

# Green Way: engineering transformations to the Green Industrial Technologies

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**Abstract.** This research integrates the spectres of the Green Silk Road policy with strategic plans, technological achievements, smart engineering decisions, international development prospects. It is conducting the development of the "One Belt One Road" which associated with technological and economic changes in the regions of interaction. Since the announcement of this initiative on September 7, 2013 as an international integration strategy of cooperation, almost 6 years have passed. One of the most important direction including all industrial cooperation aspects is a green policy – the set of rules and principles of manufacturing connected to the environment protection. Currently, the influence of interstate integration on the economic condition of countries and regions is increasing, but in combination with this there is a negative impact on the natural environment of the planet. It is time to put the protection of the planet on the first place in the world, and within the framework of integration projects like the New Silk Road many countries are ready to participate in the joint protection of the environment and many of them have already achieved certain results.

## 1. Introduction

More than two thousand years ago, hardworking and brave peoples of the Eurasian continent opened trade and cultural routes that connected the great civilizations of Asia, Europe and Africa, which were given the common name "The Great Silk Road" by their descendants. The Belt and Road initiative is geographically structured along six corridors, and the Maritime Silk Road as follows (Figure 1).

The SREB (Silk Road Economic Belt) is 8,400 km long originating in Xian and includes 3,400 km in China, 2,800 km in Kazakhstan and 2,200 km in Russia. For many centuries, the spirit of the silk road was transmitted, based on the principles of "peace and cooperation, openness and tolerance, mutual learning, mutual benefit and mutual benefit", which contributed to the development of human culture, as well as the progress and prosperity of the countries along the silk road.

This spirit has become a symbol of interaction and cooperation between East and West, and has made up the global cultural and historical heritage of all states.





Figure 1 – One Belt One Road: common geographical structure of Economic Road and Maritime Way.

The purpose of the joint construction of the OBOR is to promote the free movement of economic factors, the efficient allocation of resources and the deep integration of markets, to stimulate the establishment of economic policies in countries along the OBOR.

## 2. Green Silk Road Initiative declaration

Representatives of non-governmental organizations from around the world agreed the mechanisms of joint international governance, social and environmental responsibility and public participation in the framework of the New Silk Road, and the construction of the so-called "ecological civilization". The Declaration of the Green Silk Road initiative was first presented in November 2016 at the all-Russian civil society Forum in Moscow, and has since been open for signature by both organizations and individual activists.

Based on the Declaration, the initiative aims to unite the efforts of civil society (citizens and associations), to create and implement environmental development strategies, to form mechanisms of "green economy" and "green financing", to ensure compliance with the strictest international social and environmental standards.

In particular, it is necessary to create the unification of civil society, corporations, government agencies to create mechanisms for strategic planning of green development and strategic environmental assessment of plans and programs, and other mechanisms for risk assessment, including risks associated with climate change.

## 3. Green policy: tendency and the prospects of development

Environmental policy is an integral part of the general policy of the state including political, economic, legal, educational and other measures taken to manage the environmental situation and ensure the rational use of natural resources in the country. The main form of international environmental cooperation is international conventions and protocols. Measures to protect the environment from industrial pollution can be divided into several groups. In 2014 the Russian innovation company EIS offered the leadership of Russia and China the geopolitical project "Smart Green Silk Road" as an improved version of the OBOR.

### 3.1. Green technological transformation identification

Nowadays, a powerful factor that gave a new impetus to progress in the direction of the growing needs of mankind, was the spread of digital technologies: 3D modeling, 3D scanning, 3D printing and robotics. But in order for an innovative product to fit seamlessly into the multidimensional space of the future, at the present stage of development of society the environmental component of any innovation comes to the fore, it means that the innovation must be environmentally acceptable.

First, these are measures for monitoring, control of maximum permissible emissions (MPG). Secondly, these are measures to improve various kinds of treatment facilities, waste processing, land reclamation. Thirdly, these are measures related to the radical improvement of technological processes of industrial production, aimed at saving fuel, raw materials and water and reducing harmful emissions. Fourth, organizational and structural measures such as phasing out of the most "dirty" coal industry.

Fifth, it is more rational placement of polluting enterprises (for example, their withdrawal from large cities and densely populated areas).

