ARCHITECTURE CIVIL ENGINEERING ENVIRONMENT
The Silesian University of Technology
No. 1/2023

doi: 10.2478/ACEE-2023-0003

TERRITORIAL PLANNING OF THE COASTAL ZONE BASED ON DEPRESSED ECONOMIC AREAS (ON THE EXAMPLE OF ODESSA)

Svitlana STOROZHUK [a*], Tamara PANCHENKO [b], Natalia DUBININA [c]

[a] PhD, Associate Professor; Faculty of Architecture, Odessa State Academy of Civil Engineering and Architecture, 4 Didrikhson Str., Odessa, Ukraine, ORCID: 0000-0001-8390-7190
*E-mail address: *mesvet@ukr.net*

[b] PhD, Prof.; Faculty of Architecture, Kyiv National University of Civil Engineering and Architecture, 31 Prospect Povitroflotsky st., Kyiv, Ukraine, ORCID: 0000-0001-6341-230X

[c] PhD, Senior Lecturer; Odessa State Academy of Civil Engineering and Architecture, 4 Didrikhson Str., Odessa, Ukraine, ORCID: 0000-0002-3250-9528

Received: 4.04.2022; Revised: 19.12.2022; Accepted: 20.03.2023

Abstract
The article is devoted to the recreational use of the depressed economic territories of coastal cities, using the example of the city of Odessa. As the part of the study, the depressed economic areas of Odessa, located on the Black Sea coast, formed as a result of various factors: economic, technological, etc. were identified and analyzed. Based on the study of international experience redevelopment of abandoned areas, and to identify "recreational potential" of the city of Odessa, the landscape and recreational function have been selected, which will lead to the increase of green areas in the structure of an urban environment and the improvement of sanitary and hygienic conditions in residential and coastal areas. The principles, models and methods of functional planning organization of landscape and recreational formations in coastal depressed areas were formulated. This made it possible to use degraded urban areas effectively to create an ecologically clean, comfortable environment for a recreation of the population and the development of domestic tourism.

Keywords: **Depressed economic areas; Coastal zone of Odessa; Recreational potential; Renovation.**

1. INTRODUCTION

In connection with the industrial development of coastal cities, namely sea trade, merchant and military fleets, the economic use of water resources, significant in area, valuable areas of the coastal territories of the Azov and the Black Sea coast of Ukraine have been developed for industrial facilities. Some of these objects have lost their original function today, and are in a "depressed state", which is associated with a crisis in production, stagnation in the economy and technological (automation of production); social (the growing role of intellectual labour) factors.

Today, such depressed areas do not meet environmental safety standards, rational use of land resources and, in general, the aesthetics of the urban environment. In the special conditions of coastal cities, there are acute problems of the banks' liberation from industrial development or its reconstruction, renovation or transformation, as well as ensuring the ecological regime of water protection zones. Depressive areas are a potential reserve for the development of other urban functions (landscape-recreational, tourist, housing and public), and with a significant size – the creation of techno-polices, techno-parks and innovation

clusters; in the structure of nature management, they occupy a kind of niche of a degraded industrial landscape, which requires rehabilitation, reclamation and reasonable use for other purposes [1].

Therefore, the study of sea-coastal economic territories of Odessa-city that are in a depressed state was chosen as the object and the subject of the research. With the help of retrospective methods of research, the modern state of economic areas of Odessa city was studied, the objects that are in a depressed state were identified, and their areas were marked on the general plan of the city.

The recreational plan of Odessa city was analysed; its development on account of depressive economic territories was identified. Due to the comparative and planning analyses, the examples of world practice of economic territories' renovation under new functions were identified. As the result, the given methods allowed to develop the principles, models and methods of functional-planning organization of landscape-recreational formations in depressed economic areas.

The "alternative and adaptive" use of industrial heritage is noted in the important international document "Dublin Principles: Joint ICOMOS-TICCIH Principles for the Conservation of the Heritage of Industrial Sites, Structures, Zones and Landscapes" (Paris, 2011) [2]; recommendations on "adapting new uses and new functions to existing cultural heritage ... and historic buildings" are set out in the European document "The Paris Declaration on Cultural Heritage as a Driving Force for the Development" (Paris, 2011) [3]. Important for the implementation of these provisions are the Law of Ukraine "On the Protection of Cultural Heritage" (2000) [4] and the project of the European Commission "Regional Cooperation for the Preservation of Cultural Heritage", within the framework of which the draft "Concept of National Policy for the Preservation of Cultural Heritage in Ukraine" was developed (Kiev, 2014) [5].

The presence of multi-functional business areas in the range of existing human settlements leads to an increase of anthropogenic impact on the environment, which is a major cause of environmental problems in the world today. Therefore, the main environmental requirements for the renovation of industrial areas should be:

1) the reduction of the negative impact on the environment;
2) the increase in the percentage and efficiency of the use of landscape territories;
3) the use of energy-saving technologies;
4) the increase of the artistic and architectural expressiveness of the building;
5) socio-economic conditionality of architectural and urban planning solutions [6].

Consequently, the use of depressed areas of former production facilities for a recreational function is extremely important in connection with the need to increase green areas in the structure of the urban environment and to improve sanitary and hygienic conditions in residential and on coastal areas.

2. WORLD EXPERIENCE IN THE IMPLEMENTATION OF LANDSCAPE AND RECREATIONAL FUNCTIONS IN DEPRESSED ECONOMIC AREAS

The analysis of world experience (Austria, Great Britain, Germany, Netherlands, Russia, Ukraine etc.), concerning the introduction of new functions on the depressive economic areas and the plots of the industrial heritage, testify that this issue is not paid much attention to. Specialists of different countries have developed and realized the projects of renovation of separate industrial objects and revitalization of the territories of their location: Manfred Wehdorn (Austria) [7] and Jean Nouvel (France) – a multifunctional residential complex of gasholders "Vienna Gasometers" in Wien (Austria) [8], Patrick Berger (France) – "Park Andre Citroen" [9] in Paris etc. The main functions of such repurposing of depressed areas are:

– ***residential***: "New city in Docklands" (Great Britain) – docks, used for new residential complexes; a new district "Kop van Zuid" in Rotterdam (Netherlands) on the site of shipyards and terminals for ocean liners, etc. [1];
– ***public and business***: "Elster-Business-Park" – a technology park on the site of a worsted-spinning factory (Germany); the Moscow office centre "The Design-plant Flakon" on the basis of a former factory for the production of glass products (Russia), etc. In Ukraine, it is "The Art-plant Platforma" on the site of the Darnytskyi Silk Factory (Kyiv); "The Art-plant Mechanika" based on old workshops of the locomotive factory (Kharkiv), etc. [1];
– ***cultural***: "The Museum tram" in Krakow (Poland) is a complex, consisting of 13 buildings, where 23 wagons, skates and other vehicles are presented [10]; giant factories in the Ruhr industrial area (Germany) turned into the centres of design and

modern art, scuba diving, mountaineering, with the Zeche industrial complex Zollverein, adapted for tourism and recognized as a UNESCO cultural heritage site; a modern centre of culture and art "Theatre Complex" in Beijing (China), created in the building of a former printing house in one of the Beijing's art districts, where warehouses have been transformed into art galleries and exhibition halls, and the main theatre building (a steel block with a folding wall) was connected with them by bridges and partitions into a single cultural space [11].

– ***landscape and recreation***: "Park Andre Citroen" on the site of the former "Citroen" car factory in Paris (France). There are six thematic gardens (blue, green, orange, red, silver, gold) and other themed gardens ("A Garden of Metamorphoses", "A Garden of Movement", "A Garden of Moshes", etc.), greenhouses, artificial streams, fountains, etc. located on the territory of the park; a hotel, a hospital, a school are located separately, and the entire complex is completed by the building of a restored factory, transformed into an ultra-modern geometric structure made of glass and mirror planes [9].

So, for example, the new indoor theme park "Battersea" in London (UK), created on the site of a closed coal power plant is dedicated to the history of English industry from the beginning of the Industrial Revolution to the present day, where "The Museum of industry" is organized, supplemented by some of the largest in the world, roller coaster. This is not only an entertainment, but also an educational and scientific centre, the most impressive object of its kind in the world – as iconic as the London Eye and the cable car across the Thames [12].

Another example is the Nagatino i-Land techno-park in Moscow (Russia), founded on the site of the former AMC automobile plant (1916). The main advantages: are the location in the city centre (8 km from the Kremlin), on the river bank, surrounded by the forest zone of the Nagatinskaya Poima park, next to the Kolomenskoye museum-reserve; the largest metropolitan business complex (6 high-rise office buildings, ground parking, service and financial institutions, recreation areas, etc.); this is the so-called "city within a city". The renovation of economic areas for technological parks (techno-parks) and theme parks is also promising for the reorganization of industrial facilities and the revitalization of depressed economic areas in the conditions of the coastal strip of the sea [13].

