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ABSTRACT

of the dissertation for the degree of Doctor of Philosophy

URBAN REGENERATION OF INDUSTRIAL AREAS OF ABSHERON

Speciality: 6405.01 – Urban planning, settelment planning and landscape architecture

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INTRODUCTION

Relevance of the topic. At the turn of the XX-XXI centuries in connection with the transition to market relations the city authorities of Baku and Sumgait faced with the challenge of ageing and dilapidation of industrial zones. Industrial areas cover almost 30% of the area of Baku and about 65% of the area of Sumgait. These zones are not being used to their full potential, most of the factories there no longer operate, and some have been destroyed to make way for unorganized housing construction. As a result, significant areas in central parts of these cities remain closed and not integrated into the urban environment, despite the fact that the effective use of territory of the old industrial zone is an important urban planning task for Baku. This problem against the backdrop of acute land shortage on the Absheron Peninsula, is quite pressing and requires immediate intervention from the relevant authorities.

The degree of study of the topic. Contemprary architecture and urban planning have been studied by researchers such as E.E. Gasimzada, Sh. S. Fatullayev, R. M. Efendizade, F. M. Huseynov, N. H. Nagiyev, Sh. Sh. Gahramanova, N.O. Yusifli, N. J. Abdullayeva, A. A. Hasanova, Kh. A. Jafarov, S. Dadasheva, Y. A. Hajieva, Z. A. Mammadov, E. Alaskarov, A. M. Azizov, and others. Works devoted to preservation of heritage include the works of such authors as G. H. Mammadova, D. A. Akhundov, S. Kh. Hadjieva, E.E. Hasanov, A. T. Salimova. Also, scientific works of foreign authors in the field of urban planning were used, such as Z. N. Yargina, T. Y. Bistrova, E.V. Demidova, R.A. Drojjin, M. Mukha, and others. References to their researche became the basis for the analysis of theoretical and practical approaches to urban planning.

Object and subject of research. Objects of research: industrial and post-industrial territories of the Absheron Peninsula, including Baku and Sumgait. Subject of the study: urban regeneration of former industrial areas of Absheron, including the cities of Baku and Sumgait.

Research boundaries. The spatial boundaries encompass the Absheron Peninsula, focusing on industrial and post-industrial areas.

The time boundaries are limited to the modern period.

Purpose of the study. The Development of effective urban planning approaches to regeneration of industrial areas of Baku and Sumgait taking into account principles of sustainable and environmentally safe development. The main objectives of the study are:

- to study the historical stages of formation and development of industrial zones of the cities Baku and Sumgait in context of the urban development evolution of the Absheron Peninsula;
- to conduct an analysis of current state of industrial territories, taking into account architectural, spatial, environmental and socio-economic characteristics;
- to identify the main problems hindering the integration of former industrial areas into the urban fabric, including legal, infrastructural and investment barriers;
- to systematize foreign and post-soviet experience in renovation and adaptive reuse of industrial areas, em identify models applicable to Azerbaijan;
- to develop principles and approaches to renovation of industrial areas, taking into account requirements of environmental sustainability, spatial integration and social inclusiveness;
- to substantiate the conceptual and methodological foundations of the author's approach to the regeneration of industrial zones in the Absheron territory;

Research methods. Methodology of the work is based on a systematic approach, which includes analysis of theoretical works, design, and archival and statistic materials on Baku, Sumgait and other cities of Azerbaijan, conducting site analysis with photographic recording of the studied objects, developing principles for the urban renovation of the industrial areas of Baku and Absheron and the methodological foundations of author's approach to the renovation of these territories.

The main provisions submitted for defense.

The following are brought up for defense:

- The formation and development of industrial areas of Baku and Absheron and prerequisites for the renovation of industrial zones.

- Analysis of current state of former industrial areas.
- The main problems of the industrial area regeneration process.
- Environmental analysis of regenerated industrial areas.
- Principles of urban renovation of industrial areas of Baku and Absheron.
- The concept of reconstruction of industrial areas of Absheron.
- Methodological foundations of the author's approach to the regeneration of industrial territories of Absheron.

Scientific novelty of the research.

For the first time, the dissertation formulated the basic principles of urban regeneration of industrial areas of Baku and Absheron, and developed a concept for the regeneration of industrial zones in the study area.

Theoretical and practical significance of the research.

The main provisions and conclusions of the dissertation can be used in the development of the master plan for the city of Sumgait, projects for the reconstruction and regeneration individual industrial zones of Baku and Sumgait, as well as other cities of Azerbaijan.

Testing and implementation (of research results). The main provisions of the dissertation were represented at the conference dedicated to the 101st anniversary of the National Leader Heydar Aliyev's birthday "Global Climate Changes and the Modern Ecosystem of Azerbaijan" (Baku 2024), at the International Conference "Energy and Environmental Technologies in Architecture and Construction" (ICETEA 2024, Baku), at the VIII International Scientific and Practical Conference "Safe and Comfortable City" (Russia, 2025), at the VI International Scientific and Practical Conference "Environmental Safety and Sustainable Development of Urbanized Areas" (Russia, 2025), at the conference "Modern Civil Engineering Problems" (Baku, 2025), at the conference "The Past, Present And Future Of Architectural Education In Azerbaijan" (Baku, 2025).The result of the dissertation were published in scientific journals published in our Republic and in the Russian Federation.

