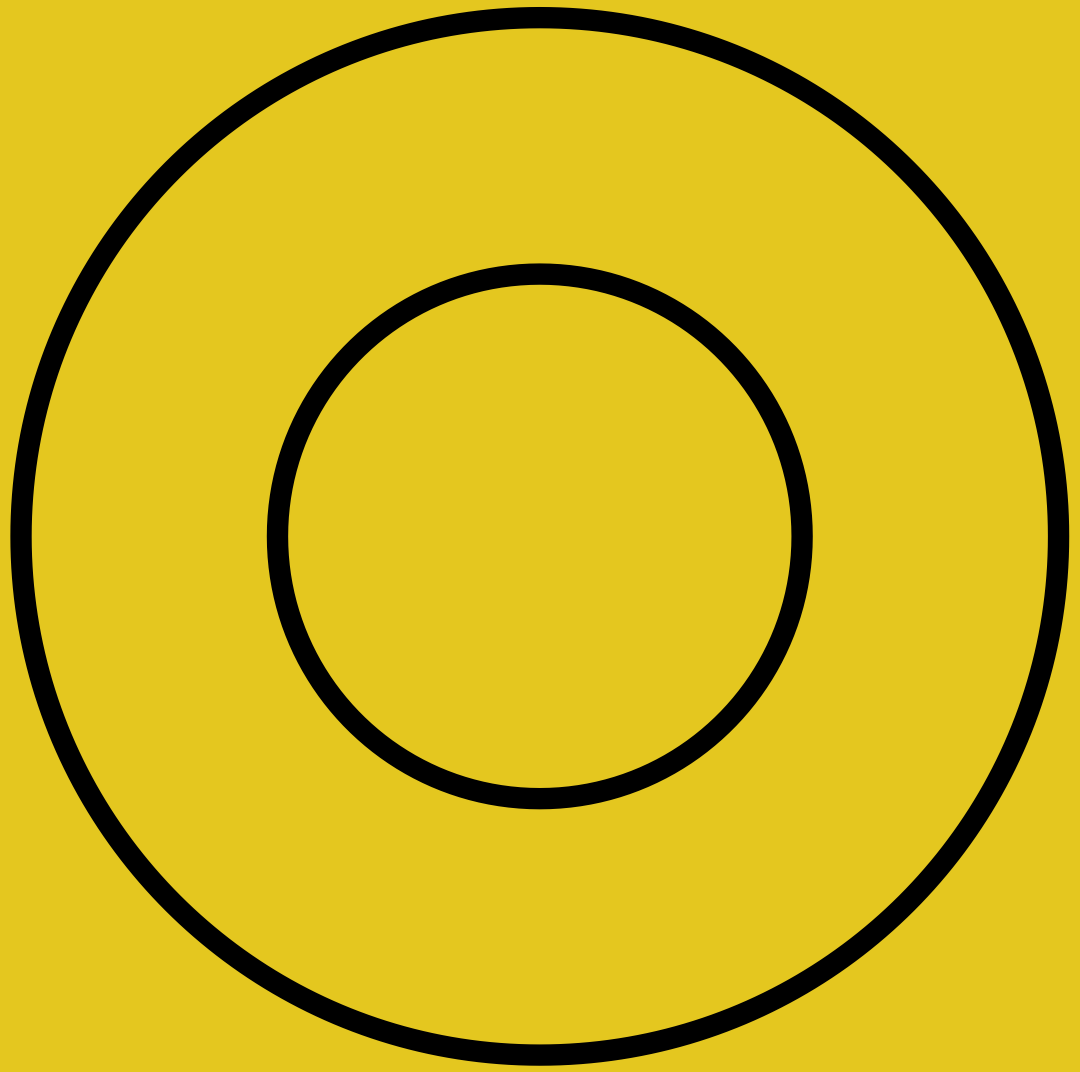
Strategy of mobility and development transport infrastructure Irpin community

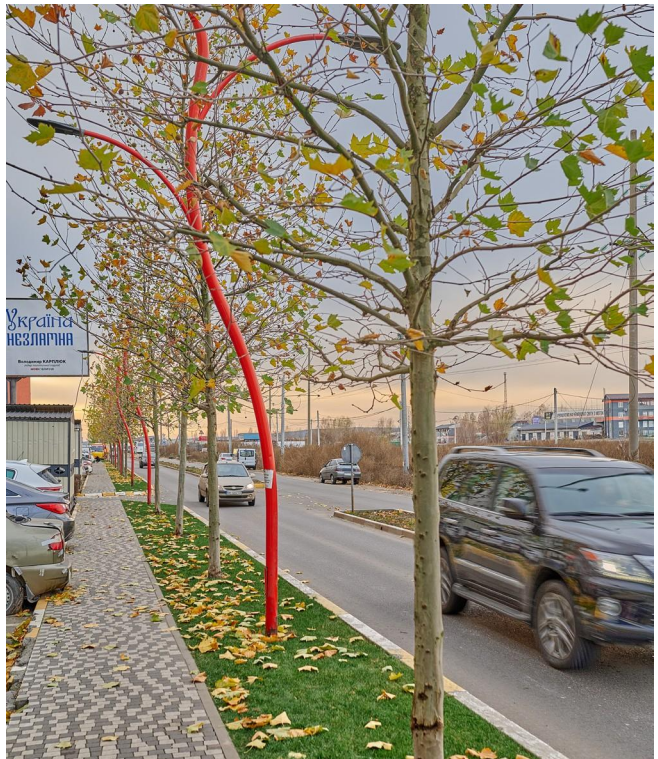
Irpin
2023



IRPIN
RECONSTRUCTION SUMMIT

Introduction

Restoration of transport infrastructure is a priority direction not only for individual cities, but also for the entire country. It is the roads that connect. Irpin city-territorial community with the rest of the country and the world, including external financial markets, trade flows, investment pools, the movement of supply chains and ideas, as well as modern means of transport and communication Irpin community is located in the center of Kyiv region and has great logistical potential: three highways, a railway and an airport are nearby, which will create prerequisites for the effective implementation of mobility strategies and the development of transport infrastructure. In order to restore Irpin and make it even better than it was before the war, a strategy of mobility and development of the community's transport infrastructure was developed. Transport sector experts, together with the Irpin Reconstruction Summit team, held meetings and analyzed the current state Infrastructure, organized workshops and community discussions to create comfortable and safe conditions for all road users. When we talk about transportation and communication in the city, everything is important here. It is important how people walk and ride bicycles. It is also important how people come home from work and park vehicles under their houses and how they move on weekends when they have to rest.In fact, we should take into account many details for pedestrian routes to the work of public transport.The strategy of mobility and development of the transport infrastructure of the Irpin community was developed for the city managers in order to take into account all points of view, thoughts and visions in shaping the perspective of the city's development



Strategy of mobility and development transport infrastructure Irpin community

Prepared by the ORESUND team:

Yuriy Lozovenko - architect, transport planner
Kateryna Lozovenko - project manager, data analyst
Demyan Danyliuk is an expert in electromobility and participatory planning
Artem Polyukh - design engineer

e-mail: info@oresund.solutions, website: https://www.oresund.solutions/

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List of terms and abbreviations

Definition of basic concepts:

Transit-oriented development, TOD Development, oriented on the use of public transport, the principle of development of the urban area, the goal of which is to increase the number of mixed buildings (residential, business, entertainment) within walking distance of main public transport.

The tree-shaped structure of the STR with such a structure transport flow from secondary streets flows into the trunk, loading them, forming the so-called "branches" of the tree. Modal split (modal distribution) is the distribution of users who use certain types of transport or ways of moving in certain proportions. For example, a conditional resident of Irpin has the following distribution as of now: walking 15%, bicycle transport - 5%, road transport - 60%, non-rail public transport - 15%, public rail transport - 5%.

Abbreviations:

STR - street and road network
PT - public transport
V - vehicle(s) solid waste -
TI- transport interchange
RA- Road accident
TA traffic accident
RTR- Road traffic rules
ORT - organization of road traffic
PPD- project and estimate documentation
TEJ - technical and economic justification
DPP - Department of Patrol Police
MC - means of calming the movement RS - rolling stock
PC - pedestrian crossing
LMP - low-mobility population groups
ICE - internal combustion engine
TI - traffic light object

Content

1.Introduction

1.Intro duction

this document was prepared as part of the Irpin reconstruction summit project. Irpin reconstruction summit is the first systematic project in Ukraine during the war between Russia and Ukraine, organized by volunteers, aimed at the systematic and sustainable reconstruction of Ukrainian cities, now the city of Irpin and the community.

Specialists from various fields (more than 200 participants) are involved in the project: architects, designers, project managers, urbanists, fundraisers, translators, designers have united in groups to develop sustainable solutions for the restoration of the important social infrastructure of the community in partnership with international organizations.

The document was formed on the basis of research, in particular, a conducted mobility survey, analysis of strategic documents of the community and cities of the agglomeration, field surveys of the street and road network, holding meetings with the involvement of the community.

Compliance with state policies and international obligations

Adoption of the Transport Infrastructure and Mobility Development Strategy corresponds to strategic documents and goals adopted at the state level. The goals for reducing greenhouse gas emissions are enshrined in the Low-Carbon Development Strategy of Ukraine until 2050, which in turn helps Ukraine reduce the negative consequences of climate change. The development of sustainable mobility corresponds to the National Transport Strategy-2030, one of the priority areas of which is the improvement of urban mobility and regional integration of Ukraine. Also, the provisions of the Strategy correspond to the goals of the Agreement of Mayors of the East, to which Irpin and Bucha joined in 2017, namely the reduction of greenhouse gas emissions by 30% by 2030. At the European level, the development of sustainable mobility is part of the implementation of the EU Sustainable and Smart Mobility Strategy (2020), which calls on states and local governments to significantly contribute to the transition residents to use more sustainable modes of transport. This strategy, in turn, was developed to implement the "EU Green Course" (2019), which aims to make Europe a carbon-neutral continent by 2050.

At the global level, the implementation of the strategy for the development of transport infrastructure and mobility corresponds to 11 of the 17 Global Sustainable Development Goals, which were approved by the United Nations in 2015, namely:

No. 1 Overcoming poverty
#3 Strong population health
#5 Gender equality
#7 Renewable energy
#8 Decent work and economic
#9 Innovation and infrastructure growth
#10 Reducing inequality
#11 Sustainable development of cities and communities
#12 Responsible consumption
#13 Combating climate change
#14 Partnership for sustainable development

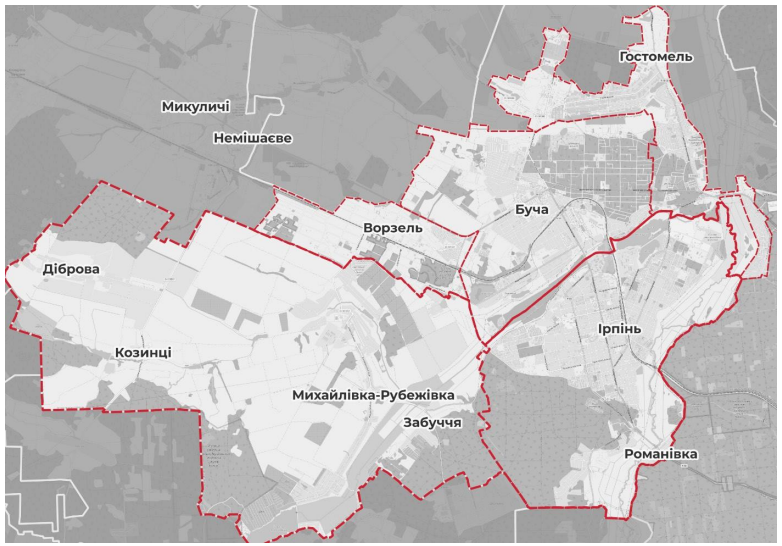
he horizon of implementation of the operational goals of the Strategy is 10 years.

2. Irpin: community, agglomeration, zone of influence

2. Irpin: community, agglomeration, influence areas/ SWOT

analysis

The boundaries of the Irpin urban territorial community are clearly defined and officially approved with the formation of the community in 2020. It includes Irpin, Mykhailivka-Rubezhivka, Zabuchchia, Kozyntsi, Dibrova. The Irpin agglomeration is the north-western part of the Kyiv agglomeration, which includes the near suburban zone from the satellite cities around the capital. The Irpin agglomeration is formed by four main settlements that border each other and the creation of communities were united by a single self-government: Irpin, Bucha, Gostomel, Vorzel. Adjacent villages also gravitate to the agglomeration: Mykhailivka-Rubezhivka and Zabuchchia (Irpinska TG), Blystavitsa (Buchanska TG), Gorenka (Gostomelska TG). The zone of influence of Irpen (agglomerations, communities) includes nearby settlements of neighboring communities and nearby residential areas of the capital, namely: > Kotsyubynske (Irpin city council), > Stoyanka, Gorenichi, Bilogorodka (Bilogorodsk TG), > Dmitrivka, Kapitanivka, Mila, Petrushki, Khmilna (Dmitrivska TG), >> Nemishaeve, Mykulychi, Klavdievo-Tarasov (Nemyshaivska TG), >> Myrotske, Blystavitsa (Buchanska TG), >> Novobilichy, Akademmistechko, Svyatoshyn, Berkovets, Pushcha-Vodytsia, Vinogradar (Kyiv).



Boundaries of the Irpin agglomeration and community

SWOT analysis

As part of the preparation of the Strategy, 14 strategic documents of the cities of the Irpin community and localities close to it were analyzed: master plans, city programs, strategies, concepts, etc.

2 field trips were carried out in order to conduct a field survey of the street and road network and identify mobility trends. In addition, a mobility survey was conducted.

The received information is systematized and presented in the form of a SWOT analysis of the existing transport situation of the Irpin community and agglomeration.

Strengths:

> Availability of traffic calming devices on many streets of the community (raised

pedestrian crossings and intersections, roundabouts, etc.); ► Availability and development of bicycle infrastructure. In the community

there are a number of bicycle paths; > Irpin - city-park. The existing parks and promenade are in good condition and are popular with local vests;

► The central part of Irpin is a continuous pedestrian zone; > Attempts to organize a packaging space in the center of Irpen;

► Territorial proximity to the city of Kyiv;

► Increase in the number of working-age population of the community;

> Attracting investments, increasing the number of small and medium-sized businesses; > Available barrier-free pedestrian crossings across the railway; ► There is no shortage of parking spaces in the public centers of Irpin, Bucha.

