

# Analysing Environmental Implications of Anthropogenic Impacts as a Result of Syzran Shale-processing Refinery Work

**Chumachenko N.G., Turnikov V.V., Petrova E.V.**

*Samara State Technical University, Institute of Architecture and Civil Engineering*

*Address: Molodogvardeyskaya St., 194, Samara, 443001, Russia*

**Abstract.** *Extraction and primary processing of natural minerals have a direct human impact on the lithosphere in the following way: the area of excavation and the area covered by rock dumps of overburden and substandard rocks increase; the landscape also changes. This problem occurs on all operated deposits and exists in out-of-operation deposits. This paper performs a critical analysis of environmental implications of anthropogenic impacts as a result of Syzran shale-processing refinery work. Rock dumps parameters № 1 of Mine 3 and № 2 of Mine 5/6 of ZAO "Kashpirskaya Mine" are investigated. Rock dumps depth and surface area, conservation volume and utilization capacity are considered to be landscape modifying parameters. The research demonstrates rock dumps parameters change in the period from 1950 to 2002. The paper evaluates the degree of anthropogenic impact of dumps territories and burnt rocks burials which were formed during the extraction of oil shale at Syzran shale-processing refinery. Those rock dumps resulted in the following transformation and change of the natural system and landscape: curvature of the slopes altered, soil and vegetation cover was dislocated. The only industry capable of reducing ecological tension in the region is building industry.*

**Keywords:** *resource output, anthropologic impact, burnt rock dump, construction industry, landscape change.*

## I. INTRODUCTION

Samara region has various natural minerals reserves for the production of building materials. To begin with, such materials are brick and tile, and expanded-clay and argillous raw materials, the fields of which distributed on the whole region. Besides, there are other mineral resources in the region. Among the major fields with a long history of exploitation: deposits of carbonate rocks - Sokskoe and Troekurovo-Guben; Balasheevskie molding sands; Kashpirskoe oil shale. Among the major fields with a long history of exploitation may be: Sokskoe and Troekurovo-Guberskoe, Balasheevskiy molding sand; Kashpirskoye oil shale field. The extraction of natural resources in most cases is being done with surface mining. As the location production the pit area is increased and the pit has much overburden dumps and non-standard raw materials, which leads to an influential change in the landscape. These effects are manifested in all producing fields and stayed in the unexploited fields.

Due to the scale of the Russian Federation, the Samara Region, in particular, the task was monitoring the area occupied by pits and dumps. The area has a lot of vacant land, but landscape changing barrow pits and accumulated dumps, has ecological effect of anthropogenic impacts. A typical example is the area of oil extraction shale OOO "Shahti Kashpirskaya" Syzran petrochemical company based in Shale.

## II. EXPERIMENTAL METHODS

When the extraction and processing of natural mineral raw materials, human influence directly on the lithosphere. The degree of human influence is difficult enough to estimate, but there are indicators, that can be measured, estimated, trace the dynamic. Tetnor A.N. [1] It says that anthropogenic impacts include all types of oppressive nature effect produced by the technology and the human directly.

The anthropogenic impacts on the biosphere in the past decade came on the same level with the natural influences, become a guiding force further evolution of ecosystems. This is due not only population growth, but a quantum leap in the development of science and technology.

An analysis of the ecological effects of anthropologic impacts allows them to divide all types on positive and negative. The positive human effects on the biosphere may be the restoration of natural resources, groundwater recharge, and land remediation on the land development of mineral resources.

Negative human effects on the biosphere are manifested in the most different and extensive actions: deforestation over large areas, salinization and desertification, depletion of fresh water, the destruction of natural landscapes.

Many human effects are made on purpose; there is the technical transformation and destruction of

natural systems and landscapes, to achieve the goals In the process of natural resources extraction. By the nature, the depth and distribution areas, the anthropogenic impacts time actions [2-5] may be different.

When extraction of mineral resources with surface mining first of all, there is an infringement of the soil cover in the developed area of the field due to remove, pollution, bury and destruction of soil. The area of disturbed soil with the further development of deposits is increasing. A similar situation may be with the construction (drifting of building pits, trenches for communications, road construction).

The next stage is extraction of mineral resources where overburden removes, and they are also stored around the pit. As the development of pits - the number of pits is increasing while they are produced. The negative consequences at this stage include reducing the area of fertile land, and subsequently the landscape changes.

In the future, sub-standard difference of mineral raw materials may be added to the overburden. Each field has its own situation, which depends on many factors: geological features, square pits, production capacity (availability of access roads and approaches to the development of new lands).

Technogetic impact in this case is a change in structure of the complex geodynamic its components or linkages between them. This may be a change in any of geological factors or process conditions of flow. Besides the terrain disturbance there may be changing the slope of the curvature, the composition and the build of massive rocks.

In the future, there will be a violation of the hydrological, hydrogeological and hydrodynamic conditions, which led to the modification or destruction of the biochemical cycles.

There are a lot of negative impacts in extractions of mineral resources by underground method. A typical example of shale extraction is Syzran petrochemical company based in Shale.

