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Artemiy KURBANOV, Inna VERSHININA

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Milos Island as an Example of Sustainable Development

Artemiy KURBANOV[1], Inna VERSHININA[2]*

Abstract

Sustainable development is the harmonization of the interests of the economy, local communities, and environment. Case study of Milos Island is an example of combination of economic and environmental interests of the local population in terms of the model of sustainable development. Milos Island belongs to the Cycladic islands in the Aegean Sea. Milos is of volcanic origin and therefore the mining industry is on the island. The island has bentonite, barrit, kaolin and others minerals. On the other hand, the island is a popular destination for domestic and international tourism. Milos also has cultural and religious significance: as a place of discovery of the statue of Aphrodite (Venus) of Milos and the place of early Christian catacombs location. The largest mining company in the island - S&B - cooperates with the Municipality in order to sustainable development on the island. The mining company helps to maintain employment of the local population, which is especially important in a situation of economic crisis in Greece. But it also tries to save the unique nature of the island. The western part of the island and its coast are included in the list of "Special Zone Reservation" in the framework of the European project "Natura 2000".

Keywords: *Ecology, sustainable development, environment, Milos Island, employment, quality of life.*

[1] Associate professor, Lomonosov Moscow State University, Moscow, Russian Federation, ark112@yandex.ru.
[2] Associate professor, Lomonosov Moscow State University, Moscow, Russian Federation, urbansociology@yandex.ru

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Corresponding Author: Inna VERSHININA
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1. Introduction

Industrial revolution has provoked intense use of natural resources, which resulted in the exhaustion of soils and minerals. Fast expansion of European civilization to other regions and development of new continents, where resources seemed unlimited, have accelerated their thoughtless use.

Foundation of the Yellowstone National Park in the United States in 1872 became an important milestone in development of ecological culture. It was the first public recognition of need for primeval wild nature as a background for civilized life and value of the environment for the purposes different from irresponsible financial exploitation. However, warnings of necessity to respect the environment and natural resources were continuously ignored. This resulted into a global character of environmental problems that lead to climate change and threaten existence of a large number of biological species. For several decades already international organizations have been calling mankind for respect for the environment to preserve the climatic system and biodiversity seeking benefits to present and future generations. To draw attention of general public to environmental problems and need for their solving various campaigns, which are widely covered in mass media, for example, Earth Day, are carried out. Year 2017 is announced to be the Year of Ecology in Russia, thus demonstrating that Russia is also interested in discussion of these problems and search of ways for their solving.

Many see the reasons for the current ecological situation in those ideals that have been created in the age of Enlightenment, when nature was considered a workshop, promoting distribution of ideas that a human being stands above their native habitat: economic rationality penetrates into all spheres of public life, "industrialism substantiates souls" [10]. Industrialization has never been followed by care of saving the environment, thus it has led to environmental disaster. The problem of sustainable development is one of the most urgent and discussed today.

Since the end of the 1980s, the idea of sustainable development, which assumes balanced achievement of economic and social goals while preserving and keeping the capacity of natural systems to provide natural resources and ecosystem services. This article examines a concrete example of the implementation of the principles of sustainable development. The case of Milos proves that economic interests can be combined with a careful attitude towards the environment.

2. Theoretical Background

According to Toffler, due to industrial opposition to nature, increasing population, harmful technology, insatiable need for expansion, industrial civilization has done more harm to environment than any of the previous ages, which made the problems of environmental pollution and consumption of resources in the 20th century more acute than ever: "Never before did any civilization create the means for literally destroying not a city but a planet. Never did whole oceans face toxification, whole species vanish overnight from the earth as a result of human greed or inadvertence; never did mines scar the earth's surface so savagely; never did hair-spray aerosols deplete the ozone layer, or thermopollution threaten the planetary climate" [18].

As early as in the late 1930s, Mumford warned us about dangers hidden in technical progress, but he believed in rationality of mankind that would be able to pass to "new kinetic power sources, such as a solar engine and water resources" [14]. A number of researchers note positive changes. For example, Rifkin claim that we live in the era of the third industrial revolution. It consists of five pillars:

- Shifting to renewable energy.
- Transforming the building stock of every continent into micro-power plants to collect renewable energies on site.
- Deploying hydrogen and other storage technology in every building and throughout the infrastructure to store intermittent energies.
- Using Internet technology to transform the power grid of every continent into an energy-sharing inter-grid that acts just like the internet.
- Transitioning the transport fleet to electric plug-in and fuel cell vehicles that can buy and sell electricity on a smart, continental, interactive power grid [16].

