■			Management and organization
P14	Development and implementation of a system of monitoring the use of parking spaces in the city		■		Monitoring and data gathering
P15	Development and introduction of electronic navigation information system on the availability of free parking places		■		Infrastructure
P17	Dissemination of social advertisement regarding maintaining and enhancing the culture of parking	■	■	■	Promotion and awareness
P18	Conduction regular competence development activities for city planners and transport engineers in the field of parking space planning and organization	■	■	■	Capacity Building
EC5	Liquidation of a bus station on Khlibna St			■	Infrastructure
EC6	Transfer hub development "Stations", reorganization of road traffic in the area of the railway station		■		Infrastructure
EC7	Reconstruction of bus station-1 on 93 Kyivska St in order to serve only interurban and international routes			■	Infrastructure

Scenario 4 – Transformation

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT1	Creation of an unified centralized management system of public transport in the city	■	■		Management and organization
PT2	Development and update of transport model	■	■	■	Monitoring and data gathering
PT3	Creation of unified public transport dispatch system	■			Monitoring and data gathering
PT4	Reorganization of the route network of trolleybuses	■			Management and organization
PT5	Reorganization of the route network of city passenger buses	■			Management and organization
PT6	Reorganization of the route network of suburban passenger transport	■			Management and organization
PT7	Development and approval of Quality Standards for public passenger transport services in the city of Zhytomyr	■			Management and organization
PT8	Introduction of the Zhytomyr resident card and its integration with other systems	■	■		Management and organization
PT9	Organization of events informing the public on e-ticket operation	■			Promotion and awareness

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT10	Integration of new housing areas into the public transport network at the planning level of the territories	■	■	■	Management and organization
PT11	Trolleybus rolling stock and network update	■	■	■	Infrastructure
PT12	The purchase of buses of environmental standard Euro-5	■	■	■	Infrastructure
PT13	Technical re-equipment of contact, cable networks, street railways and traction substations	■			Infrastructure
PT14	Creation of dedicated public transport lanes	■			Infrastructure
PT15	Updating and technical re-equipment of the production facility of tram and trolleybus depot	■	■	■	Infrastructure
PT16	Arrangement of key trans-shipment units of public transport (for example, bus station, railway station) with a table showing traffic data	■			Infrastructure
PT17	The purchase of electric buses infrastructure	■			Infrastructure
PT18	Construction trolley line on Maliovanka district	■			Infrastructure
PT19	Development of tram network "The short-lines" by the laying of additional branches from the existing tram line to the Synnyi Market and Polova city district		■	■	Infrastructure
PT20	Renovation and commissioning of the trolleybus depot on Pokrovska St.		■		Infrastructure
PT21	Development of the site for monitoring system of the operation and informing of communal services (public transport traffic, snow removal, traffic restrictions, etc.) in real time		■		Management and organization