Oil shales are common minerals. The structure of combustible organic substances (up to 70%) in limestone or mud mineral mass is a part of them. Shales can be used as fuel, and the most valuable direction is a chemical feedstock.

One of the largest oil shale fields in the Volga is Kashpirskoe near Syzran. Value Volga shale is their shallow occurrence, facilitates the production, and in particular the composition of the organic part.

For the first time, Kashpirskoye oil shale field in the scientific papers referred to the XVIII century. During the nineteenth century, geologists have repeatedly offered to expand extraction of oil shale in the village Kashpir. But in practice, these proposals have been implemented since 1917. At this time, the question of building a shale company near Syzran Shale was opened.

Oil shale extraction was carried out by underground method, first of all, from pits and adits and further- in closed mines by drilling and blasting method.

The Mine № 1 was founded in 1932 to provide raw materials and fuel for Syzran Shale company which was built in the same year, which specializes in thermal processing of oil shale. As the report shows [6], the company was built next to the Kashpirskim shale field.

The mine № 5/6 put out the operation in 1950 and the mine № 3 is in 1959. In 1967, after working reserves, mine № 1 was closed, and in 1991 the mine the №5/6 was closed as well.

Oil shale extraction in the Kashpirskoe field lasted more than 80 years until 2003 and was accompanied by the accumulation of waste rock and rock containing not removed during the extraction and subsequent sorting shale. The presence of organic substances in dumps promoted mixed spontaneous combustion [7], which led to the formation of burnt rock.

### III. EXPERIMENT

On the instructions of the Ministry of Natural Resources in the Samara region in 2003 - 2004 on the theme "Creating a local source of raw materials based on the construction industry waste dumps and burial audit exploited and unexploited fields of Samara region" was estimated man-made dumps and burial formation of waste shale Syzran company. Published dumps Kashpirskiyi fields date was manipulated for analysis since 1950.

According to published data, all waste dumps are not burning, waste dumps № 1 and № 2 are plat, deformation was off.

Survey dumps conducted in 2004 showed [6] that their form in certain areas characterized by a plat (Fig. 1 and 2), there is altitude. Waste dump mine № 1 has the shape of the pit (Fig. 3). The central part is developed and there are the pit heap remains, which look like indiscrete mass of weathering products (Fig. 4).



Fig. 1. Rock dump №1



Fig.2. Rock dump №2



Fig.4. Rock dump of mine №1



Fig.3. Rock dump of mine №1

As follows from the data, presented in Fig. 5, the done supply of rocks in the dump №1, changed widely. It amounted to 55 thousand m<sup>3</sup> in 1950, it changed from 179 to 260.8 thousand m<sup>3</sup> in the period of stable work (1977-1989). The exception was in 1981, when the supply was 130 thousand m<sup>3</sup>.

The decline in production was since 1990. The extraction peak was in 1991. The decay period was from 1992 to 2002.



Fig.5. Dynamic of accumulation and usage of pit dump №1  
 Volume thousand m<sup>3</sup>, Years, Shorthand: years handling mineral resources into the dump

The volume of use of the breed in the published data has come to represent in 1988. There is an important development in the use (more than 10-fold) from 1990 to 1992 and reached 450 thousand m<sup>3</sup> to 1992. The period from 1992 to 1998 can be characterized as a period of smooth development the volume of use. In the period from 1999 to 2003 volume was using the maximum and stable in the period from 1999 to 2003.

The dump volume №11 was uniformly increased from 1950 to 1989. As we can see from Fig. 6, its volume increased during this period by more than 5 times. The dump volume began to decrease since 1987, due to the start of the planned overburden use. From 1988 to 1994 the volume of the dump varies slightly from 1988 to 1994. The dump area built up from 1984 to 1987, and since 1990 it does not change and amounts to 155,940 m<sup>2</sup>.