As for the directions of adaptation of industrial facilities for a recreational function, they can be extremely diverse: these are "centres of contemporary art and media technologies" and "design plants", "museums of transport and engineering", and "theatre complexes". All of these reorganized production facilities are examples of the modernization of individual industrial buildings, their complexes, and their territories [14, 15].

The unique object of renovation of economic territories for recreational functions deserves attention – the amusement park "Kernie's Wunderland" in Kalkar (Germany) on the territory of the former nuclear power plant, which was not put into operation for environmental reasons. As a result of the transformation of an industrial facility with an ideal state of buildings and structures into an entertainment facility, a landscape park was created, about 40 attractions (roller coasters, a Ferris wheel, etc.), tennis courts, a water park, a restaurant chain, and a hotel were built. Today this unusual amusement complex known as "Wunderland Kalkar" is one of the most visited places in the world, receiving 650,000 tourists annually [16].

The operational field for scientific research, field surveys, the experimental design of this type of objects and territories, the development of conceptual provisions in Ukraine, the seaside city of Odessa was chosen as a unique, multifunctional centre of industrial-port, resort and tourist-recreational development.

The analysis of foreign experience shows that each country has its own specifics for the renovation of industrial facilities and territories in accordance with national traditions, the structure of the post-industrial economy, and natural and climatic features. Restoration and repurposing of industrial facilities, rehabilitation and beautification of abandoned territories is an important architectural and town-planning direction of the revival of the urban environment in many European countries, such as Great Britain, France, Germany and others.

In accordance with the defined functions, a nomenclature of objects with different functional purposes is proposed: residential (multifunctional complexes, multi-apartment and individual residential buildings, hotels), public and business (multifunctional and business centres, technology parks, trade and exhibition centres), cultural (multifunctional cultural centres, thematic museums, art centres, educational and sports centres, theatre complexes), landscape and recreation (resort and recreation complexes, multifunctional parks, city gardens (squares, boulevards), theme parks, amusement parks, cultural and leisure

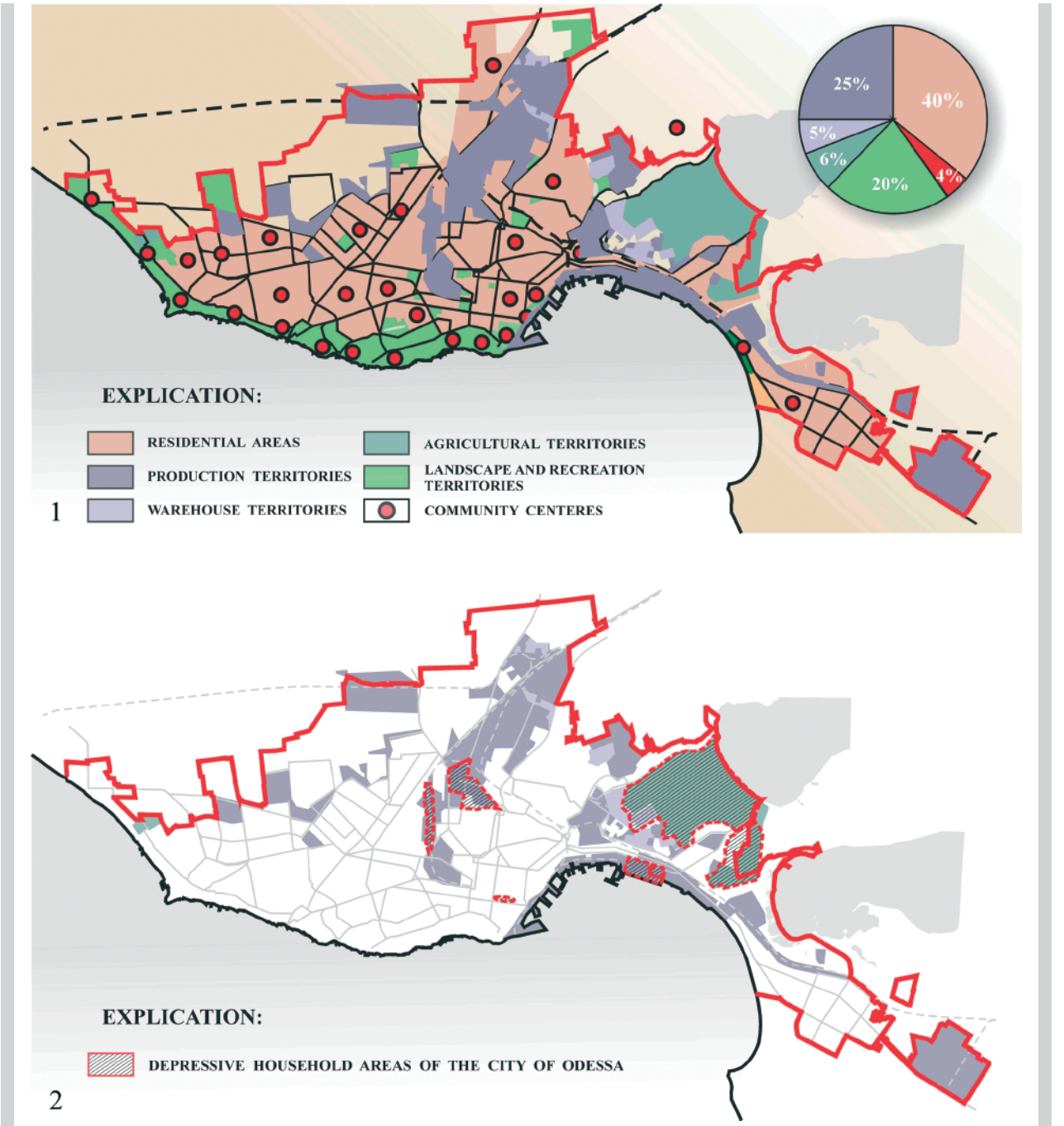


Figure 1.
The functional-planning organization of Odessa city: 1) the functional-planning scheme; 2) the arrangement of household areas. Developed by S. Storozhuk

complexes). It was established that the preservation of industrial heritage should be carried out by the following methods: a) renovation and revitalization of individual production facilities; b) urban planning adaptation of the territories of their location; c) radical changes of destroyed objects and abandoned territories [1].

3. THE CHARACTERISTICS OF THE AVAILABLE DEPRESSED ECONOMIC AREAS IN THE COASTAL ZONE OF ODESSA

The city of Odessa, in accordance with its territorial

planning development and economic structure, belongs to the type of "industrial port" cities with a developed resort and recreational function. For a century, the development of industrial zones took place on the periphery of the city, as well as in the northern part of the Odessa coast; resort and recreational zones were formed mainly in the south, using beach resources from Chernomork to Sanzheyka, as well as the balneological resources of Arcadia. The industrial zones of the city, located along the coast, occupy about 10 km or 33% of the total length of the Odessa coastline today, blocking free access to the population of residential areas to the coast of the Black Sea Bay (Fig. 1).

The main urban planning characteristics of functional zones, presented in Figure 1, indicate that industrial, warehousing and agricultural territories make up more than 40% of the city's territory, which, on one hand, upsets the balance of correlation with other types of land use, and on the other hand, the significant areas of misuse are hidden, including depressive areas [17].

The analysis of the project documentation ("State building codes of Ukraine", "New General Plan of Odessa", 2015), and field surveys made it possible to establish that within the territory of Odessa, its industrial and other functional areas (warehousing, agricultural, etc.), a network of depressed economic territories have been formed lately. It arose not only on the coastal territory of the city (Peresyp district) but also spread to the coastal zone of the Khadzhibey and Kuyalnitsky estuaries (northwestern part of Odessa, Suvorovsky district) [18, 19, 20, 21].

1. The district "Peresyp": the factories "Meat processing plant" and "ZOR – Odesselmash", a former industrial giant. Industrial facilities have direct access to the sea; today the entire territory is in disrepair and is a temporary parking lot for heavy vehicles and trucks, and also open areas, warehouses and premises are leased. In the future, how an ownerless territory can be adapted for "landscape and recreational functions" of short-term rest, and the presence of old factory buildings, an old railway line, a semaphore and a barrier can become the exhibits of an "open-air museum" [22, 23, 24, 25].
2. "The fields of irrigation and filtration" is a network of silted and reedy canals, where wastewater flows from the city centre; the territory, located on the periphery of the irrigated fields, is in disrepair; plots close to the irrigation fields are used for warehouses and container terminals. These territories can also be classified as "depressed", and given the historical features – the ruins of a cave city on Shkodova Mountain, this territory can be partially redesigned for a "tourist-recreational" function [26].