A significant contribution to formation of sustainable development concept was made by the United Nations World Commission on Environment and Development, which published its report "Our Common Future" in 1987. In this report sustainable development is defined as the kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs [15].

The concept of sustainable development has passed a long evolutionary way, in which three stages can be distinguished:

- initial (1968–1972), when we saw actualization of issues related to environmental pollution, overpopulation and shortage of natural resources and actually came down to one common idea of inevitable

global crisis while maintaining the current vector of development of the humanity;

- political (1972–1992), related to promotion of the concept and formation of international institutes of interaction, with UN divisions participating in development of offers on prevention of environmental disaster;
- stage of social and economic problems (since 1992 till present), which is characterized by transition of the concept of sustainable development to the condition of imperative obligatory for realization [2].

In this study, we research socioeconomic problems in the context of the 2030 Agenda and the sustainable development goals (SDGs). In order to describe it, a specialized scientific language needs to be developed. The subject under investigation is the possibility of economic growth without an ecological damage. Especially important is the question of sustainable development in the modern world. The methodological basis of the research is formed by the theory and applied analysis of the SDGs, as represented in the works of Horkheimer and Adorno [10], Mumford [14], Toffler [18], and Rifkin [16], as well as the views and conclusions put forward in the studies by Yannis [21], Koliopoulou and Papadami [12], and Stefanakis [17].

3. Argument of the paper

"The 2030 Agenda for Sustainable Development commits to promoting development in a balanced way—economically, socially and environmentally—in all countries of the world, leaving no one behind and paying special attention to those people who are poorest or most excluded." [8]. Sustainable development in the modern world assumes harmonization of economic interests, concerns of local social communities, and ecological imperatives. The UN experts have defined 20 major issues in the field of sustainable development, including:

- "Coping with the increasing impacts of climate change.
- Ensuring access to affordable, sustainable, and reliable modern energy services for all.
- Accelerating the implementation of environmentally-friendly renewable energy.
- The need to develop alternative economic models that decouple economic growth resource use and minimize environmental degradation.
- The need to protect and restore ecosystems.

- Strengthen and enhance the means of implementation and global partnership for sustainable development.
- Enhancing social protection and environmental protection in developing countries as a means to decrease inequalities and combat environmental degradation and climate change.
- Integrated assessment of sustainable development pathways.
- Increasing the sustainability, inclusiveness, safety, and resilience of cities and human settlements.
- Depletion of ocean fish stocks and exploitation of marine resources.
- Promotion of sustainable industrialization." [7].

Climate change and environmental degradation are the causes of different social problems, for example, international migration. Sustainable development can solve some of these problems.

4. Arguments to support the thesis

"For sustainability, economic growth must also be "green", simultaneously creating employment and reducing negative environmental impacts. This requires profound changes in production and consumption patterns and energy use through legislation, regulation and public policies. Relevant in this regard could be "eco-social policies" that aim to shift behaviors or provide incentives for more sustainable environmental management or resource use, strengthening the resilience or adaptive capacities of individuals and communities while also achieving social goals" [8]. Despite the seeming difficulty in realization of this program's principles, some countries and regions quite successfully cope with their implementation. The brightest examples are territories with natural geographical isolation. Islands with developed industrial production are of unconditional interest in terms of studying the realization of sustainable development practices.

Islands of the Mediterranean Sea, especially those belonging to Greece, have been experiencing anthropogenic influence for more than two millennia. Most of them represent unique ecosystems with endemic species of plants and animals, protection of which is a part of the common problem of biodiversity protection. During each historical period human activities on development of these islands were of various natures: development of agriculture, mining industry, etc. In the last quarter of the 20th and the beginning of the 21st century tourism becomes the basis of the islands' economy. At the same time, mining industry makes a contribution to the economy of some of them and influences their development as well. We

suggest considering a case of Milos Island that, from our point of view, represents an example of balanced combination of economic, ecological and local population's interests within the model of sustainable development.

Milos is a part of the Cyclades island group in the Aegean Sea and belongs to Greece. As the island has a volcanic origin, it is of particular interest for mining industry. Currently, bentonite, baryte, kaolin and other minerals are being mined on the island [3]. On the other hand, the island is a popular travel destination for domestic and international tourism. Milos also has a cultural value as the place where the statue of Aphrodite (Venus) was found, and as the location of early Christian catacombs.