2. Irpin: community, agglomeration, influence areas/ SWOT-analysis

Weaknesses

> The tree-shaped structure of the street and road network between the settlements of the community and Kyiv;

>> The lack of direct connections between settlements within the community complicates pedestrian and bicycle traffic between settlements, makes bus service economically unprofitable;

>> Bus public transport is unattractive to the user: unclear traffic schedules, unsatisfactory state of rolling stock,

unpredictability, etc.; ► About 40% of the population of the agglomeration most often use it

by car for transportation according to the mobility survey conducted in November 2022; >> New residential complexes appear among forest park zones at a considerable distance from points of attraction, highway corridors and transport hubs;

> In the new micro-districts, economic and business, administrative or educational functions are completely absent; ► Automotive-oriented master plans. General plans of the population

points of the community are not connected with each other. There is absolutely

separated; >> Railway public transport does not use its potential;

> The points of attraction of the city of Irpin are concentrated in the central part; >> Weak economic and infrastructural connections between Irpin and

Bucha TC >> Traffic light objects do not have conflict-free regulation.

Opportunities:

> Due to a break in active monofunctional housing construction, there are opportunities to revise urban planning policy in the direction of sustainable development; > Use of the railway as main public transport can improve mobility both within and outside the community; > Strengthening ties between neighboring communities will provide a positive social economic effect; >> The bicycle path on the embankment of the Irpin River was built for recreational purposes, but if it is connected to Romanivka, it will be a convenient bicycle route in city center; >> After combining the existing sections of bicycle paths and lanes, a complete bicycle network will be formed; >> The possibility of organizing paid parking to regulate the demand for this service.

Threats:

> Bus public transport in the community will cease to exist, the attractiveness of a private car will increase. This will contribute to the deterioration of air quality, increase in traffic jams, loss of time and labor productivity;

► The existing development encourages the use of private cars, but not

active methods of movement (on foot, on two wheels or public transport);

> Deterioration of traffic safety, increase in the number of road accidents due to increased use of private cars; ► Increasing the load on the main streets of the community and agglomeration due to the concentration of the main points of attraction only in the administrative center of the community; > Complete social, economic and infrastructural isolation between the communities of Irpin and Buchan.

* See Appendix 1 for a full detailed analysis.

3. Key conclusions based on the conducted research

3. Key conclusions based on the conducted research

The cities of Irpin, Bucha, the villages of Gostomel and Vorzel, as well as the adjacent villages of Mykhailivka-Rubezhivka and Zabuchchia form the so-called Irpin agglomeration, which is part of the larger Kyiv agglomeration. These settlements are closely connected by socio-economic ties: the city of Irpin cannot be considered separately from neighboring cities and towns.As well as the analysis of the existing situation, the Mobility Strategy should be developed for the entire agglomeration, as well as take into account the necessary connections at the community level.

The formed features of the spatial structure and development of the Irpin agglomeration, the proximity of the capital and the presence of a greater variety of functions and services in it, the configuration of STR and the state of public transport in the Irpin agglomeration today lead to increased car use. According to the mobility survey, about 40% of the population of the agglomeration most often use a car for transportation. New dense residential development in spatial and transport aspects additionally stimulates the use of machines for movements, deepening transport problems, in particular traffic jams. Decisions included in the General Plans of Irpin nd Bucha regarding residential development, unfortunately, do not solve these problems, but "legalize" and strengthen such approaches. Despite the satisfactory networks within settlements, the structure of STR has shortcomings at the agglomeration level, the lack of direct short connections between cities does not stimulate active types of mobility. There is a erosion of the function of certain types of streets and roads, which leads to a worse work of public transport, a decrease in traffic safety.

At the level of communities and access to Kyiv, STR has a pronounced tree-like structure, which is the least efficient type of network. There is a lack of direct connections between neighboring settlements: residents of the villages of the Irpin community are forced to go to the center of the community through two other communities.

The master plans of the cities and towns of the agglomeration are car-centric with regard to the development of the transport network: they are primarily oriented towards the growth of motorization and the development of the trunk STR for its satisfaction.

Parking lots, highways, intersections according to the General Plans require colossal investments in infrastructure, regardless of the capacity and resources of cities. Pedestrian and bicycle traffic is ignored as a mode of movement, and the desired connections remain missing due to the individuality of solutions for each city.

Despite everything, in Irpin, Bucha and Vorzel, high-quality traffic safety solutions, in particular, raised crossings and small roundabouts, are increasingly being used. Some streets follow the best practices of the European Union. Already now, the community's settlements are aimed at the development of bicycle infrastructure, and Velorukh's existing share in the mobility structure provides a strong impetus for this.

A significant gap in the transport infrastructure of the agglomeration remains public transport with low-quality services, poor rolling stock not adapted for MGN, unclear network and timetable. The R-30 highway, intended for access from the agglomeration to Kyiv, has the lowest number and frequency of PT routes. Only a quarter of the residents of the agglomeration most often use buses, and the railway is generally an outsider of passenger transportation in the agglomeration. Russia's war against Ukraine led to significant destruction and damage in Irpin agglomeration. The need to rebuild the infrastructure opens a window opportunities for modern, progressive and sustainable approaches.

3. Key conclusions based on the conducted research

The new Mobility and Transport Development Strategy should be based on the best approaches and practices of developed countries:

>> Sustainable development, adaptation to climate change, environmental friendliness; > Principles of sustainable mobility: the main priority is the person, not the person's car; the point is to move people, not vehicles; ► Priority in development for sustainable types of movement: on foot, by bicycle, by public transport;

>> Principles of "zero mortality" on the roads: the infrastructure should be safe, not only the behavior of traffic participants; > Clarity, predictability, uniformity of movement, functional approach and

recognition of types of STR; > Connectivity and connectivity of STR, convenience for all types of movement with the priority of sustainable species; >> <<Cities without inequalities" — 100% inclusive infrastructure; > <<The city is 15 minutes away", "the city is accessible by foot" - the proximity of the majority functional needs of residents from home;> Polycentricity of the agglomeration, polyfunctionality of centers; Development of the city according to the principles of TOD "development, oriented to Use of public transport" gravitation to nodes of mass public transportation;

> Orientation to transport with a larger carrying capacity (capacity) at

lower costs for its organization in the direction of the capital;

> Integration of the suburban network of the State Enterprise with the network of the capital;

> Decentralization of daily movements, decentralization of external transport (access to long-distance communication from within the agglomeration), without the need to go to Kyiv;

4. Best practices in the field of mobility and transport infrastructure

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Sustainable mobility

Sustainable development and the Covenant of Mayors

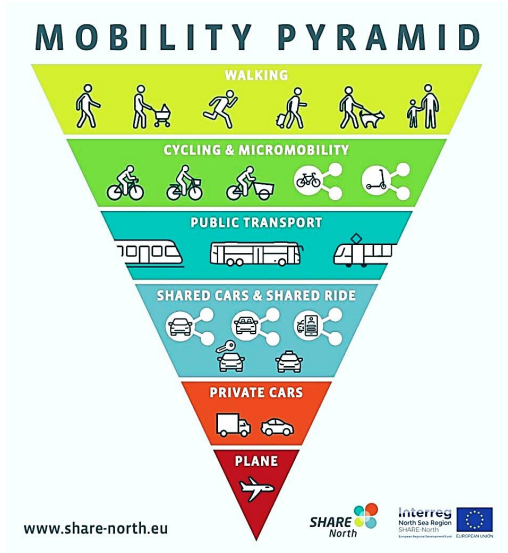
Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

It is about rational consumption of resources, protection of the environment, social justice, absence of racial and national discrimination. The goal of sustainable development is to raise the standard of living of the population.

The main goal of sustainable development is a harmonious combination of Society, Economy and Environment.

The concept of Sustainable Development has 17 global goals, including social and economic equality, responsible consumption, justice and partnership, a clean ecosystem and public health, overcoming poverty and hunger, education and innovation in infrastructure. These are the key areas of development of the countries adopted at the UN Summit for the period from 2015 to 2030. Sustainable development is a general and cross-cutting concept of the Sustainable Development Goals of the UN, in the Green Course of the EU and in the strategic documents of Ukraine.

The sustainable mobility strategy touches on renewable energy, economic growth, innovation in infrastructure, reducing inequality, responsible consumption, combating climate change and partnership for development. But in the context of the development of transport infrastructure and mobility, cities should first of all be guided by goal #11 Sustainable development of cities and communities.



a pyramid based on the most stable modes of movement: walking, cycling and micromobility, public transport.

4. Best practices in the field of mobility and transport infrastructure

1. A key means of achieving this goal is sustainable urban mobility, because Sustainable Urban Mobility is a way of moving people and moving goods that is environmentally, socially and economically sustainable. The development of sustainable mobility in cities involves 10 main principles, following which it is possible to achieve the global goals of Sustainable Development:

   1. Planning of cities with high building density and human scale; 2. Optimization of the road network and its use; 3. Development of public transport-oriented buildings; 4. Encouragement of pedestrian and bicycle traffic; 5. Improvement of public transport; 6. Control of the use of vehicles; 7. Parking management; 8. Promotion of ecological vehicles; 9. Communication strategies with residents; 10. A comprehensive approach to solving problems.

   As a way to achieve the goals of sustainable mobility, namely reducing damage to the environment, there is an initiative of the European Union called the "Covenant of Mayors". The Covenant of Mayors is the world's largest grassroots climate and energy movement. The European initiative Covenant of Mayors unites thousands of local authorities who have voluntarily taken on commitment to increase energy efficiency and the use of renewable energy sources in their territories.

The signatories of the Agreement undertake to reduce their own emissions of CO2 and other greenhouse gases by at least 30% by 2030, contributing to "green" economic growth and improving the quality of life.

The cities of Irpin and Bucha have been signatories to the Agreement since 2017.

1 Covenant of Mayors – Europe: https://eu-mayors.ec.europa.eu/en/home)

4. Best practices in the field of mobility and transport infrastructure

Spatial planning

Development oriented towards the use of public transport

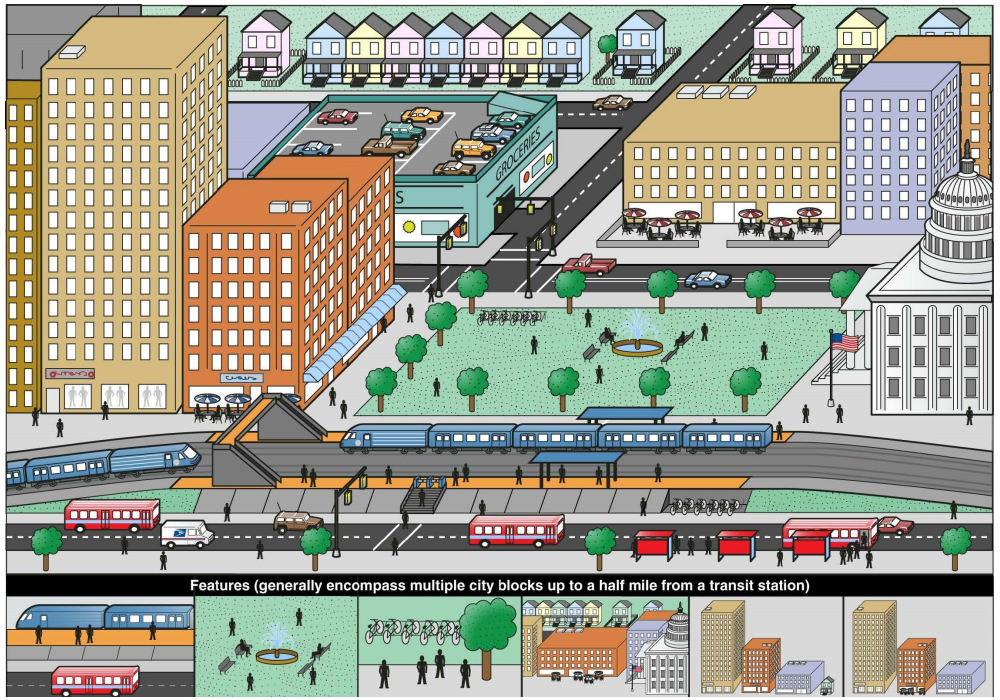
Transit-oriented development (TOD)1 — the principle of urban territory development, the purpose of which is to increase the volume and density of mixed buildings (residential, public, business, entertainment) within walking distance of main public transport (railway, tram, metro, bus).

TOD promotes the connection between a compact city and increased use of public transport. The key goal of introducing this principle is to reduce the use of a private car for daily trips (car use) and to promote the sustainable development of built-up areas.

What does TOD look like?

It usually includes a major public transport stop (railway station, high-intensity rail or non-rail stop), surrounded by a zone of mixed high-density development (high-rise residential development, shopping and entertainment center, office centers) and lower density areas extending further from this stop .

The densest TOD zones are usually located within 400-800 m from the main transport stop, because this is considered an acceptable radius of accessibility for walking, in particular solving the problem "last mile"2.



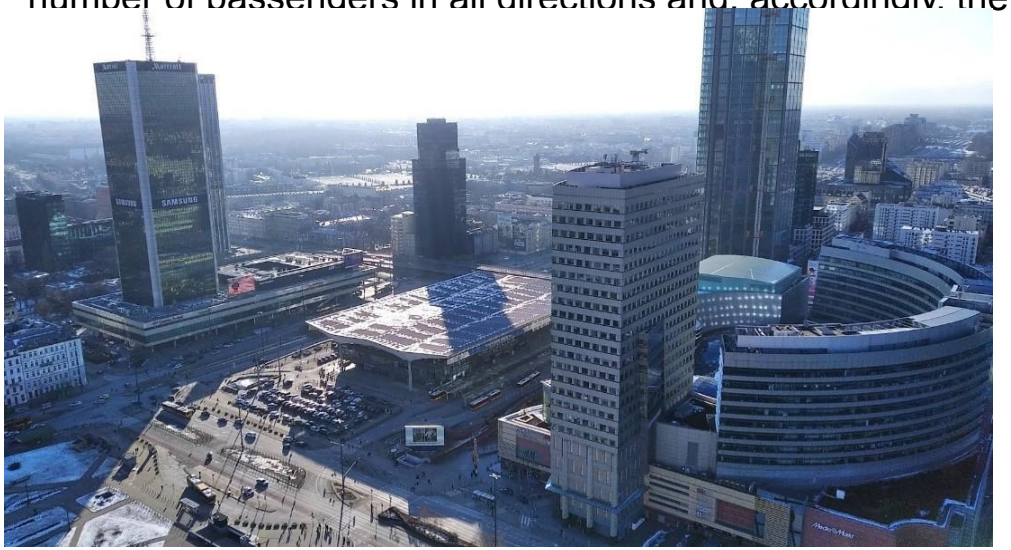
Impact on the environment

In the development of territories oriented to the use of public transport, the main focus is on reducing the distances that must be overcome to receive benefits, to increase the use of public transport, walking and cycling. Residents use more sustainable modes of transportation for daily activities, while reducing travel distances (i.e., time and energy consumption). In addition, it allows for a higher density of housing and public buildings, which reduces energy consumption in terms of the specific area of the premises.