Name of the organization where the dissertation was completed. The dissertation was completed at the Department of

Architectural design and Urban planning at the Azerbaijan University of Architecture and Construction.

Dissirtation volume (the length of individual structural sections and the total volume of the dissertation are indicated in characters). The dissertation consists of an introduction, 3 chapters, conclusions, and bibliography. The dissertation also includes illustrations consisting of tables, figures, and photographic materials. The study's content is contained in 159 printed pages, 22 appendix pages, and 64 illustrated pages. The dissertation's structural sections are as follows: Introduction – 6 142 characters, Chapter I – 80 346 characters, Chapter II – 82 648 characters, Chapter III – 39 315 characters, and conclusions – 10 526 characters. Overall, the dissertation is 246 pages long and contains 218 977 characters.

MAIN CONTENT OF THE DISSERTATION

Chapter 1. Brief history of urban development and prerequisites for renovation of the industrial areas Baku and Absheron.

1.1. Theoretical and methodological foundations of renovation and adaptive reuse of old industrial areas and development

The renovation and reuse of industrial sites is an important area of contemporary urban planning policy aimed at sustainable development, preserving cultural identity, and optimizing the use of urban space. The theoretical underpinnings of this process are rooted in the concepts of sustainable urbanism, regeneration, and a rethinking of industrial heritage as a valuable urban resource. Researchers note that the classical growth model has become insufficient, replaced by flexible strategies focused on sustainability, adaptation, and managing decline. F. Oswalt's concept of soft planning emphasizes the importance of contextuality, network interaction, and gradual change.

Methodological approaches to renovation vary depending on the transformation goals, the condition of the sites, the historical and

cultural context, and socio-economic objectives. Old industrial areas often have a fragile functional structure, requiring comprehensive restructuring and restoration of spatial integrity. The methodology is shifting from physical renewal to the integration of social, infrastructural, and environmental factors.

The rethinking of industrial heritage is based on the concepts of "adaptive reuse" and revitalization, which involves the preservation of tangible and intangible values.

Modern methodology involves a multi-layered approach: restoring buildings, adapting functional content, updating infrastructure, shaping spaces, and developing new urban activities. Thus, renovation integrates the principles of sustainability, cultural preservation, and strategic planning, ensuring the comprehensive transformation of post-industrial territories.

1.2. Formation and development of the industrial territories of Baku and Absheron.

The development of Baku as leading industrial center began in the 19th and 20th centuries, in parallel with development of Absheron oil fields. However, foundations for development were laid long before the industrial era. The presence of oil and gas since ancient times is confirmed by written sources. Among early places for oil production, Surakhany, Balakhany, Ramana, Binagadi, Bibi-Eybat, Pirallahi, and Bail are mentioned. By the 17th century, there were up 350-400 wells in Absheron. By the beginning of 19th century, this stage of intensive development ended.

New stage is associated with mechanized oil production. In 1847 the first well was drilled mechanicaly in Bibi-Eybat, in 1871 a large industrial well was drilled in Balakhany. On the 1854 plan the connections between Baku and industrial areas were indicated for the first time. In 1859 Baku received the status of a provincial capital. During the same period the first oil refineries appeared, and in 1860, naphthal factories were established along Balakhany road. The growth of oil production led to the formation of industrial zone. In 1876 the first organized industrial zone "Black city" district was

created. Later the "White city" emerged. By the beginning of 20th century large industrial district had formed.

In 1920, the second stage of region's development began. The population influx increased, and workers' settlements in Azneft were formed. The 1927 Master Plan divided the city into residential and industrial zones. In the 1930s, a plan for 5 satellite cities of Baku was proposed. Three-part structure of the city was formed.

The mid-20th century characterized by the industrialization of Sumgait and the development of heavy industry here. In 1950s - 1980s large industrial complexes formed, the number of population increased. Master plans from these years were based on the idea of expanding urban structure and bringing residential zone closer to the work places. The creating new industrial city in Dubendy and development of Sumgait were proposed. The Baku region was considered as a multifunctional urban complex.

1.3. Prerequisites of regeneration of industrial zones of Baku and Absheron

One of Baku's current challenges is its deteriorating industrial zone, which accounts for approximately 40% of the city's area and presents a number of challenges. The feasibility of regenerating the industrial zone is determined by the following factors:[1]

Historical background. The formation of industrial zones resulted from the oil boom of the 19th and early 20th centuries, and the oil industry subsequently played a decisive role. The transition to the post-industrial era necessitated a fundamental transformation of these areas. Many of these structures are monuments to industrial heritage.

Economic backgrounds. The uneven distribution of production in Azerbaijan persists, with the Absheron Peninsula attracting investment and labor. The transition to capitalist

[1] Багирова-Ибрагимли Г.А. Предпосылки реновации промышленных зон в Баку и Апшероне. Журнал Академический Вестник УралНИИпроект РААСН. №1. – Екатеринбург – 2017, – с. 29-34

urbanization has led to the dominance of private interests over urban development, and public investment has been replaced by investments focused on quick returns. Under these circumstances, the state needs to improve its tax policy to encourage developers to regenerate industrial zones.

Urban planning backgrounds. The closure of factories and the shortage of available land in Greater Baku and Absheron exacerbate the challenges of rational land use and the creation of a comfortable urban environment. Given the lack of recreational opportunities and overburdened infrastructure, the rehabilitation of industrial zones is becoming the most pressing development area.

