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Location of Industrial Territories in Urban Planing

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Abstract: *Under the industrial zone of the city should be understood the totality of industrial enterprises, research and production organizations and institutions, pilot production and design organizations, as well as energy, industrial, transport and industrial storage facilities in the urban areas they occupy.*

Keywords: *Industrial zone, city, sanitary zone, enterprise classification, residential area, transport service, wind rose.*

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Introduction. Industrial districts of the city are created on the territory of the industrial zone and are intended for the organized placement of industrial enterprises and facilities that have direct connections with them - technological, energy, and transport. These districts should be planning connected with the residential part of the city. They are organized taking into account the specialization of production (metallurgy, chemistry, food industry, construction industry). *(Fig.1).*

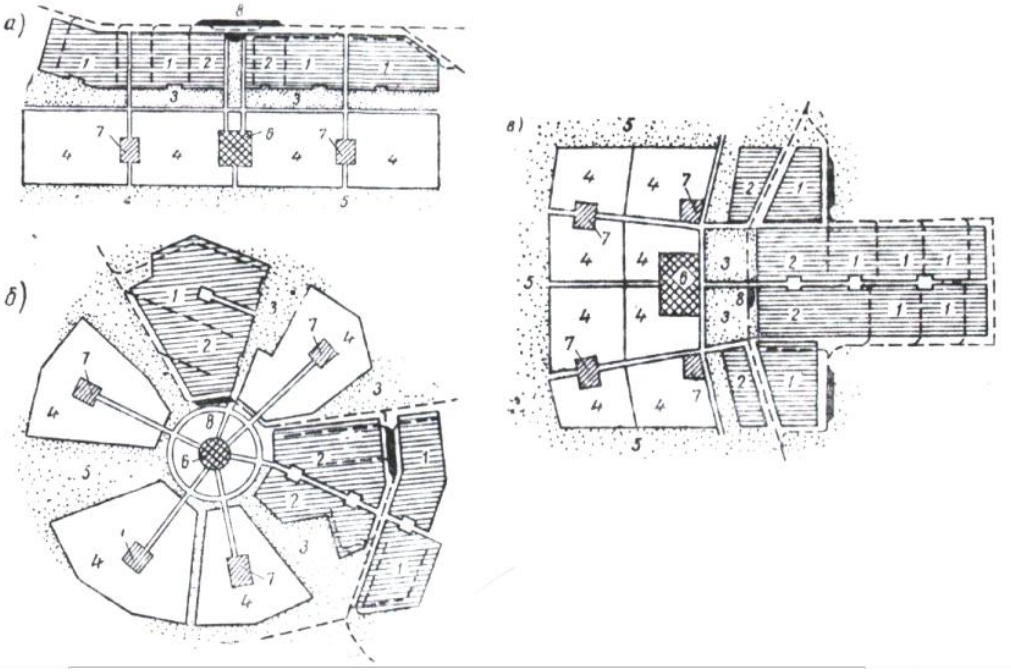

Fig.1. Location of industry relative to the residential area of the city:

а - tape; б - radial; в - perpendicular;

1 - large enterprises emitting harmful substances; 2 - local industry enterprises; 3 - sanitary protection zone; 4 - residential area; 5 - recreation areas; 6 - city center; 7 - regional centers; 8 - station [2].

Main part. Depending on the sanitary classification of enterprises, their transport links and location in relation to the residential area, the industrial districts of the city are divided into classes:

- Class I – sanitary protection zone 1000 m;
- Class II – sanitary protection zone 500 m;
- Class III – sanitary protection zone 300 m;
- Class IV – sanitary protection zone 100 m;
- Class V - sanitary protection zone 50 m.

The industrial area of the city includes:

- industrial enterprises, power plants, warehouses, engineering structures and networks, territories for dumps;
- municipal enterprises serving the enterprises of the region (canteen, consumer services for workers, bathhouse, laundry);
- access railway lines connecting the enterprises of the region with the nearest station or junction point to the public railway;
- access roads that provide internal and external transport links of the industrial area (industrial roads, passenger roads, places for stopping vehicles, parking for urban and individual vehicles, area - wide garages, gas stations);
- the public center of the district (administrative institutions of the district, post office, telegraph, savings bank, club, library, guest houses, clinic or outpatient clinic, police station, cafes, shops), scientific institutions, etc.;
- pre-factory areas of industrial enterprises, which can house a factory canteen, factory management, fire station, checkpoints, guard rooms and other buildings and structures;
- a sanitary protection zone between the residential area and the places where harmful substances are released on the territory of industrial enterprises;
- green spaces (landscaping of the sanitary protection zone, the entrance of the enterprise, alleys along driveways, protective strips, squares);
- the necessary reserve territories for the expansion of enterprises or the construction of new ones;
- Scientific and technical center and educational institutions associated with the enterprises of the industrial region.

Transport service of the industrial area is carried out by the following types of transport:

- railway;
- automobile;
- conveyor and pipeline;
- Water.