№	Measures	Year of implementation			Category
		2023	2028	2033	
PT22	Carrying out mobility survey of the population	■	■	■	Monitoring and data gathering
PT23	Carrying out public transport customer satisfaction survey	■	■	■	Monitoring and data gathering
PT24	Conducting an audit of stopping points in the city	■	■	■	Monitoring and data gathering
PT25	Formation of system of monitoring of transport emissions (air pollution)		■		Monitoring and data gathering
PT26	Conducting regular professional development trainings for executive staff in the field of management and development of public transportation, data collection and analysis by employees of relevant local government body	■	■	■	Capacity Building
S1	Establishment of traffic management center	■			Management and organization
S2	Speed decrease on separate streets up to 30 km / h	■			Infrastructure
S3	Construction of road infrastructure by traffic calming measures	■	■	■	Infrastructure
S4	Implementation of the road safety educational campaign on traffic safety and adherence to traffic rules for schoolchildren, drivers and cyclists	■	■	■	Promotion and awareness
S5	Installation of bollards at public transport stops	■	■	■	Infrastructure
S6	Reconstruction of the road section R-18		■		Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
S7	Full repair of networks of external lighting and replacing lights with led lights	■	■	■	Infrastructure
S8	The adjustment and placement of traffic signs, road marking, organization of traffic according to the established norms	■			Infrastructure
S9	Construction of traffic lights at the crossroads	■	■	■	Infrastructure
S10	Certification of streets of Zhytomyr and creation of a geo-information system and road infrastructure database	■			Management and organization
S11	The sustenance and maintenance operation of traffic control devices	■	■	■	Infrastructure
S12	Creation of a police reported accident database with access for local authorities	■			Monitoring and data gathering
S13	Purchase of road equipment for traffic control and parking spaces arrangement	■	■	■	Infrastructure
S14	Additional lighting of crosswalks, streets and alleys	■	■	■	Infrastructure
S15	Construction of safety islands for pedestrians on Myru and Nezalezhnosti Prospects	■			Infrastructure
S16	Carrying out a Road Safety Week	■	■	■	Promotion and awareness
S17	Dissemination of social advertising on traffic safety of vehicles and pedestrians	■	■	■	Promotion and awareness
S18	Raising pedestrian crossings to the sidewalk level	■			Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
S19	Taking into account the truck traffic while planning the development of new territories	■	■	■	Management and organization
S20	Carrying out overhaul and reconstruction of streets, roads and overpasses	■	■	■	Infrastructure
S21	Carrying out of overpass overhaul on Kyivska St. (above the railways)	■			Infrastructure
S22	Conduction of regular training for representatives of local government institutions and police in the field of road safety management	■	■	■	Capacity Building
S23	Development of Complex Road Traffic Management Scheme	■			Management and organization
S24	Road safety audit conduction, especially on road accident concentration zones	■	■	■	Monitoring and data gathering
W1	Development and approval of the program or concept for development of barrier-free pedestrian infrastructure in the city	■			Management and organization
W2	Creation of management department and appointing a responsible person for the pedestrian infrastructure development in the city	■			Management and organization
W3	Development of mobility plans and traffic safety for schools and other educational institutions	■			Management and organization
W4	Implementation of pedestrian infrastructure monitoring and audit system	■	■	■	Monitoring and data gathering
W5	Carrying out major repairs, reconstruction and further maintenance of public transport stops and sidewalks	■	■	■	Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
W6	Establishment of proper pedestrian infrastructure in new residential development areas and its integration into the network of current pedestrian infrastructure in the city of Zhytomyr at the territory planning level	■	■	■	Infrastructure
W7	Creation of recreational zones, tourist routes and sightseeing areas maps	■			Promotion and awareness
W8	Development and placement of navigation signs in the city	■			Promotion and awareness
W9	Development of Concept of green corridors that links city districts	■			Infrastructure
W10	Development of green corridor #1	■			Infrastructure
W11	Development of green corridor #2	■			Infrastructure
W12	Development of green corridor #3	■	■		Infrastructure
W13	Development of green corridor #4		■	■	Infrastructure
W14	Reconstruction of Sobornyi and Peremohy Squares with the organization of barrier-free pedestrian movement	■			Infrastructure
W15	Creation of pedestrian zones on Mala Berdychivska, Lyatoshynskoho, Novyi Boulevard, Staryi Boulevard, Pushkinska streets and on Skorulskoho by-street	■	■		Infrastructure
W16	Carrying out park and recreation areas improvement works in the city	■	■	■	Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
W17	Equipment of safe pedestrian crossings, sidewalks and sideways for all especially for people with disabilities	■	■	■	Infrastructure
W18	Accessibility provisions to public transport stops and designating places for people with disabilities	■	■	■	Infrastructure
W19	Seating arrangement in public spaces	■	■	■	Infrastructure
W20	Public restrooms arrangement in public spaces	■			Infrastructure
W21	Establishment of smart crosswalks			■	Infrastructure
W22	Organization the event "Car-free day"	■	■	■	Promotion and awareness
W23	Temporary restrictions on the movement of vehicles and the organization of temporary pedestrian spaces (e.g. during “Maisternya mista Zhytomyr”)	■	■	■	Infrastructure
W24	Creation a database of places that should be adapted for people with disabilities	■	■		Monitoring and data gathering
W25	Equipment of pedestrian crossings with sound signals of support for people with disabilities	■			Infrastructure
W26	Conducting regular competence development trainings for city planners and transport engineers on planning and organization of pedestrian space and its barrier-free	■	■	■	Capacity Building
C1	Development and approval a concept or target program for development of cycling with developed Cycling Route Network	■			Management and organization
C2	Creating a management department and appointing a responsible person for the cycling development in the city	■			Management and organization

№	Measures	Year of implementation			Category
		2023	2028	2033	
C3	Including works for ensuring safe movement of cyclists while construction planning and maintaining of streets and roads	■	■	■	Management and organization
C4	Construction of a bicycle route Velyka Berdychivska St. (Sobornyi Square – Seletska St.)	■			Infrastructure
C5	Construction of a bicycle route Kyivska St. (Sobornyi Square – Paradzhanova St.)	■			Infrastructure
C6	Construction of a bicycle route Peremohy St. – Myru Prospect (Sobornyi Square – General Vsevolod Petriv St.)	■			Infrastructure
C7	Construction of a bicycle route Velyka Berdychivska St. – Shevchenka St. – Koroliova St.		■		Infrastructure
C8	Construction of a bicycle route Shidna St. – Nezalezhnosti Prospect (Myru Prospect – Koroliova St.)		■		Infrastructure
C9	Construction of a bicycle route Vitruka St. – Vokzalnaya St. (Kyivska St. – Honty St.)		■		Infrastructure
C10	Construction of a bicycle route Pokrovska St. (Velyka Berdychivska St. – Tarnovskoho St.)			■	Infrastructure
C11	Construction of a bicycle route Chudnivska St. (Sobornyi Square – Korbutyvskyi Hydropark)			■	Infrastructure
C12	Construction of a bicycle route in Hydropark		■		Infrastructure
C13	Construction and arrangement of a relief bicycle track on Maidan Zhody	■			Infrastructure
C14	Arrangement of bicycle parking stations for short-term storage	■	■	■	Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
C15	Street and road network construction for charging electric bicycles			■	Infrastructure
C16	E-bikes popularization	■	■		Promotion and awareness
C17	Implementation of the bike-sharing system		■		Management and organization
C18	Navigation arrangement for the cycling route network in the city	■	■	■	Promotion and awareness
C19	Arrangement of bicycle parking stations for long-term storage		■		Infrastructure
C20	Conducting a cycling survey in key point locations of the city	■	■	■	Monitoring and data gathering
C21	Development of monitoring and audit system of the cycling infrastructure in the city	■			Monitoring and data gathering
C22	Integration of new housing areas into the cycling network at the planning stage of the territories	■	■	■	Management and organization
C23	Integration of cycling with public transport system		■	■	Management and organization
C24	Conducting bike tours	■	■	■	Promotion and awareness
C25	Conducting European Mobility Week	■	■	■	Promotion and awareness