"The Zhevakhov Mountain", located in the northern part of Odessa Bay, between the mouths of two estuaries – Khadzhibey and Kuyalnytsky, is an archaeological site, known since the end of the 18th century; in the past "The Zhevakhova Mountain" was an ancient settlement, now it is an archaeological site, a residential area, an industrial zone. It was established that the areas that can be classified as "depressed" are the territory of the partially abandoned car market "Kuyalnik" and the destroyed brick factory "Bolshevik", where there is a prospect of creating a modern "resort and recreation complex" [27, 28] (Fig. 2).

4. THE IDENTIFICATION OF THE "RECREATIONAL POTENTIAL" OF THE CITY OF ODESSA

The territorial planning of the coastal zone is consistent with the main directions of urban planning policy, which is reflected in the basic laws of Ukraine "On the natural reserve fund of Ukraine" (1992) [29], "On tourism" (1995) [30], "On resorts" (2000) [31], in the Resolution of the Cabinet of Ministers of Ukraine "on the approval of the Procedure for determining the size and boundaries of water protection zones and the regime for conducting economic activities in them" (1996) [32]. And also connected with the implementation of the "Comprehensive Planning Scheme for the Territory of Resort, Health and Recreational Importance of the Odessa Region" (State Enterprise Ukrainian State Research Institute of Urban Design "Giprograd" named after Yu. N. Belokon, 2006), etc.

To identify the recreational potential of Odessa in general and determine locations of prospective placement, recreational entities have analysed the existing landscape and recreational areas of the city with the use of DBN B.2.2-12: 2019 "Planning and construction of the territories" and "Methods of determining the recreational capacity (capacity) resorts and areas rest" [18].

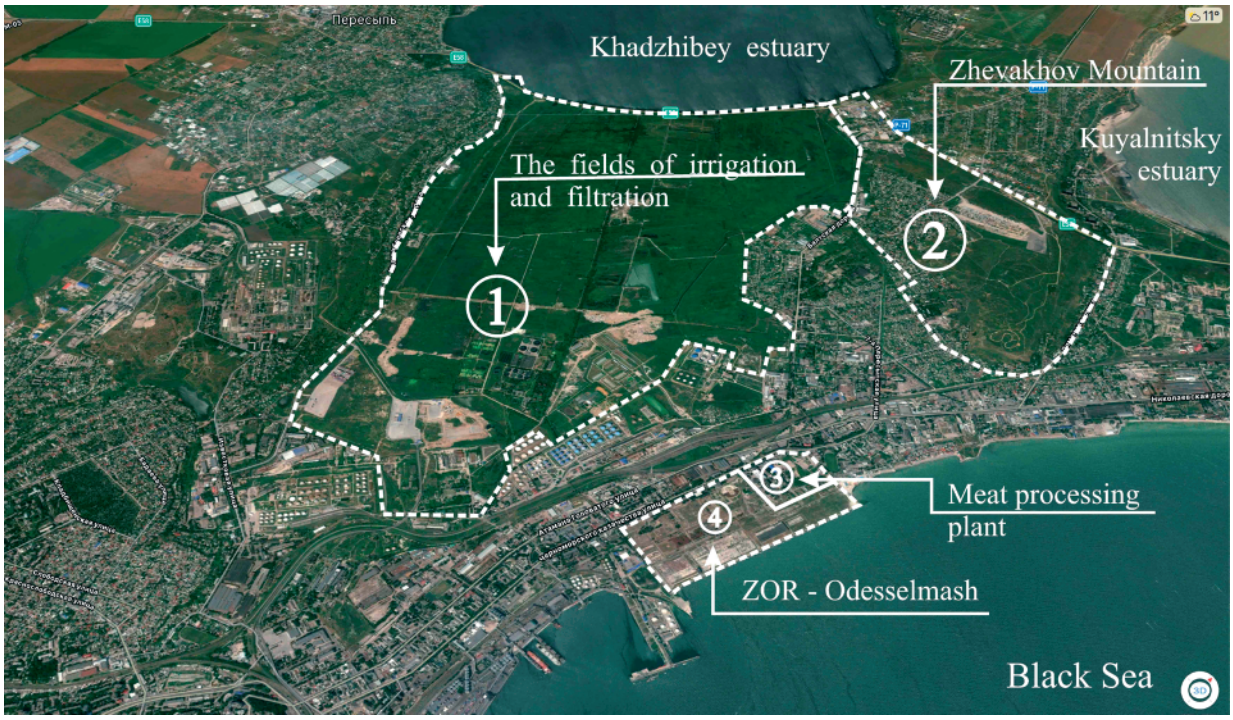


Figure 2.
The map's fragment of Odessa city on the satellite image (2018): 1) The fields of irrigation and filtration; 2) Zhevakhov mountain; 3) Meat processing plant; 4) ZOR – Odesselmash. Developed by S. Storozhuk

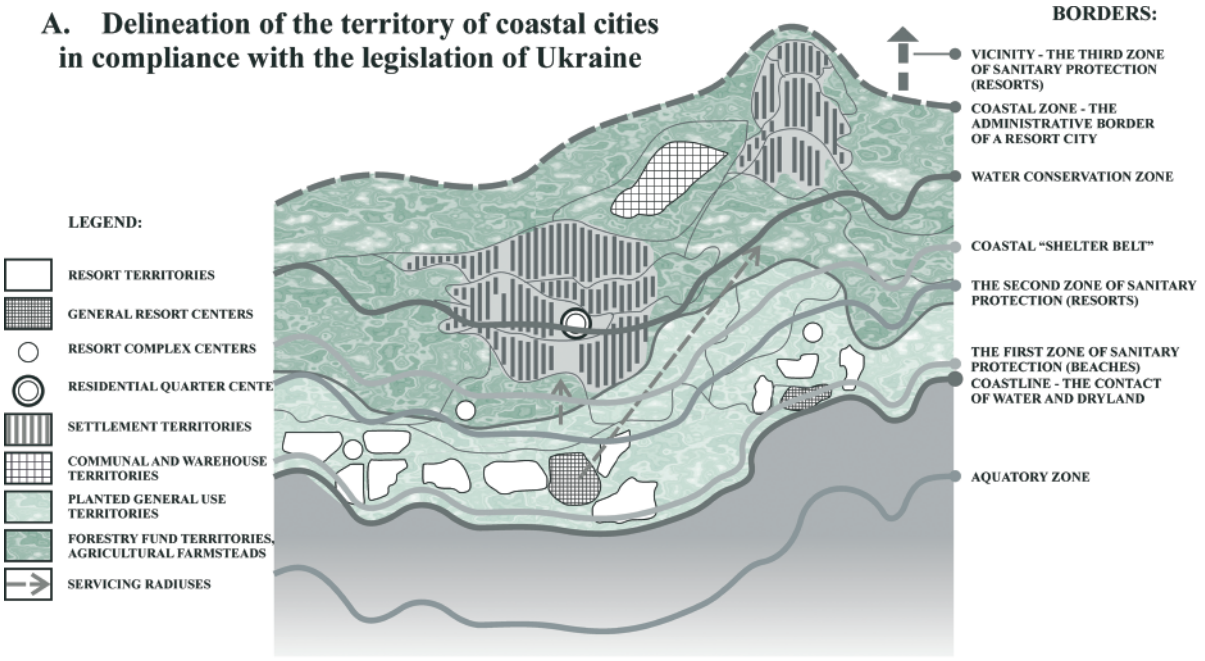
Table 1.
Differentiated indicators of the need for coastal territories for town-planning development and nature protection [33]

Functional zones and their elements	Estimated indicators for balanced development of coastal territories			
	based on an industrial and production, posts complex		based on a resort and recreational, tourist complex	
	ha per 1000 persons	%	ha per 1000 persons	%
Town-planning territories:				
- settlement (incl. public)	30.0	40.0	40.0	40.0
- production (incl. communal)	20.0	27.0	15.0	15.0
- resort and recreational	10.0	13.0	20.0	20.0
- planted (general use)	15.0	20.0	25.0	25.0
Subtotal	75.0	100.0	100.0	100.0
Nature protection territories:				
- forests, forest-parks, sanitary protection areas	140	70.0	150	75.0
- out-of-city resting areas	50	25.0	30	15.0
- nature reserve objects	10	5.0	20	10.0
Subtotal	200	100.0	200	100.0
Total	**275**		**300**	

Considering that landscape and recreational areas are a network of green areas and other open spaces for various purposes, namely: landscape complexes, recreational areas, resorts and health-improving areas, cultural heritage and tourist areas, territories of nature reserves and water resources, and other areas of green construction, it was found that in the conditions of Odessa, almost all types of such territories are scarce and disordered, especially in the coastal zone. The results of the assessment of the recreational potential of Odessa make up 20% of the total city area, which makes the most depressed areas promising for this functional use.