1 Транзитно-орієнтований розвиток: http://bit.ly/40etux6
2 Micro mobility: The solution to the First & last mile challenge: https://www.swarco.com/stories/micro-mobility-solution-first-last-mile-challenge

4. Best practices in the field of mobility and transport infrastructure

The main advantages of TOD: ▹ Provides access to public transport primarily on foot, secondarily by bicycle (means of micromobility), which allows you to travel without a car; ▹ Facilitates the daily routine associated with access to various services, as everything is concentrated around the main HT node; ▹ Reduces car use and increases the demand for walking and the use of bicycles, micromobility means; ▹ Increases the number and density of the population near HT stops, which ultimately increases the number of passengers in all directions and, accordingly, the



An example of construction, according to the principle of TOD, Art. Warsaw-Centralna. Photo: ORESUND

4. Best practices in the field of mobility and transport infrastructure

Polycentricity

Polycentricity is a term found in administrative-territorial and economic aspects. For example, the unification of a number of settlements and the implementation of a decentralization policy is the creation of polycentric centers of community activity, when the cities and towns of the region do not gravitate economically to the regional center, but become independent centers of business activity.

Polycentricity in the context of the city and agglomeration should be considered local decentralization of points of mass attraction. The main magnet for business, entertainment and other activity is not the city-wide city center (or the core of the agglomeration), but local sub-centers in each district, within which residents can satisfy their daily needs, including work and study.

The implementation of the principle of polycentricity involves the reduction of excessive transport movements within the city limits and stimulates walking, the use of bicycle transport and micromobility means. The basis of the principle of polycentric development is the creation of moderately dense multifunctional buildings (mixed residential, office-business, public, commercial, entertainment, administrative, educational, medical functions).

Good urban spatial planning is when you don't have to nowhere to go , — you have a wide choice of means of transportation in in the form of public and bicycle transport, not private,automobile.

(Mixed-use development)[1]

A mixed-use development is a type of urban development that combines a set of different ways of using a building or space. For example, placing residential, commercial, office, cultural, institutional or entertainment facilities in one space. At the same time, the functions of these objects are organically combined.
The main functions that can be combined within the framework of mixed development (the list is not exhaustive):

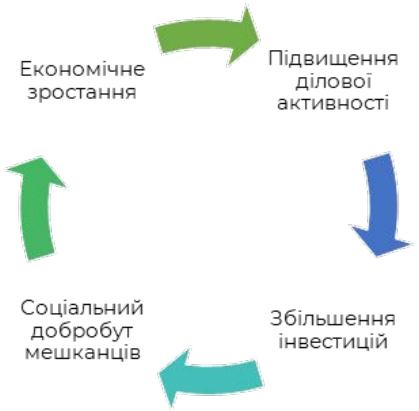
#	Function	Example of implementation
1	Residential	Multi-, medium-, low-rise buildings, hotels, etc
2	Administrative	ASC, representative offices of banks, etc
3	Business	office premises, coffee shops, restaurants, medical facilities, etc
4	Educational	office premises, coffee shops, restaurants, medical facilities, etc
5	Entertaining	Malls, cinemas, theaters, etc
6	Recreational	Public spaces, parks, squares, etc

A new multi-storey residential complex in which the first floor has a medical center, a supermarket, a kindergarten and a dentist's office is an example of a mixed building.

Or when a large residential building, a shopping and entertainment ~~center, a public~~ transport hub, a hotel, an office center are located within one block — this is also an example of mixed use of space. 1 Mixed-use development: https://en.wikipedia.org/wiki/Mixed-use_development

4. Best practices in the field of mobility and transport infrastructure

The most common example of mixed-use development is the civic center of any old (historic) city. Residents can meet all their needs within walking distance, so the main task is to create the environment of a city-wide community center in other densely built-up areas.



1. **Advantages of the city 15 minutes:** Socio-economic equity - those without a car can easily access all their needs; The need for transport movements is reduced to a minimum, so reducing the use of private cars improves the impact on the environment (reduces emissions) and human health; Permanent methods of movement - on foot, by bicycle, which improve health and well-being - become convenient; Convenient location of services, access to which is carried out in several ways, saves time and resources; Economic attractiveness, an increase in the price of real estate, and therefore - an increase in tax revenues to the local budget.

The city of 15 minutes is primarily about planning: ▹ Creation of bicycle infrastructure; ▹ Construction of schools and hospitals; ▹ Construction of office premises and retail spaces; ▹ Creation of public spaces.

In addition to convenience for residents, such a building also has a positive economic effect on the scale of the city and community

The 15-minute city concept assumes that residents can meet all their daily needs within a radius of 15 minutes on foot or by bike.

Drink coffee, take the child to kindergarten, make a business call, go to the gym - all this without leaving my area! City "15 minutes"

Imagine you left home with your child, got on your bike and in 5 minutes ended up near the kindergarten where she studies. You left her there and for a while
5 minutes - you are already sitting in your favorite coffee shop, which is adjacent to your office.
You decided to walk the way back, leaving the bike behind

- near the office, took the child and reached home in 15 minutes.

fining-15-minute-city
https://www.cnu.org/publicsquare/2021/02/08/de-

Photo: Trafikkontoret, Stockholm City

4. Best practices in the field of mobility and transportation infrastructure

In summary,

The principles of Transit-Oriented Development (TOD) and polycentricity, the organization of mixed-use development, and the creation of a "15-minute city" are all separate components that contribute to comprehensive sustainable development in spatial planning.

The goals of these concepts are:

▷ Reducing the transportation burden on the city's road network.
▷ Creating attractive conditions for conducting business not only in the city center but also in other areas of the city.
▷ Having a positive impact on the environment and the city's economy.
▷ Increasing social activity within other districts.

4. Best practices in the field of mobility and transportation infrastructure

Modes of mobility

"Green corridors" as an element of promoting sustainable modes of transportation.

The concept of "green corridors" involves creating convenient routes for pedestrians and cyclists that traverse through the city, urban areas, and communities. These corridors are designed to connect residential neighborhoods and points of attraction in different parts of the urban area, bypassing major roads and heavily congested streets. Along these corridors, the aim is to provide safe and convenient conditions for pedestrians and cyclists, with minimal conflicts with motorized traffic.

These "green corridors" connect parks, squares, recreational areas, and often pass through tranquil and green streets where vehicle traffic is either low or compensated by wide pedestrian-friendly areas.

The creation of "green corridors" serves as an additional factor in promoting pedestrian and bicycle mobility, encouraging increased cycling trips and walking as alternatives to car usage.

The development of "green corridors" will contribute to the revitalization of public spaces, enhance the presence of restaurants, shops, and increase the number of people on the streets, resulting in improved social and psychological safety.

The key requirements for the design of "green corridors" include:
▹ Wide sidewalks, alleys, or pedestrian zones with even pavement surfaces (stone/concrete tiles, asphalt, concrete, compacted stone screenings).
▹ Barrier-free environment.
▹ High-quality greenery throughout the length of the corridor.
▹ Lighting, presence of benches, trash bins, and other street furniture.
▹ Minimal conflicts with motorized traffic and heavy traffic intersections.

Green corridor along the Rochor Canal, Singapore.
Photo: Ramboll Studio Dreiseitl

Green corridor along the Elbe River, Germany, Hamburg.
Photo: enviropaul.wordpress.com

4. Best practices in the field of mobility and transportation infrastructure

The bicycle is one of the most sustainable modes of transportation.
The development of bicycle infrastructure makes the community environment safer, more environmentally friendly, and comfortable. Promoting bicycle transportation is a sign of progressive transport policy.

Ranking second, after walking, in the mobility pyramid, the bicycle increases the mobility of residents, helps cover longer distances in less time, promotes healthier lifestyles, and makes cities cleaner.

Furthermore, the infrastructure for bicycles can also be used for micromobility devices, which significantly expands the potential user base.

For individuals or families, the bicycle is the most ecological and efficient means of transport for moving within populated areas. Distances ranging from 1 to 5 kilometers are considered the most efficient for bicycle use and comfortable for people of all ages and physical abilities.

The bicycle is the epitome of equality*1. The proliferation of electric bicycles and micromobility devices extends this range of comfort to 10-20 kilometers, making this mode of transportation suitable for travel between cities, villages, and the center of communities.

Public health is an important factor, especially considering the aging population. Studies show that regular bicycle use positively affects reducing the risk of cardiovascular diseases and musculoskeletal disorders. This benefits both individuals and communities, as healthier individuals require less medical assistance, maintain economic activity for longer, and lead happier lives.

In the context of comprehensive invasion and post-occupation of regions, the bicycle has become an important and accessible mode of transportation for residents.

*1.WHY THE TRANSITION TO ECOLOGICAL AND HEALTHY MOBILITY BRINGS TREMENDOUS REWARDS TO CITIES, https://mobility-lviv.com/shifting-to-green-healthy-mobility-cities/

Krakow, Poland.
Photo: ORESUND

4. Best practices in the field of mobility and transportation infrastructure

Public transport

Public transport provides the everyday mobility needed to make cities sustainable, convenient, liveable, prosperous and efficient. Most of the residents use it as the main mode of transportation for medium and long distances. The more often the bus runs, the more passengers it has
transports, and therefore residents' productivity and life satisfaction increase.

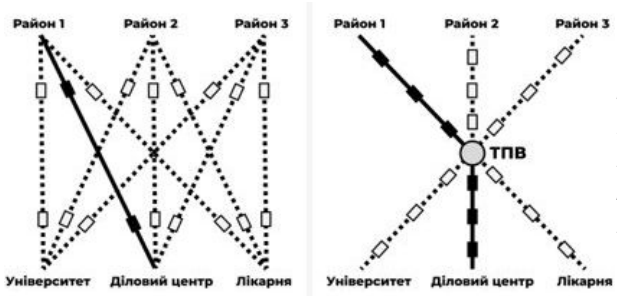
Public transport is one of the key ways to reduce harmful emissions in the transport sector, in particular passenger transport. Even a bus with a diesel or gas engine emits less harmful emissions per passenger, and in general there are fewer buses than other vehicles with internal combustion engines. Electric public transport, in this context, is an ideal solution, but requires much larger investments.

The route network of any settlement can be formed according to two basic approaches:

- Maximum branching (as many routes as possible, connecting as many urban areas as possible, but not frequent/crowded)
- High frequency of traffic (there are fewer routes and they run frequently, but passengers change trains, and thanks to the high frequency of traffic, they reach their destination quickly).

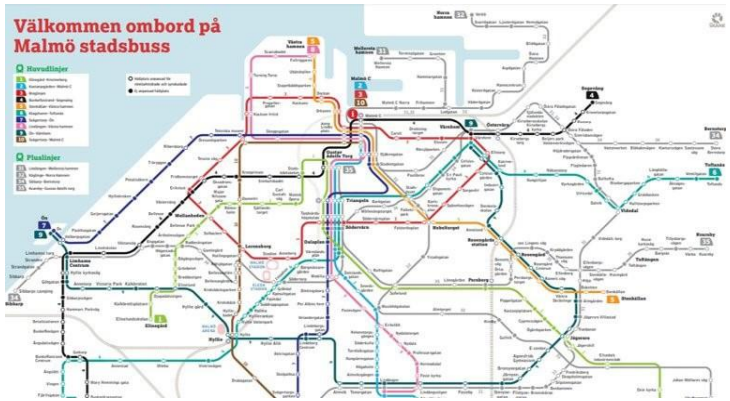
Any of these approaches requires a resource to ensure the operation of the GT network. The main resource is finances for the organization of transportation: funds are collected from passengers (according to the tariff) and funds are allocated from the budget (cover the difference). Derived from this are material and human resources: rolling stock, infrastructure and personnel.

Resources are always limited, so they must be used as efficiently as possible so that more people can benefit. In the network
with a relatively small number of routes, but which travel frequently to get from any point A to point B may require at least one transfer, but the transfer time will be short. This is usually much faster than waiting for a direct route that may only run every 20, 30 or 60 minutes and being overbooked.



*Schematic diagrams of HT: 1) branched network,
2) high frequency of movement with transfers*

It is possible to allocate the available limited resource to many direct routes that run infrequently and over long distances, or to a smaller number of routes that run frequently. What is important is not the number of routes, but the number of vehicles and the waiting time at the stop. More routes will not lead to a better quality of public transport, because it does not mean an increase in the number of vehicles in general, but only their redistribution - waiting times will increase on all routes, because resources are limited.



*Scheme of the operator's railways
VBB (Berlin, Brandenburg and surrounding regions)*

4. Best practices in the field of mobility and transportation infrastructure

Railway transport is the framework of the GT network

Rail transport is the most cost-effective in terms of transporting large volumes of passenger traffic, especially with the existing railway network. Suburban or regional railways in countries developed from the point of view of sustainable mobility are the trunk framework of HT.

The railway is capable of transporting up to 50,000 passengers per hour in one direction on one line. One 10...12-car train can accommodate up to 1,200 passengers, and a 2-story train can accommodate up to 2,000. At the same time, energy consumption for transporting 1 person is 5 times lower than by bus transport. The traffic interval in large agglomerations is often only 4-5 minutes, which is equal to the subway with significantly lower network development costs (by 5-10 times).

The railway in the urban agglomeration is also the fastest way of movement: free of traffic jams, it can provide a route speed of up to 50 km/h. for city/suburban traffic and up to 80 km/h. for regional. For comparison: the route speed of the city ground railway is within 20-30 km/h, motor vehicles - 15-35 km/h. depending on the VDM load.

2-deck commuter train, Sydney. Photo: transportsydney.wordpress. com

Focusing on rail in mass transportation is consistent with TOD principles. The railway station becomes the public center of the city, a town where dense residential, business and public buildings are concentrated, public spaces and zones of urban activity are created. City and suburban bus routes are connected to the station, bicycle corridors are suitable and bicycle parking spaces are arranged for further transfer to the train or vice versa.

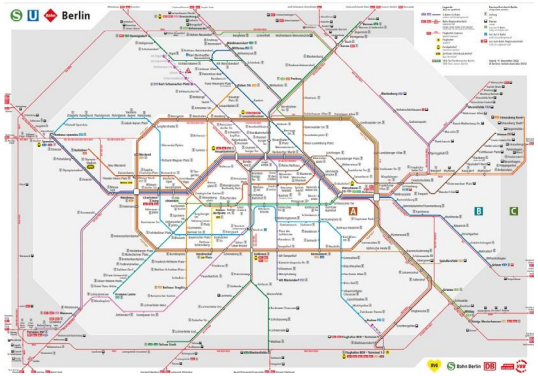
This helps to reduce the use of cars, because you don't need to go there by car to solve cases in this city: the office and business center is 5 minutes away. on foot from the platform, with the purchase of coffee on the way. And a transfer from a train to a bus or tram can generally take place within the same platform:

Photo: ln-online.de

Suburban routes are integrated into a single network and provide convenient movement throughout the region. Thus, the regional carrier VBB (Berlin - Brandenburg region, metro, city and suburban trains, regional trains) covers not only the agglomeration of Berlin, but also provides connections with neighboring cities and even with the border cities of Poland. At the same time, the railway is the main framework of the railway network.