Milos is one of points on birds' migratory routes, its coastal waters are the habitat of Mediterranean monk seal (*Monachus monachus*), flora and fauna of the island include numerous rare species, some of which are its endemics, for example, the Milos viper (*Macrovipera schweizeri*) [4]. In this regard, the western part of the island and its coastal zone [19] are included in the list "Special Reservation Zones*"* in the framework of the pan-European project "NATURA 2000" [13]. One should note that the island form, which is a "horseshoe" or "half-moon", bolstered the separation of this territory for being almost uninhabited and having the entire infrastructure in its eastern part. The natural border of "Special Reservation Zones" is a fresh-water lake Achivadolimni located in the middle part of the island, on the narrow isthmus separating Western and Eastern Milos.

Nevertheless, a number of mining industry facilities (first of all, related to exploitation of kaolin fields) operate on the territory of Western Milos. To decrease the risks for local fauna, in particular, for the Milos viper mentioned above, one of the factors for population reduction of which is road traffic, a large-scale research (1993-1997) was done, on the basis of which they conducted reconstruction of certain sections of the road network through which reptiles' movement routes run (under a roadbed the so-called "snake tunnels" were laid) [1, 21].

The largest mining company on the island is S&B, having started its activities in 1934. The company interacts with the Milos Municipality to ensure sustainable development on the island. In particular, it has made large investments in infrastructure (for example, stations of sewage treatment), and also carries out reclamation of mines using the types of vegetation specific to the island, which are grown up on a special plantation [17].

S & B began research in the field of reclamation in the late 70s of the 20th century. Its goal was to introduce such practices into the main production cycle. By the mid-1980s, reclamation became an integral part of the company's work on the island of Milos. The necessary infrastructure was formed on the island: a special department, a plant nursery and specialized

equipment. This division received sustainable financing. His work includes scientific research and approbation of their results. The experience of reclamation areas in which intensive mining activity was carried out showed that success in this area is determined, first of all, by the species composition of plants used to restore the biosphere. The specificity of the climatic conditions of Milos, primarily the lack of water and high air temperatures in the summer months, necessitated the use of local plant species that could survive such conditions. An important factor was the ability of these species to adapt to the characteristics of the soil of the island.

Reclamation in Milos is carried out with the involvement of scientific institutions and scientific society. This allowed us to develop new ideas and methods. The collaboration of company specialists and scientists included the reproduction of a wide variety of plants in the laboratory and in nurseries, their large scale production and introduction in nature, monitoring and recording of the evolution of the re-created ecosystems. Such cooperation has made it possible to achieve impressive results. A study conducted in 2004 by the Biology Dept. University of Athens, showed that the reclamation method developed allowed the local biocenosis to be restored in a short period of time in the areas in which the reclamation was carried out (the microfauna was restored in three years, then the larger fauna was re-established). At the same time, the density of populations of local species in the areas where reclamation was carried out was in some cases higher than in untouched areas.

When carrying out reclamation, a wide variety of plant species (more than 80) is used, which makes new habitats resistant to external unfavorable factors. In order to preserve biodiversity, the company annually creates and replenishes plant stocks (up to 15,000) and seeds (over 700 kg.). The latter are prepared for the restoration of biotopes affected by intense human activities and natural disasters (fires etc.) [9]

S & B Reclamation work contributes to its progress towards sustainable development, as it protects and maintains biodiversity as the natural capital of the island. This is a fundamental element of the welfare of its residents and visitors. All mining activity of S & B is less than 4 percent of the total surface area of Milos. During its 80-year presence in Milos, the company has recovered over 40 percent of the total area of the territories involved in mining. Work on conservation beyond its own S & B mines in Milos or elsewhere is an indispensable part of the company's strategy.

Activities of mining companies carried out all the year round help the level of population employment stay close to 100 percent, which is especially important during the economic crisis in Greece and Southern Europe. Interaction of these two branches of economy at the present time

has a healthful influence on the local community condition and creates positive effect for preservation of ecological equilibrium as careful attitude to the unique nature of the island is one of the conditions for its tourist appeal [12].

Thus, the authorities of the island managed to achieve balance between interests of mining industry, which provides employment for a considerable part of the local population, and care about ecology. Harm to the environment is minimized where possible. In particular, electric power on the island is provided by the four windmills located in the western part at the "Koutsounorachi" place, far from residential houses.

These windmills belong to AEOLIKI MILOS S.A., a subsidiary of ITA Group, a Greek leading company in the renewable energy market. Wind Park is a part of the desalination of seawater to potable system. Desalination unit is located at the old mine at "Vouno Triovassalou" and produces top quality potable water, in accordance with EU legislation. According to the ITA Group, this project completely covers the demand for Milos in the water, even during the summer months when consumption rises sharply due to tourism, providing 24 hours of high quality drinking water at a much lower cost than the transport of water with aquifer ships [11].