Social background. Baku's heterogeneous and chaotic urban planning requires a humane environment. Regeneration of the industrial zones of Baku and Sumgait, adjacent to residential development, will allow the city to be filled with new social and business functions. The unique architectural potential of industrial buildings reinforces the need to adapt them to modern conditions.

Environmental backgrounds. The regeneration of outdated industrial complexes in Baku and Absheron is urgent due to their non-compliance with environmental standards. Pollution of the surrounding landscape negatively impact public health. The decommissioning and reclamation of old enterprises will significantly improve the city's ecology.

Aesthetic and psychological backgrounds. Abandoned industrial zones in Baku and Absheron peninsula create "ghost territories", negatively impacting the psychological well-being of residents. The low aesthetics and drab appearance of the buildings require comprehensive regeneration, improved appearance, and integration into the urban environment.

1.4. The influence of various factors on the development of the renovation process

The work identifies the main factors influencing the regeneration of industrial zones in Absheron and the adaptation of industrial development to new conditions. These factors were

categorized inti: ***urban planning*** (location and size of the territory, morphology of surrounding buildings, influence of the functional structure of the urban environment), ***economic*** (economic potential for reuse of the complex, cost-effectiveness of architectural, construction and functional-technological solutions, cost-effectiveness of production processes, nature of investment, tax policy), ***environmental*** (environmental characteristics of the facility and territory, concentration of emissions, size of sanitary protection zones), ***social*** (social importance of the facility and the territory, employment and services to the population in these industries), ***architectural and aesthetics*** (architectural and artistic solutions of the facilities, conditions of visual perception of development, compositional and aesthetics features of the surrounding buildings, aesthetic significance of the environment), ***infrastructural*** (The presence and condition of industrial, social, transport and engineering infrastructure), ***protective and rehabilitation*** (historical significance of the facilities, the presence of architectural, historical, and industrial heritage monuments, quality of the enterprise environment, socio-cultural significance of the facility), ***structural*** (compliance of the existing structure with the modern requirements, physical deterioration of the facility), ***technological*** (the use of modern waste-free and environmentally friendly technologies, the cooperation of various functions), ***architectural planning*** (integration of functions, development of underground space, opportunities for improving engineering and transport infrastructure, planning restrictions).

Chapter 2. Analysis of the current state of industrial areas in Baku and Absheron, subject to renovation.

2.1. The current state of industrial areas of Absheron

The region's main industrial enterprises are located in the cities of Baku and Sumgait, which are the focus of this study. However, the paper also provides a comparative analysis of other industrial centers of Azerbaijan are Ganja and Mingachevir.

Industrial zone of the city of Sumgait. The city of Sumgait is

located in the north-western part of the Absheron, 35 km from Baku and stretches along the Casian Sea. The industrial zone, covering 3940 ha, is concentrated in the western part of the city. The main industries are chemical, metallurgical, construction and mechanical engineering. Many Soviet enterprises are morally and physical obsolete, which makes their reconstruction necessary. Since the 2000s new industrial zones have been developing, including SOCAR Polymer, Sumgait Technology Park, and projects of the Azersunholding group. Modern transformations are focused on environmentally friendly and high-tech production, logistics, and service, while the vacated areas are planned to be used for recreation, landscaping, and new construction.

Industrial zone of Baku. The industrial zone of Baku occupies a center place in the urban structure, with concentrations in Garadagh, Sabunchu, Surakhani, Khazar, and other districts. The oil, chemical, metallurgical, construction, food and light industries are developed here. Most of the enterprises are outdated and require modernization or relocation to industrial parks of Sumgait and Absheron. The Baku 2040 Master Plan envisages the withdrawal of some production facilities, the renovation of old industrial zones for housing, business and public functions, and the creation of a polycentric structure. It is planned to develop approximately 2800 ha, including repurposed industrial zones, warehouses, and other territories. Despite the progressive ideas, the plan calls for the demolition of enterprises that have potential for renovation, which is explained by the lack of an inventory of existing industrial facilities.

Analysis of the current situation of the industrial zones in Gandja. Ganja's industrial potential has been developing for over a hundred years, including mechanical engineering, metalworking, food and light industries. Today the city's industrial zones are worn out, some are not used for their intended purpose, and there are environmental and infrastructural problems. Within the framework of the 2040 master plan, industrial clusters (aluminum, mechanical engineering, building materials, textile), modernization of enterprises and the introduction 4.0 technologies are being implemented, wich will ensure employment growth and the integration of industrial

zones into the urban structure.

The current state of industrial zones of Mingachevir. Mingachevir is the city with historically developed energy and textile industry, but many of its factories are outdated. There operate a state district power plant, "Azerkabell", and a fiberglass and rubber products plant. An industrial park have been established, new production facilities, logistics, and environmental technologies are being developed. Renovation of industrial zones and modernization of infrastructure aimed at sustainable reindustrialization and integration with urban environment.

Typology of main industrial zones of Azerbaijan. A typology of industrial zones was developed taking into account their functional purpose, urban planning location, level of infrastructure equipment and level of physical and moral deterioration, which can be conditionally classified as follows: historical-industrial zones, Soviet industrial cluster, modern industrial zones, and technology parks.

2.2. The main problems of the process of renovation of industrial areas and buildings.

Redevelopment of industrial areas is a complex process that requires coordination between government bodies, investors, and the population. In practice the interaction between the parties is insufficient: low involvement of residents, lack of clear legal mechanisms, bureaucratic barrier. However, the shortage of available land in Absheron makes the regeneration of industrial zones a priority for sustainable development.