The operator provides a single ticket and convenient transfers to all public transport within the agglomeration - buses, trams, metro, city, suburban and regional trains. And in 2022, an experiment was conducted with a monthly ticket for all these types of HT for only 9 euros. During the 3 months of the experiment, 52 million such tickets were sold.

4. Best practices in the field of mobility and transportation infrastructure



Railway scheme of the operator VBB (Berlin, Brandenburg and surrounding regions)

The railway provides multimodal passenger transportation: tram, trolley bus stops, and metro stations are usually located near the platforms and stations. Ideally, the bus station or bus stop should be located in the immediate vicinity of the station platforms. This allows you to conveniently combine the railway with other types of public transportation, making daily trips completely independent of the need for a car.

An important aspect is the combination with the bicycle and micromobility: both the possibility to leave the bicycle at the station in the bicycle parking and continue the journey by train, and the possibility to transport it in the carriage to further complete the so-called "last mile" from the station to the final point of the trip.

A typical railway station in the Netherlands is a landfill. Photo: maps.google. com

Electric mobility

Electric mobility is part of sustainable urban mobility.

The concept of "electric mobility" often refers to electric cars (passenger cars with an electric engine), and the "development of electric mobility" refers to the promotion of their spread, in particular through charging infrastructure and various incentive programs. In fact, this is only one of the many forms of electric mobility.

An electric car is still a car. Giving priority to electric vehicles over other ecological methods of urban mobility will lead to the preservation and strengthening of the phenomenon of motorization with all the negative consequences, such as the increase in transport delays for loading VDM, road accidents and injuries, loss of time and productivity, harmful emissions into the air, excessive use of urban space by parked cars cars

The main means of electric mobility:

Personal electric transport	Electric scooter
	A unicycle
	Electric bicycle (in particular, cargo for delivery of goods)
	Electric mopeds and motorcycles
Public transport	Trolleybuses
	Self-powered trolleybus
	Electric buses
Electric cars	Electrified railway for suburban and long-distance connections
	Electric vans and light trucks
	Private electric car

4. Best practices in the field of mobility and transportation infrastructure

Cities' strategic plans and goals should include new services and technologies, such as electrification of the bus fleet, car and bike sharing, charging and energy infrastructure in the urban space, new schemes and vehicles for delivery.

In the course of implementing the European Green Deal, the EU aims to become carbon neutral by 2050. To achieve this, the EU transport sector must reduce CO2 emissions by 90%. The EU Sustainable and Smart Mobility Strategy describes the Commission's planned steps to transform the EU's transport system to meet the ambitions
European Green Agreement. Considering this, electromobility will be the basis of the further development of the transport industry.

As part of the post-war reconstruction of Ukraine and the process of European integration, cities should step onto the new rails of the "green economy" and, in particular, implement better practices of urban mobility.

Autonomous trolleybus, Solingen, Germany. Photo: ORESUND

4. Best practices in the field of mobility and transportation infrastructure

Parking Organization

Street space is a valuable resource owned by the community, in high demand, and limited. Although a car is a means of transportation in urban areas, ultimately it is someone's private property and cannot occupy a space that belongs to everyone for free.

Instead, car owners can temporarily lease this territory from the community to park their private property (while not in motion). This forms the basis of the regulatory model implemented in developed countries.

Parking is a service with both demand and supply. Increased supply of parking, especially free parking, leads to urban emptiness. Houston, USA, is an example of this. Therefore, organizing parking involves limiting the number of parking spaces in dense areas and regulating demand for this service through its pricing.

Paid Parking and Zoning

To rationalize the use of urban space, it is advisable to designate parking zones based on demand. Accordingly, the cost of parking per hour in the central part of the city should be the highest compared to other zones. The farther away from the center, the lower the cost of the service.

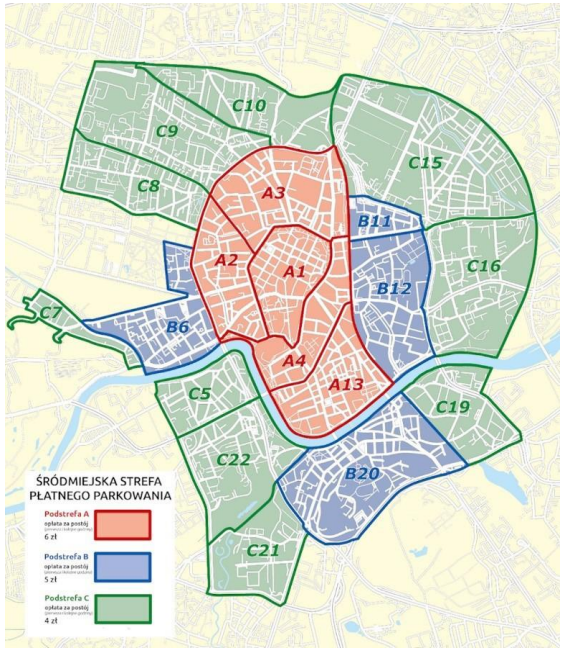
The pricing should be set at a level that does not encourage residents to use their cars extensively or leave them parked on the streets for a long time. This promotes car turnover, which means managing demand. The cost of the service is determined on an individual basis.

Setting the price is recommended to ensure that 15% of the parking spaces in a zone are consistently available. For example, if a parking zone has 100 spaces, 15 of them should always be vacant.

Source: Mobility Lviv, "Parking Management: Park4SUMP," CIVITAS Park4SUMP, 2020. (Link provided in the original text)

for new arrivals, and at the same time some of the users who have already parked must leave (they should be encouraged to do so by the cost and time limit).

The organization of parking must be carried out in accordance with the norms defined by the law. In Ukraine, this is Resolution of the Cabinet of Ministers of December 3, 2009 No. 1342 "On approval of the Rules for parking vehicles."



Map of paid parking zones in Krakow, Poland (red - the most expensive).
Photo: http://zdmk.krakow.pl/

4. Best practices in the field of mobility and transportation infrastructure

Traffic safety

Zero road deaths (Vision Zero1)

Vision Zero is a program to improve road safety and reduce deaths in road accidents, which was adopted by the Swedish Parliament in October 1997.

The basic principle of the program is the inadmissibility of fatal traffic accidents. According to it, traffic deaths cannot be treated as an inevitable evil associated with motorization.

The program's main approach to this problem is designed to remove the main blame for road deaths from drivers, to make it so that those who design, build and maintain roads, and car manufacturers participate in solving the problem.

Roundabout in Malmö, Sweden. Security island in Frankfurt, Photo: Oleksandr Shutyuk Germany. Photo: Oleksandr Shutyuk

The developers of the program understand that drivers are people, not machines, and will always make mistakes. However, it is necessary to organize road traffic in such a way that human errors do not lead to fatal consequences.

The increase in security is achieved by the introduction of radical changes to the infrastructure and is complemented by advocacy campaigns.

1 Vision Zero: https://en.wikipedia.org/wiki/Vision_Zero

The task of developing road infrastructure is to physically prevent road accidents with injuries and fatalities. The infrastructure should be clear, predictable, define driver behavior, and prevent accidents.

Infrastructure changes include the implementation of physical traffic calming measures (safety islands, directional islands, chicanes, raised crossings and intersections, etc.) and reorganization of traffic flow (construction of roundabouts, installation of controlled intersections, separation of high-speed transit traffic from local traffic, etc.). These measures aim to physically reduce speed in areas of heightened attention to potential conflicts and to separate traffic with significant differences in mass and speed.

Advocacy campaigns focus on requirements such as wearing seat belts, prohibiting phone use and distractions while driving, and more. According to the Vision Zero program, in Helsinki in 2019, no pedestrians or cyclists were killed. The city achieved this by reducing speed limits on its streets to 30-40-50 km/h.

Central streets	30 km/h
Main streets	40 km/h
Main	50 km/h

A functional approach to the planning of the street and road network (VDM)

In order to clearly understand what infrastructural and safety solutions should be implemented on this or that section of the street or highway, it is necessary to introduce a clear functional distribution of streets and roads according to modes of use, speed and requirements for safety approaches.

It is not possible to apply the same security measures to the entire network or to apply some solutions point by point without consideration

2 How Helsinki and Oslo cut pedestrian deaths to zero - https://www.theguardian.com/world/2020/mar/16/how-helsinki-and-oslo-cut-pedestrian-deaths-to-zero

4. Best practices in the field of mobility and transportation infrastructure

The overall road network (ORN) and its desired use are defined by the best Dutch practices in "Sustainable Road Safety Design." According to these practices, all categories of streets and roads should correspond to their intended functions, form, and usage, based on three fundamental safety principles:

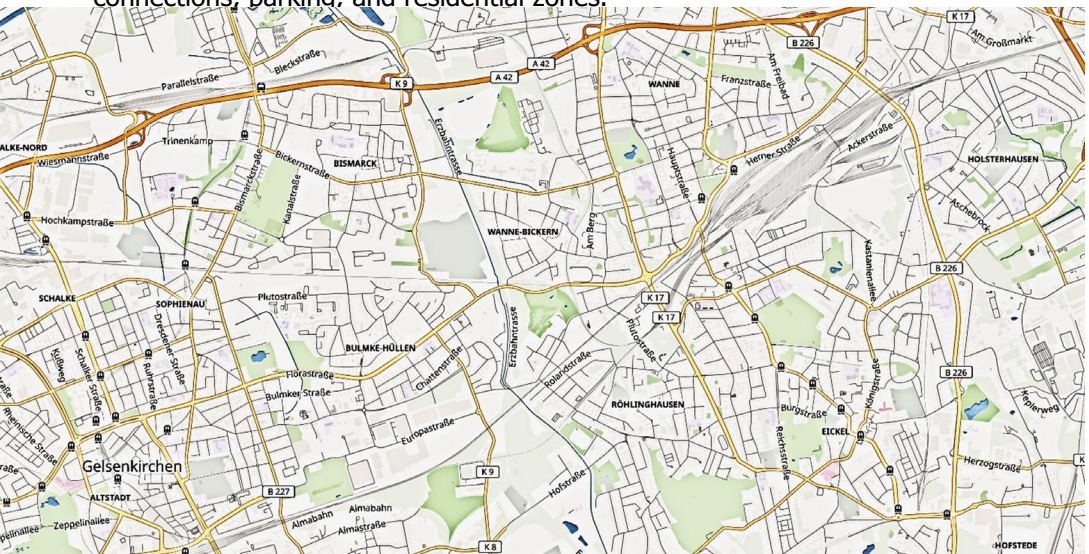
- Monofunctionality: Each road/street should be used exclusively based on its designed category and expected function within the transportation network, taking into account its type, composition, and traffic volume.
- Homogeneity: Uniform design leads to homogeneous traffic flow, minimizing differences in speed, direction, and mass of vehicles in close proximity.
- Predictability: Roads should be recognizable by drivers, ensuring clarity and predictability in interpreting traffic organization.

Additionally, three primary functions of the road network are identified:

▹ Transit (throughput capacity): Ensuring the fast and unobstructed movement of a large volume of vehicles.

▹ Distribution (routing): Gathering various traffic flows from areas and territories and distributing them according to their respective directions.

▹ Access (local traffic): Serving as access points for residential areas, providing entry and exit to/from housing developments, facilitating access to facilities, local connections, parking, and residential zones.



The detailed distribution of VDM by functional purpose is given in the table:

	Between settlements	Inside the settlements
Transit	International, national high-speed transit, connection between major cities: ▹ Main (highway) highways of category I (2+2, 3+3) ▹ Main (highway) highways of II category (2+1)	External, freight transit, roads within the built-up area, "departure highways": ▹ Main roads (2+2, 2+1) End-to-end internal transit, main entrances to the city, freight traffic, GT priority: ▹ Main city-wide streets (2+2, 2+1)
Distribution	Regional, territorial transit, connection between the centers of the districts and the OTG, distribution of flows ▹ Secondary highways of III-IV categories (1+1)	Intra-city, inter-district communication, main streets of the center and districts, distribution of flows, access to significant attractions: ▹ Main (district) streets (1+1, 2+1, 2+2 - boulevards)
Access	MLocal traffic between settlements within the districts and OTG, direct access to buildings and attractions: ▹ Local roads of IV-V categories (4-7 m)	Local traffic, communication within districts, collectors, access to attractions: ▹ Local transit streets (1+1), main road backups for access to facilities Access to housing, parking, residential area, entrances to attractions, driving inside parking lots: ▹ Non-transit streets and thoroughfares, main street backups

Note: 2+2 refers to the number of lanes in each direction of traffic. 2 lanes in one direction + 2 lanes in the opposite direction.

* The detailed functional distribution of VDM in the building is described in Appendix 2.

5. Description and analysis of further development scenarios

5. Description and analysis of further development scenarios (1/3)

1. Development by Inertia based on Established Principles and Approaches
Systemic changes are not implemented, and chaotic construction, primarily residential, continues. Urban planning and infrastructure are struggling to catch up with uncontrolled development.

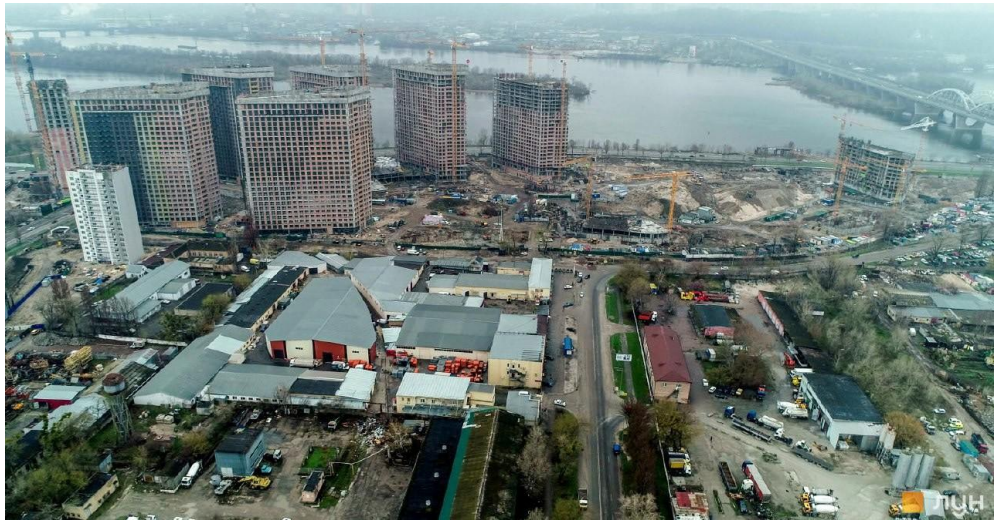
Assumption: During peak hours, public transportation operates overcrowded, and railway transportation is not popular. The area surrounding the "Irpin" station deteriorates, and safety conditions worsen.