№	Measures	Year of implementation			Category
		2023	2028	2033	
C26	Conducting Bikeday	■	■	■	Promotion and awareness
C27	Conducting event "Cycling to work"	■	■	■	Promotion and awareness
C28	Conduction regular competence development activities for city planners and transport engineers in the field of organization and planning of cycling traffic	■	■	■	Capacity Building
P1	Development and approval of the concept or city dedicated program on parking space organization	■			Management and organization
P2	Development of the concept of transportation, parking and unloading of freight transport within the city	■			Management and organization
P3	Establishment of a local parking inspection	■			Management and organization
P4	Organization of municipal parking areas in the city districts	■			Infrastructure
P5	Creating ordered parking space in places where new buildings are constructed	■	■	■	Infrastructure
P6	Arrangement of special parking places for vehicles of people with disabilities in the parking slots, in the parking areas on the streets	■			Infrastructure
P7	The creation of parking spaces near transport hubs on the periphery of the city	■	■		Infrastructure
P8	Installation of a paid parking system on specially designated territories	■			Management and organization

№	Measures	Year of implementation			Category
		2023	2028	2033	
P9	Implementation of the regulation of the traffic schedule, parking for the transportation of goods to shops by freight transport within the central part of the city	■			Management and organization
P10	Design of platforms for loading / unloading of commercial transport within the city	■			Management and organization
P11	Determination of streets and roads where truck traffic is allowed	■			Management and organization
P12	Arrangement of four platforms for parking freight transport at the town's exit		■		Infrastructure
P13	Traffic prohibition in the city on certain time periods of the day	■			Management and organization
P14	Development and implementation of a system of monitoring the use of parking spaces in the city		■		Monitoring and data gathering
P15	Development and introduction of electronic navigation information system on the availability of free parking places		■		Infrastructure
P16	Establishment of informing boards of the availability of free parking spaces		■	■	Infrastructure
P17	Dissemination of social advertisement regarding maintaining and enhancing the culture of parking	■	■	■	Promotion and awareness
P18	Conduction regular competence development activities for city planners and transport engineers in the field of parking space planning and organization	■	■	■	Capacity Building
EC1	Hub development "Sinnyi Market"		■	■	Infrastructure

№	Measures	Year of implementation			Category
		2023	2028	2033	
EC2	Electrification of the line Zhytomyr-Novograd-Volynskyi		■	■	Infrastructure
EC3	Completion of reconstruction of the airport and take-off runway		■	■	Infrastructure
EC4	Creation of suburban bus stations on the main output highways of the city on the following streets: Chernyakhivsky, Shchorsa, Kyivske highway, Velyka Berdychivska and Myry Prospect		■	■	Infrastructure
EC5	Liquidation of a bus station on Khlibna St		■		Infrastructure
EC6	Transfer hub development "Stations", reorganization of road traffic in the area of the railway station		■		Infrastructure
EC7	Reconstruction of bus station-1 on 93 Kyivska St in order to serve only interurban and international routes	■			Infrastructure

Chapter 9 Monitoring System

Monitoring is a crucial element of any strategic document. Ongoing strategic management is only possible with an effective and reliable monitoring scheme, which enables midterm evaluation of the execution of particular tasks and achievement of goals. The monitoring process is a tool for an objective feedback and reflection on whether the goals that have been set are being achieved or not. Typically, key performance indicators are used for measuring development. Such performance indicators are a type of quantitative measurement that allows to see the progress or trend.

For SUMPs, it is recommended to not only use output indicators (such as number of infrastructures built or trainings provided) and transport activity indicators (such as motorisation rates or traffic flows), but in particular also outcome indicators that directly measure the goals impacted by mobility. Such synthetic mobility indicators usually include also social (safety, satisfaction), environmental (emissions, noise, energy consumption, land use) and economic aspects (price level of transport services, costs and advantages for local authorities and consumers).

SUMP indicators for Zhytomyr have been developed in a highly participatory and iterative process in line with the goals for sustainable mobility. The indicators were thoroughly checked for their comprehensiveness and ability to show the progress in achieving the goals.

This chapter describes the monitoring system with a clear structure: for each goal there are one or more indicators that reflects the nature of the goal and allow to monitor its progress. The goals are organized according to priorities and for each priority there is an overall indicator that is relevant to all goals. Each goal has a current status unless such data is not being collected currently and a goal value to be achieved for future periods of 5, 10 and 15 years. In the end of the chapter, there is a table that groups indicators into monitoring tools (Table 3). Monitoring tools contain description, frequency of data collection and responsible body.

Different indicators have different frequency of data collection, some of them are collected daily (like road accident data) and grouped into reports quarterly while others are collected once in a year or even few years (for example, mobility survey). However, it is important that data in all indicators is comparable and that corresponding time periods have been selected.