In a market economy, the main burden falls on private investors. However, the high level of infrastructure deterioration, the uncertainty of the condition of structures, and the difficulties of integrating new functions reduce investment attractiveness. The imperfect regulatory framework remains a significant barrier: the uncertain status of territories, complex approval procedures, and the lack of comprehensive project assessment methods. All this increases timeframes and costs, reducing developer interest.

Governance bodies also face challenges: a lack of conceptual planning experience, limited financial resources, and a lack of effective legal mechanisms to stimulate investment. The post-Soviet context is characterized by decentralized decision-making, private capital participation, and the integration of new functions into old industrial spaces, but with a lack of environmental analysis and systemic planning.

Modern renovation aims to create new growth centers, enhance investment attractiveness, and improve environmental quality. Key challenges include adapting utility infrastructure, soil and groundwater pollution, and the need to reclaim and integrate new areas into the urban fabric.

2.3. Urban ecological aspect. Environmental analysis of reconstructed industrial areas.

Industrial areas on Absheron Peninsula have a significant negative impact on the environment. In Baku, the occupy approximately 30% of the area, and in Sumgait, up to 65%, often adjacent to residential developments, increasing environmental risks. The current situation requires a scientifically based landscape-ecological approach to rehabilitation aimed at humanizing the urban environment, restoring the natural balance, and improving quality of life.

The main environmental problems include air and water pollution, landscape degradation, lack of recreational areas, and deteriorating urban aesthetics. The arid climate, poor soils, and long-term exploitation of oil fields exacerbated the destruction of natural systems. The area of oil-contaminated land exceeds 20 000 ha, of wicj 7 886 ha are classified as extremely contaminated. The most problematic areas are located in the oil refining areas of Baku and around the industrial hubs of Sumgait.

Although emissions have declined in recent years, industrial plants in Baku and Sumgait remain the largest sources of air pollution in the country. Hundreds of emission sources operate in Sumgait, and growing industrial activity maintains high pollution levels, exacerbated by motor vehicles.

To improve the environmental situation, projects are being implemented to rehabilitate industrial areas, including relocating Sumgait's chemical production facilities outside the city and creating new industrial clusters in more favorable locations.

Priority redevelopment areas include: depressed and polluted areas, areas with lost functions, and zones with high landscape potential along the Caspian coast. Key environmental transformation measures include the creation of green corridors, the establishment of buffer zones, the development of linear green structures, and the gradual construction of a unified urban green framework. The comprehensive implementation of these measures will reduce environmental impacts, improve the quality of the urban environment, and enhance the urban development value of the areas being redeveloped.

Chapter 3. Principles of urban regeneration of industrial areas of Baku and Absheron.

3.1. International practices of urban regeneration as a methodological basis for the transformation of industrial areas.

Regeneration and adaptive use of old industrial sites have become a key focus of urban development policy in developed countries since the second half of the 20th century. International experience is particularly important for developing approaches to renovating Absheron's industrial zones, given land shortages and the need to preserve cultural heritage.

The idea of adapting historic sites dates back to Viollet-le-Duc, who first proposed changing the function of buildings without losing their form. Later, A. Riegel substantiated adaptive use as a basis for heritage preservation. The widespread reimagining of industrial sites began after World War II, and its most active phase occurred in the 1970s and 1980s, when large-scale projects began in Europe and North America to convert warehouses, factories, and power plants into museums, offices, and cultural centers.

Some of the most striking examples include the Tate modern in London, the Zollverein Industrial Museum in Essen, the gasometer complex in Vienna, Horno 3 in Monterrey, and the business and residential districts on the sites of factories in Barcelona and Philadelphia. In many cases, renovation not only creates a new function for the building but also changes the character of the entire neighborhood, enhancing its investment appeal and cultural status.

Adaptive renovation typically relies on three approaches: maintaining industrial function with modernization; partial re-functionalization with conservation and the introduction of modern elements; and complete transformation or construction from scratch.

International practice demonstrates two fundamental principles of modern renovation: resource conservation and community participation. Architectural solutions are based on preserving form while changing function, maintaining the integrity of the complex, and avoiding decorative elements, thereby maintaining the 'spirit of place" and integrating industrial heritage into the modern urban environment.

3.2. Concept for the regeneration of industrial areas in baku and Absheron.

Regeneration of Absheron industrial zones can be based on three main approaches:[2]

1. *Full refurbishment* – applicable to the coastal industrial zone of Baku and includes the adaptation of individual buildings, environmental rehabilitation of contaminated areas and complete demolition followed by redevelopment.

2. *Partial land reclamation* – is typical of Baku's old industrial zone. It involves preserving valuable elements of the planning structure, turning industrial heritage sites into museums, and integrating new buildings into the existing environment.

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[2] Багирова-Ибрагимли Г.А. Направления развития промышленных зон Абшерона [Электронный ресурс] / Г.А. Багирова-Ибрагимли // Архитектон: известия вузов. – 2025. – №2(90). – URL: http://archvuz.ru/2025_2/14/

3. *Preserving industrial functions* – is particularly relevant for Sumgait. This includes two directions: memorialization (restoration of industrial architectural monuments) and reconstruction (modernization of enterprises and implementation of new technologies).

