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# Digital subsurface - use as an important factor in the development of the region

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**Abstract.** The article describes the role and significance of digitalization in the modern world. The author claims that the transition to digital subsurface use will open up new opportunities for the regional development of the fuel and energy complex, will avoid some existing environmental problems and bring the region's economy to a more favorable level.

## 1. Introduction

At present, any actively developing territory strives to go forward, creating scientific and technical opportunities and prospects. The state is now trying to switch to digitalization and the digital economy, which is essentially inevitable [1].

Digitalization of individual industries will provide great opportunities for development not only for specific regions, but also for the whole country [2].

A distinctive aspect of the nature of the Russian economy is the presence of a large natural resource reserve, a significant part of which is accounted for by the Yamalo-Nenets Autonomous Okrug.

The subsoil of the Yamalo-Nenets Autonomous Okrug includes the main types of minerals from the most common, to combustible, metallic and non-metallic types. Combustible minerals are mainly represented by oil and gas deposits in the north of the West Siberian region [3].

The purpose of the study is to study digital subsurface use and its impact on the further development of the region.

The object of the study was the Yamalo-Nenets Autonomous Okrug, as a territory rich in mineral extraction and a forge of mineral resources in the Russian Federation [4].

The research was based on such methods as analytical, economic and statistical, and monographic.

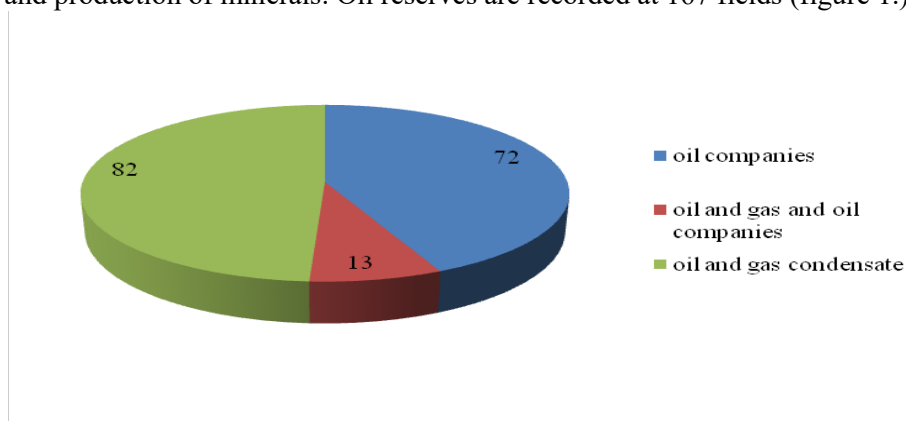
The relevance of the topic is undeniable, since digital subsurface use is the main path to the careful and rational use of resources. Information related to subsurface use is growing every year and it is important to use it in the right way, so that it brings a certain benefit, with the use of the latest technologies [5]. As a result, a new reality has emerged - the creation of a single information base that will allow you to combine key data:

- On the most popular objects and subsurface areas;
- About licensing;
- About the state expertise;
- About the current geological state of certain objects and their study in the future;
- About the latest technologies used;
- About the plots that were put up for auctions and competitions, and much more.



## 2. Materials and methods

At the beginning of this year, 73 enterprises engaged in activities in the field of subsurface use were registered in the territory of the district, they also hold 291 licenses for the study, evaluation, search, exploration and production of minerals. Oil reserves are recorded at 167 fields (figure 1.).

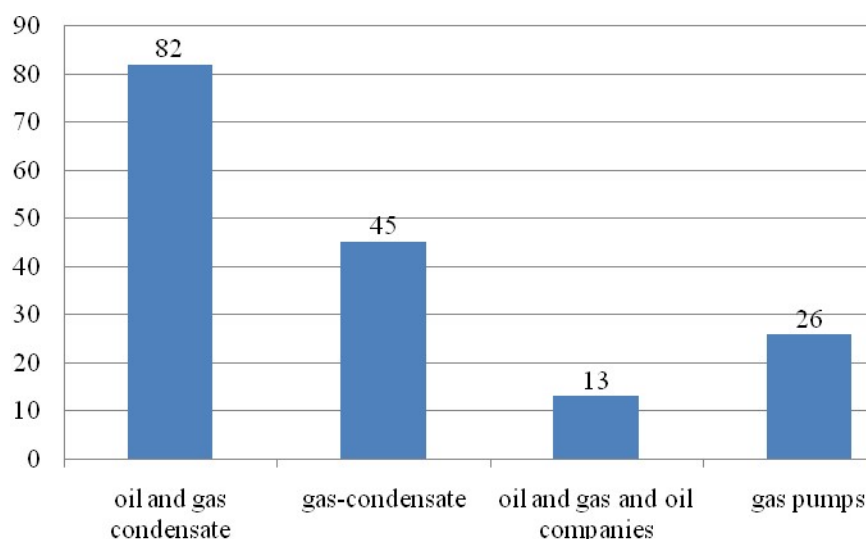


**Figure 1.** The number of oil fields registered on the territory of the Autonomous Okrug, pcs.

Main oil-producing enterprises:

- AO “Gazpromneft-Noyabrskneftegaz”;
- OOO “Gazpromneft-Yamal”;
- PAO “Rosneft Oil Company”;
- OOO “YARGEO”.