The exploitation of mineral deposits does not stop, industrial activities remain ongoing. Nevertheless, the orientation of local authorities to sustainable development results in the fact that subsequently even the nature of former pits is restored to keep fragile balance between economic and ecological values.

5. Arguments to argue the thesis

It is now widely recognized that the causes of environmental degradation and climate change are essentially linked to human activity: "The rapid—albeit uneven—economic growth and social progress seen over the last decades have been accompanied by mounting environmental pressures and reduction of natural resources." [8]. The accelerated climate change can damage ecosystems. Harmful effects on human livelihoods are also possible [20].

"The adoption of the Paris Agreement (UNFCCC 2015), the first universal binding global climate agreement, in 2015 by 195 Member States of the UN presents an important call for action towards a low-carbon economy and shows the commitment of countries to reduce greenhouse gas emissions and support adaptation efforts." [8]. As Trump quitted the Paris Agreement, it is impossible again to solve the global problem by efforts of the whole

international community because of the USA, and as in the situation with the Kyoto Protocol, regional efforts are of particular importance. Overexploitation of ecosystems driven by unsustainable consumption and production patterns are popular models today.

However, sustainable development is possible. There are some smart cities and smart islands in the world. Their economic growth is green and sustainable.

6. Dismantling the arguments against

The Network of Sustainable Greek Islands (DAFNI) was founded in 2006. Currently, DAFNI has 44 members, including 40 island municipalities. Milos is among them. Milos joined the Pact of Islands in 2011. It is a scheme for cooperation of European islands in sustainable energy planning. This cooperation also involves the joint development of action plans in the field of sustainable energy to achieve or exceed the EU's 2020 sustainability targets.

DAFNI is a non-profit organization that aims to create opportunities and support initiatives for the sustainable development of the Greek islands. The main tasks are:

- Expand the capacity of local societies and island authorities to make decisions on key topics such as local economic development, environmental protection and the preservation of cultural heritage.
- Introduction of integrated, innovative and intelligent solutions in the field of renewable energy and energy efficiency, sustainable transport and mobility, sustainable waste and water management.
- Use funding from EU programs in the interests of island members of the Network.
- Promote investment schemes and management practices that promote innovation and social integration.
- Preserve and protect the natural environment of the islands, which is a key economic resource at the local and national levels
- Support for quality and sustainable tourism.
- Participate in international organizations, which allow exchanging experience and sharing knowledge [5].

On the basis of long-term cooperation between the European islands, DAFNI is currently coordinating the pan-European efforts of island and stakeholder representatives to develop the Smart Islands Initiative. The Smart Islands initiative is an upward effort led by island authorities and communities in Europe that sheds light on the potential of the islands to

become the ideal territories for the deployment of innovative technologies in energy, transport and mobility, water and waste management and ICT. The "Smart Islands" initiative is aimed at demonstrating that the islands can take pilot projects and gain knowledge about the rational and effective management of resources and infrastructure.

The first step for calling the Initiative was the 1st Smart Islands Forum, which was held in Athens on June 21-22, 2016. There were more than 40 representatives of the islands. They jointly developed the Smart Islands Declaration.

The next step was "Smart Islands Event: Creating New Pathways for EU islands", which was held on March 28, 2017 in Brussels in the premises of the European Parliament. The event was attended by more than 100 representatives of European islands, stakeholders and policy makers. During the event, 36 representatives of the islands signed the Smart Islands Declaration, undertaking to take measures to create smart, comprehensive and prosperous societies for an innovative and sustainable Europe.

7. Conclusions

Degradation of land was the main source of environmental stress on the Milos Island. However, the problem was solved. The management of terrestrial ecosystems can be effective, the authorities of Milos combat land degradation and biodiversity loss.

Thus, sustainable development is a concept connecting economy, ecology and ethics [6]. Formation of the rationalistic values system under the influence of the Enlightenment ideas has driven mankind to the threshold of environmental disaster. But it is possible to overcome this, if we align our behavior not only with economic feasibility, but also with other ideals. The citizens of Milos island, which at the beginning of the 1980s was on the verge of ecological crisis threatening the loss of biodiversity, could change the situation, and within a considerably short term. Sustainable development is possible, as the example of Milos proves.

Recycling of materials, including waste sorting, demonstrates transition to the new level of ecological consciousness. A number of materials today have become kind of a revolving fund, from which only a small part has to be lost because of wear-and-tear, but the major part receives the second, third and next life. It reduces importance of extractive occupations on the labor market, but allows creating new jobs in other sectors (for example, processing industry). Transition from destructive use of resources and energy to constructive one means transition from

consumer ideology of industrial society to biotechnologies based on respect for life in all its expressions, as well as on a high level of ecological consciousness.

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