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Integration of man-made contaminated areas of the former airport into urban space (on the example Berlin-Tempelhof airport)

The positive experience of the restoration of the territory of the former airport and its return to use by the residents of the city was considered. This approach can be used to restore other areas after aviation use. The need to take into account the degree of pollution of the territory by persistent pollutants, in particular the accumulation of heavy metals in the soil, is discussed.

The restoration of land that has been polluted for a long time is a huge step towards the ecological balance of urban life. Tempelhof Feld, an airport that has been in operation for 85 years, is a good example of this. Berlin-Tempelhof airport is an airport in Berlin that has been operating since the 1920s. to 2008. His story is a story about how even from a large polluted area you can get a clean island of life in the very center of a multi-million city.

The Tempelhof Field, on which the Tempelhof airport was built, used to serve as a drill ground. In 1909, Orville Wright presented his aircraft here, conducted demonstration flights and set several records. In 1922, the area was leveled and strengthen ed, and in 1923 the first two hangars appeared here. The first airline connected Berlin with Königsberg. From here, after the airport was put into operation on April 6, 1926, the first regular flight of the Lufthansa airline to Zurich was made.

The closure of the oldest and at that time one of the largest airports in Berlin was due to unprofitability. For Berliners, this did not become a global problem because there were still two large airports in the city. More this event became difficult because of the nostalgia and warm feelings of the locals. Indeed, thanks to Tempelhof Feld, the city was able to survive the blockade of the Western part in 1948. And it is also a very valuable historical monument because it was the last functioning airport built before the Second World War.

380 hectares belonging to the airport were polluted during 85 years of operation of the terminal with various emissions into the atmosphere and soil. Therefore, undoubtedly, from the point of view of ecology, the closure of Tempelhof Feld had only a positive impact on the state of the district and the entire city as a whole. It also gave local residents a clean ecological island in the very center of the city, where they can enjoy not only nature, but also do their favorite things.

Now Tempelhof Feld is a conservation area protected by German law. A favorite place for people who love to lead an active lifestyle or take a walk in nature. On the territory of the airport, you can ride on various sports modes of transport, play sports, enjoy nature or have a picnic. Various events are constantly held on the territory of the former airport. Since 2017, the Formula E racing championship has been held on the territory of the airport. A kite festival is taking place. A large number of music festivals and concerts are also held. Hundreds of people come to

this place every day to ride a bike or scooter. Run a few miles. Or go in for an unusual sport for us - windsurfing. Also on the territory there are areas for walking and training dogs. Now most of the territory of the reserve is occupied by spiky plants. There are also a small number of wildflowers. The reserve has several parts for birds and insects. Throughout the area you can see signs with species that are rare in Berlin and are found in the park.

The given example is a positive experience in solving the problem of using the territory of the former airport. Since similar technogenically polluted territories exist in many countries, there is a need to determine ways to return them to use with a different purpose. At the same time, the degree of soil and surface water pollution due to the long-term influx of air transport emissions into them should be determined first of all. During long-term use of the airport territory, aviation transport with the equipment assigned to it significantly pollutes the soil with various mechanical, physical and chemical impurities.

Soil pollution occurs as a result of the settling of pollutants from the air pool to the soil surface, which enter the atmosphere with the exhaust gases of airplanes, land-based aviation equipment, and boiler furnaces.

The soil cover is a system that is less dynamic and more buffer than atmospheric air or water bodies. One of the characteristics of the soil is that it accumulates information about the processes and changes that occur, and therefore not only indicates the state of the environment at the current moment in time, but also reflects past processes. Soils play a protective role in relation to natural waters, atmosphere and vegetation. At the same time, performing protective functions, soils can become the main source of many chemicals that pollute natural waters and are dangerous for plants.

Studies conducted in Ukraine and abroad show that the level of soil pollution in the area of airports and aircraft maintenance enterprises is quite high. 1 m^2 of soil contains up to 250 g of organic and inorganic chemical substances of artificial origin. There are large areas of airport territory subject to wind erosion. This process is facilitated by soil pollution with fuel and lubricants, as well as gas emissions entering the natural environment as a result of emissions from internal combustion engines and special vehicles. The most intensive pollution of the soil in the places where vehicles are filled with fuel and lubricants, due to emergency spills.

Heavy metals are especially persistent pollutants, therefore, when significant pollution is detected, it is necessary to carry out remediation of the territory using appropriate methods. The soils of former airport areas are contaminated with the following heavy metals: zinc, copper, lead, chromium, tin, tungsten, as well as specific metals (cobalt, nickel, cadmium, strontium, silver, lithium).

Unlike organic chemical pollutants that decompose over time, heavy metals can only be redistributed among the components of the natural environment, and the periods of their decomposition can be many thousands of years.

Examination of soils near airports showed an increased content of heavy metals in them more than 20 times. The maximum pollution was observed near fuel and lubricant warehouses, repair shops, the platform, as well as along the runways, especially in the places where planes take off and land. With severe and moderate

pollution, from 8 to 18 mg/kg of heavy metals were found in the soil, the content of which significantly exceeded the permissible standards.

Organic pollutants are subject to biodegradation and after a long period of time after the closure of airports do not exceed the usually permissible normative values.

It is important to have a developed plan for the further use of the restored territory and to carry out cleaning measures in accordance with it. Planting plants that have phytoremediation properties can be an economically beneficial and expedient solution that will reduce the time of restoration of the territory after aviation use.

Thus, solving the problems of returning man-made contaminated territories of former airports is a difficult task of cleaning, first of all, the soil as the main pollution accumulator. At the same time, there are examples showing the positive experience of restoring such areas.

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