Car usage is increasing, while the development of bicycle infrastructure remains stagnant. The level of bicycle usage as a daily mode of transportation either remains unchanged or decreases. The number of accidents and traffic incidents with injuries rises, and pedestrian movement becomes increasingly inconvenient and unsafe.

The residential construction continues to grow on any available vacant land, especially on the outskirts, far from the focal points and public transportation stops. Office buildings, schools, kindergartens, and sports facilities are not being established. The community puts pressure on local authorities, expressing dissatisfaction with the spatial development, transportation, and mobility policies.

The local government mainly focuses on maintaining the current state of infrastructure, at most conducting major repairs and occasional new construction projects based on outdated approaches, without a clear understanding of their purpose and exacerbating the existing problems.

An example of such development is the city of Kyiv, Ukraine.



Construction and infrastructure in Kyiv. Photo: lun.ua

5. Description and analysis of further development scenarios (2/3)

2. Active Extensive Development

Significant investments are directed towards extensive development of transportation infrastructure without considering spatial and economic feasibility. New construction projects are carried out rapidly, disregarding the principles of sustainable development and mobility.

Assumption: New express roads and interchanges are being mass-built, and streets are expanded by encroaching on sidewalks, as car usage and motorization increase. Commercial infrastructure oriented towards vehicular traffic emerges, such as "Big Box" retail centers and the like. As a result, transportation delays increase, and traffic congestion arises on multi-lane roads.

The number of cars sharply rises, leading to the construction of multi-level parking structures. To accommodate them, private plots of land are acquired. Green areas diminish, and the city starts experiencing flooding after heavy rainfall or winter, prompting the haphazard construction of expensive underground water drainage systems with forced water pumping.

Bicycle infrastructure remains limited to parks and waterfronts, failing to serve as a transportation function. The existing public transport is perceived as outdated and ceases to function effectively. As a result, extensive futuristic alternatives, such as metro tunnels in the region, monorail tracks, cable car systems, tunnels for Tesla, Hyperloop, and others, start being actively advocated for and constructed.

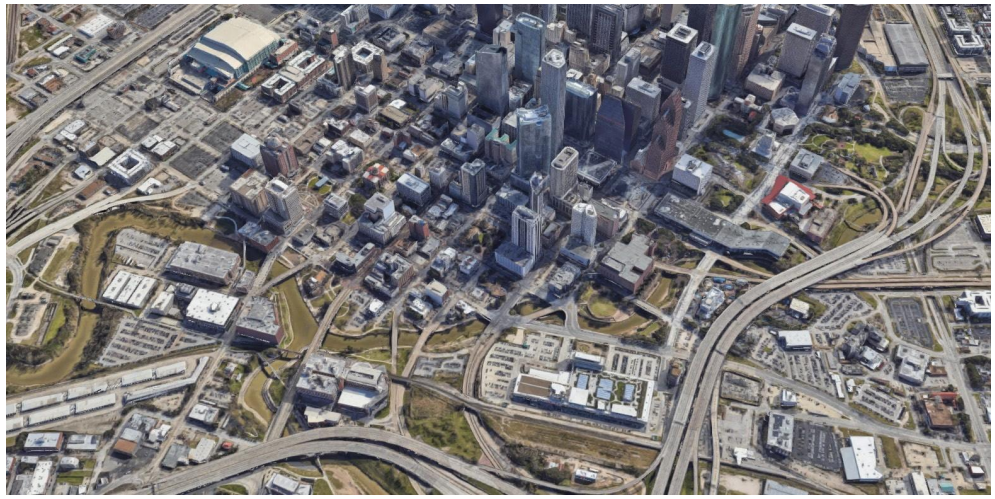
These projects are overtly expensive and questionable, leading to a decrease in investment flow towards their construction. They become long-term construction sites without foreseeable completion dates, and the constructed sections become isolated "attractions" leading nowhere, without passenger flows or prospects for development. Eventually, they burden the communities with constant maintenance costs for sustaining this infrastructure in working condition, leading to bankruptcy.

Residential construction continues to grow rapidly without the accompanying social and public infrastructure. Schools, kindergartens, and office centers are not being built at a corresponding pace. Social inequality and tension increase, while social security deteriorates. People increasingly rely on cars and avoid walking, resulting in empty and unsafe streets.

Strong pendulum migration from residential areas to the center of Irpin and to Kyiv persists, leaving new residential neighborhoods as "bedroom communities" empty during the day and overcrowded with parked cars at night. There are constant traffic congestions in the morning when leaving residential areas and in the evening when entering.

Accidents and the number of traffic incidents with injuries increase significantly.

An example of such development can be observed in Houston, USA.



Houston, USA - the city center with deserted streets, surrounded by highways.
Photo: google.maps

5. Description and analysis of scenarios for further development (3/3)

3. Harmonious

Reconstruction based on the principles of Sustainable Development. Investments are directed towards rational and balanced transportation solutions, the development of pedestrian and cycling infrastructure, revitalization of quality public transportation, and enhancing road safety.

Assumption: Rail transportation becomes the backbone of the agglomeration: Irpin and Bucha city territories, together with Ukrzaliznytsia (Ukrainian Railways), establish a joint venture. Investments are allocated for acquiring efficient and modern public transport vehicles, such as electric trains, autonomous trolleybuses, electric buses, and large-capacity buses running on biofuel. Funding is provided for organizing transportation services. Irpin becomes the center of community and agglomeration's public and business activities.

At the same level as public transport, bicycle and pedestrian infrastructure is developed. Through balanced development of transportation infrastructure alongside existing conditions for private transport, there is a shift in population habits and priorities. Using public transport, bicycles, and walking becomes attractive, reducing travel time for all users. The use of private cars becomes less advantageous and less practical for users as alternative modes gain popularity. As residents increasingly use public transport, the dependence on private cars decreases, resulting in cleaner air and improved road safety.

Street reconstruction is carried out based on the principles of functional approach and sustainable mobility. This includes the construction of bicycle infrastructure, traffic calming measures, accessible public spaces both in the city center and on the periphery. Transit traffic is diverted outside dense residential areas, and priority is given to public transport on main streets in Irpin and Bucha.

The city has a policy regarding urban development. Therefore, housing construction follows the principles of the "15-minute city," TOD (Transit-Oriented Development),

The concept of polyfunctionality with a concentration of activities near railway stations and public transport nodes involves the construction of schools, kindergartens, commercial, and office spaces. Residential areas transform into zones of public activity and workplaces, rather than just places of residence. The Irpin station becomes a hub of strong business activity and economic development.

An example of such development is the city of Ljubljana, Slovenia

Ljubljana, Slovenia. Photo: Oleksandr Shutyuk

6. Vision and goals of the Mobility Strategy

6. Vision and goals of the Mobility Strategy

Based on the conducted analysis and public events, and after analyzing possible development scenarios of the community, a Vision has been formulated.

Every resident of the community and the agglomeration should have equal opportunities for safe and convenient mobility, as well as access to high-quality and reliable mobility services.

This entails guiding the community and the agglomeration towards the principles of sustainable mobility, reducing reliance on private car transportation, and promoting pedestrian movement, cycling, and public transportation as the primary means of mobility.

Rail transportation becomes the priority mode of transportation within and beyond the agglomeration and the community.

Strategic objectives:

1	**Physically accessible public space and environment**
1.1	The planning of public areas takes place in accordance with the principles of universal design1 (accessibility, intuitiveness, low physical effort, etc.)
1.2	The planning of other territories by private individuals and organizations takes place in coordination with plans and recommendations from the city and joint communication with residents
1.3	Increasing recreational areas accessible to people within the city of Irpin and the agglomeration, creating green corridors
2	**Rethinking the street and road network**
2.1	Hierarchy system of monofunctional streets according to Dutch approaches, connectivity of the street-road network (additional streets and bridges / punctures, in particular through the railway), local transit streets as auxiliary links, transfer of external transit outside the city limits.
2.2	Transition from a tree-like structure to a connected network of direct short links (lattice structure)
3	**Safe streets for all**
3.1	Safe and convenient pedestrian routes to the centers of social and business activity within the city and agglomeration
3.2	Implementation of the "School Streets" program (a program to radically increase safety and calm traffic through infrastructural solutions, especially near educational institutions).
4	**Transport connection**
4.1	The city is 15 minutes away from all amenities:	Most attractions within the city can be reached in 15 minutes on foot or by bicycle, up to 30 minutes within the agglomeration and up to 45 minutes — to the city of Kyiv
		Encouragement of walking and cycling, comfortable connections of all areas of the city with the center, neighboring areas and villages between themselves and within them.
		Creation of a bicycle network and infrastructure that connects the main settlements of the community with the city of Kyiv
		Creation of modern transport and interchange hubs
		Creation of public spaces in local centers with a concentration of attraction points

1 Універсальний дизайн, Програмою розвитку Організації Об'єднаних Націй (ПРООН), https://ud.org.ua/pro-proekt

6. Vision and goals of the Mobility Strategy

		Creation of a single transport portal of the Irpin community (information about routes, traffic schedules, etc.)
		Cashless payment method in public transport of the community
4.3	Traffic and parking	Achieving zero deaths on streets and roads (Vision Zero)
		Reduction of the share of car use from <40% to <20%
		Development of electric taxi systems (<80% of the fleet)
		Streamlining the delivery and service system in the city center
		Rational organization of street parking space
5	**Interdepartmental cooperation**	
5.1	Co-financing of infrastructure projects that border or are owned or on the territory of other government organizations or neighboring communities (for example, railway crossings or tunnel piercings)	
5.2	Selection of the optimal route and construction of bypass roads in the agglomeration: 1) connection T-10-01 - P-30 and 2) bypass M-07 outside the built-up area	

7. Strategic measures and recommendations

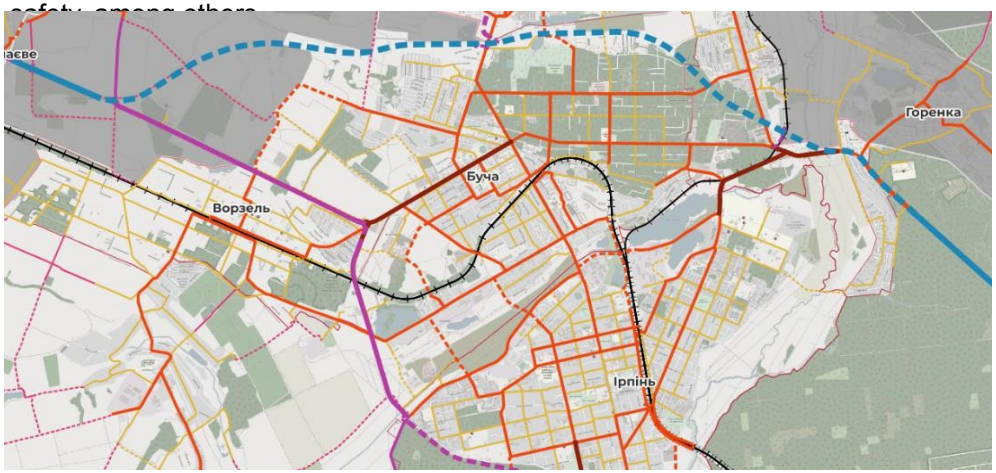
7. Strategic measures and recommendations / Optimization and development of a rational street and road network (VDM)

Optimization and development of a rational street and road network (VDM)

▹ Development based on the principles of "Sustainable and Safe Road Planning," a functional approach to the division of the road network, connectivity of the network and short links system, following the principles of "Vision Zero" for road safety.

▹ Based on this Strategy, further development and approval of the road network development plan for Irpin, Irpin's territorial community, in cooperation with neighboring communities within the Irpin agglomeration (Irpin - Bucha - Hostomel - Vorzel) and adjacent areas of neighboring communities.

▹ Assigning a clearly defined functional type to each element of the road network, with the subsequent fulfillment of all requirements regarding parameters and road safety, among others.



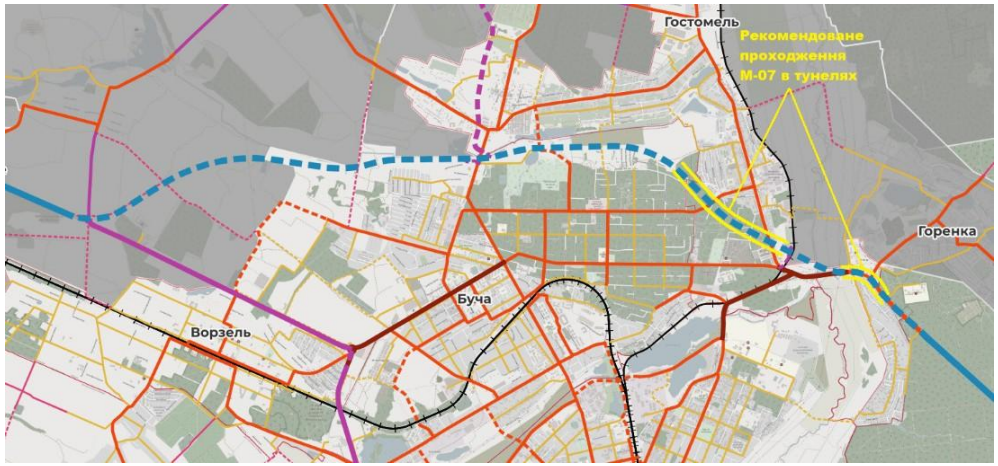
More details - Annexes 5, 6

I. Formation of a network of high-speed highways and main roads within the influence zone of the Irpin community and agglomeration, and coordination and approval of these decisions with Ukravtodor (State Road Agency):

M-06 is intended to become a high-speed road of "expressway" type (130 km/h) - with isolation from adjacent territories and local roads.

2. The M-07 highway is intended to become a high-speed road of the "expressway" type (2+1 or 2+2, 100-110 km/h) with the closure of left turns and U-turns, and the provision of interchanges with other roads only at different levels. It will be isolated from adjacent areas and local roads.

▹ With the construction of a bypass for the densely populated areas of the Irpin agglomeration (Bucha, Hostomel) while maintaining isolation from these areas (tunnels, excavations, embankments, overpasses). The optimal route for the bypass will be chosen, taking into account the requirements for the parameters of a high-speed highway, economic feasibility, and considering the interests of the affected communities without harming their well-being. The preliminary priority is given to the option along the border of Bucha and Hostomel, connecting to the existing M-07 highway after Vorzel.



More details - Appendix 3

▹ With the alignment of the M-07 highway into a unified high-speed corridor (without interchanges along the route) and passing through settlements that cannot be bypassed, at least as a main road (speed limit of 70-80 km/h).