PRIORITY 1.
Strengthening the role of public transport*

The overall indicator

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
1.0	Share of public transport in urban modal split	Trips carried out by public transport divided by total number of trips according to mobility survey in Zhytomyr	%	46 [9]			

Goal 1.1 Improving the quality of public transport passenger service

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
1.1.1.	Satisfaction level of public transport user	Number of respondents who are satisfied or rather satisfied with level of public transport services divided by total number of respondents	%	39.41[10]			
1.1.2.	Public transport availability for people with reduced mobility	Number of vehicles, equipped for people with disabilities divided by total number of vehicles in public transport system	%	0 [11]			
1.1.3.	Average age of rolling stock	Sum of age of all public transport vehicles divided by number of vehicles	years	15.52 [12]			
1.1.4.	Fleet under 10 years of age	Percentage of rolling stock under the age of 10 years	%	56 [13]			

* It is about public transport serving the main urban and urban agglomeration networks

Goal 1.2 The use of more environmentally friendly vehicles

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
1.2.1.	Environmentally friendly public transport	E-transport passenger-kilometres Gas passenger-kilometres Diesel passenger-kilometres	pas km	N/a			
1.2.2.	Share of electric public transport	The ratio of the total vehicle kilometres of the electric transport to the total public transport vehicle kilometre	%	21.4 [14]			

Goal 1.3 Integration of public transport into one integrated system

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
1.3.1.	Integration of public transport within unified control system	The percentage of integrated routes that are being integrated into the unified control system that is being operated or accessed by the city and is used to monitor public transport operation	%	62 [15]			

Goal 1.4 Enhancing the financial efficiency of public transport

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
1.4.1.	Number of paid passengers	Municipal public transport Private public transport	mln. people	19.3 [16] N/a			
1.4.2.	Farebox revenue	Overall revenue from ticket sales collected by operators (company-operator) Municipal public transport: Tram: Trolleybus: Bus: Private public transport:	Thousand UAH	N/a			

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
1.4.3.	Revenue from other activities	Revenue received by other activities of the company, such as advertisement, rent or other services divided by overall revenue	%	N/a			
1.4.4.	Efficiency	Revenue from ticket sales divided by total passenger-kilometers	UAH/ pas km	N/a			

Goal 1.5 Prioritization of public transport in traffic

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
1.5.1.	The length of dedicated public transport infrastructure	The total length of all infrastructure that provides separated public transport from other traffic right of way, such as bus lanes, trolleybus lanes, tram tracks, etc.	km	6.95			
1.5.2.	Number of intersections with public transport priority	Total number of intersections where an adaptive traffic with priority for public transport is installed	units	0	0		

PRIORITY 2. Road safety

The overall indicator

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
2.0	Injured in traffic accident[17]	The total number of injured as the result of traffic accident within administrative borders of Zhytomyr city per year	persons	353 [18] [19]			

Goal 2.1 Enhancing the safety of vulnerable road users

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
2.1.1.	Cyclists safety	Number of injured cyclists as the result of traffic accident within administrative borders of Zhytomyr city per year	persons	11 [19] [20]			
2.1.2.	Pedestrians safety	Number of injured pedestrians as the result of traffic accident within administrative borders of Zhytomyr city per year	persons	119 [19] [21]			

Goal 2.1 Mortality reduction on roads

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
2.2.1.	Traffic mortality	The total number of people killed as the result of traffic accident within administrative borders of Zhytomyr city per year	persons	6 [19]			

Goal 2.2 Improvement of road safety awareness among the citizens

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
2.3.1.	Implemented safety activities	The overall number of implemented activities (events) in the field of traffic safety organization in city of Zhytomyr	units	N/a			
2.3.2.	Mobility and road-traffic safety plans at schools	The number of schools that have mobility and road safety plans	units	0			

PRIORITY 3.
Encourage people to walk

The overall indicator

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
3.0	Share of walking	Walking trips divided by total number of trips according to mobility survey in Zhytomyr	%	38 [22]			

Goal 3.1 Providing qualitative pedestrian infrastructure appropriate for moving of people with reduced mobility

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
3.1.1.	Crossings accessible for all pedestrians	The number of crossings with proper facilities for people with disabilities divided by total number of pedestrian crossings with administrative borders of Zhytomyr	%	N/a			
3.1.2.	Length of improved walking infrastructure	Length of walking infrastructure that was improved by city of Zhytomyr for the period from previous monitoring (5 years), which includes: repair or reconstruction (bringing back the technical state); upgrading and modernization (repair and introduction of new elements or better technical standard), as well as building a new infrastructure	km	N/a			

Goal 3.2 Development of the green corridors system for pedestrian walking around the city

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
3.2.1.	Length of green corridors	The length of green corridors in the city according to approved city database of green corridors	km	0			
3.2.2.	Density of areas to rest	The number of benches divided by length of green corridor	units/km	N/a			

Goal 3.3 Development of pedestrian spaces and improvement of the quality of public space

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
3.3.1.	Public spaces territory	The percentage of the public spaces territory divided by the districts	%	N/a			