The formation of a network of landscape and recreational areas in Odessa is based on the normative recommendations of the above-mentioned DBN and

A. Delineation of the territory of coastal cities in compliance with the legislation of Ukraine



B. Width of nature protection zones along coastline

Zones	Width of nature protection zones (from the sea line), m	Legislative and other documents regulating these zones
AQUATORY ZONE	1 SEA MILE FROM THE SEA LINE (1600 m)	LAW OF UKRAINE "ON THE COASTLINE"
FIRST ZONE OF SANITARY PROTECTION (BEACHES)	NO LESS THAN 100 m	LAW OF UKRAINE "ON RESORTS"
SECOND ZONE OF SANITARY PROTECTION (RESORTS)	UNDER DIFFERENT CONDITIONS 1000 - 5000 m	"DESIGNERS REFERENCE BOOK TOWN-PLANNING" (2006) DESIGN DOCUMENTATION
COASTAL "SHELTER BELT"	NO LESS THEN 2000 m	LAND CODE OF UKRAINE
WATER CONSERVATION ZONE	UNDER DIFFERENT CONDITIONS 2200 - 8400 m	WATER CODE OF UKRAINE; METHODOLOGY OF ORGANIZING WATER CONSERVATION ZONES OF RIVERS OF UKRAINE (2004)
COASTAL ZONE	ACCORDING TO BORDERS OF THE CITY	LAW OF UKRAINE "ON THE COASTLINE"
VICINITY - THIRD ZONE OF SANITARY PROTECTION (RESORTS)	UNDER DIFFERENT CONDITIONS 5000 - 25000 m	GUIDELINES "RESORTS PLANNING AND DEVELOPMENT (1969)

Figure 3.
Delineation of the territory of coastal cities in compliance with the legislation of Ukraine. Developed by T. Panchenko

includes: recreational areas of general use (areas of landscape gardening, forest parks, etc.); green areas of limited use (residential areas, cultural heritage, etc.); green areas for special purposes (landscaping along pedestrian and transport networks, sanitary protection and security zones). Since the city of Odessa is located in the south-eastern steppe part of the territory of Ukraine with a population of over 500 thousand people, its prospective needs in landscape and recreational territories are determined by the indicators of regulatory support at the rate of 200 m^2/person. Taking it into account, the corresponding calculations were carried out and the main structural elements of green areas for various purposes and the normative share of green spaces within the area of their territory were determined, which are shown in Figure 1 and Table 1 [34, 35, 36].

The indicators of the data in Figure 1 and Table 1 indicate that there are many parks, squares and gardens in Odessa, but they are not evenly located within the city, two of which are in a depressed state (Dyukovsky Park, Savitsky Park). Basically, all parks, squares and gardens, including the Botanical Garden of ONU named after II Mechnikov are located in the centre of the city and its historical area. The peculiarities of uneven distribution of public recreational areas in different districts of Odessa is a prerequisite and justification for the expediency of using other

Table2.
Nomenclature of objects and functional zoning of the adjacent, beach and basin areas [33]

Objects	Sectors	Space of the sector, % of the total area space
Adjacent area:		
Green planting of general use (boulevards, public gardens, equipped embankments, etc.). Enterprises of seasonal mobile retail trade servicing a limited assortment (soft drinks, fruit, ice cream, etc.). Boatels, boat camps, climate treatment pavilions. Sports and children's playgrounds. Buildings: - administrative and communication means; - rescue and medical services; - storage of beach inventory; - restrooms and showers.	Administrative and economic	3-5
	Rescue and medical	1-2
	Servicing	20-25
	Sports 7-15	
	Rest	50-70
Beach area:		
Equipment for sun-protection and sunbathing procedures (sunshades, deck chairs, light dismountable constructions for tents, etc.). Waters attractions, swimming pools. Moorages for water transport means (hydro-cycles and water skies, rowing boats).	Solarium, aeraria	40-60
	Servicing	8-10
	Children	5-7
	Sports	8-10
	Rest	20-25
Basin area:		
Constructions: - slipways and moorages for small-size sea vessels (cutters, motor boats); - stands of yachts (marines); yacht -clubs, water sports and tourism complexes (on the spot water surface, on the coastline); - floating hotels, aquarium restaurants, and restaurants, on the sea surface (provided observance of sanitary and hygienic terms of use of the sea basin); - aquatels, flotels, floto-camps.	Bathing	75-90
	Children	3-5
	Sports	5-10
	Fishing	3-5

Table 3.
The capacity of seaside rest zones on the sea coast of Odessa city

City	F, m^2	L, m	N1, (5-8 m^2)	N2, (0.2-0.25 m)	k, (0.5-1.0)	W1	W2
Odessa	426500	20000	8	0,25	1,0	53 312,5	80 000

territories, including abandoned economic areas for new recreational zones.

It has been established that zones of short-term and long-term rest of the population are created mainly on recreational lands within cities (inner city), suburban zones (suburban), in settlement systems (suburban or inter-settlement), while zones of short-term rest, as a rule, are located, taking into account their availability by public transport at a distance of no more than 30 km. This condition is absolutely acceptable for Odessa, given its successful location on the shores of the Odessa Gulf of the Black Sea with the availability of public city beaches; for example, a remote point of a residential area (Lenposelok) is at a distance of 11.5 km from the coastline, creates a comfortable environment for short-term rest, taking into account its convenient accessibility for the population. At the same time, it should be noted that free access for the population to the Odessa coast is not possible everywhere; 33% of the total coastline is covered by the industrial zones of the city, most of which are in a depressed state (Fig. 3).

It is known that on the territories, adjacent to the beach zones and water areas, as a rule, beachside and aquatic zones are created (Table 2).

The capacity of the seaside rest zones on the sea coast is estimated, according to the beaches' square (W1) and the length of a coastline (W2) according to the formula [6, 7]:

$$W_1 = \frac{F}{N_1 k}; \qquad W_2 = \frac{L}{N_2 k}$$

Table 4.
The indexes of touristic high season in Odessa

	Year	The number of tourists, (season)	The number of tourists, (day: May– September)
1	2014	1 000 000	5 229
2	2015	1 700 000	8 889
3	2016	2 100 000	10 980
4	2017	2 500 000	13 071
5	2018	3 200 000	16 732
6	2019	3 300 000	17 255
7	2020	5 000 000	26 144

where F – the total square of natural and artificial beaches, m^2;

L – the total length of a coastline of natural and artificial beaches, which is used for the entrance into water, m;

N1 – the norm for the beach square per one visitor (5-8 m^2);

N2 – the norm for the length of a beach's coastline per one visitor (0.2-0.25 m);

k – the coefficient of a beach's simultaneous load (0.5-1.0).

The calculations result for the capacity of seaside rest zones on the sea coast of Odessa city in presented in Table 3.

According to the results of calculations of the capacity of coastal recreation areas on the seaside coast of Odessa, it can be seen that at the same time, more than 53 thousand vacationers can be on the beach, which is not enough for the development of tourism in the city. Analysing the indicators of the tourist high season in Odessa in recent years, it can be seen that every year the flow of tourists is increasing, for example, over the past 3 years it has increased by 20%, and as a result of the current global pandemic of coronavirus infection COVID-19, caused by the SARS-CoV-2 coronavirus, the borders of many states are closed, which led to the prosperity of local (domestic tourism), in 2020 it was likely to receive about 5 million guests. The number of tourists grows in the summer months (May-September), which is approximately 80% of the total flow of all tourists, where the peak, depending on weather conditions, is in July-August. As a result, it can be calculated that on a summer day, there were more than 17 thousand hours of tourists, wishing to visit the beach area of the Black Sea coast of Odessa in 2019, and 26 thousand hours in 2020 (Table 4). More than 1 million inhabitants live in the city of Odessa, of which 125 thousand are schoolchildren and children of kindergarten age (according to the Department of Education and Science of the Odessa City Council, August 28, 2017), most of whom spend all their free time in the summer holidays on coastal recreational areas. Using the data only for schoolchildren and children of kindergarten age (50%), it can be assumed that more than 60 thousand city residents and 17 thousand tourists visit the beach recreation area, which is more than 75 thousand hours per day, with permissible calculations of the capacity of coastal recreation areas in Odessa – 53 thousand hours. This indicates a huge shortage of coastal recreation areas on the seaside coast of Odessa [37, 38, 39, 40].