The analysis allowed us to formulate key regeneration principles:

- comprehensiveness, which implies a systemic approach to transforming territories as part of the overall urban structure;
- ranking the significance and classification of zones based on investment attractiveness;
- inventory of planning elements and heritage sites;
- prioritization – determining the order of renovation, taking into account environmental and economic factors;
- algorithmic approach – a clear sequence of work;
- environmental continuity – transition to environmentally friendly production, landscaping, and engineering rehabilitation;
- adaptation – the ability to change the functions of industrial areas;
- humanization and social orientation – the creation of a comfortable environment, service facilities, sport, and recreation;
- cultural matrix – consideration of traditions and identity;
- biopositivity – maximum greening, creation of green roofs;
- semi-functionality, multi-level, communicative, and accessible environment.

Compositional techniques include modification, replacement, addition or elimination of elements, as well as combinatorics, which allows for the combination of different functions and forms within an industrial complex.

3.3. Methodological foundations of the author's approach to thr regeneration of industrial areas of Absheron

The study offers 4 basic regeneration models of industrial zones in Absheron on the basis of structural and morphological analysis of the investigated areas

- *"fragmentary" model* – involves transforming individual sites into open, landscaped, mix-use spaces. These zones include creative clusters, art objects, seasonal exhibitions, museums, and public squares. The environment is enriched with retail and cultural facilities, small architectural forms, horizontal and vertical landscaping, and graffiti. This approach is particularly effective in central Baku, where historical buildings allow fot the adaptation of individual industrial sites for public function.

- *"linear-nodular" model* is a chain of local multifunctional nodes located along a defined trajectory. The nodes are iconic buildings and venues for cultural events—museums, theaters, exhibition centers, concert halls, as well as recreational and sports spaces. This model is suitable for Baku's coastal industrial zone, creating a transition from the busy central area to the recreational boulevard and strengthening the system of "anchor points" along the extended coastline.

- *"complex" model* is the largest renovation project in scale, where the goal is to create a multifunctional environment with a predominance of cultural, business, housing, commercial and service functions and well-developed infrastructure (self-sufficient district). Proposed locations are the peripheral industrial zones in Baku. According to this model, "White city" renovation project was proposed on the territory of "Black city" in Baku.

- *"evolutionary revival" model* is aimed at modernizing industrial areas without change in function. It involves upgrading existing enterprises, implementing environmentally-friendly technologies, revising production cycles, greening, and increasing the openness of the production environment. This model is suitable for Sumgait, where a Sumgait Technological Park is being created based on the rehabilitation of former industrial facilities.

Main conclusions of the dissertation

1. The development of Baku since 19th century has been closely linked to the formation and development of the oil industry. The region's active industrialization began in the 1870s, driven by

several key events: the drilling of the first mechanized well at the Balakhany field; the adoption of the Law on the Abolition of the Tax-Farming System in the Oil Industry on Febrary 17, 1872; and the development of large oil fields in the Ramana, Sabunchu, Balakhani, and Bibi-Heybat districts in 1873.

2. Natural and geographical conditions and the particular location of oil resources contributed to the formation of a dispersed settlement pattern on the Absheron Peninsula, with a dominant core in the form of Baku and a system of satellite workers' settlements. This predetermined the spatial demarcation of the territory into residential and industrial zones, as well as the emergence of a three-part planning structure, in wich the industrial belt occupied the central position, and residential areas the western and eastern parts.

3. The key reasons for the degradation of the industrial zones of Baku and Absheron were: the breakdown of production and economic ties after the collapse of the USSR, the insufficient adaptation of industrial enterprises to new market conditions, the loss of economic profitability and functional significance, as well as the lack of investment attractiveness due to ineffective tax policies. The consequences of this process are high levels of environmental pollution, overload of transport infrastructure, and the exclusion of these territories from full urban development due to a shortage of land in Absheron.

4. The study identified and characterized the key prerequisites for the regeneration and renovation of the industrial areas of Baku and Absheron. These are presented in six interconnected blocks: historical, related to the industrial heritage of the studied area; economic, driven by the need to integrate unused territories into economic circulation; urban planning, related to the rationalization of the urban structure; social, reflecting the needs of the local population for improved environmental conditions; environmental, aimed at restoring natural landscape components; and aesthetic, contributing to the formation of a comfortable and visually harmonious urban environment.

5. Based on the analysis of local and foreign literature, as well as the current situation of the industrial zones of Baku and

populated areas of Absheron, we identified the main factors influencing the regeneration of the industrial zones of Absheron and the adaptation of industrial development to new conditions, which are divided into: urban planning, economic, environmental, architectural and aesthetic, infrastructural, security and rehabilitation, structural, technological, architectural and planning.

6. A study of the current state of industrial enterprises in Absheron leads to the conclusion that the main industrial enterprises are concentrated in the cities of Baku and Sumgait. Most of the industrial enterprises in these cities are significantly obsolete and physically deteriorated, making their reconstruction impossible. Currently, they are either not operating as intended or have partially or completely ceased operations. Most of the large industrial enterprises are a legacy of the Soviet past and require significant capital investment for reconstruction. It would be advisable to liquidate the outdated and physically obsolete industrial enterprises in Sumgait and Baku or relocate them to specially created industrial hubs. The resulting freed-up areas could be used for urban development.

7. The removal of industrial enterprises in Baku directly related to oil and gas production presents a great challenge, while the majority of industrial enterprises producing building materials, and the chemical and metallurgical industries of Baku and Sumgait can be moved outside the city to the Absheron Industrial Hub, and some of them to regions.