Goal 3.4 Raising public awareness of opportunities and the motivation to walk

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
3.4.1.	Level of satisfaction with of pedestrian infrastructure	The percentage of people who rate the quality of sidewalks as “good”	%	26 [23]			
3.4.2.	City navigation system	Approved unified information system of the navigation in the city that includes detailed guidelines on form and requirements for navigation, concept of dislocation and implementation strategy	Yes or no	No			

PRIORITY 4. Cycling

The overall indicator

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
4.0	Share of cycling	Trips carried out by cyclists divided by total number of trips according to mobility survey in Zhytomyr	%	1.3 [24]			

Goal 4.1 Creation of safe and comfortable conditions for cyclists

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
4.1.1.	Cycling injuries	The number of traffic accidents with cyclists per year	persons	11 [19]			
4.1.2.	Cycling mortality	The number of cyclists killed in accident per year	persons	0 [19]			
4.1.3.	Women in cycling traffic	Total number of women cycling on road segment divided by total number of cycling passing	%	N/a			
4.1.4.	Length of cycling infrastructure	Total length of cycling infrastructure in the city	km	0.4 [25]			
4.1.5.	Density of cycling network	Length of cycling infrastructure divided by area of Zhytomyr	km/km^2	0.007			

Goal 4.2 Increasing the attractiveness of cycling

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
4.2.1.	Share of cycling in school trips	Trips to schools carried out by cyclists divided by total number of trips to school in Zhytomyr	%	N/a			
4.2.2.	Share of cycling in university trips	Trips to universities carried out by cyclists divided by the total number of trips to universities in Zhytomyr	%	N/a			

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
4.2.3.	The number of users in public bike-sharing system	Unique users or annual number of trips conducted	Persons or units	0			

Goal 4.3 Creating conditions for safe storage of bicycles

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
4.3.1.	Number of cycling thefts	Number of registered cases of bicycle thefts	Units	211 [26]			
4.3.2.	Level of cycling thefts	Number of cycling thefts divided by the percentage of cycle rides multiplied by population and population mobility rate	Units/ thousand people	N/a			
4.3.3.	Availability of parking racks for bikes	The number of short term and long term publicly accessible parking racks	units	76 [27]			

PRIORITY 5. Parking management

The overall indicator

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
5.0	Concept of parking management in the city	Developed and approved document on parking management in the city	Yes or no	No			

Goal 5.1 Reducing the number of cars on the roadways and sidewalks in the city centre

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
5.1.1.	Parking rules violations	The number of parking rules violations per 1000 cars or per population	units/1000 cars or thousand people	N/a			

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
5.1.2.	On-street parking	Number of on-street parking places	units	N/a			

Goal 5.2 Parking management in residential areas

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
5.2.1.	Parking space density	Number of parking spaces per 1 square kilometre	units/ km^2	N/a			

Goal 5.3 Organisation of commercial and municipal transport logistics

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
5.3.1.	Concept or goal-oriented program for the regulation of commercial and utility transport	Developed and approved concept or program for the regulation of commercial and utility transport	Yes or no	No			

PRIORITY 6. External accessibility of Zhytomyr

Goal 6.1 Providing high-speed railway service

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
6.1.1.	Electrification of railway transport	Railway electrification	Yes or no	No			
6.1.2.	Direct rail link to Kyiv	Number of direct regular (off-season) railway passenger connections with Kyiv	Yes or no	No			
6.1.3.	Level of passenger rail service	Number of passenger regular trains servicing Zhytomyr	units	11 [28]			
6.1.4.	Level of freight rail service	Number of freight trains servicing Zhytomyr	units	N/a			

Goal 6.2 Implementation of freight and passenger services through Zhytomyr airport

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
6.2.1.	Air accessibility	Average annual number of regular passenger flights from airport of Zhytomyr	units	N/a			
6.2.2.	Tourist air connectivity	Average annual number of charter flights	units	N/a			
6.2.3.	Air connectivity	Number of destinations operated from Zhytomyr airport	units	N/a			
6.2.4.	Air market development	Average monthly passenger traffic volume	persons	7000 [29]			
6.2.5.	Air logistics connectivity	Average annual cargo volume passing through Zhytomyr airport	tons	N/A			
6.2.6.	Airport activity	Annual number of regular flights passengers and freight	units	N/A			

Goal 6.3 Development of integrated bus stations

Ref. No.	Indicator	Description	Unit	Base year	2023	2028	2033
6.3.1.	External bus accessibility 1	Number of integrated bus stations	units	0			
6.3.2.	Central area bus accessibility	Number of suburban and intercity routes ending (terminating) in the centre	units	388 [30]			
6.3.3.	External bus accessibility 2	Number of suburban routes ending on integrated bus stations outside of city centre	units	0			