### 3.2. *Smart projects of "Green Technologies"*

The main part of green technologies are concentrated in a relatively small number of countries, with different countries specializing in different types of technologies. Technologies to combat water and air pollution, waste management are actively developing in OECD countries: in Australia – to combat water pollution, in Denmark – on renewable (primarily wind) energy, in Germany – to combat air pollution, in Spain – on solar energy.

Significant progress in the development of "green" technologies is also noted in the countries of the New Silk Road and BRICS: Russia, India, Indonesia, China, South Africa, Brazil are developing technologies for waste management, water pollution control and renewable energy. In some countries, as part of the Green policy, bio plastics have been synthesized using a substance that is found in the resin of coniferous trees. Renewable resources such as corn and sugar cane are the raw materials for the production of environmentally friendly materials such as poly-lactide. In general, the world has formed a powerful promising scientific and technical movement – the "blue revolution" – the effective use of plants and animals of the seas, rivers and lakes in various important areas of human activity: from the study of the mechanism of functioning of plants and animal reservoirs of various types to the creation of new technologies and products on this basis (bionics) and "domestication" of growing aquatic plants – algae for the production of bio fuels, fibers, carbohydrates, polysaccharides, food, food additives, medicines and other valuable products. At the same time, "blue technologies" are economical (solar energy is directly transformed into bio-fuels and other valuable products) and environmentally friendly (do not occupy land, do not increase the content of carbon dioxide in the atmosphere). From green technologies in different industries are already known such as "technology to improve the yield and quality of crops", "two-stroke diesel engine for small aircraft", wind-solar installation "Tornado". Also: technology of production of medicines on the basis of "green chemistry" and nanotechnologies for treatment of oncologic diseases and drug resistant forms of tuberculosis; technologies of electrochemical chlorination for direct extraction from ore and tailings of enrichment of non-ferrous and precious metals.

### 3.3. *Greening" of the industrial projects*

It is an urgent problem today in the light of the positive dynamics of damage as well as the increasing role of the environmental factor in the construction of socio-economic strategies for the development of regions. In the process of greening the leading role at this stage belongs to the state. It is the state that can interest entrepreneurs in the inclusion of the environmental factor in the development strategies of their enterprises, encourage them to introduce innovations, carry out technological modernization. In the framework of international projects and the formation of Green policy, enterprises have the right to vote, in addition, they are responsible to their state when adopting such a policy. The state has the right to both encourage the assistance of Green policy enterprises and to hold them administratively liable for non-compliance with the rules and requirements of the policy. Among the modern spheres of development of "green technologies" the key is energy. The main directions of its "greening" are increasing energy efficiency and developing new energy sources, primarily alternative ones.

## 4. **Decisions. Conclusion.**

The World Wildlife Fund joined the Declaration of the international civil initiative "Green Silk Road" prepared by non-governmental organizations and experts from 11 countries. The Declaration was prepared in response to possible environmental and social challenges from the implementation of mega-projects of the "Silk Road Economic Belt" on the territory of Eurasia.

As part of the integration of countries into the project Green Policy many countries have entered into cooperation with representatives GEIDCO – international organization for cooperation and

cooperation in creating a global energy network, which discussed opportunities for the implementation of the project Silk Road super grid (super net export of clean energy in the countries of the silk road). The "One Belt One Road" environmental technology exchange and transfer center is BRETTC in Shenzhen province. GEIDCO (Global Energy Interconnection Development and Cooperation Organization) was established on the initiative of China in March 2016. To date, the organization has 602 members from 85 countries. The goal of GEIDCO is to prevent climate change, as well as to promote sustainable development through the creation of a system of global energy interconnections using clean sources. BRETTC (Belt and Road Environmental Technology Exchange and Transfer Center) the "One Belt One Road" environmental technology exchange and transfer center was founded by the Ministry of ecology and environment of the PRC and the Shenzhen municipal government. BRETTC aims to develop international cooperation for the implementation of an environmentally friendly "One Belt One Road" model. The company Power China (Power Construction Corporation of China) was founded in 2011 and provides full-cycle services for the construction of hydro, solar and other types of power plants. As an example, "Green building" is becoming so prevalent these days that it may not be enough to erect individual eco buildings anymore – the newest trend is entire eco-cities. Expected to be up and running in 2020, Tianjin Eco-City is one of these real-life sustainable communities, spanning 30 square kilometers and showcasing the hottest energy-saving technologies. Designed by Surbana Urban Planning Group, the city will have an advanced light rail transit system and varied eco-landscapes ranging from a sun-powered solar-scape to a greenery-clad earth-scape (Figure 2).