External engineering communications of industrial enterprises (water pipelines, heat pipelines, gas pipelines, sewage collectors, power lines and communications) are routed taking into account the

integrated placement of the relevant networks, laying them in the shortest direction, if possible, near highways (without interfering with further rational development of adjacent reserve territories for building industrial and housing construction) and with the least number of turns and intersections with railways and roads, rivers, canals, reservoirs and ravines.The area of the territory of industrial regions is determined by:

- the composition of industrial enterprises located in the region;
- capacity of enterprises and prospects for their development;
- The nature of its development (number of storeys and the width of the gaps between them, established by the requirements of technological processes, fire safety, etc.)[3,4].

The territory of the sanitary protection zone should be landscaped and landscaped, it is recommended to build squares and boulevards along the ways of approaching workers to enterprises. In the absence of existing woody vegetation within the boundaries of the sanitary protection zones, the territory of the zone can be used to accommodate nurseries, greenhouses and orchards.

During the construction in cities and towns of industrial enterprises that do not stand out in the communities of harmful and unpleasant smelling societies, and also do not create increased noise levels, association and electromagnetic discussions, the establishment of complex industrial and residential zones interacting with residential development. Industrial (production) zones must be identified taking into account environmental and environmentally friendly, environmentally safe and pedestrian links with the places of resettlement of workers employed at enterprises. These zones do not have to be divided by transit railways and roads.

The communal storage zone should be located outside the residential area, using, if possible, the territories of the sanitary protection zones of industrial enterprises and other facilities. In cities, it is necessary to highlight: a zone (or several zones in large cities) of places of recreation for the population in abundantly landscaped, health-improving areas and near water spaces, including suburban areas; sanitary protection zones for isolating industrial zones from residential ones according to sanitary requirements, as well as for the protection of water supply sources, etc. *(Fig.2)*

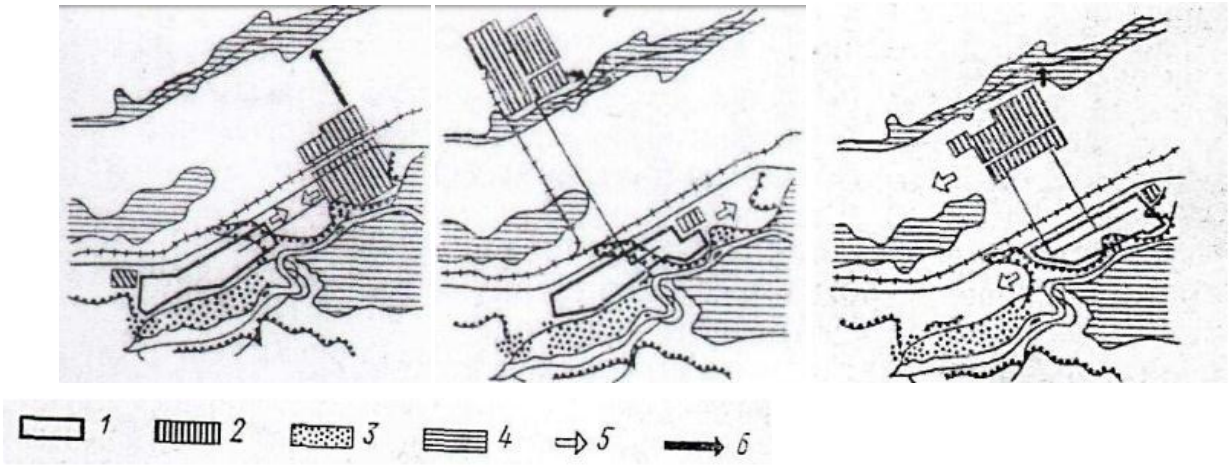

Fig.2. Options for choosing an urban area, taking into account functional zoning:

1 - residential area; 2 - industrial territories; 3 - recreation area; 4 - territory unsuitable for placement of industrial and residential buildings; 5 - the direction of the city's development; 6 - discharge of industrial effluents.

During the reconstruction of cities and other settlements, the functional zoning of the territory should be streamlined, in particular, the necessary areas should be allocated for the placement of institutions and service enterprises, the organization of parks and, in general, the improvement of transport links, the improvement of the architectural qualities of planning and development.

Even in a well-chosen territory for the location of a settlement, the intersection of functional zones can be carried out in different ways. In urban planning practice, it is customary to use 2-3 possible zoning of the selected territory to highlight *(Fig. 2).* Urban areas that are most favorable in terms of hygienic and architectural requirements (dry, close to green spaces and water bodies), located isolated from industrial zones, are assigned to residential areas - residential areas and microdistricts. At the same time, a convenient interconnection of residential areas with an industrial area, a recreation area, a public center, a railway station, a port, etc. is provided.

When choosing a location and planning a residential area, one should take into account the direction and speed of the winds, ensuring the ventilation of the urban area, and do not use closed basins for residential development. In areas with cold winds or dry winds of high speeds, it is necessary to protect residential buildings from the wind by placing them on lee slopes or under the protection of green belts.