7. Strategic measures and recommendations / Optimization and development of a rational street and road network (VDM)

The Ring Road of Kyiv should also become a high-speed continuous road with a speed limit of over 100 km/h, as envisaged by the General Plan of the capital, in order to form an integrated network of high-speed roads in the region.
The R-30 road should become a highway (2+2, 2+1, 70-90 km/h) and be connected to the M-07 high-speed corridor:

▹ By extending it with a new section bypassing Irpin (isolated from local connections) and using existing sections of the T-1001 and the old M-07 road bypassing Vorzel.
▹ By straightening the R-30 route into a single corridor (without junction exits along the route) and passing through the built-up areas of Romanivka and Kyiv as a major street (2+2 with separated directions, 50-60 km/h).

After diverting transit traffic to high-speed and major roads bypassing the built-up areas, the old sections of the M-07 and R-30 roads should become urban streets with parameters aligned with the Urban Development Plan.

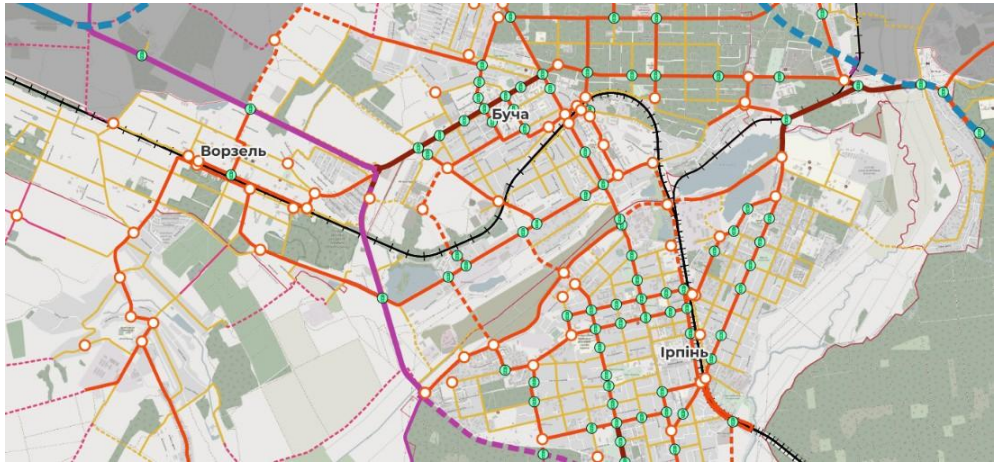
II. Formation of the main framework of the Irpin agglomeration and community's transportation system (in conjunction with neighboring territorial communities) based on a network of major streets and secondary roads (1+1, III-IV categories) - essentially operating at the same hierarchy level, differing only in terms of "within built-up areas" or "outside built-up areas":

Increasing the number of direct connections within the agglomeration (Irpin-Bucha, Bucha-Gostomel) and achieving a uniform density of such streets and roads within the built-up areas according to their population density - aiming to disperse traffic flows across the entire network and reduce congestion on problematic sections, minimizing travel distances and, as a result, the reliance on car trips.
Constructing additional underpasses beneath the railway and building tunnels instead of level crossings in Irpin, Bucha, and Vorzel to reduce the railway's impact as a barrier to transportation connectivity (including road traffic).
Downgrading existing "major" streets to "primary" status, reducing the negative impact of motor vehicles.

Within built-up areas, the goals include improving traffic safety (allowing for the implementation of more effective traffic calming measures, reducing speed limits to 40 km/h), reducing roadway width (and the associated maintenance costs), increasing pedestrian areas, facilitating the establishment of cycling infrastructure and parking facilities.

Creating new convenient public transportation corridors (including dedicated bus lanes) with more direct routes, better coverage of densely populated areas and points of attraction within the agglomeration, and faster connections between them, thereby improving the quality of transportation services.

By diverting transit traffic to the outskirts and outside the built-up areas, it becomes possible to downgrade "major" streets in city centers to "local" status (with a speed limit of 30 km/h) or even restrict private vehicle transit (excluding public transportation). For example, a proposal to restrict car traffic (excluding public transportation) and potentially close off Soborna Street in the area of Shevchenko Street in Irpin.



More details - Annexes 7,8

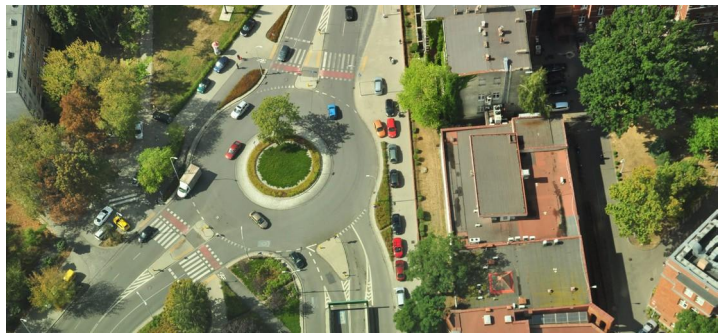
7. Strategic measures and recommendations / Optimization and development of a rational street and road network (VDM)

III. Formation of a network of local transit streets and roads (both within and outside the built-up area) as a complement to the main road network, without the need for constructing new highways (including expanding existing lanes by relocating private property fences):
Ensuring better connectivity and accessibility within the urban agglomeration and community, facilitating direct short connections (with an emphasis on sustainable mobility) and enabling passage in compact conditions at a speed of 30 km/h.
Instead of major streets along recreational areas such as rivers and forests (it makes sense to retain only one "main" street along the Irpin River in the south), the development should be integrated with "green zones."
Providing numerous direct connections between the villages of the Irpin community and neighboring communities through inexpensive local roads of category V (lower construction requirements, less impact on the environment), ensuring direct access to attraction points alongside major and express roads.
Ensuring traffic safety by separating local traffic (including pedestrian and bicycle traffic) from high-speed transit, applying comprehensive traffic calming measures on the local street and road network, and reducing the need for automobile trips over shorter distances.
IV. Pre-determining the locations for traffic lights and roundabouts of mini, small, and medium diameters to safely regulate traffic at intersections (based on the development plan of the urban agglomeration, spatial conditions, and the configuration of intersecting streets and roads).
Where are traffic lights justified?
▹ On major highways and streets - at intersections and pedestrian crossings where grade-separated crossings are not feasible or practical, and uncontrolled junctions pose a danger to all road users.
▹ On main streets - at intersections and pedestrian crossings where uncontrolled intersections can be hazardous and other traffic calming measures (e.g., roundabouts) are not feasible or less effective (e.g., raised pedestrian crossings in intensive traffic corridors).

▹ With more complex and conflict-free regulation, involving more than just 2 phases, with turn channelization, staggered turning movements, and separation of pedestrian/cyclist movements.

Where are roundabouts justified?
▹ Medium-sized: on sections of major streets, highways, and secondary roads with moderate traffic, prominent turning flows, including freight traffic, where signalized intersections are less efficient in terms of flow delay and traffic calming (at city entrances).
▹ Small-sized: on main streets and secondary roads - at intersections with large merging radii, changes in the main road's direction, Y-shaped intersections with acute merging angles, serving as traffic calming measures within built-up areas.
▹ Mini-sized: on local streets (occasionally on main streets) - primarily as traffic calming measures and a means to simplify intersection navigation with complex geometry.

Controlled intersection in the Netherlands. Source: Bicycle Dutch



Wroclaw, Poland. Photo by Oleksandr Shutyuk

7. Strategic measures and recommendations / Reorganization and sustainable development of the public transport network (PT)

Reorganization and sustainable development of the public transport network

▹ development of the PT network according to the principles of TI(with the main emphasis on the railway connection of the agglomeration with Kyiv and other cities), sustainable mobility (PT traffic has a higher priority than traffic auto), integration of the network into a single system (at the agglomeration level and at the level of connection with Kyiv) - with transfers for a single ticket, reducing the number of routes for greater frequency of movement and reliability, electromobility and environmentally friendly technologies;

▹ on the basis of this Strategy - further development and approval of the development plan of the PT of the Irpin agglomeration, the Irpin PT, in cooperation with neighboring communities, establishing healthy communication and cooperation with Ukrzaliznytsia and Kyiv in the context of convenient public transport connections; ▹ the emergence and development of long-distance railway and international air connections in the Irpin agglomeration on the basis of existing infrastructure facilities (Irpin railway station, Gostomel Airport).

I. Better external passenger connections of the Irpin agglomeration: it will not be necessary to go to Kyiv, load the capital SRT with additional traffic, and PT - with additional passenger flows to go to other cities of Ukraine or abroad: 1. Transformation of Gostomel Airport from a departmental airport into an international passenger air hub (3rd near Kyiv), focused on the Irpin agglomeration, the city of Kyiv and the region, neighboring regions: ▹ arrangement of the trunk road from the new bypass M-07 and territorial roads in the north of the region to the future of the airport passenger terminal, with the arrangement of interchanges, parking lots, public transport stops near the terminal;

▹ modernization and electrification of the existing departmental railway line with the organization of a suburban railway connection with the city of Kyiv and Boryspil Airport: construction of the terminal station of electric trains near Gostomel Airport, reconnection of this branch from st. Bucha to Art. Irpin to shorten the route to Kyiv; ▹ organization of non-rail PT routes from the airport to the Irpin agglomeration and to Kyiv with the arrangement of solid waste in a complex with the airport terminal and the railway station.

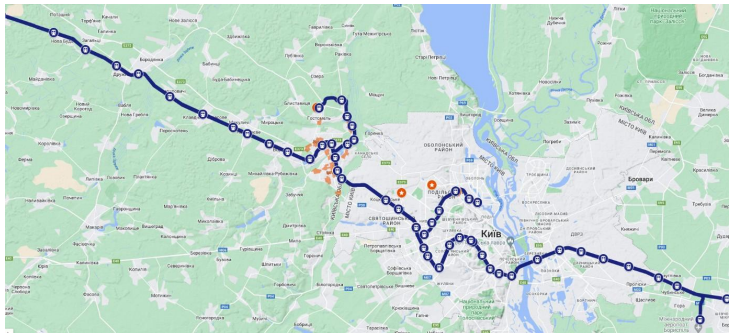
2. Transformation of Art. Irpin from an ordinary suburban station to a long-distance passenger hub for the Irpin agglomeration and neighboring towns and villages: ▹ - stop at the long-distance train station: a) Intercity+ and Intercity to Holm, Przemyśl (Poland), Lutsk, Rivne, Lviv, Ivano-Frankivsk, Kharkiv, Dnipro b) Night express trains and night fast trains to Kharkiv, Dnipro, Zaporizhzhia, Lviv, Uzhhorod, Chernivtsi, Poltava, Sumy, Donetsk, Luhansk. c) Regional express trains and regional trains to Korosten, Shepetivka, Zhytomyr, Vinnytsia, Cherkasy, Chernihiv;

▹ convenient transfer to long-distance trains from suburban trains from Gostomel, Bucha,Nemishaevo, Borodyanka, Kotsiubinske and other cities and villages; ▹ Irpin station is the end point of the vast majority of non-rail PT routes in the agglomeration (buses, trolleybuses, electric buses): it is the base point for the development of the non-rail PT network and the main solid waste disposal site in the agglomeration; ▹ according to the TOD principle, a dense mixed-use development is developing around the station with an emphasis on business functions - offices, hotels, banks, shopping malls, apartments: it is convenient to come here by train for business and solve them at a distance of 5 minutes. from the station.

TOD development near the station, Amsterdam. Source: Google Maps

7. Strategic measures and recommendations / Reorganization and sustainable development of the public transport network (PT)

3. Suburban railway - the main framework of the PT network, trunk mass transport for connecting with Kyiv and the region - modern, fast, comfortable, reliable, ecological, inclusive and multimodal: ▹ organization of a joint venture for suburban railway transportation: Ukrzaliznytsia + KCSA + Kyiv Regional State Administration + Irpinska, Buchanska, Gostomelska, Nemishaevska TC+ private investors: taking into account the interests of communities in the organization of transportation (convenient, capacious rolling stock, schedule, speed) and quality control of transportation from communities: communities do not simply reimburse benefits, but directly influence the formation of the schedule, tariffs, etc.;



More details - Appendix 9

▹ integration into a single system with Kyiv-City-Express (city train), suburban trains of Kyiv region, Aeroexpress to AP "Boryspil" - a single ticket, synchronous schedules, timetable, convenient transfers; ▹ better railway connections throughout the territory of Kyiv and beyond its borders to the east (not only to Svyatoshyn), rational routes and frequency (the number and frequency increases with the approach from the borders of the region to the capital, through routes for unloading Kyiv ground transport and streets from traffic):

a) Bucha - Boryspil (via Kyiv Pass, Darnytsia): through Kyiv between major cities of the Kyiv agglomeration: 60-120 min. ("peak" - "interpeak"), b) AP "Gostomel" - AP "Boryspil" (via Kyiv-pass., Darnytsia) - through the capital connecting all 3 airports of Kyiv: 60-120 minutes, c) Borodyanka - Pochayna (via Svyatoshyn): direct connection with the northern part of Kyiv - Obolon, Troeshchyna: 60-120 minutes, d) Teteriv - Kyiv-suburban: from the border of the Kyiv region to the capital's central station: 120-240 minutes, d) Korosten - Svyatoshyn: to the nearest Kyiv landfill: 120-240 minutes.

Thus, the smallest clock interval according to st. Vorzel - 30 min., according to st. Bucha - 15-30 minutes, according to st. Irpin - 15 minutes, providing a "peak" passenger flow of up to 6,000...8,000 passengers/hour. when using rolling stock of the appropriate capacity;

▹ increase of district (up to 100-120 km/h) and route (up to 45-55 km/h) speeds to ensure faster connections and train turnover; if necessary - completion of the 3rd track on the Irpin - Svyatoshyn section (12 km); ▹ additional suburban train stops in Mykulychy, Irpin (Technopark, embankment, Kyiv (Polytechnic - near KPI) for better coverage of the population and points of attraction, in particular - near the planned development area of Irpen, new stations on the line to AP "Gostomel" near transport nodes and gravity zones; ▹ All railway stations in the agglomeration are areas of spatial development according to TOD principles: dense business, public and residential buildings, solid waste;

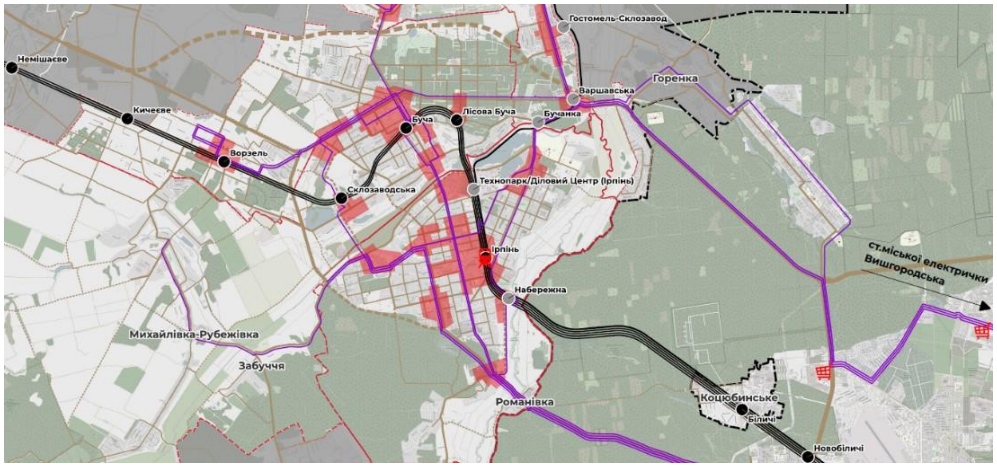
▹ Inclusiveness of rolling stock for LMP, the possibility of transporting bicycles and means of micromobility (bicycle wagons), multimodal movements.