Figure 2 – Tianjin Eco-City with energy-saving technologies.

"Green technologies" is the result of IT solutions aimed at nature conservation. The most obvious and understandable example is recycling of materials, wastewater treatment, energy conservation, renewable energy. For example, starting to use them at the construction stage will lead to the fact that the cost of these works may increase by 10-15%, but in the future they will reduce energy consumption by 25% and water consumption by 30%. Due to this, savings in payment for electricity and water are achieved. A striking example of how the economy and the environment get along with each other is Japan. This country, through the introduction of state programs, has formed and established work in several areas: low-carbon energy production and its rational consumption, energy efficiency, a closed resource-waste cycle of production and consumption, the promotion of environmental goods, etc. As a result, Japan announced a reduction in the use of oil by 40% as an energy source. Europe is not far behind its Asian partners: Sweden informed that by 2020 it plans to completely get rid of oil, as well as exclude coal and nuclear energy from production processes, and the European Commission announced the launch of a program, the essence of which is to reduce carbon emissions by 20% while increasing the use of renewable energy sources to 20%.

At the local level, green technologies have been introduced on a large scale in Russia. An elementary example is the scheme of separate garbage collection, when it is possible to throw plastic into one basket, and glass into another.

For example, one of the smart homes in Russia. The main concept of the operation of this house is to use IT-technologies: open the apartment by fingerprint, adjust all the houses through smart phone or tablet, electricity and water consumption meters themselves record the indicators and send them to the management company. Garbage containers are equipped with an alarm of filling waste-scavengers

arrive in the yard on time, so there are no problems with overflowing tanks. In addition, the house is equipped with its own gas boiler on the roof, which allows residents to turn on or off the heating on their own. The water under floor heating system is also regulated through smart phones independently, which contributes to a great saving of resources. An addition, system for water filtration and disinfection is laid under the foundation of the building. A huge number of sensors ensure that unforeseen situations do not happen: smart sockets will not allow the wiring to burn, and water leakage will not happen, because the system also takes care of this. Solar panels are responsible for lighting in the yard. This is true that the nearby lights are powered not from the district power grid, but from the solar modules installed on the roof. In general, such solutions will greatly save on energy consumption – according to forecasts, residents will pay less for housing and communal services by 20-30%.

In the southern part of the Russian Federation, as well as in some other regions, solar energy collection complexes are working with might and main (Figure 3). The largest of them is located in Orenburg, built under the Federal program for the development of renewable energy sources. This complex provides electricity to about 10 thousand private homes within a radius of 40 km. The most interesting thing is that the batteries will generate energy even on sunny days, and save up to 40 thousand conventional fuel-about 500 tanks of fuel oil. Popular gradual transition to energy-saving lighting lamps, which have much greater light output and consume less electricity than classic bulbs. "Green" technology "revolve" around us for several years, people just used to ignore them.



Figure 3 – Solar energy collection complexes in Russian Federation. “Grigor” solar power plant in the Orenburg region. Photo – site of “Hevel” group of companies.

The situation on our planet is far from ideal, and it will not improve due to the gradual disappearance of vital resources. Therefore, the trend to preserve nature in all possible ways is now really relevant. The introduction of "green" technologies one way or another will happen all over the world. And already now in all spheres of life options of effective replacement of these or those resources on less expensive, but at the same time also environmentally friendly are studied. The current consumption of natural resources is to the detriment of our planet, and the next generations will have a much smaller supply of raw materials for life support.

Summarizing the above, it should be noted once again that one of the most important directions of modern development of scientific and technological progress is a paradigm shift: from extensive to sustainable development with an emphasis on the maximum conservation of nature and its most active member – human, whose destructive activity in relation to nature has reached a critical level. Within the framework of international projects the implementation of strategic initiatives is bound to bring success, because common priorities take place in conjunction with the mandatory achievement of common goals. It is time to save the planet from unreasonable overexploitation of its resources by human. This is the most important direction of cooperation between countries with the formation of common priorities for the future of all mankind.

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