8. The implementation of projects to rehabilitate industrial areas on the Absheron Peninsula is often associated with a number of constraints that significantly reduce their investment attractiveness. These include: a high degree of deterioration of the engineering and technical infrastructure, necessitating large-scale restoration work; uncertainty about the operational characteristics of existing buildings and structures raising doubts about their suitability for reuse; difficulties in integrating new function of the facilities into the existing urban development context; a lack of clear legal regulation, in particular, an insufficient regulatory framework defining the status and possible development scenarios for such areas; difficulties in

coordinating design decisions at various administrative levels; and insufficient consideration of the comprehensive justification of project from the standpoint of economics, ecology, and socio-cultural feasibility.

9. One of the key challenges facing city authorities in the renovation of large industrial areas is the lack of experience in strategic planning and the integrated development of such spaces. Additional obstacles include insufficient funding, which leads to delays in project implementation, and the absence of cearly defined legal mechanisms regulating regeneration processes and stimulating investor participation. At the same time, the development of former industrial areas offers several advantages over vacant sites, including the possibility of implementing integrated development with infrastructure and recreational elements, favorable geografic locations, proximity to transportation hubs, scenic views, and the potential for creating jobs near residential development.

10. The effectiveness and economic feasibility of industrial facility regeneration directly depend on a number of factors, including: the size of the site, the physical condition of the structures, the architectural and planning features of the development, the level of deterioration of utility networks, the degree of contamination of the site, and the market value of the property. When redeveloping industrial areas in Absheron, particulat attention should be paid to preserving the historical appearance of the reconstructed facilities, ensurng the adapted facility complies with the urban development plan and national construction standards, the potential for increased pressure on existing utility infrastructure, and other factors.

11. The current state of the Absheron Peninsula's industrial zones demonstrates their low efficiency in maintaining the ecological balance, despite significant potential for the gradual restoration of natural environmental components. Moreover, the place of relocation, modernization, and environmental rehabilitation of enterprises in central Baku, as well as in the industrial districts of Sumgait, lags significantly behind modern requirements for sustainable development and the socio-ecological transformation of urban space.

12. An analysis of the environmental condition of Absheron's industrial areas reveals a number of pressing issues: extensive pollution of the natural environment, including air, soil, and water; degradation of natural landscapes, particularly in the coastal zone, where pollution levels are estimated to be among the highest along the entire Caspian coast. An aggravating factor is the region's unfavorable natural and climatic conditions (arid climate, weak soils, frequent wind), limiting the potential fo natural restoration. A decline in the visual and aesthetic qualities of the urban environment and a shortage of recreational spaces sre also noted, particularly within Baku and Sumgait, where the main recreational areas are concentrated in the northeastern part of the peninsula.

13. The study revealed that within the industrial zones of Absheron there are areas with potential for transformation through a process of phased modernization and environmental rehabilitation. These areas include: 1) depressed areas in a state of ecological and functional degradation (polluted as a result of oil production and refining, industrial landfills, waste heaps, polluted water bodies, dilapidated and unused industrial buildings); 2) coastal areas with high landscape potential, particularly within Baku and Sumgait, which could be adapted for recreational use with appropriate improvements.

14. The current economic situation in Azerbaijan generally does not facilitate the complete relocation of environmentally harmful industries outside the cities, particularly from Sumgait and the oil producing areas of Baku. In this context, the phased modernization of enterprises combined with the ecological reconstruction of the territories is the most realistic and economically feasible development strategy for the industrial zones of Sumgait and Baku.

15. Analyzing the global experience of rehabilitating old industrial territories, we can note two main principles of rehabilitating these areas: solving problem with resource conservation and participation. Also, the similar techniques of form-building in these projects can be defined in the following theses: a change of function without changing the form, an aesthetics of

integrity and complete absence of decoration. The first statement means that in order to preserve historical layers, the so called "spirit of place", planners often intend to preserve the forms and historical details, rhythm and dynamics of structures that have become an integral part of the place. When speaking about the aesthetics of integrity, we mean the planning unity of entire complex or structures connected by a single planning solution. The lack of decorativeness is primarily associated with the traditionally brutal forms of industrial buildings and with a sense of modernity.

16. A cluster approach, taking into account the duality of renovation goals – restoring the natural framework and fully integrating industrial areas into urban space – could serve as a basis for a flexible, adaptive renovation methodology for Absheron's industrial zones. In this case we can imagine proposed "updated" clusters as "open" self-sufficient and sustainable interconnected (horizontally connected) groups of units and expand the range of their function. Group sustainability refers economic, environmental, social, and innovative sustainability.

17. As part of the Baku 2040 master plan, it was necessary to develop a separate subprogram for the renovation of Baku's industrial areas for subsequent inclusion in the strategic documents of the Ministry of Economy and the State Committee for urban planning and architecture. It is necessary to include here a register of key industrial sites subject to renovation, identifying priority transformation zones, such as the Bail Shipyard, old logistic complexes in the Sabunchy, Binagady, Lockbatan, indicating their areas, condition, transport accessibility, and potential for secondary use.

18. Investor incentives could include tax and rent incentives for businesses investing in industrial site renovations. Local community involvement and process transparency are essential. This could be achieved by introducing open architectural competitions for industrial site renovations. Another method could be developing projects that take into account the opinions of nearby residents through public hearings and surveys.

