

*Materials of Conferences***LANDSCAPE APPROACH TO
GEOECOLOGICAL RESEARCH OF THE
SMALL RIVER BASINS**

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Due to high rate of economical activity anthropogenic pressure grows on the geosystems of different hierarchical level (from landscape region to phase [biogeosystem formed on homogeneous element of relief]), including water objects. At the same time the condition of water objects changes quality of geosystems connected with them. It creates the potential danger not only to living organisms but also to people.

The state of the natural complexes of the small rivers basin is an indicator of the river network condition. Any change in the natural-territorial complexes (NTC) has an effect on their hydrological regime and also it brings the series of changes into the large rivers. Besides river system represents independent azonal territorial unit but its basin is characterized by certain set of geocomplexes – NTC. The very aggregate of characteristics of geocomplexes determines hydrological indices of river in different parts of it, forming the general picture of hydrological and hydrochemical indices of the river system.

The small and medium river basin landscapes constantly escape from steadfast attention of researchers in spite of the fact that they define an ecological situation of region on the whole. As a result, it is necessary to study and preservation of an initial spatial link (natural-territorial complexes) which define the characteristic and condition of the small rivers.

Nowadays the problems of a geoeological condition of large river systems and the small rivers and also natural outflow of the underground waters connected with karst are poorly studied. For example, the majority of research in this region is made in practical aspect without detailed consideration of geographical and geoeological conditions of the small rivers. The importance of research is also proved by the fact that small rivers of Krasnoyarsk region are less studied than large ones. On the territory of the Krasnoyarsk region (excluding the Angara river basin) more than 180 thousand rivers in length less than 100 km, that makes more than 96 % of total of all types of the rivers in this vast region. Only 135 small rivers had or have stationary points of hydrometric observation [1]. It is important to notice the economical aspect of this problem, the installation of stationary points of observation on all small rivers is impossible because of large financial expenses. Therefore

the small rivers are studied not enough. The problem-solving helps to understand dynamics of landscape shape changes of the river basin. Besides, it is necessary to understand the problem of natural genesis of landscapes, and to determine the anthropogenic factors influence on natural landscape formative and hydrological processes [2].

Objects of our geoeological research are the natural-territorial complexes including basins of the medium and small rivers of the Krasnoyarsk region - Mana, Kacha, Bolshaya and Malaya Sliznevo, Bazai Kha, Beryozovka, Esaulovka. Subject of research is NTC geoeological condition and its interrelation with hydrological and hydrochemical indicators of the rivers for the further monitoring.

The research is based on the following sources: historical archives, funds, scientific publications, and thematic maps. The major method of our research is a landscape method. The further work was connected with deciphering space images and field work which was based on the landscape basis of NTC level of groups of natural boundaries made by us (Scale 1:100 000, 1:200 000). Sources of the primary information about ecological condition of studied areas are laboratory examination of water (hydrochemical indicators of water samples), and also the state reports about environmental conditions the Krasnoyarsk region (1999-2005), data from meteorological stations and materials of Central Siberian Hydrometeorological Station.

Since 2004 we collected the information about the basic characteristics of investigated objects gathered. Complex field research was carried out on 7 rivers with different anthropogenic loading and physical-geographical characteristics. On the example of the Kacha River we will consider interrelations between NTC conditions, formation of a river basin, its hydrological and hydrochemical parameters.

The territory investigated by us is situated down on a joint of two landscapes: the Krasnoyarsk Plain and the Kemchugsky Hills. In this connection on the given territory three more transitive areas are allocated: foothill ridge weakly inclined plain, bog-valley terraced complex, and valley complex of the Yenisei River. Foothill ridge weakly inclined plain is a result of transition from the Kemchugsky Hills to the Krasnoyarsk Plain, bog-valley terraced complex was formed due to the work of the Kacha River. Valley complex of the Yenisei River is the 5th Yenisei above-floodplain terrace which is situated in the mouth of the Kacha River.

On all area of studied basin there are 5 landscape areas with different physical-geographical characteristics. From this follows that kinds of human economic activities on all of these areas are various.

Landscape area I - the foothill height concerning the Kemchugsky Hills; in each square kilome-

ter a discharge is formed about 6 times more than in the Krasnoyarsk Plain. Occupying approximately 30 % from all area of the Kacha River basin the mountain part of this territory gives 80 - 85 % of the general discharge [3]. The district defines features of all river basin nutrition (the mixed type with prevalence of snow). The forest district, with prevailing forms of a relief - gentle and middle-slopes, wide NTC watersheds, is presented by subtaiga pine and larch-pine forests, with dark coniferous representatives on valleys of the rivers. From the middle of the XX-th century 10 - 15 % of the given district of a river basin were used by people for timber cutting. In total during 1935 - 1980 more than 16 thousand hectares were cut down. Forests in the Kacha riverheads (the areas of continuous cuttings down have reached 50-85 %) was most intensively cut down, and by 1990 actual decrease of forest coverage taking into account forest regeneration has made 10-35 % and more [3]. Now the most part remains «forestless» since it is used for gardening.