In addition, the rules and norms for the design of populated areas provide for the placement of residential areas on the windward side for the winds of the prevailing direction, as well as upstream of the rivers in relation to industrial, energy and agricultural enterprises with noisy technological processes, which are sources of harmful and unpleasant emissions into the environment. smelling substances. The prevailing direction of the winds must be taken according to the average wind rose of the summer and winter periods of the year (taking into account the daily course) based on long-term observations of hydrometeorological service stations.

In areas with the opposite direction of the prevailing winds in the summer and winter periods of the year, residential areas are recommended to be located to the left and right of the indicated wind directions in relation to enterprises with technological processes that are sources of harmful and unpleasantly smelling substances. The wind rose is compiled to determine their dominant direction in a given area, taking into account long-term indicators of frequency and strength of winds *(Fig. 3).*

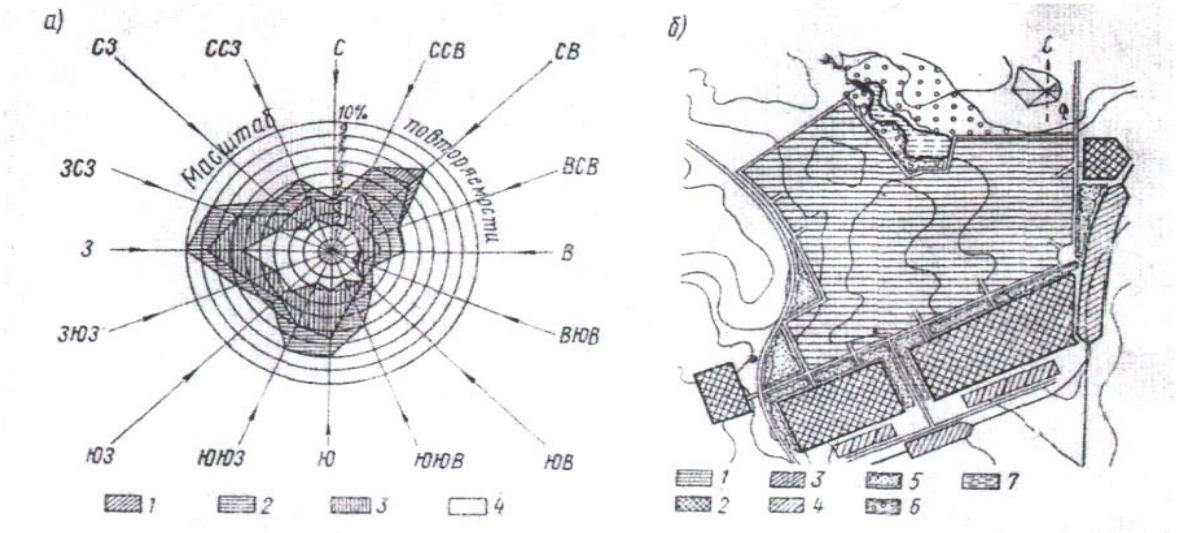

Fig.3. Wind roses and their influence:

а – rose of frequency and strength of winds; б – the importance of the wind rose when choosing a territory for a populated place when developing a functional zoning scheme:

1 - residential area; 2 - industrial; 3 - transport; 4 - warehouse; 5 - protective zones; 6 - forest parks; 7 - water beach [2].

To characterize the repeatability of the winds, segments are plotted on each of the directions of the vectors from the center on a scale, proportional to the percentage of their repeatability in this direction, assuming that the wind blows from the circle to the center. Each vector depicting the general frequency of winds in a given direction is divided into segments proportional to the number of winds assigned to each of the groups characterizing the wind strength. By connecting the ends of the segments of the same name in terms of wind strength with straight lines, separate wind roses are obtained by strength for each group of winds. The best hygienic and picturesque areas of the residential area should be allocated for the location of the city center, residential complexes and public buildings, as well as for city parks and stadiums. Industrial enterprises located on the leeward side and downstream of the river, it is advisable to group in one or more industrial areas, depending on the type of production and sanitary requirements, conveniently connecting enterprises with residential areas by rail, highways and waterways. Industrial zones to reduce the volume of excavation should be located, if possible, on a relatively flat area (with a slope of 0.05 to 5%), taking into account the removal of surface water and the required sanitary isolation from residential areas and recreation areas [1].

To ensure the possibility of unhindered development of enterprises, it is unacceptable to place their territories in a closed system. Industrial zones, where there are enterprises with a large cargo turnover, should be brought closer to railways and port facilities, connecting their territories with access roads outside the territories of residential areas and parks. Industrial enterprises, residential areas and the city center should be conveniently linked by transport routes, and the time spent on moving in one direction should be no more than 30-40 minutes.

Conclusion. The urban industrial territories that have developed to date, as a rule, do not satisfy both the environmental and architectural planning requirements of the organization of a modern city. In the same time they play a city-forming role, because sometimes occupy up to half of all urban land in established cities. In order to restore the broken ecological balance, directions for optimizing the industrial development of the city during its reconstruction are proposed.

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