Oil production for the entire period of use varies in the limit of 990 million tons. Gas reserves are recorded at 166 fields (figure 2).



**Figure 2.** Number of gas fields, pcs.

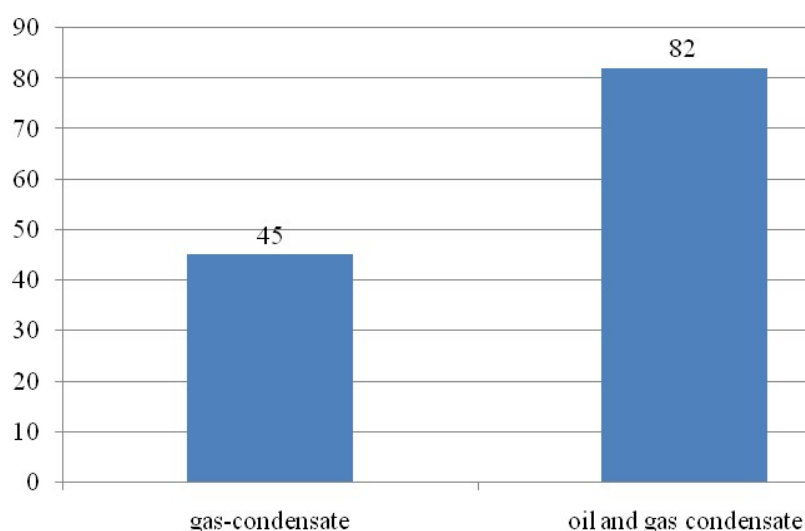
The main gas fields are considered to be:

- Bovanenkovskoe;

- Urengoykoe;
- Yamburgskoe;
- Polar.

The total volume of gas is 32307 billion m<sup>3</sup>.

Gas condensate reserves are recorded at 127 fields (figure 3).



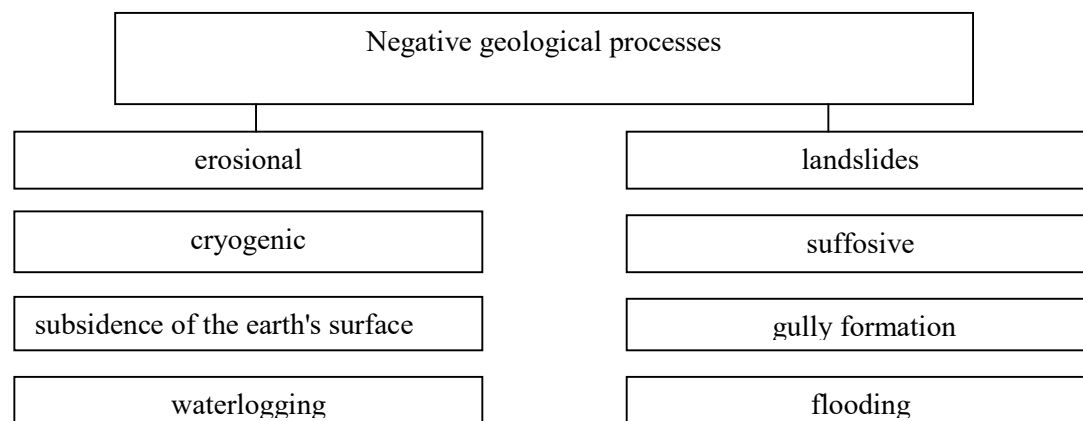
**Figure 3.** Number of oil and gas condensate fields, pcs.

Four oil and gas condensate fields are considered the largest:

- Bovanenkovskoe;
- Urengoykoe;
- Yamburgskoe;
- Polar.

The main reserves amounted to 1288 million tons [6].

In the study area, as a result of active subsurface use, certain dangerous geological processes were identified, which are shown in figure 4.