Table 3. Monitoring tools

№	Tool name	Description	Frequency of data collection	Potential responsible	Indicator number
1.	Mobility survey	Survey of residents regarding their movement in the city. The mobility survey includes general information about the person (gender, age, education, etc.), general information about person's mobility, access to different transport options, number of trips, selected modes, location, time of movement, etc.. The sample should be random, taking into account general demographic and social-economical structure of the city. It may include suburban areas. Seasonal variation of mobility should be accounted. It is recommended to conduct the survey throughout a year or for both winter and summer period.	Every 5 years	Department of Transport and Communications of Zhytomyr City Council	1.0 3.0 4.0 4.2.1 4.2.2
2.	Public transport user satisfaction survey	Survey of residents that allows to identify the level of satisfaction with public transport services that might include an overall system satisfaction, satisfaction with travel time, price, comfort, reliability, clarity of schedule execution, safety, waiting time, temperature inside the vehicle and crowdedness, the need to transfer and time required to access stop point	Annually	Department of Transport and Communications of Zhytomyr City Council	1.1.1
3.	Public transport monitoring system report (GPS system)	Report on public transport performance indicators based on GPS tracking data including reliability of public transport (the ratio of the number of vehicles entering the route to the number indicated in the route passport), clarity of schedule execution	Monthly	Department of Transport and Communications of Zhytomyr City Council	1.3.1
4.	Financial report on public transport operation	Report of public transport operators on their incomes and expenses	Annually	Public transport operators in Zhytomyr	1.4.1 1.4.2

№	Tool name	Description	Frequency of data collection	Potential responsible	Indicator number
5.	Rolling stock report	Report on quantity, quality, accessibility and age of rolling stock	Annually	Department of Transport and Communications of Zhytomyr City Council	1.1.2 1.1.3 1.1.4 1.2.2
6.	Public transport infrastructure control report	Report on the status, availability and compliance of public transport infrastructure with prioritization of public transport	Annually	Department of Transport and Communications of Zhytomyr City Council	1.5.1 1.5.2
7.	National Police report	Report on road accidents in Zhytomyr, traffic safety measures on the road network and communication with population (especially in schools) and number of bicycle thefts in the city	Quarterly	Police, Department of traffic safety of the patrol police	2.0 2.1.1 2.1.2 2.2.1 2.2.2 2.3.1 2.3.2 4.1.1 4.1.2 4.3.1 5.1.1 5.4.1
8.	Cyclists counts	Counting cyclists on road network indicating their direction, gender, approximate age and helmet presence	Twice a year (Spring and autumn time)	Department of Transport and Communications of Zhytomyr City Council	4.1.3
9.	Pedestrian infrastructure quality survey	Survey on availability and quality of pedestrian infrastructure, green corridors and public spaces	Annually	Department of Urban Development and Land Relations of Zhytomyr City Council Department of Transport and Communications of Zhytomyr City Council	3.1.1 3.1.2 3.2.1 3.2.2 3.3.1 3.4.1 3.4.2

№	Tool name	Description	Frequency of data collection	Potential responsible	Indicator number
10.	Cycling infrastructure quality survey	Survey on availability and quality of cycling infrastructure	Annually	Department of Urban Development and Land Relations of Zhytomyr City Council	4.1.4 4.1.5 4.3.3
11.	Bike-sharing operator report	Report on use of bike-sharing system	Twice a year	Bike-sharing operator	4.2.3
12.	Parking management report	Report on availability and management of parking places	Annually	Department of Transport and Communications of Zhytomyr City Council or responsible entity for parking (e.g. Parkservice)	5.0 5.1.2 5.2.1
13.	Rail service survey	Survey of rail service and external connectivity of the city	Annually	Regional branch "South-West railway" of JSC “Ukrzaliznytsya”	6.1.1 6.1.2 6.1.3 6.1.4
14.	Report on airport operation	Report that is provided by airport administration and includes number or regular and charter flights, number of destinations, passenger and cargo traffic volume	Annually	Zhytomyr airport	6.2.1 6.2.2 6.2.3 6.2.4 6.2.5 6.2.6

Annex A. Glossary

Term	Definition
Accessibility	The accessibility of an activity to an individual is the ease with which the individual can get to the places where that activity can be performed
Alternative scenarios	Describe developments resulting from different choices of policies and measures
Green corridor	These are routes for slow walking and cycling mobility that have intense landscaping
Indicator	A defined piece of data (usually quantitative) that is used to monitor progress in achieving a particular objective or target. For example, road accident numbers are one indicator of safety
Integrated approach	Integration of practices and policies between transport modes, policy sectors, public and private agencies, authority levels and between neighboring authorities
Integrated bus station	Complex of buildings, structures, parking lots, with stopping point and other relevant infrastructure to provide necessary services and accessibility to the city districts
Integration	Combining policy instruments so that they reinforce one another in meeting objectives
Intercepting parking or intercepting parking lot	Paid underground or surface Parking or a specially equipped area, located at the entrances to the city near major highways with good infrastructure transport interchanges public transport, which allows the vehicle owner to leave your car at the required time and continue the movement in the Central part of the city using public transport
Measure	In the context of SUMP, the term measure refers to a policy, campaign or project that is implemented to contribute to the achievement of the SUMP's objectives and targets
Mobility	Ease of moving about
Mobility management	Mobility management is a means to promote sustainable transport and manage the demand for car use by changing travellers' attitudes and behaviour. The SUMP approach encourages a balanced development of all transport modes through actions that include technical, promotional and marketing-based measures as well as infrastructure
Model	A (mathematical) representation of the relationships within the transport system (also linked to land use); widely used to predict the outcomes of transport strategies
Monitoring	An ongoing measurement of progress through the collection of new data and/or collation of existing data sources

