



## The monitoring system of the Kazakhstan sector of Caspian Sea

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### The monitoring system of the Kazakhstan sector of Caspian Sea

The Caspian Sea is the largest closed reservoir in the world, which washes the western part of Kazakhstan. The area of water territory is 371,000 sq km; the sea level is lower than the level of the ocean on 28.5 m (1971). Maximum depth is 1,025m (in the southern part); the Kazakhstan part is not deep, and the depth of the North Caspian sea is about 15-20 m. The Caspian Sea is divided according to physical and geographical conditions to 3 parts - North Caspian, Middle Caspian and South Caspian Sea.

Fauna is represented by 1809 species, 415 of which belong to the vertebrates, 101 species of fish, it also has the majority of the world's sturgeon, freshwater fish - roach, carp, pike, saltwater fish - carp, mullet, sprats, Kutum, bream, salmon, perch, pike, mammal - caspian seal.

The plant world is represented by 728 species, of which algae are dominated - blue-green, diatoms, red, brown, Stoneworts and others, from flowering - eelgrass and seagrass.

Development of sea oil-and-gas deposits of the Kazakhstan sector of Caspian sea entails increase of anthropogenic pressure on the environment. According to preliminary estimates, the volume of recoverable hydrocarbon resources in the Kazakhstan sector of Caspian Sea is about 8.0 billion tons per year.

The impact of terrestrial and marine infrastructure, oil and gas facilities on natural systems is reflected in discharges and emissions into the environment of gaseous, solid and liquid pollutants, consumption of natural resources for industrial, farm and household needs, and violation of coastal landscapes. Dangerous influence on the environment is burning natural oil gas on torches. In this regard, there is a need for a system of state monitoring.

In a basis of environmental monitoring system of the Kazakhstan sector of Caspian Sea has been put an ecosystem approach, creation of an automated system on the basis of GIS technologies and modeling of forecasts of environmental condition. Objects of monitoring in the Caspian Sea will be: air, sea water, bottom sediments, coastal ecosystems, benthos, plankton, aquatic vegetation, fish, birds, seals.

The main component of environmental monitoring system of the Kazakhstan sector of the Caspian Sea will be conducted on the basis of the complex program "Ecologist".

#### 1. Modeling of Ecological processes

- Data support by 3 types of sources: files with List structure, Prototype Files and files with Analogs of Normative
- International and Regional Regulation
- Creating of Pollution Matrix
- Adjusting of adaptive Factors

#### 2. Choosing and elaborating the proper mathematical methods for Resource Control

- Consecutive Calculations Method
- Coordinated Descend Method
- Liner Programming

### 3.Computerizing

- Analyses of Environment State
- Multi Projecting of resource control
- Algorithmic and Graphical Support of Step by step Project forming

Block Scheme of System

New Object - Creating New Object for Applied Ecological Study (OAES)

Choosing Territory, Environment Media, Harmful Substances

Description of Pollution Sources, Measures and Natural Phenomena

Forming Models

Old Object - Choosing Old OAES

Model Creating and Parameters Adjusting

Report – Analyses of Ecological State

Control – Multi Project Designing of Environment Measures

The system of environmental monitoring of the Kazakhstan sector of Caspian Sea will allow to evaluate the ecosystem of Caspian Sea and the coastal areas in the Kazakhstan sector, air pollution, sediment, impacts on biodiversity, to identify the oil film on water surface, to determine the parameters of the spill, to convert the monitoring results in graphical and tabular form, to predict the development of the current situation with regard to the influence of external factors in the geographic information (GIS) environment, to plan operations localization of zones of pollution and disaster situations.