Thus, as a result of assessing the recreational potential of coastal common areas, using the example of the city of Odessa, it was revealed:

– landscaping of common areas, namely parks, gardens, squares, pedestrian boulevards, etc., are not evenly distributed throughout the city, which is a prerequisite for the use of other territories, including abandoned utility sites for new recreational areas. For example, the creation of specialized parks on the "Fields of irrigation and filtration" (landscape, zoological and botanical);
– a huge shortage of coastal recreation areas on the seaside coast of Odessa and the lack of free access of the population to the entire coastline makes it possible to reorganize the coastal territory, using the abandoned areas of "Irrigation and filtration fields" (Khadzhibey estuary), "Meat processing plant" and "ZOR – Odesselmash" for the organization of seaside pedestrian boulevards, embankments and public beaches. Also, on the territory of "Meat processing plant" and "ZOR – Odesselmash", it is possible to create an exhibition, sports parks and attractions.

5. THE PRINCIPLES, MODELS AND TECHNIQUES OF FUNCTIONAL PLANNING ORGANIZATION OF LANDSCAPE AND RECREATIONAL FORMATIONS IN COASTAL DEPRESSED AREAS

Based on the generalization of world experience, the study of the depressed areas of the city of Odessa, as well as its recreational potential, the following principles have been formulated, and the corresponding models of the functional and planning organization of landscape and recreational complexes in coastal depressed areas of economic territories have been developed:



Figure 4.
The variant of the organization of the landscape-recreational formations on the territory of irrigation and filtration fields. Developed by M. Vedernikova, diploma leaders O. Savytska, S. Storozhuk: 1) The general view of the object's territory; 2) The scheme of development and integration of the territory of Filtration Fields in the city's structure; 3) The general plan of the territory

1. The principle of "alternative recreational use of industrial territories" (preservation, restoration, change of function), which has passed into the category of abandoned (frozen) due to the termination of the functioning of industrial enterprises; options – "preservation" – conservation of industrial heritage (object's defence from further destruction that provides preservation of its identity with minimal interference with the existing kind) [4]; "Renewal" – modernization (improvement, with giving a new look to the object, processing, taking into account modern requirements, without changing the function) [4]; "Recreational use" (change of function) – renovation (adaptation of the existing

depressive economic areas on account of the change of functional purpose of city planning objects for further use) [1] and revitalization (restoration of the depressive city environment, at which it becomes suitable for a living) [41].

2. The principle of "renovation of industrial heritage sites" with the inclusion of a new recreational function, which provides for the creation of hotels, residential and recreational complexes, theme parks, open-air museums, etc. – with the preservation and reconstruction of the most industrial landmark.
3. The principle of "creation of innovative tourist complexes", using the material and technical infrastructure of non-functioning enterprises (railways, hangars, warehouses, etc.), as well as problematic monuments of cultural heritage.
4. The principle of "optimization of the parameters of landscape territories" in the land balance of the urban environment, which is of particular importance for coastal cities with the presence of significant recreational flows of domestic and foreign tourism, needs for short-term rest and rest "weekend" for the local population of cities, as well as long-term recreation for various contingents of tourists (population of the region, Ukraine, abroad).

The principle of *alternative recreational use of industrial territories* is based on the choice of one of several possible options for using depressed economic territories for different functions.

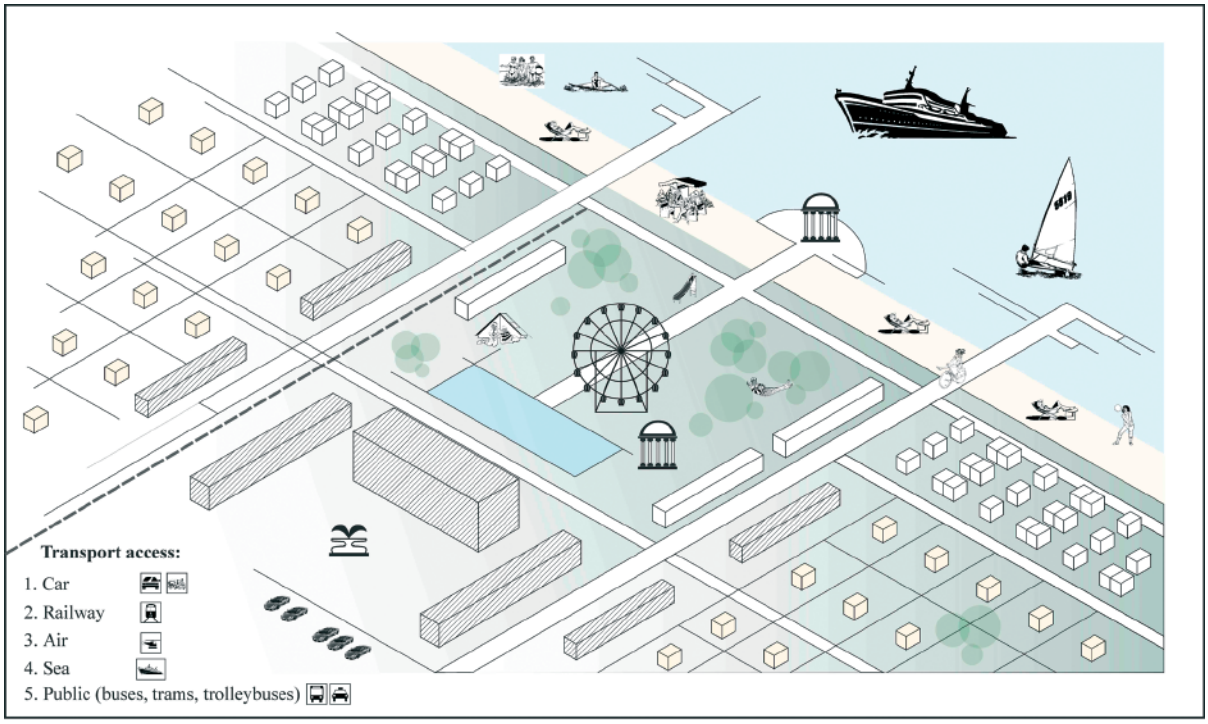
In the conditions of Odessa, for example, the largest depressed economic territories in terms of area are located in the localities: "The Zhevakhov Mountain" (area of 200 hectares) and "The Fields of irrigation and filtration" (area of 950 hectares). These territories are distinguished by the generally neglected state of industrial facilities and parts of their territory (wetlands), as well as the neighbourhood with harmful industrial facilities that have a large sanitary protection zone. At the same time, these places have an interesting "industrial landscape", and a large number of artefacts, therefore, based on world experience, there is a proposal to turn the territory of "The Zhevakhov Mountain" and "Irrigation and Filtration Fields" into a "historical and archaeological park-museum" with a multifunctional trade and an entertainment function and "The Museum – a park of landscape and architectural art under the open sky" with a tourist sports and health centre of water tourism.

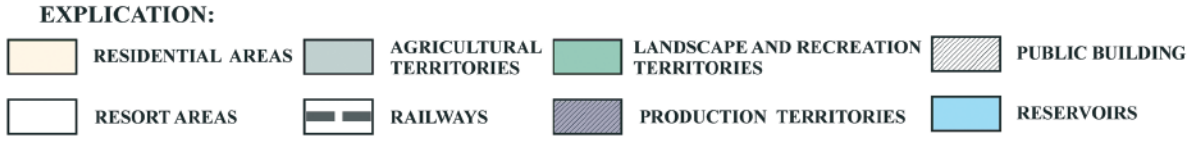
An example of such a proposal is the scientific project work "The Renovation of the territory of the filtration fields in the floodplains of the Khadzhibey estuary in the city of Odesa" (author M. Vedernikova, leaders O. Savytska, S. Storozhuk, 2019), which was carried out by the representatives of the department urban planning of the architectural school of the Odessa State Academy of Civil Engineering and Architecture (Fig.4).

The main problem of the given object of the research: transport availability of the area is limited by railway tracks; the significant part territory falls within the sphere of influence of the sanitary protection zones of the station biological wastewater treatment, the oil refinery plant and the oil pipeline, serving it; the discharge of water from urban sewers in the Khadzhibey estuary brought it to a state of ecological disasters. Besides, the level of water in the estuary is significantly higher than the mark of the territory of fields' filtration and the Black Sea.

