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The conditions and factors for the formation of environmentally dangerous internal processes in water in technogenically loaded territories

The conditions for structural and functional changes in technogenically transformed water systems under intensive influence of civil aviation enterprises were analyzed. The conditions for the formation of ecologically dangerous processes in water, which are the reason for the fact that technogenically transformed water ecosystems lose self-cleaning and self-regeneration ability, were revealed.

Every technogenic load on water ecosystems leads to the formation of ecologically dangerous processes inside them and transformation of natural modes of hydro-ecosystem bonds, that causes the violation of their stable functioning and formation of technogenically transformed water systems. The result of these processes is the technogenic transformation of water systems, that inevitably leads to the loss of the ability of the aquatic ecosystem to self-cleaning, self-healing and self-regeneration. That is why it is extremely important to estimate a level of changes in natural water ecosystems, during the technogenic transformation into technogenically changed water systems, including the areas influenced by aviation enterprises [1-6]. In such a situation it is so topical to study the intensity of internal processes in water, namely, the structural and functional organization of the evolution of technogenically transformed water systems, located alongside civil aviation enterprises [7, 8].

To determine the causes of ecologically dangerous inland water processes formation and to establish structural and functional changes of technogenically transformed water systems it is necessary to clearly outline the limits of possible technogenic influence (in our case – enterprises for operation and repair of aviation engineering), which a particular water object can withstand [9, 10]. Since the evolution and functioning of a single hydro ecosystem under the influence of technogenic factors contributes to the formation of «specialized» subsystems, joint by feedback links, that provides homeostatic mechanism for the development of a single conceptual model of the system. As an investigation object a single conceptual system of hydrographic structural units of the Dnipro basin was chosen.

The subsystems of this system, which are undergoing technogenic transformations because of the activity of enterprises of aviation industry, are:

I. ***The area of Nyvka river*** (the area of discharging the return water of enterprises for the operation and repair of aviation engineering), right tributary of Irpin river, that is one of the main sources of technogenic pollution (pic. 1).

Pic. 1. Nyvka river

II. ***The main watercourse of Irpin river*** (from the place of confluence of Nyvka river to the mouth) – right tributary of Dnipro river (pic. 2).

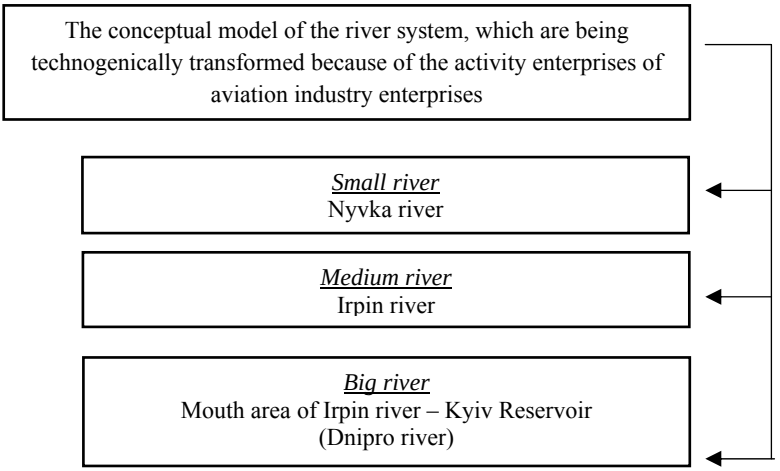
Pic. 2. The place of confluence of Nyvka river (on the right) into Irpin river (on the left)

III. ***Near-mouth coastal zone of the Kyiv Reservoir, at the place of confluence of Irpin river*** (pic. 3).

Pic. 3. The place of confluence of Irpin river into Kyiv Reservoir

The length of the conceptual water ecosystem is approximately 55 km: from the Nyvka river mouth (Solomyansky district of Kyiv) and to the area of watercourse of Irpin river, which flows into the Kyiv Reservoir near Kozarovychi village.

A generalized conceptual system of hydrographic structural units of the Dnipro basin, which are being intensively technogenically transformed, is shown in pic. 1.



Pic. 1. The subsystems of structural units of a single conceptual system of technogenically transformed water systems because of the activity of aviation industry enterprises

The aggregate of interrelated components in the system «natural environment (Irpin river) – technogenically transformed environment (Nyvka river)» are subordinated and connected with each other as a result of the functional interaction, hydrographic location and feature all hierarchical levels of the ecosystem. Such an integration is consistent with the hierarchical concept of system formation «technogenic influence – effects of the influence» in the presence of technogenically transformed water ecosystems.

So, the causes and effects of the formation and functioning of technogenically transformed water systems and their ecologically balanced evolution can be reduced to the matrix basis, which has several phases:

- ecological evolution of the river system of hydrographic structural integration, that is undergoing technogenic transformations because of the activity of enterprises of aviation industry;
- strategic directions of the approach to the research of structural and functional changes in technogenically transformed water systems evolution;

- application of tactical approaches to the determination the causes and effects of technogenically transformed water systems formation;

- definition of scientific regularities of the evolution of technogenically transformed water systems in the system «technogenic influence – effects of the influence»;

- development of technogenic influence indicators;

- definition of indicators of ecological capacity balance loss;

- definition of the features of the compensatory mechanism of technogenically transformed water systems biotic self-regulation.

Such a matrix basis, developed to find out the causes and effects of the formation and functioning of technogenically transformed water ecosystems, which are under the influence of aviation industry enterprises, can be used as a model for forecasting the state of technogenically transformed small and medium rivers of Ukraine.

Conclusions. The conditions and factors of the formation of ecologically dangerous inland-water processes associated with their technogenic transformation under intensive influence of civil aviation enterprises were analyzed. The causes and effects of formation of technogenically transformed water ecosystems in system «technogenic influence – effects of the influence» were defined.

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