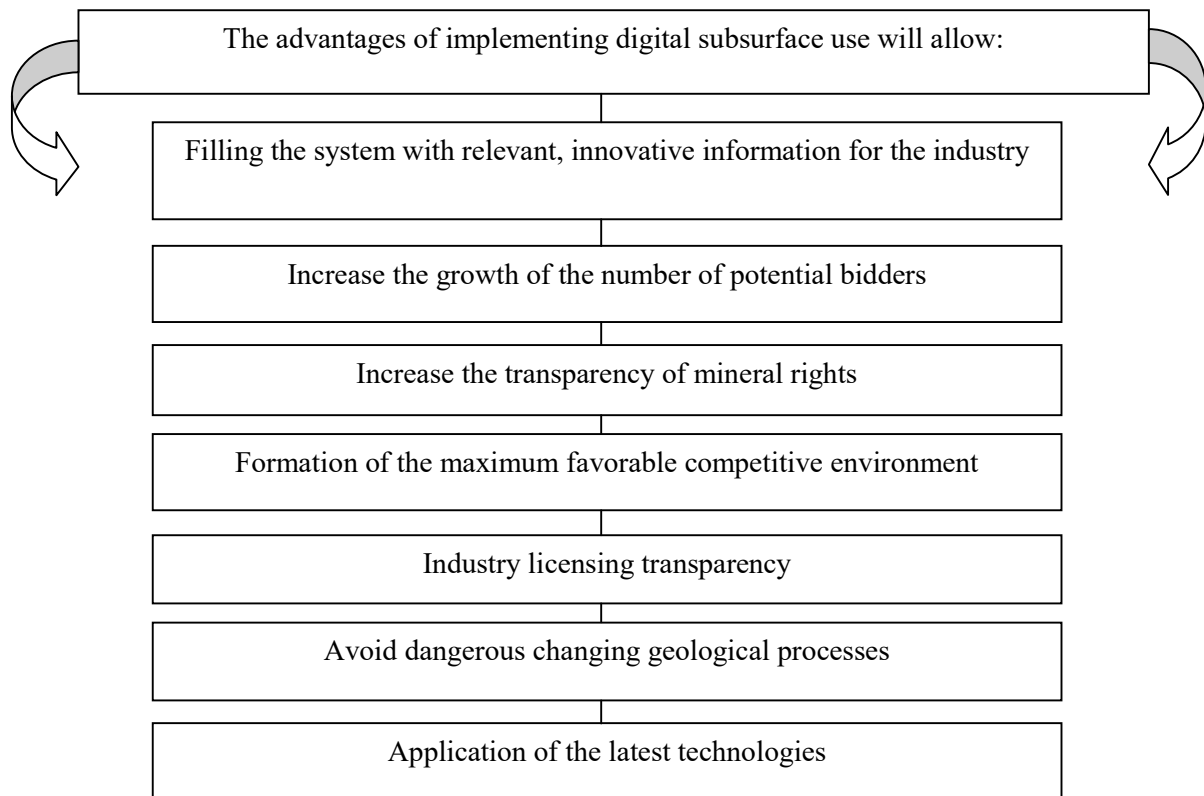
**Figure 4.** Existing geological problems arising on the territory of the Autonomous Okrug.

The high intensity of gully formation is present mainly in settlements and adjacent territories, where there is a pruning of the slopes [7]. The main source of gully formation is rain and snowmelt. The processes of flooding and waterlogging are observed throughout the study area. In the industrial areas of the region, there is frequent man-made flooding. The ground water level increases, which leads to different types of precipitation, thereby deforming buildings and structures.

Since the autonomous okrug is located in a low-lying part, there is a partial waterlogging. This is mainly due to artificial embankments associated with the construction and industrial sectors, when roads and pipelines are being built.

### 3. Results

The introduction of digital subsurface use is significant, first of all, from the point of view of the efficiency of work: the placement of equipment, the correct distribution of resources, the exact location of minerals. Digitalization of the industry leads to careful and rational use, since this industry is dominant on the territory of the Autonomous Okrug, then the transition to the digital space requires primary value. Consider the advantages of digital subsurface use, specifically for the study area, which are presented in figure 5.



**Figure 5.** Advantages of implementing digital subsurface use.

The creation of a single information space in the region will help to avoid a number of dangerous exogenous and endogenous geological processes that are currently observed in the study area, which will allow you to fence and warn against negative consequences not only in subsurface use, but also to save economic costs and energy resources, and bring the autonomous district to a more sustainable level.

#### 4. Discussion

Now there is a lot of talk about the possibilities of digitalization, in particular about how it can effectively improve business efficiency, open up opportunities for many industries and change the world as a whole, and even an individual.

Digitalization is our new perfect reality, which can change not only the technological component, but also the interaction of people with each other, the exchange of information resources, the creation of business systems, around digital platforms [8].

In the very near future, most of the physical objects will receive their digital counterparts [9]. And if now it seems that this is the fate of large industrial enterprises that have set a course for the development of Industry 4.0, then with the progressive development of autopilot transport and a smart urban environment, this will become our real life [10-13].

The enterprise of the near future is based on the interaction of smart equipment and all other smart systems of the enterprise with each other. Each object receives its task in the form of a digital model and provides further data transmission. All this will allow us to move to an improved state of production, in other words, to the industrial Internet of things, which is already actively used and mastered all over the world. Technologies based on cyber-physical solutions and full automation of production are the industrial revolution-Industry 4.0.

The rapid development of technology leads to the merging of two sides, the real world and digital counterparts. Digitalization continues to conquer all sectors of the economy and all spheres of our life.

#### 5. Conclusion

When switching to digital subsurface use, the autonomous okrug will provide itself with a number of economic advantages:

- Interaction of new partnership formats;
- Increase the investment attractiveness of the territory;
- Create a favorable competitive environment;
- Provide new economic flows to the region;
- Provide the local population with new jobs, through the involvement in the turnover of new more promising geological sites;
- Bring the region to a higher economic level.

The transition to digital reality is not just our immediate future, it is already the present, which opens up great opportunities and prospects for our country.

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