The project proposal is the design of landscape parks for various functional purposes, which does not contradict the New General Plan of the city of Odessa (2015). To improve the ecological situation of the Khadzhibey estuary, and eliminate the threat of flooding of the Peresyp and Filtration Fields, this design solution provides water channels, connecting the estuary with the sea. Direct water communication with the sea will make it possible to create a public water transport system, serving the villages on the shores of the Khadzhibey estuary, and coastal areas of Odessa, Nikolaev and Kherson regions. To include the territory in the urban fabric, two additional roads of regional significance are proposed parallel to the Bypass Road and the highway. To create a safe and uninterrupted connection with the Peresyp zone, it is proposed to design two-level interchanges for the intersection of highways and railway tracks. It is proposed to make the residential zone low-rise, with a low population density due to the instability of the soil, the high level of groundwater and the possibility of creating a recreational zone with a large percentage of rented resort housing.

The design solution of the "Multifunctional park in the north-eastern part of the Filtration Fields" includes the following main areas: a beach, a promenade, a coastal park with a skate park and tennis courts, a festival site, a botanical research complex, camping. Roadways, parking lots, and utility sites have been developed on the territory; pedestrian routes and bicycle paths do not intersect in the same plane with car passages; bridges are designed for safe movement.





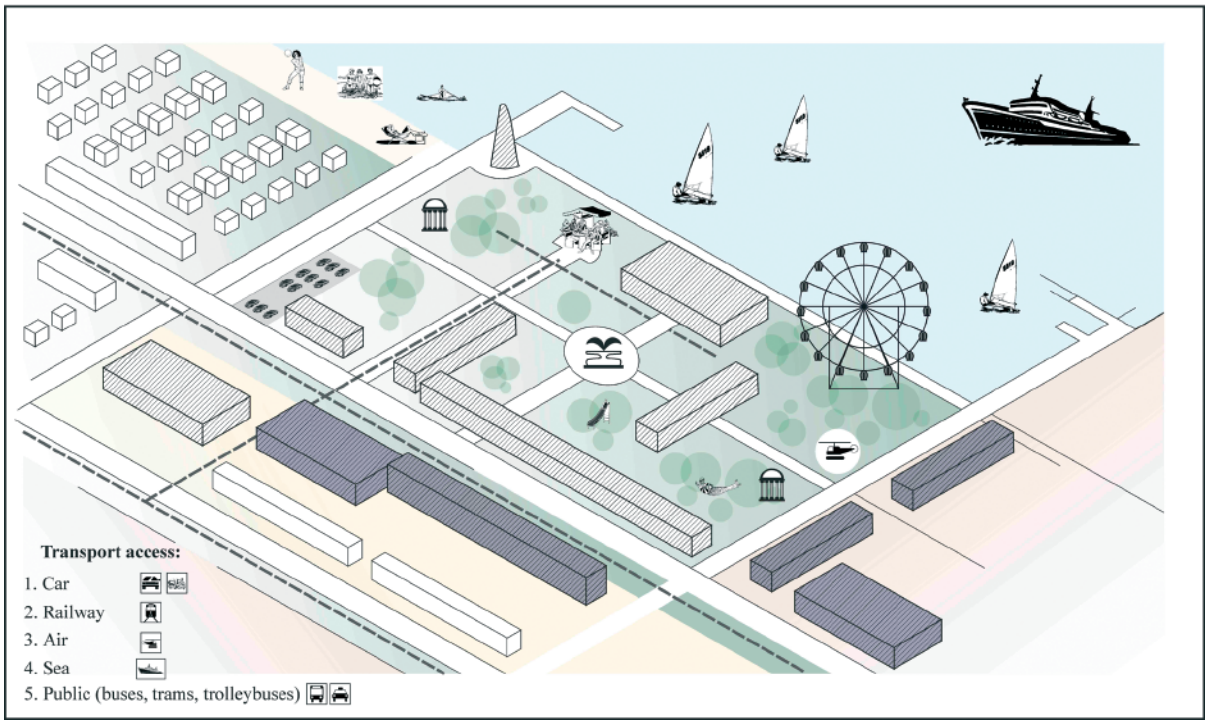


Figure 5.
Volumetric-spacious model of the organization of the landscape-recreational formations on the seaside agricultural and port areas. Developed by S. Storozhuk

The principle of *renovation of objects of industrial decline* with the inclusion of new recreational functions, the transfer of buildings of hotels, residential and recreational complexes, theme parks, and museums of just the sky on depressive state territories with the savings of self-reconstruction. On the basis of the study and the analysis of the world experience of renovation, revitalization and saving of industrial decline, functional directions of their choice (residential, civil, cultural and landscape and recreational) were determined. All these functions for the purpose of attaching objects of industrial decline and winning of their land plots can be looked at as well as when combined, for example, with the inclusion of a new recreational function on all typologically-designated depressive plots.

The principle of *creation of innovative tourist complexes* of foundations on the basis of material and technical infrastructure of non-functioning enterprises (airways, hangars, warehouses) or problematic objects in the cultural landscape. Some economic plots have depressed former rails, bridges and tunnels under former rails that should be used for the creation of innovative landscapes and recreational and tourist complexes.

The principle of *optimizing the parameters of landscape* territories in the land balance of the city centre foresees the transformation of depressive economic areas into the landscape and recreational establishments (complexes of recreational mortgages, parks, and gardens). It is proved by the presence of sanitary and protection zones between industrial objects and residential and community zones, the absence of sufficient green areas in various areas of populated areas, the availability of urban quarters and microdistricts in the conditions of megacities.

On the basis of the formulated principles of reorganization of depressive coastal areas for new functions, planning models for the formation of the landscape and recreational complexes have been developed, which provide for:

a) the determination of the depressed area in the existing urban planning situation (centre, periphery, coastal strip, line, etc.);

b) the establishment of the main functions during the reorganization (recreation, tourism, park, etc.);

c) functional zoning of the relevant site (structures, landscaping, parking lots, etc.);

d) architectural and compositional solutions of new formations.

Each economic site that is being reorganized must have its own individual composition of functional zones, for example, objects that are located in the coastal part of a seaside city must have the following functional zones:

a) *beaches and water recreation facilities*, with sectors: aquatorial (places for swimming, children's and sports entertainment, fishing, water transport); beach (solarium, aerarium, mobile service points, pedestrian communications, children's, sports and recreational areas); beachside (administrative and economic and medical rescue facilities, institutions, services, pedestrian communications, green areas for recreation;

b) the *embankment* is a place for walking with sectors of quiet recreation (boulevards, places for reading and quiet games) and active recreation (sports, dance, playgrounds);

c) *landscaping* – garden and park areas, boulevards, areas for recreation, games, physical culture and sports exercises, walking paths;

d) *services* – areas of small recreational business objects (trade establishments, consumer services, catering establishments), clothing storage and repair points of a photographic studio, communications enterprises, and the like;

e) *cultural and leisure facilities* – health and fitness and sports facilities (aqua centres, golf clubs, etc.), cultural and art institutions (exhibitions, clubs, cinemas, amphitheatres, attractions, places of worship, etc.);

f) *health resort and recreational institutions* – sanatoriums, hotels with special-purpose on-site blocks (medical and resort, cultural and entertainment, office and congress), hotels (hotels of different categories, specialized hotels: apart-hotels, aquatics, hostels, etc.); etc.), boarding houses (rest houses), tourist centres, recreational housing, camping's, health camps;

g) *residential* – for placing residential buildings of permanent residence for the local population (residential areas, villages, etc.);

h) *economic and industrial* – research areas (centres, office and laboratory premises, technology parks, educational institutions), communal areas – intended to accommodate groups of individual enterprises that provide the population's needs for services (boat stations, parking lots, parking lots, dry cleaners, warehouses etc.);

i) *nature reserves* (reserves, wildlife sanctuaries, natural monuments, nature reserves, etc.) and the territories of historical and cultural significance (Fig. 5).