Bicycle carriage in a commuter train, Denmark. Source: These Days

7. Strategic measures and recommendations / Reorganization and sustainable development of the public transport network (PT)

II. A network of convenient non-rail PT to Kyiv and in the agglomeration: modern rolling stock (autonomous trolleybuses, electric buses, biogas buses) of medium, large and extra-large capacity (from 50 to 150 passengers), fewer routes = higher frequency of traffic (at least 20 ...30 min.):

1. The only operator of non-rail passenger transportation: a single ticket with the possibility of transfers, long-term travel tickets for a day/week/month, integration into a single payment system with the suburban railway and PT Kyiv, transition to payment for transport work under fixed contracts.
2. Reducing the number of routes to Kyiv and within the agglomeration: less duplication, fewer detours in all areas (more direct routes), tracing direct routes through as many places as possible - densely built-up zones, points of attraction, public centers of cities and towns of the agglomeration, hubs (TI).
3. Transfer of HT routes in agglomerations from expressways and bypass roads to secondary and local roads, main streets - including the planned VDM:
4. coverage of larger areas of development, priority PT traffic corridors.PT routes to Kyiv - 8 routes from the agglomeration instead of the current 16, to 2 powerful hubs in Kyiv (St. Svyatoshyn, st. Vyshhorodska) despite other landfills and large points of attraction, most routes are directed along R-30 instead of M-07.



More details - Appendix 10

▹ routes to St. Svyatoshyn pass through st. Akademmistechko, but st. Svyatoshyn has more options for transplants to other species PT (metro, city and suburban railway, trolleybus and bus routes of Kyiv) and nearby "magnets" - shopping centers, food establishments, offices, enterprises; ▹ routes to St. Vyshhorodska (Kyiv-City-Express) pass through powerful points - shopping center "Lavina-Mall", "Retroville", residential district Vynogradar, numerous industrial areas of Kurenivka, and at st. Vyshgorodskaya - transfer to the city railway, tram, trolleybus and bus routes to different districts of Kyiv; ▹ - proposed routes (large and extra-large capacity RS):

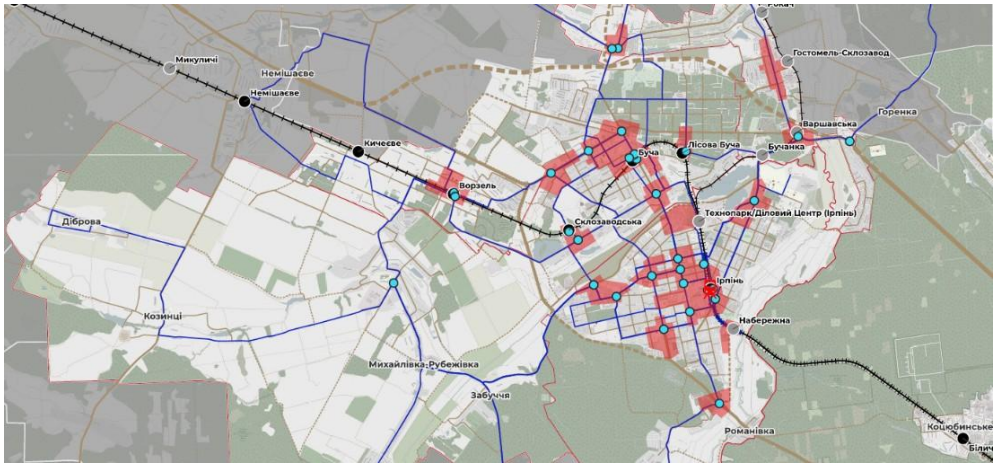
- AP "Gostomel" - Bucha (Station) - Irpin (Cathedral) - Svyatoshyn, Vorzel - Bucha (Center) - Irpin (Cathedral) - Svyatoshyn, Bucha (Center, Glass Factory) - Irpin (Synergy, University) - Svyatoshyn, Mykhailivka-Rubezhivka - Zabuchchia - Irpin (University) - Svyatoshyn, AP "Gostomel" - Gostomel (Center) - Irpin (Severinivska) - Svyatoshyn, Irpin (Synergy, Kotlyarevsky) - M-07 - Vynogradar - Vyshhorodska, Vorzel - Bucha (Center, Shevchenka) - M-07 - Vynogradar - Vyshhorodska, Gostomel (Balanivka, Yarova, Center) - Gorenka - Pushcha-Vodytsia - Vynogradar - Vyshhorodska.

▹ the routes have a similar length (26-30 km) and, accordingly, the cycle time along the route, which can ensure synchronous clock intervals on shared areas (5-10-15-20 min.), and therefore - predictability and reliability of movement. ▹ at the first stages, due to the impossibility of organizing routes on missing sections of the VDM, these routes may end earlier - in Irpin (Synergy district), go through parallel existing streets; in the absence of tunnels under the railway in Irpin, it is necessary to administratively ensure the possibility of passing through the existing crossings (as it is currently possible in Bucha).

7. Strategic measures and recommendations / Reorganization and sustainable development of the public transport network (PT)

5. PT routes in the agglomeration - 15 routes instead of 23, including new connections from Irpin to Dmitrivska and Bilohorodska TC

▹ all routes, except one, pass or end near st. Irpin (AS Irpin) - the main transport hub of the Irpin agglomeration; in the absence of a puncture under the railway near the Irpin AC - a detour along Pidhirnaya - Mayakovskogo str.; ▹ routes start and run in such a way as to cover as many built-up areas and points of attraction along the way as possible (in particular railway stations, town centers and industrial areas - workplaces, planned and areas of mass attraction and development areas, such as Irpin Technopark), while the length of the route exceeds the air distance by no more than 1.5 times;



More details - Appendix 11

▹ new routes to Dmytrivska and Bilogorodska TC are offered: access to the railway hub st. Irpin from these communities with a significant number of residents (10-15 thousand from each community will be covered by routes), accessibility of residents of Irpin TC to workplaces at enterprises of these communities, improvement of communication and

socio-economic relations between neighboring communities; ▹ routes within Irpin and between Irpin and Bucha are formed according to the principle of ring connections (in both directions), covering all densely built-up areas and large areas of attraction points, including production areas (workplaces) - rings are offered in such a way that they do not duplicate, but complement these internal routes; ▹ routes from the outskirts of the agglomeration, Irpin TC and neighboring communities pass in such a way as not to duplicate the internal routes of Irpin-Bucha

▹at the first stages, if it is impossible to organize routes on the missing sections of the VDM, these routes can be passed parallel existing streets and roads; in the absence of tunnels under the railway in Irpen, it is necessary to administratively ensure the possibility of passing through the existing crossings; ▹ routes should be served by medium and large-capacity vehicles with convenient access to public transport; the desired frequency of movement is at least 30 min. during "peak" hours.

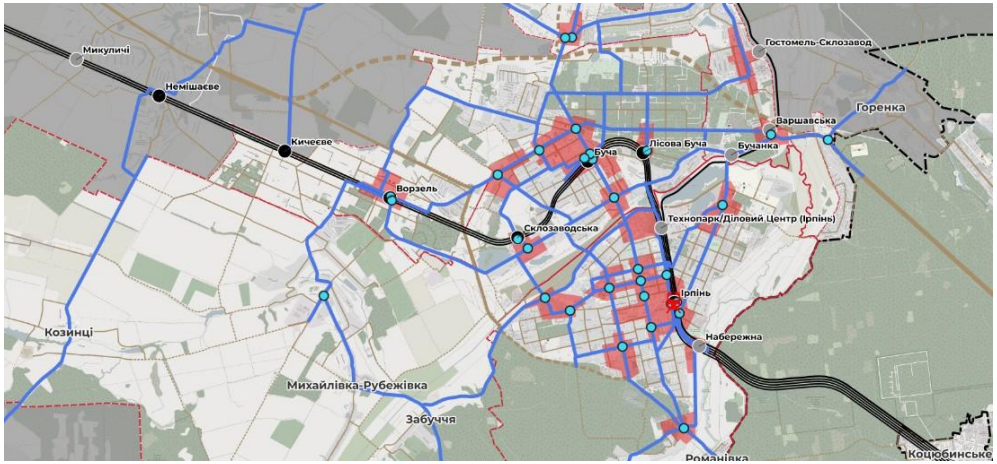
7. Strategic measures and recommendations / Reorganization and sustainable development of the public transport network (PT)

Irpin - the "cycling capital of Kyiv region" and a safe place for pedestrians!

▹ ▹ development of pedestrian and bicycle infrastructure, a network of bicycle-pedestrian connections according to the principles of sustainable mobility (pedestrians and bicycles are more important than cars), zero road deaths (traffic safety is more important than capacity), 100% inclusiveness (no barriers for LMP), "city 15 minutes" (faster access by foot and bicycle to points of attraction than by transport), priority of pedestrian traffic in residential areas;

▹ on the basis of this Strategy - further development and approval of development plans for the Irpin agglomeration, Irpin TC, in cooperation with neighboring cities (in particular, Kyiv) and communities:

1) Bicycle transport, recreational and tourist infrastructure Bicycle and pedestrian "green corridors" - alternative quiet routes
2) Short cycling and walking connections, "school streets", convenient pedestrian infrastructure on the streets and roads of the community and agglomeration
3) Pedestrian public and recreational zones in the agglomeration and community



More details - Appendix 13

▹ ▹ development of a network of cycle paths and "green corridors" even beyond the boundaries of the Irpin agglomeration and the Irpin TG - to the nearest neighboring cities and towns as recommendations (as a subject of cooperation of the Irpin TC with neighboring communities) - providing the residents of Irpen with infrastructure not only within the city, but also safe conditions for the same residents outside the city and community - at the expense of harmonious development and good neighborly relations of neighboring communities. ▹ arrangement of the agglomeration STR in accordance with the requirements for the safety and convenience of pedestrian and bicycle traffic for each functional type, especially local transit streets in the mode of 30 km/h, non-transit (20 km/h), pedestrian streets, zones, "Green corridors, e.t.c.

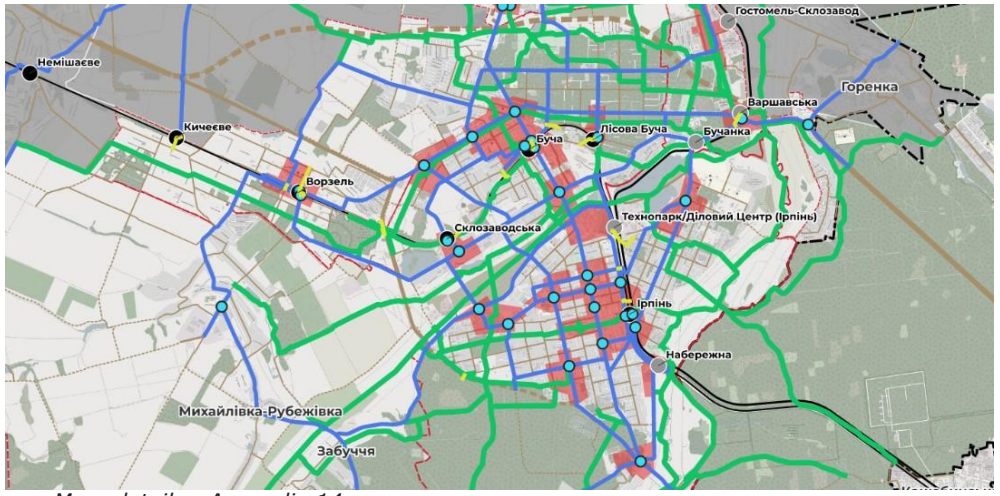
Bicycle and pedestrian path, Józefoslav (suburb of Warsaw), Poland, Google maps

1. Sections of the main bicycle transport corridors - sections of the transit STR (main roads and streets, main streets, local transit streets in the mode of 40 km/h), where the infrastructure must be separated for the daily transportation of cyclists:

▹ regardless of the developed network of main and secondary routes within the framework of the Bicycle Concept - on these sections STR are required

7. Strategic measures and recommendations / Irpin - the "cycling capital of Kyiv region" and a safe place for pedestrians!

conditions for the physical safety of the movement of cyclists under the RTR, regardless of the number of users; ▹ bicycle paths, bicycle-pedestrian paths, bicycle lanes (including structurally separated from car lanes), designated lanes for motor vehicles, at least recommended bicycle corridors; safe crossings of motor transport infrastructure - at intersections, transitions, including barrier-free crossings at different levels ▹ bicycle-pedestrian paths are a priority type of infrastructure on streets in estates, with compact spatial conditions, with low pedestrian traffic, along main and secondary roads between settlements, outside bicycle routes according to the Bicycle Concept.



More details - Appendix 14

"Green corridors" - form a branched, but united network of bicycle and pedestrian paths alternative to the transport STR through the entire agglomeration and outside, which:

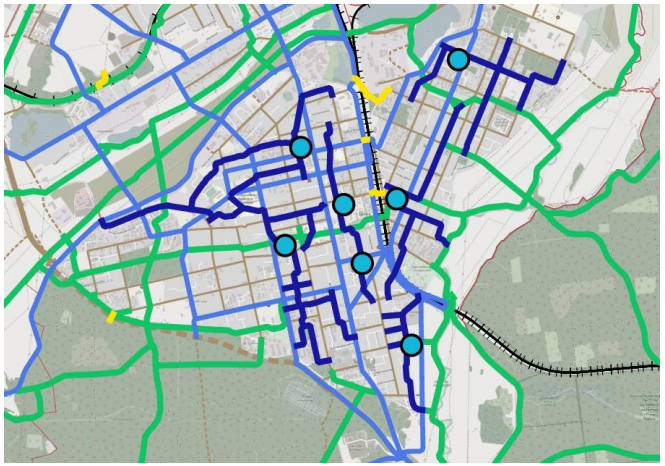
Green cycle-pedestrian corridor, Netherlands. Source: Cycling Embassy of Great Britain

▹ pass away from main streets and roads, car traffic, industrial pollution, sources of anthropogenic noise - recreational zones of the agglomeration - along rivers, parks, forests and forest parks, railway sanitary strips or along forest strips between rural areas;

▹ connect already existing pedestrian recreational and public areas with each other, create new ones along natural and landscape objects (rivers, forests, flooded/reclaimed quarries, etc.), connect these objects with the city - open them to people, make them accessible for residents of the agglomeration; ▹ pass through local non-transit streets with mode 20, as an exception - 30 km/h, on the same level (without separation of sidewalks), with minimal traffic, preferably no through traffic, pedestrian zones, dirt roads and paths (with a minimally reinforced surface), streets with wide highways and expressways cross only at different levels, transit streets - at traffic lights or at elevated crossings/intersections;

7. Strategic measures and recommendations / Irpin - the "cycling capital of Kyiv region" and a safe place for pedestrians!