Term	Definition
Parking management	Strategies aimed at making better use of parking supply through altering the amount, location and design, regulation, pricing, and management of on- and/or off-street parking
Participatory approach	Involving citizens and stakeholders from the outset and throughout the process of decision making, implementation and evaluation, building local capacities for handling complex planning issues, and ensuring gender equity
Person with reduced mobility	Any person whose mobility is reduced due to any physical disability (sensory or locomotor, permanent or temporary), intellectual disability or impairment, or any other cause of disability, or age, and whose situation needs appropriate attention and the adaptation to his or her particular needs of the service
Public space	Public places in the city, open to all residents and intended for mass public use
Reliability	For the public transport system, reliability means that vehicles depart on time and arrive at all stops on schedule
Scenario	Possible future situation in terms of a range of factors such as economic growth, changes in population and household size, income and car ownership
Stakeholder	Any person, group or organization that is exposed to the proposed project, or that may affect the project and its implementation. This term includes the public as well as a wide range of other groups (e.g. business, authorities and special interest groups.)
Sustainable mobility	Meets present generation mobility needs without compromising the future generation's ability to meet their own mobility needs
Tool	In the context of SUMP preparation, tools are a series of work practices or processes that can be utilised by planning authorities
Vision	Provides a qualitative description of a desired urban future and serves to guide the development of suitable measures in sustainable urban mobility planning
Vulnerable road users	Non-motorised road users, such as pedestrians and cyclists as well as motor-cyclists and persons with disabilities or reduced mobility and orientation

Annex B. Experts consulted in workshops and expert group meetings

The list of carried out workshops and expert group meetings within Sustainable Urban Mobility Plan development

Ref. №	Event	Date
1.	Meeting of the Steering Committee with the key stakeholders on defining the priorities of the Sustainable Urban Mobility Plan for the city of Zhytomyr	12.01.2018
2.	Workshop on goals setting for the priority “Strengthening the role of public transport”	12.02.2018
3.	Workshop on goals setting for the priority “Traffic Safety”	13.02.2018
4.	Workshop on goals setting for the priority “Cycling”	14.02.2018
5.	Workshop on goals setting for the priority “Encourage to walk”	14.02.2018
6.	Workshop on goals setting for the priority “External accessibility of Zhytomyr”	15.02.2018
7.	Workshop on goals setting for the priority “Parking management”	15.02.2018
8.	Workshop on Zhytomyr SUMP goals and indicators setting by the priorities: Traffic Safety, Encourage to walk and Cycling	06.03.2018
9.	Workshop on Zhytomyr SUMP goals and indicators setting by the priorities: Strengthening the role of public transport, Parking management and External accessibility of Zhytomyr	07.03.2018

The list of experts consulted in workshops and expert group meetings

Ref. №	Expert	Organisation / position	Event
1.	Andrii Nechuiviter	Chief of ME “ZhTTU” of Zhytomyr City Council	2, 9
2.	Danylo Onopriichuk	LLC “Service Center of Real Estate”	3
3.	Dmytro Tkachuk	Deputy Mayor on Issues of Executive Bodies	1, 2, 3, 4, 6, 8
4.	Halyna Semenets	Expert of the Project “Integrated Urban Development in Ukraine”	9
5.	Hryhorii Melnychuk	Expert of the Project “Integrated Urban Development in Ukraine”	2, 9
6.	Iryna Milash	Project Assistant “Integrated Urban Development in Ukraine”, GIZ	2, 3, 8, 9

Ref. №	Expert	Organisation / position	Event
7.	Iryna Upir	Head of Division of organizational work of the Department of Social Policy of Zhytomyr City Council, Committee on Accessibility	7, 8, 9
8.	Ivan Furlet	Chief of ME “Zhytomyrtransport” of Zhytomyr City Council, Zhytomyr City Council Member	8, 9
9.	Lina Nabiieva	Chief Specialist of the Education Department of Zhytomyr City Council	5, 4
10.	Marcin Wolek	Rupprecht Consult	1, 2, 3, 4, 5, 6, 7, 8, 9
11.	Maria Baida	Head of GIZ Project Office in Zhytomyr	1, 2, 3, 4, 5, 6, 7, 8, 9
12.	Maryna Kravets	Department of Health of Zhytomyr City Council	8
13.	Maryna Poplavska	Department of Transport and Communications of Zhytomyr City Council	3, 6
14.	Mykhailo Hryshchuk	Chief of Transport and Communications Department of Zhytomyr City Council	3
15.	Mykola Kostrytsia	Director of the Department of Economic Development of Zhytomyr City Council	1, 2, 4, 6, 7, 8, 9
16.	Mykola Yermakov	Chief specialist of Transport and Communications Department of Zhytomyr City Council	7, 9
17.	Nadiya Oleshchuk	Dornier Consulting International GmbH	1, 2, 3, 4, 5, 6, 7, 8, 9
18.	Oleh Chernyahovych	Deputy of Zhytomyr city council	9
19.	Oleh Samarin	Chief specialist of Transport and Communications Administration of Zhytomyr City Council	8
20.	Oleksandr Bezpaliuk	BSI-Group	8
21.	Oleksandr Dzendzelivskyi	Zhytomyr National Agroecological University (ZNAU)	9
22.	Olena Chernyshova	Dornier Consulting International GmbH	1, 2, 4, 5, 6, 7, 8, 9
23.	Olena Yurchenko	Head of the Division of Social and Economic Planning of the Department of Economic Development of Zhytomyr City Council	4, 5, 8