Landscape area II - foothill ridge weakly inclined plain consists of 22 % of the area of the river basin. More smoothed relief contributes to the fact that 35 - 40 % of territory is occupied by dwelling building, agricultural fields, cottages, summer pastures. As a result practically all inflows the Kacha River are regulated by artificial dams and about 11 ponds were constructed. In the given territory the drawoff for irrigation of agricultural fields is carried out. Uncontrollable discharge from cattle-breeding complex on the territory of a river reservoir are fixed. For drinking water supply, the Kacha River discharge is not used because its water does not meet the sanitary requirements.

Landscape area III - the raised forest-steppe plain, occupies 33 % of the area of the river basin. 70 - 80 % of this district are smoothed raised elevations and very gentle slopes which are occupied by arable lands, mowings and pastures livestock, settlements. There is an increased use of water for irrigation compared to the previous district as there are more agricultural enterprises. Pollution sources pollution of this part of basin are unauthorized dumps of solid domestic and industrial wastes, boiler-houses in immediate proximity from river-bed, industrial areas, summer camp for rest of children, asphalt factory, petroleum products warehouses, garages with mechanical workshops, dumps in a coastal zone, cattle-breeding complexes and the agricultural enterprises.

Landscape area IV - bog-valley terraced complex of the Kacha River, occupies 11 % of the area of the river basin. Only 50% of its economic potential is used. It is basically valley meadows on which pasture of livestock and fellings are made and cottages are built. Mechanical pollution of the river bed by the adjacent industrial enterprises takes place. Also the large airport discharges polluted water to sewage system.

Landscape area V – valley complex of terraces of the Yenisei River. The district occupies only 4 % of the area of pool of the Kacha River, 95 % of district are city buildings of the Krasnoyarsk. The bottom part and a river mouth are in city boundaries. On the given territory there are dumps of the large enterprises, not authorised dumps of a household waste, city rubbish.

In parallel with studying of ecological condition NTC, hydrological measurements and hydrochemical analyses according to a number of indicators (pH, indicators of biological and chemical consumption of oxygen, the maintenance of the dissolved oxygen, rigidity of water, mineral structure, biogene elements) are conducted.

Such landscape-geoecological approach allows to receive full complex representation about a modern condition of territory of basin as a whole, to allocate zones of the high anthropogenic loading and to define dynamics of the following processes influencing on hydrological and hydrochemical indicators of river system. The revealed regularities allow not only to predict, but also directly plan the protective actions increasing NTC stability, and preventing the rivers from negative change.

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ON MONITORING OF ASTANA SOLID WASTE LANDFILL

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The new capital of the Republic of Kazakhstan is in the stage of active construction and growth of population. These factors are attended with natural growth of solid domestic waste amount. From July, 2006, in Astana a new landfill located as far as 6 km along the Astana-Pavlodar highway, 50 m eastwards from the one, near the old polygon, operates.

The landfill area is bermed with a 1,5 m tall embankment to prevent atmospheric fallouts from draining from the landfill territory. Gathering and stocking of recyclable materials is carried out separately: metal scrap, reinforced concrete, automobile tires, wood waste.

In geomorphological relation the areas of the polygons are located on the water-parting of Sarybulak and Solyonaya Balka streams flowing into the Ishim River. In 2001 the groundwater monitoring project, wherein it was considered sufficient to manage a network of three well bores №1,2,3 to organize a secure network and find out the mere fact of contamination, was developed. The presence of these well bores together with the existing bore №201 allowed evaluating the intensity of groundwater contamination processes.

The bore № 1 was drilled 50 m northwards from the open cast.

The bore № 2 was drilled down the groundwater stream 50 m southwards from the open cast; nowadays the bore is out of order.

The bore № 3 was drilled down the groundwater stream 200 m southwards from the open cast. The bores' depth made 40 meters each one. All the bores revealed Paleozoic formations. The water bearing zone of the upper Devonian rocks jointing is defined by the well bore №201, which is 40 m deep, drilled in 1991 for the landfill water supply.

In the course of the works carried out from 2003 to 2007 it was found out that there is a hydrochemical influence of the polygon on the groundwater. In all the bores it was determined an increased concentration of cadmium, lead, solid residue. In 2008 the drilling of two more well bores in the SDW disposal location area is prescribed by the Environmental Management Plan: downstream the groundwater flow, high and low the landfill location. These measures will allow improving the existing system of overseeing the influence of the landfill on the environment.

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