3. "School streets" - the most convenient and safe ways for children to approach schools in Irpjn, Mykhailivka-Rubezhivka, Kozyntsiv - bypassing transit streets, formed not by temporarily blocking the route of children's movement, but have safe planning and PPE on a permanent basis.



More details- Appendix 16

▹ non-transit or pedestrian streets on one level, physical traffic restriction <20 km/h, closure of transit for cars, "streets for play, not traffic", park alleys; as an exception - short sections of transit streets with wide sidewalks and curbs; ▹ covering with FEM or cobblestones with numerous ZZR (hills, raised intersections, narrowing, displacement of the travel path, overlapping with columns, flower pots), intersection of transit streets - raised PP, intersections, mini-rings, traffic lights; ▹ have good lighting, places for recreation, playgrounds, the appearance of "active" facades along the street is encouraged;

▹ **sections of "school streets" directly near schools - preferably closed to cars - turned into pedestrian public spaces. 4. Short bicycle-pedestrian connections - direct passages, connected mainly by the crossing of railways or main roads along a shorter route than the general STR, as a rule barrier-free: Some of these connections are already available (e.g. regulated and**

1) underground railway crossings in the area of st. Irpin, transition to st. Lisova Bucha, Bucha, Vorzel, Kicheeve). Offered: tunnel from the northern side of St. Irpin (Gryboyedov - Poltava junction); a bridge over the railway in the area of the planned Technopark station next to the development area of Irpin (technopark, business center); a bridge over the planned Irpin bypass road (in a recess) to the forest; the exit from the Sadova - Kotlyarevsky tunnel under the railway in the direction of Turgenivska; underground punctures under the railway near st. Bucha - at the place of natural transitions; bicycle-pedestrian bridge over the railway along the P-30 overpass (T-1001); the bridge over the current M-07 along the track to AP "Gostomel"; alternative to O-100507 connection between Dibrova and Kozyntsi (to school).

In addition to these proposed, it is important to provide a system of short connections in new residential areas to encourage movement on foot: open the gates and fences of housing estates, or provide places for such passageways along closed housing estates for the possibility of through pedestrian traffic by a shorter route - residents to points of attraction and railway stops, children to kindergartens, schools, playgrounds, parks, etc.

Non-transit street, Antwerp, Belgium. Source: Melissa & Chris Bruntlett

7. Strategic measures and recommendations / Irpin - the "cycling capital of Kyiv region" and a safe place for pedestrians!

Measures to reduce the negative impact of transport on the environment: ▹ stimulation of the development of electric mobility - electric bicycles, electric scooters, electric cars, electric trucks, electric buses and trolleybuses (with autonomous driving), electric trains as the main PT of the agglomeration; ▹ development of electric mobility infrastructure - charging stations, parking places for electric cars, scooters, maintenance stations, etc.; ▹ policies on restricting access to the agglomeration of cars with an emission class below Euro-4 (Euro-5), high taxation of cars with a smaller class and a large engine volume/fuel consumption, "environmental tax";

▹ maximum restriction of the use of diesel buses on PT routes - transition to ecological (biogas) and electric rolling stock; ▹ encouraging and stimulating the use of public transport (especially trains for trips outside the agglomeration), creating the most attractive conditions (safety, accessibility, comfort) for movement on foot and by bicycle/micromobility means; ▹ arrangement of highways and expressways in ditches, tunnels, fences with sound-proof screens, sanitary landscaping strips.

Bochnia, Poland, regional highway No. 94 (city bypass), Google maps

8. Recommendations regarding performance performance measurement systems

8. Recommendations on systems for measuring performance indicators

Operational goals and time frames for their achievement:

	Operational goals		2 years	5 years	10 years
1A	**Physically accessible public space and environment**				
A-1	Create a department under the city council, which must monitor compliance with the requirements of the Federal Ministry of Internal Affairs and Communications, DSTU and city rules regarding inclusiveness, design code, and traffic safety		+		
	Control of compliance with DBN requirements regarding inclusiveness, design code, traffic safety		+	+	+
A-2	Approve the concept of "green corridors" and its implementation plan		+		
	Implement the concept of "green corridors" on the territory of the city and community (agglomeration)		10%	50%	100%
	Develop and implement a system of "short bicycle-pedestrian connections" in the city of Irpin		+, 10%	50%	100%
2Б	**Rethinking the street and road network**				
Б-1	Approve at the level of the Spatial Development Plan and other urban planning documents the "VDM Development Plan" in accordance with the functional purpose proposed by this document (Appendix 2)		+		
Б-2	Develop and approve the design code of streets, according to the functional types of VDM		+		
3B	**Safe streets for all**				
B-1	Develop and implement the "Irpenia Mobility Organization Plan" for the first 2-5 years, which includes ODR and minimal capital works for the re-planning of streets and junctions		+, 50%	100%	
B-2	Approve the titular list of repairs, reconstructions, construction of VDM* in accordance with the functional types defined by the "VDM Development Plan" based on this Strategy		+	+	
B-3	Develop and implement, based on the proposed measures of this Strategy, a plan for "Installation of traffic light objects, roundabouts and other PPE in Irpinsk TG"		+, 20%	60%	100%
B-4	Carry out all repairs, reconstructions, construction of sections of VDM* in accordance with the "VDM Development Plan" and the plan "Arrangement of road junctions, roundabouts and other PPE"		20%	50%	100%
G-5	Develop and implement a detailed concept of "School Streets" in accordance with this Strategy		+, 30%	100%	
GГ	**Transport connection**				
G-1	City 15 minutes walk to all amenities on TOD basis	Implement the Concept of Bicycle Infrastructure Development of the Irpin Community (2023),	20%	50%	100%
		Develop a Concept of local centers based on solid waste in densely built-up areas far from the center	+		
		Organize solid waste collection at the intersection of various highway routes	20%	50%	100%
		Arrange public spaces in areas far from the center	30%	80%	100%

8. Recommendations regarding performance performance measurement systems

	Operational goals		2 years	5 years	10 years
		To encourage the emergence of public facilities, medicine, education, services, to stimulate the construction of offices, shopping malls, hotels, banks in local centers based on solid waste	+	+	+
G-2	Reliable public transport within the community	Develop a detailed document "Optimization of the public transport network of the Irpin agglomeration"	+		
		Create a single non-rail HT operator within the agglomeration and community (municipal, private or joint enterprise) with payment for transport work	+		
		Updating the existing fleet, purchasing the necessary new rolling stock	+	+	
		Create a utility company for the construction, operation and maintenance of the infrastructure for trolleybuses with autonomous driving to the city of Kyiv, purchase the appropriate rolling stock		+	
		Introduce a system of a single ticket for all types of public transportation, an electronic ticket for different trip durations, integrate the system with the suburban and city transportation of Kyiv		+	+
		Organize routes according to "Optimization of the public transport network of the Irpin agglomeration"	30%	70%	100%
G3	Traffic and parking	Develop and implement a paid parking system in Irpin based on payment zoning	+	+	
		Attract private business and implement 1-3 car sharing systems (agglomeration, community, connection to Kyiv)	+	+	
		Develop a program document, attract a private investor and develop the infrastructure of electric mobility in the agglomeration	+	+	
5D	**Interdepartmental cooperation**				
D-1	Establish a constructive dialogue, develop a cooperation plan with PJSC "Ukrzaliznytsia", achieve the stopping of long-distance trains (Intercity, night, regional trains) according to Art. Irpin, to improve the quality of suburban services in trips to Kyiv (more flights, access to Kyiv-pass., Darnytsia, Pochayna, and not only to Svyatoshyn)		+		
D-2	To create a joint transport enterprise with PJSC "Ukrzaliznytsia" for the organization of efficient suburban railway transportation		+	+	
	Purchase rolling stock and introduce suburban routes according to the time schedule (15-30-45-60 min.) based on the proposals of this Strategy (5 routes, until the line to AP Gostomel appears - an additional route from Buchi to AP Boryspil)			+	+
D-3	Modernize the track to AP Gostomel (with reconnection to Irpin station instead of Buchi) and introduce a suburban route AP Gostomel - AP Boryspil, with the construction of new stops and stations, including on existing sections - in Irpen (Technopark), Kyiv			+	+
D-4	Conduct preliminary transportation planning for the purpose of routing bypass roads in the agglomeration: 1) bypass of Irpin (connecting T-1001 and R-30) and 2) bypass of M-07 outside the agglomeration development.		+		
	Conduct an Environmental Impact Assessment (EIA) for: 1) the bypass of Irpin (connecting T-1001 and R-30) and 2) the bypass of M-07 outside the agglomeration development.		+	+	

8. Recommendations regarding performance performance measurement systems

D-5	To construct the mentioned objects: 1) bypass of Irpin (connecting T-1001 and R-30) and 2) bypass of M-07 outside the agglomeration development.		+	+
D-6	In collaboration with the Cabinet of Ministers, relevant ministries, and agencies, develop a plan for the transformation of "Gostomel" Airport into an international passenger hub.	+	+	
D-7	Develop and implement the project for the international passenger Airport "Gostomel," including terminals, associated aviation infrastructure, road access, parking facilities, infrastructure for public transportation, cycling, electric mobility, car-sharing, etc.		+	+
D-8	Facilitate constructive dialogue with Kyiv, neighboring communities (Buchanska, Gostomelska, Nemishaivska, Dmytrivska, Bilohorodska) to coordinate joint, related, and adjacent projects based on the Strategy (functional scheme of public transport, public transport routes, cycling routes, "green corridors," etc.).	+	+	
	Implement these joint, related, and adjacent projects regarding transportation and mobility.	+	+	+
6E	**Institutional capacity**			
E-1	Increase the awareness of officials and specialists from the Municipal Enterprise of Infrastructure of the City (KP IMR) regarding the principles of sustainable mobility, the concept of a 15-minute city, zero fatalities, etc.	+	+	
E-2	Ability to develop programmatic documents for transportation and mobility development based on these principles with realistic goals.	+	+	
E-3	Monitor the implementation of developed programs, concepts, documents, and projects in accordance with the Strategy, and implement the Mayors' Agreement regarding transportation.	+	+	+

8. Recommendations regarding performance performance measurement systems

Indicators of effectiveness of implementation of the Strategy

The following performance measurement system is proposed. Depending on the degree of achievement of operational goals, it is necessary to strive for the following values of indicators.

Modal distribution by types of movement

The indicator indicates the completion of operations A-2, B, G-1, G-2:

<table>
<tr><th rowspan="2">№</th><th rowspan="2">Type of mobility</th><th colspan="6">Performance indicators over time</th></tr>
<tr><th colspan="2">2 years</th><th colspan="2">5 years</th><th colspan="2">10 years</th></tr>
<tr><td>1</td><td>A walk</td><td>18%</td><td rowspan="2">25%</td><td>20%</td><td rowspan="2">30%</td><td>20%</td><td rowspan="2">35%</td></tr>
<tr><td>2</td><td>Bicycle transport and LPT</td><td>7%</td><td>10%</td><td>15%</td></tr>
<tr><td>3</td><td>Non-rail public transport</td><td>30%</td><td rowspan="2">35%</td><td>30%</td><td rowspan="2">40%</td><td>30%</td><td rowspan="2">45%</td></tr>
<tr><td>4</td><td>Rail public transport</td><td>5%</td><td>10%</td><td>15%</td></tr>
<tr><td>5</td><td>Personal car transport, taxi</td><td colspan="2">40%</td><td colspan="2">30%</td><td colspan="2">20%</td></tr>
</table>

Verification: conducting a mobility survey once every 3 years, with the aim of determining modal distribution and trends in movement.

Traffic safety

An indicator indicating the execution of operational B, G-3. Here it is worth studying statistical data on traffic accidents, which are collected by the Department of the Patrol Police of Ukraine.

№	Task	Performance indicators over time		
		2 years	5 years	10 years
1	The total number of road accidents	-10%	-40%	-70%
2	Road accident with victims:	-20%	-50%	-80%
	pedestrians	-30%	-60%	-90%
	cyclists	-20%	-50%	-80%
	other participants	-10%	-40%	-70%
3	The number of dead	-30%	-60%	-90%

Verification: conducting requests to the Traffic Police Department and analyzing the database of road traffic accidents with a frequency of once every 2 years.

Global goals in the field of transportation infrastructure and mobility.

The indicator indicates the achievement of operational goals A-1, D, E.

№	Objectives	Result	
		5 years	10 years
А	Physically accessible public space and environment	60%	100%
Б	Rethinking the street and road network	70%	100%
В	Safe streets for all	60%	100%
Г	Transport connection	70%	100%
Д	Interdepartmental cooperation	50%	100%
Е	Institutional capacity	70%	100%

9. Appendices

9. Appendices

#	Name	Format	Number of sheets
1	Report on the conducted activities based on the results of the first stage (Research)	.pdf	88
2	Detailed description of the functional types of the street-road network (VDM)	.pdf	8
3	Scheme of main road corridors	.pdf	1
4	Scheme of the main frame of the VDM	.pdf	1
5	A complete diagram of the functional division of the VDM	.pdf	1
6	Scheme of functional division of VDM (agglomeration)	.pdf	1
7	Scheme of functional division of VDM with regulation of nodes	.pdf	1
8	Scheme of functional division of VDM with regulation of nodes (agglomeration)	.pdf	1
9	Scheme of suburban railway connection	.pdf	1
10	Scheme of suburban communication with the city of Kyiv	.pdf	1
11	Scheme of non-rail connection in the agglomeration	.pdf	1
12	The complete scheme of the HT network of the Irpin agglomeration	.pdf	1
13	Scheme of the main bicycle transport corridors	.pdf	1
14	Scheme of green bicycle and pedestrian corridors	.pdf	1
15	Scheme of green bicycle and pedestrian corridors of the agglomeration	.pdf	1
16	Scheme of School Streets	.pdf	1
17	Online map: Strategic recommendations regarding the organization of the VDM: http://bit.ly/3K35Dtv	-	-
18	Online map: Strategic recommendations for improving public transport: http://bit.ly/3G8HKiN	-	-
19	Online map: Strategic recommendations for pedestrian and bicycle mobility: http://bit.ly/3ZABNlE	-	-