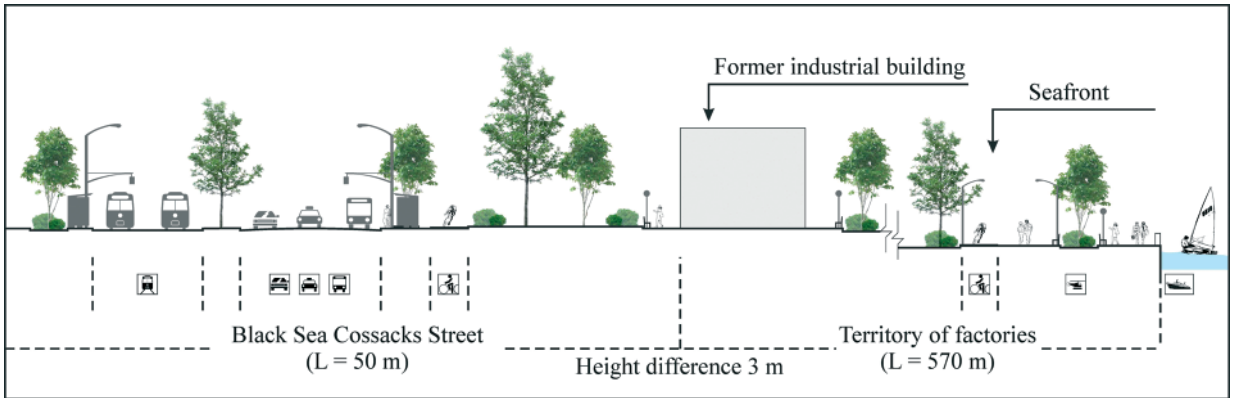


Figure 6.
An example of the formation of a transport network and pedestrian boulevards on the territory of "Meat processing plant" and "ZOR – Odesselmash". Developed by S. Storozhuk

Particular attention should be paid to the road network, providing:

– open access to the objects under study (individual automobile, public: fixed-route taxis, buses, trams, trolleybuses, railway, air, water);
– the arrangement of stops for public transport, open parking lots, and parking;
– the creation of a developed walking network (boulevards, squares, pedestrian roads) and safe access to recreational facilities (pedestrian crossings: underground and over-ground, bridges, tunnels);
– on large areas of coastal areas for the placement of tourist and youth camping, a network of service facilities (Fig. 6) [42, 43].

The formation of their "sea façade" on the basis of aesthetic architectural and compositional solutions is of great importance for coastal cities; this applies to recreational facilities that can be created in areas of depressed industrial areas in the course of their planning reorganization. Based on the example of the objects under study and world experience, the following architectural and compositional techniques were identified for creating recreational complexes in depressed economic areas:

a) the use of the existing features of the terrain relief: coastal zones, gorges, hills;
b) accentuation – the creation of dominants with the help of high-rise structures (office centres, yacht clubs, a Ferris wheel, etc.) when forming a panorama of the city, far and near;
c) preservation of the style of architectural and urban planning features of industrial objects of historical and cultural purposes;
d) the use of the individual characteristics of industrial facilities. The main feature of industrial buildings and structures (workshops) is their size and height, the presence of large-span structures;
e) the formation of a new image using modern innovative technologies;
f) taking into account the parameters of the territory that are subject to revitalization and renovation of facilities;
g) the creation of an external communication system between the objects of renovation and the urban environment.

Consequently, when determining architectural and compositional solutions in the conditions of the seaside, both urban and recreational development, which is associated with the creation of new and reconstruction of existing buildings and structures in depressed economic areas, the following features must be taken into consideration:

– different levels of human visual perception of recreational objects: from the sea (from passenger ships and boats); from a public centre (from high-altitude panoramic viewpoints) from the coast or nearby streets (for objects inside urban buildings);
– individual features of the conditions for the location of the object, relief, quality of the land plot, the ability to implement design requirements for buildings and structures; the presence of monuments of cultural heritage, both in the territory to be transformed, and in the immediate environment [41, 34, 35].

The project proposal for the creation of "landscape and recreational functions" of short-term rest on the territories of the "Meat processing plant" and "ZOR – Odesselmash" factories can be the research and



Figure 7.
Renovation of the territories of the ZOR-Odessilmash and Meat processing plant. Developed by D. Spirova, diploma leaders O. Savytska, S. Storozhuk, I. Drozhenets: 1) The general appearance of the object's area; 2) The general plan of the area

design work "Renovation of the industrial territory within the boundaries of the streets of the Black Sea Cossacks, Otaman Golovaty and Nikolai Geft in Odessa" (author D. Spirova, leaders O. Savytska, S. Storozhuk, I. Drozhenets, 2021) (Fig. 7).

The main features of this object of study: within the boundaries of the study area there are 2 historical monuments of local importance and one architectur-

al monument of local importance, which can become a promising tourist site and a point of attraction (today all 3 buildings need reconstruction); this territory has good transport accessibility, proximity to the city centre, the possibility of creating a landscaped area that meets all standards; The negative factor of the territory is a lot of abandoned sites with emergency buildings, which affects safety, as well as insufficient landscaping and lighting.

When developing a conceptual solution for the development of the territory, the main attention was directed to the modernization of the existing environment with its prospective development as entertainment, resort and tourist areas, saturated with public and recreational facilities that meet modern urban planning requirements and technologies. Simultaneously with the multifunctional park and stadium, recreational housing (hotels), entertainment centres, and embankments with moorings were designed. Green recreational areas with places for recreation are being created, pedestrian bridges are the connecting elements for the safe movement of people, and the existing transport system is also being reconstructed: the Peresyp railway station; multilevel interchanges; instead of the existing tram traffic a monorail tram was designed. For a comfortable stay and living on the territory, landscaping has been designed, which makes up more than 50% of the entire territory and is divided into landscaping for general use of the park and squares, landscaping for limited use on the territory of educational and administrative institutions, as well as landscaping for special purposes along the railway and on the border with the territory of the Oil Harbour. In addition, green roofs are provided on some of the buildings.

6. CONCLUSIONS

It has been established that the occurrence of depressed economic areas in the urban environment is a long-term process of the influence of various factors (economic, technological, etc.), the result of which is the presence of "degraded areas". In the example of the seaside city of Odessa, the presence of coastal depressed economic territories suitable for new recreational development was discovered, which is important in connection with the need to increase green areas, areas in the structure of the urban environment, and the improvement of sanitary and hygienic conditions in residential and coastal areas.

The basic principles of the functional planning organization of landscape and recreational complexes in the areas of depressed economic territories have been formulated: the principle of "alternative recreational use of industrial territories"; the principle of "renovation of industrial heritage sites" with the inclusion of a new recreational function; the principle of "creation of innovative tourist complexes"; the principle of "optimization of parameters of landscape areas" in the land balance of the urban environment.

Planning models of landscape and recreational formations have been developed with proposals for the functional zoning of their territory, taking into account urban conditions and coastal location. Compositional techniques for creating recreational complexes in the specific conditions of depressed economic areas of the city of Odessa were further developed: using the existing features of the terrain (coastal areas, gorges, hills); emphasis – creating dominants with the help of high-rise objects (office centres, yacht clubs, Ferris wheel, etc.); preservation of style of architectural and town planning features of industrial objects of historical and cultural significance; using the individual characteristics of industrial facilities; formation of a new image of the object, using modern innovative technologies; creation of transport links between renovation objects, landscape and recreational complexes and the urban environment.

Consequently, when designing landscape and recreational formations in depressed economic areas, suitable for new recreational development, it is necessary to take into account the following proposals for the functional zoning of their territories with the allocation of zones of basic, specialized and additional functions, which provides for: effective use of degraded urban areas to create ecologically clean, a comfortable environment for recreation of the population; preservation and rational use of monuments of industrial heritage, their land plots, zones of protection of monuments and the historical environment in general through planning transformation of depressed economic territories; ensuring investment attractive conditions for the construction of new recreational facilities; the development of domestic tourism.

REFERENCES

[1] Storozhuk, S. (2019). The principles of recreational use of depressive household areas of seaside cities (on the example of Odessa city): dissertation. Kyiv: KNUBA, 249.

[2] 17th General Assembly ICOMOS. (2011). «The Dublin principles». The common principles ICOMOS – TICCIH regarding preservation of the heritage of industrial objects, structures, zones and landscapes. Paris: headquarters UNESCO.

[3] 17th General Assembly ICOMOS. (2011). The Paris declaration about the heritage as a moving force of development. Paris: headquarters UNESCO, 7.

[4] The Law of Ukraine «About the preservation of cultural heritage» from June, 8 2000 year, 1805-III, The data of Verhovna Rada of Ukraine (BBP), Kyiv, 2000, 39, 333.

[5] Oliynyk P. (2014). The conception of the national policy regarding the cultural heritage of Ukraine (The project). Kyiv, 134.

[6] Tsygychko, S. (2012). Ecology in architecture and urban planning: textbook. Kharkiv: KNAMG, 146.

[7] Manfred Wehdorn (2017). Wikipedia. Retrieved from https://de.wikipedia.org/wiki/Manfred_Wehdorn (access date 29.08.2017)

[8] My Word (2010). Gasholders in Wien: the article. The categories: Modern architecture, Europe, Man-made. Retrieved from http://omyworld.ru/2541 (access date 10.01.2014).