The main content of the dissertation were represented and published in the following articles:

1. Предпосылки реновации промышленных зон в Баку и Апшероне // – Екатеринбург: Академический Вестник УралНИИпроект РААСН, – 2017. №1, – с. 29-34.
2. Формирование и развитие промышленных территорий Баку и Абшерона // – Баку: Элми Эсерлер, – 2017. №1, – с. 18-34.
3. Современные состояния промышленных территорий Абшерона // – Баку: Азербайджанда Иншаат ве Мемарлыг, – 2017. №3, – с. 43-50.
4. Приемы градостроительной реновации промышленных территорий // – Баку: Мемар, – 2018. №19, – с. 150-159.
5. Урбоэкологический аспект и анализ окружающей среды Реконструируемых промышленных территорий // – Баку: Элми Эсерлер, – 2021. № 1, – с. 29-32.
6. Environmental analysis of the reconstructed industrial areas of Baku and Absheron. Urban-ecological aspect // "Qlobal iqlim dəyişikliyi və Azərbaycanın müasir ekosistemi", – Bakı: – 2024, – s. 88-89
7. The impact of various factors on the development of the renovation process of industrial areas in Baku and Absheron // "Memarlıq və İnşaatda Enerji və Ətraf Mühit Texnologiyaları" mövzusunda (İCETEA 2024) Benalxalq konfransın materialları, – Bakı: – 2024, – s. 338-341
8. Baghirova-Ibrahimli, G. Challenges of Redeveloping Historically Formed Industrial Areas of the Absheron Peninsula // International Conference "Modern Civil Engineering Problems" – Baku, – 2025. – p. 214-216.
9. Проблемы редевелопмента исторически сформировавшихся промышленных территорий Абшерона // Труды VIII Международной научно-практической конференции «Безопасный и комфортный город», – Орёл: – 23-25 апреля, – 2025, – с. 157-164.
10. Реконструкция промышленных территорий Абшерона как

фактор урбоэкологического преобразования // Труды VI Международной научно-практической конференции «Экологическая безопасность и устойчивое развитие урбанизированных территорий», – Нижний Новгород: – 16-15 мая, – 2025, – с. 55-60
11. Направления развития промышленных зон Абшерона [Электронный ресурс] / archvuz 2,14. – Июнь 2025. URL: http://archvuz.ru/en/2025_2/14/
12. Urban regeneration strategies for industrial areas in foreign countries // "The Past, Present and Future of Architectural Education in Azerbaijan" Beynəlxalq Elmi – Praktiki konfransın materialları, – Bakı: – 2025. – s. 203-207.

FORMATION AND DEVELOPMENT OF INDUSTRIAL TERRITORIES OF BAKU AND ABSHERON

Schematic plan of the railways and roads of the Sumgait industrial district. Current status as of 1978. Source: Sumgait City Planning Project. Explanatory Note. State State Design Institute "Azgosproekt", Workshop No. 3, Order No. 5063, Baku, 1978

Top view of a chemical plant.

Metallurgical shops of a pipe rolling or aluminum plant.

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THE CURRENT STATE OF THE INDUSTRIAL TERRITORIES OF ABSHERON





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THE CURRENT STATE OF THE INDUSTRIAL TERRITORIES OF ABSHERON

Industrial zones of the city of Sumgait subject to rehabilitation

Industrial zones of the city of Sumgait subject to rehabilitation

ANALYSIS OF INDUSTRIAL ZONES OF GANJA AND ADJACENT SETTLEMENTS

Textile factory in Ganja.

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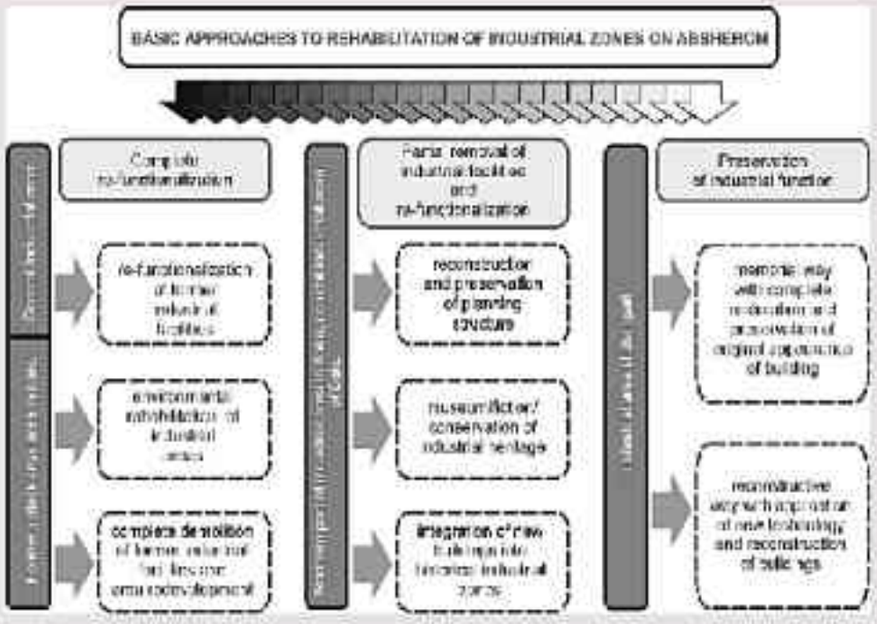
CONCEPT OF RECONSTRUCTION OF INDUSTRIAL TERRITORIES OF BAKU AND ABSHERON