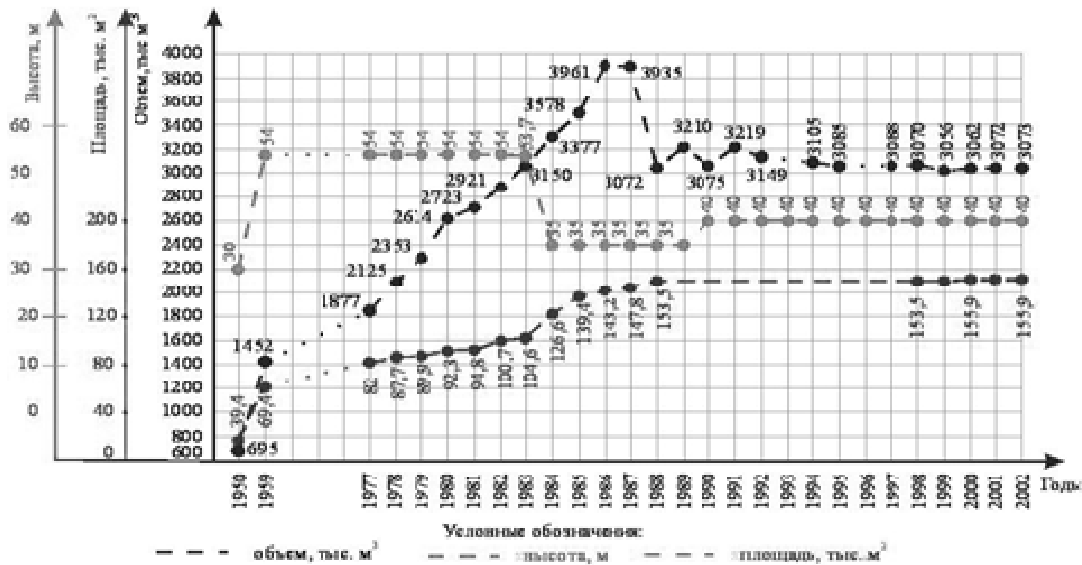


Fig.6. Dynamic of accumulation and usage of pit dump №1  
Height m, square thousand m2, Volume thousand m3, Years, Shorthands: Volume thousand m3, height m, square thousand m2.

When the dump was forming, its height has increased on 20 m., but it has not changed for the period from 1950 to 1959. The height of 40 m. appears in the published data since 1990.

The actual height for the dump №1 mine №5/6 is 35 m. The dump is filled to 94%. The use of waste rock is 7.4 m<sup>3</sup>, which corresponds to 0.9% of the accumulated volume.

The annual flow in the rock dump, as it follows from the data presented in Fig. 7, was varied over a wide range of 9 to 139.6 thousand m<sup>3</sup>.

The dynamic increase in production is typical for 1997-2001. The nature of the accumulation can be characterized as unstable.

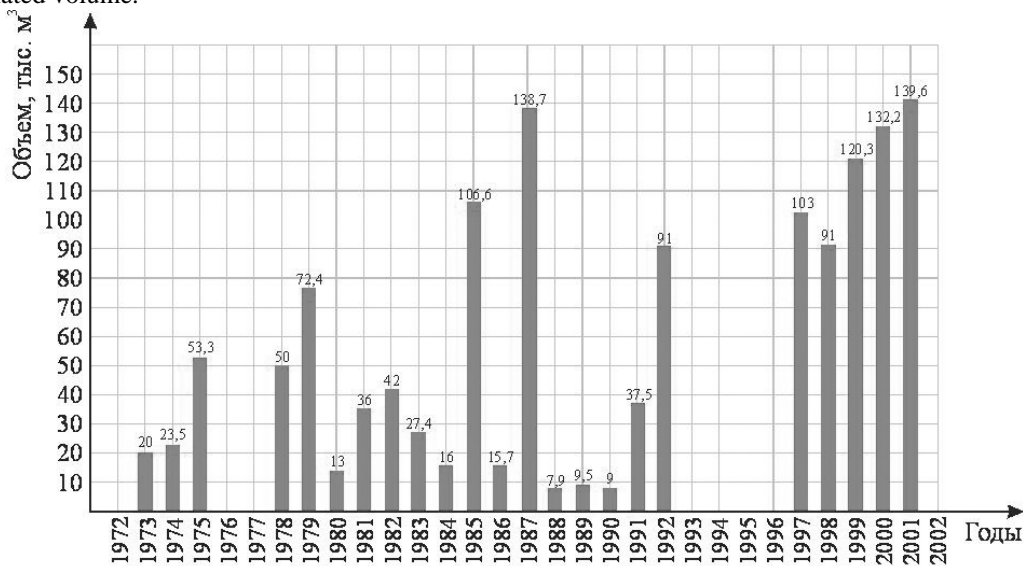


Fig. 7. Character accumulation pit dump №2  
Volume thousand m3, Years

#### IV. DISCUSSING

Due to the economic changes in the country there have been significant changes in the environmental conditions. At the time oil shale company execution work does not process the shale, and uses the accumulated stocks of resin uses for this work.

The important improvement atmosphere state is due to a decrease in emissions of oil shale company, termination of burning waste heaps mine № 3 and № 5/6 (previously backfilled burning rocks ended, new breeds are not available), stopped emissions agloporite company and insulation products company.

Water state pool is also improved, due to a decrease in the level of industrial and household waste pollution, which, in turn, is related to the termination of the mines, agloporite company and thermal insulation products company and the reduction of shale production company.

The reducing negative impact of dumps on resources land is due, primarily, to the mines closure and the lack of income in spontaneously combustible pit waste heaps.

At the same time burned rocks are mineral raw materials [6] akumineironsilicate calcium composition. When resource-saving method approach to the construction resource base industry [7-9] technological education and natural raw materials are the single source of raw materials. The human structures use in the production of various building materials [10-12] solves environmental problems. Outlined transition in the production of building materials to multi-natural and human compounds [13] is possible with computer design of charges. With this approach, burnt rocks become raw material base [6] for the production of a wide range of building materials from the burden.

#### V. CONSLUSION

1. The squares and volumes of human structures dumps and Syzran petrochemical company based in shale burial was estimated (ZAO "Mine Kashpirskaya").
2. It was found that the mine dumps Kashpirskaya, accumulated over more than 50 years, on-curently dumps do not burn, but they occupy large areas, have changed the landscape, reduce the area of fertile land and have a negative impact on the surrounding area.
3. Using rocks heaps in the construction industry will reduce environmental stress.

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