Ref. №	Expert	Organisation / position	Event
24.	Petro Yarmoliuk	Head of the Devision of Communal Services of the Department of Communal Services of Zhytomyr city council	3
25.	Ruslan Knomych	Office of the Patrol Police in Zhytomyr	3
26.	Sergii Suhomlyn	Zhytomyr City Mayor	1
27.	Tetiana Podorozhnia	Municipal Inspection of Zhytomyr City Council	7
28.	Tetiana Ziatikova	Department of Economic Development of Zhytomyr City Council	2, 5, 4, 7, 9
29.	Valentyn Vasianovych	Deputy Chief of the Transport and Communications Department of Zhytomyr City Council	5, 4, 9
30.	Viktor Derkach	Department of Economic Development of Zhytomyr City Council	9
31.	Viktor Khomenko	Head of the Information and Analytical Division of the City Health Center of Zhytomyr City Council	4, 5
32.	Viktor Maliuta	Head of the Division of Physical Culture and Sports of Family, Youth and Sports of Zhytomyr City Council	5, 4, 8
33.	Vitalii Kuchmenko	Senior Lecturer of the Department of Economics and Enterprise ZSTU	6
34.	Volodymyr Shumliakivskyi	Zhytomyr State Technological University (ZSTU)	2, 7, 8
35.	Yurii Bezborodov	Deputy Director of the Department of Urban Development and Land Relations of Zhytomyr City Council, Chief Architect of the city	5, 7, 8, 9
36.	Yurii Romaniuk	ME “Zhytomyrtransport” of Zhytomyr City Council	8, 9

Annex C. Reference list

[1] Guidelines – Developing and implementing a Sustainable Urban Mobility Plan / F. Wefering, S. Rupprecht, S. Bührmann, S. Böhler-Baedeker // European Commission. Directorate General for Mobility and Transport. - 2014.

[2] The concept of sustainable mobility plans. The position of the European Commission. COM (2013) 913 final of 17.12.2013.

[3] The General Plan of the Zhytomyr City for the period up to 2035.

[4] Decision No. 1109 of January 24, 2017 of the Zhytomyr City Council "On the Establishment of the Value of Travel in Public City Passenger Transport".

[5] Inventory of tram cars and trolleybuses, which are on the balance sheet at ME “ZhTTU” as of 01.07.2017.

[6] Electronic petition to Zhytomyr City Council No. 2017 - 664 dated on June 14, 2017.

[7] Department of economic development of Zhytomyr City Council.

[8] The program of organization of traffic safety and pedestrian traffic in Zhytomyr for 2018-2020.

[9] Estimated based of Mobility Survey, Dornier Consulting International GmbH, 2018.

[10] Mobility Survey, Dornier Consulting International GmbH, 2018.

[11] Data on business entities that carrying out transportation of passengers on public utilities routes in Zhytomyr As of November 26, 2017, the Department of Transport and Communications, Zhytomyr City Council.

[12] Estimated based on electric public transport data as of July, 2017, ME “ZhTTE“ and bus fleet as of November, 2017, the Department of Transport and Communications, Zhytomyr City Council.

[13] Self-estimated based on data on business entities that carrying out transportation of passengers on public utilities routes in Zhytomyr as of November 26, 2017, the Department of Transport and Communications, Zhytomyr City Council.

[14] Estimated based on transport model considering normal operation.

[15] Self-estimated as number of routes in the monitoring report divided by total number of routes in the city, according to According reports of Zhytomyr City Administration Transport Division [Source: http://zt-rada.gov.ua/?3506[0]=13] as of April 2018.

[16] Automatic fare colleaction system (AFC) data as for 2018.

[17] Means loss of labour capacity as a result of accident.

[18] The number shows the total number of injured people in accidents.

[19] Report of police as of 2016.

[20] The number shows the total number of people injured in accidents categories as “accident that involves cyclists”.

[21] The number shows the total number of people injured in accidents categories as “accident that involves pedestrian”.

[22] Mobility Survey, Dornier Consulting International GmbH, 2018.

[23] Report on Third Annual Ukrainian Municipal Survey carried out by International Republic Institute as for 2017.

[24] Mobility Survey, Dornier Consulting International GmbH, 2018.

[25] According to provided data from Economic development department, Zhytomyr City Council as of December, 2017.

[26] According to Police data as for 2017.

[27] According to provided data from Department of Economic Development of Zhytomyr City Council as for 01.12.2017.

[28] Official web-site of JSC “Ukrainian Railways, Open Data Source: https://www.uz.gov.ua/passengers/timetable/?station=22400&by_station=1 as for 30.07.2018.

[29] Official web-site of Zhytomyr airport as for 30.07.2018. Open Source Data: http://www.ztr.zt.ua/.

[30] Estimated based on data on suburban and intercity routes operations as for October 2018, Source: https://city.dozor.tech/, http://bus.com.ua/.

Photo on cover page: GIZ and Zhytomyr City Council photo archiv

Zhytomyr 2019