Key approaches to the renovation of Absheron's industrial zones

REHABILITATION MODEL OF INDUSTRIAL AREAS ON ABSHERON			
MODEL	OBJECT OF REGENERATION	ARCHITECTURAL ENSEMBLE	FUNCTION
«FRAGMENTARY» MODEL			MIXED URBAN ENVIRONMENT
«LINEAR-MODULAR» MODEL			CULTURAL AND RECREATIONAL SPACE
«COMPLEX» MODEL			CULTURAL, BUSINESS, HOUSING, COMMERCIAL AND SERVICE SPACE
«EVOLUTIONARY RENEWAL» MODEL			SEGMENTED INDUSTRIAL CLUSTERS

Models for the rehabilitation of industrial zones in Absheron

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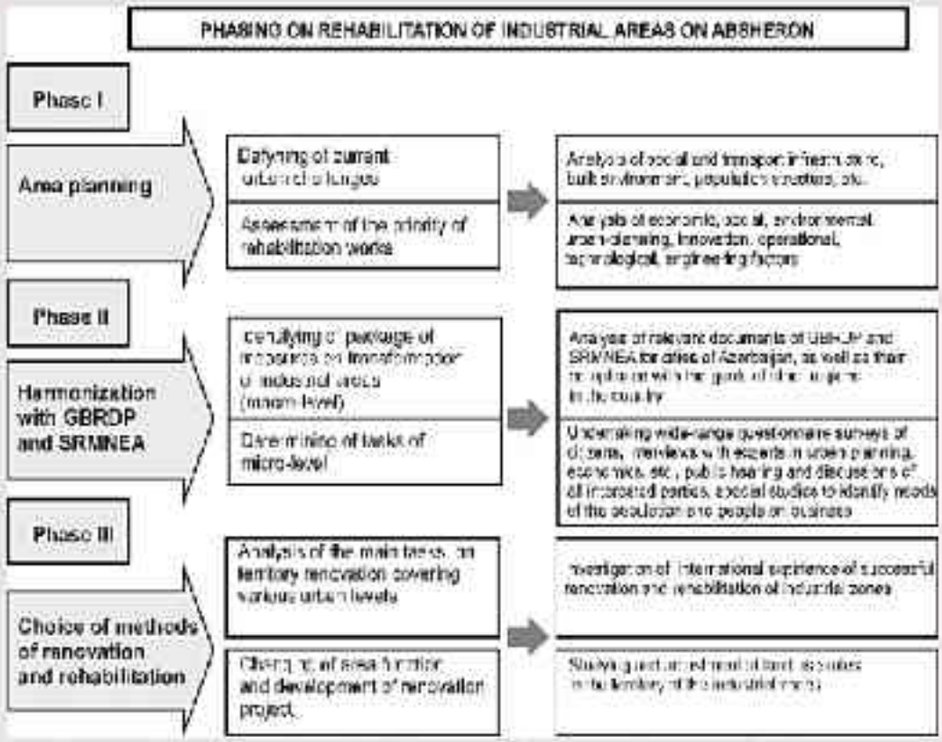
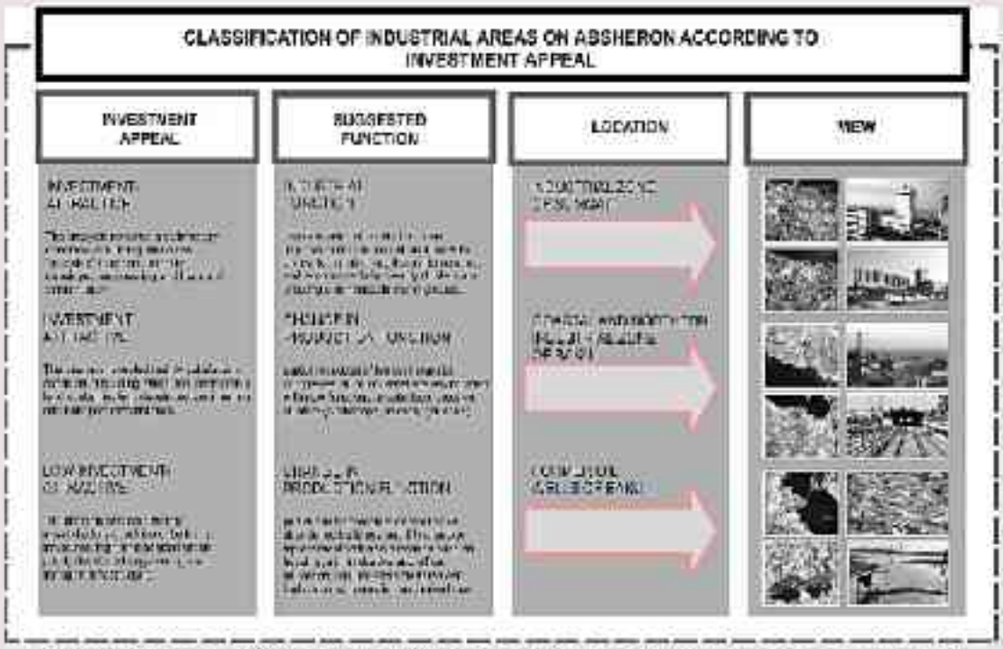
CONCEPT OF RECONSTRUCTION OF INDUSTRIAL TERRITORIES OF BAKU AND ABSHERON



Stages of work on the rehabilitation of industrial zones of Absheron.



Classification of industrial territories of Absheron according to investment attractiveness.

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