[9] Chyzhova S., Shcheglov (2015). «The park of Andre Citroen»: the article. A beautiful garden. Retrieved from https://www.gardener.ru/gap/garden_guide/page340.php (access date 30.04.2015).

[10] Rotozeev. (2012). The Museum of transport and engineering in Krakov, August, 17, Krakov, transport. Retrieved from http://rotozeev.net/page/muzej-transporta-i-inzhenerii-v-krakove (access date 28.04.2015).

[11] Perevalova, M. (2014). Chinese designers turned a depressed factory into a theatre complex. Chapter: Beautiful architecture. Home construction. Retrieved from https://domstroi24.ru/blogs/krasivaja-arhitektura/kitaiskie-dizainery-prevratili-zabroshennuyu-fabriku-v-teatralnyi.html (access date 28.04.2015).

[12] Frearson, A. (2013). The Architectural Ride at Battersea Power Station by Atelier Zündel Cristea, dezeen: top architecture stories. Retrieved from https://www.dezeen.com/2013/03/06/architectural-ride-battersea-power-station/ (access date 07.06.2021)

[13] Petrucho (2009). Technopark Nagatino i-land. LIVEJOURNAL Retrieved from https://moya-moskva.livejournal.com/1768697.html (access date 12.05.2017)

[14] Le, L, Yitong, Sh. and Xiangxin, M. (2015). Research on the innovation model of the old industrial building renovation under the concept of Ecology. International Forum on Energy, Environment Science and Materials IFEESM: Atlantis Press, 1671–1675.

[15] Ursic, M. (2011). Renovation of industrial buildings for cultural purposes: industrial heritage as a mean of urban revitalisation or gentrification in a city? Seoul, South Korea: Conference: Our living heritage: industrial buildings and sites of AsiaAt. Retrieved from https://www.researchgate.net/publication/259123655_Renovation_of_industrial_buildings_for_cultural_purposes_industrial_heritage_as_a_mean_of_urban_revitalisation_or_gentrification_in_a_city (access date 22.02.2021)

[16] Spector, D. (2011). This German Theme Park Used To Be A Nuclear Power Plant. INSIDER: Executive Lifestyle. Retrieved from https://www.businessinsider.com/german-theme-park-nuclear-power-plant-wunderland-kalkar-2011-12 (access date 30.04.2015)

[17] Onishchenko V. (2010). Urban planning principles of complex development of coastal cities (in terms of the Azov-Black Sea region): dissertation. Kyiv: DP NDPI of town-planning, 196.

[18] SBC B.2.2-12: 2019 Planning and Development of Territories. Kyiv: Ministry of Regional Development, 177.

[19] Dipromisto (2015). General plan of Odessa. Ukrainian State Research Institute of Urban Design "Dipromisto" named after Yu.M. Bilokon. Decision of the Odessa City Council 6489-VI of March 25, 2015, Odessa.

[20] Panchenko T. and Storozhuk S. (2017). Characteristics of the existing economic territories of Odessa, which have lost their main functions. Budapest: Science and Education a New Dimension. *Natural and Technical Sciences, V*(16), ISSUE 148, 1022, 10–14.

[21] Storozhuk S. (2016). Urban characteristics of economic territories of Odessa, which lost their main functions: a collection of scientific works. *Odessa: Problems of theory and history of architecture of Ukraine*, Issue. 16, 130–135.

[22] Plant named after the October Revolution (ZOR) (2017). Odessa archive: Old Odessa in photographs. Retrieved from http://viknaodessa.od.ua/odessa-archives/?zavod-imeni-oktyabrskoj-revolyutsii-zor-archive (access date 22.04.2017)

[23] Kobzar N. (2004). Savage and Pozzolana. Essays on the history of the Odessa industry. Odessa: Optimum, 226.

[24] Lyashonok S. (2013). Shine and poverty of the Odessa coast from a bird's eye view. Timer: photo. Retrieved from http://timer-odessa.net/72078 (access date 23.03.2015)

[25] Udovichenko E. (2013). What is left of the factories: Odessa homeless (photo). Information city portal: Odessa life. News of Odessa and Odessa region Section: City. Issue: 47. Retrieved from http://odessa-life.od.ua/article/4231-chto-ostalos-ot-zavodov-odesskii-besprizornyi-foto (access date 23.03.2015)

[26] Dumskaya (2012). Odessa from above: Slobodka, Peresyp, industrial and the sea. Retrieved from http://dumskaya.net/news/odessa-svysoka-slobodka-peresyp-indastrial-i-mor-020495/ (access date 21.03.2015)

[27] Storozhuk S., Pronchenko A. (2018). The study of historical significance of industrial areas. The Zhevakhova mountain: the scientific-industrial compilation. *Kyiv: The Architectureal Vysnyk of KNUBA*. Iss.14-15. 318–325.

[28] Storozhuk S., Pronchenko A. (2018). The history of development of the Zhevakhova mountain area: the materials of V th International scientific-practical conference. Odesa: The South of Ukraine in native and European history. 203–208.

[29] The Law of Ukraine «Aboout the nature-reserved fund of Ukraine» from June, 16, 1992 year, 2456-XII, The Data of Verhovna Rada of Ukraine (VRU), Kyiv. 1992, 34, 502.

[30] The Law of Ukraine «About tourism» from September, 15, 1995 year, 324/95-BP , the Data of Verhovna Rada of Ukraine (VRU), Kyiv, 1995, 31, 241.

[31] The Law of Ukraine «About resorts» from October, 5, 2000 year, 1805-III, the Data of Verhovna Rada of Ukraine (VRU), Kyiv, 2000, 50, 435.

[32] The resolution «About the approval of Determination order of dimensions and measures of water-protective zones and the regime of introduction of economic activity in them», from May,8 1996 year. 486. The Cabinet of Ministers of Ukraine, Kyiv, 1996.

[33] Panchenko T, (2009). Guidelines on territorial planning in coastal zone. Version 2. Kyiv: Ukraine – EC: Netherland, UK, Belgium, 39.

[34] Karamushka V. (2008). Spatial planning for the development of the coastal strip of the seas in Ukraine: An analytical review. Kyiv: University of Education Management of the Academy of Pedagogical Sciences of Ukraine, 53.

[35] Panchenko T. (2006). Designer Dictionary: Ed. second, addition Town-planning. Kyiv: Ukrarkhbudinform, 192.

[36] Panchenko T. (2015). Landscape and recreational planning of nature reserves: monograph. Kyiv: Logos, 176.

[37] Official site of the city of Odessa (2017) More than 125 thousand children of Odessa will attend schools and kindergartens in the new school year. Odessa: news. Retrieved from http://omr.gov.ua/ru/news/98740/ (access date 28.08.2017)

[38] Official site of the city of Odessa (2018). The concept of socio-economic development of the city of Odessa: city programs. Odessa. Retrieved from http://omr.gov.ua/programmes/211 (access date 20.07.2018)

[39] Official site of the city of Odessa (2017). Tourists are increasingly going to Odessa. Presentation of the results of the high season. Odessa: news. Retrieved from http://omr.gov.ua/ru/news/101923/ (access date 20.07.2018)

[40] Odessa Courier (2020). In 2019, the number of tourists in Odessa tripled the population of the city: article. Odessa: Urbanism. News. Retrieved from https://uc.od.ua/news/urbanism/1222646 (access date 14.01.2020)

[41] Strelka (2017). Revitalization of industrial sites: methodological recommendations for the implementation of projects to improve the quality of the environment of single-industry towns. Moscow: Strelka. Retrieved from https://strelka.com/ru/home (access date 30.04.2017)

[42] SBC B.2.3-5: 2018 Streets and roads of settlements. Kyiv: Ministry of Regional Development, 55.

[43] Kotsoni A., Dimelli D. and Ragia L. (2017). Land Use Planning for Sustainable Development of Coastal Regions. 3rd International Conference on Geographical Information Systems Theory, Applications and Management, DOI: 10.5220/0006370802900294, 290-294. Retrieved from https://www.researchgate.net/publication/316867706_Land_Use_Planning_for_Sustainable_Development_of_Coastal_Regions (access date 22.02.2021)

[44] Studme.org (2014). Architectural and compositional solutions of buildings and their complexes. Fundamentals of architecture and building structures. Retrieved from https://studme.org/1787121727014/tovarovedenie/arhitekturno-kompozitsionnye_resheniya_zdaniy_kompleksov (access date 04.02.2018)

[45] Library of the St. Petersburg University of High Technologies (2008). Architectural and compositional solutions for industrial. St. Petersburg. Retrieved from http://tehlib.com/arhitektura/arhitekturno-kompozitsionny-e-resheniya/ (access date 04.02.2018)