

New approaches in the management system of recoverable resources

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Abstract: At present, formulation and introduction problems of recourse saving and ecologically effective technology gain actuality as the main solutions to the environmental crisis. Their early solution in a number of countries, including Kazakhstan, is considered as a strategic area of natural resource management and environmental protection, expanding the market for new innovative technologies in the field of using recoverable resources (RR). Due to the fact that RR, raw materials, products and waste products produced in the manufacturing process can be further used in the production process of new products, the necessity of a valid and methodological development of RR management theory on a new quality level is appeared.

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1. Introduction

Environmental challenges take increasingly important place in the world's system of priorities. With the rapid development of civilization, as a result of which there was a wide range of consumer goods, beginning with industrial products and finishing with food, urbanization of the population, the development of the giant megacities led to the large masses waste formation of production and consumption. Statistics shows that 99% of all the harvested resources falls into the waste. And after an average of 20 years major energy carrier - oil, gas, uranium will end [1].

Modern ecological situation in the Republic of Kazakhstan constitutes a real threat to the foundations of human life. The existing situation in the field of environmental protection (EP) is characterized as critical, and one of the leading causes of the ecological crisis is unsatisfactory waste handling. The first serious problem is the situation with the waste utilization, salvage and processing. Second, the growth of accumulated waste is being constant. It is known that the formation of immense amount of waste is the major factor in environmental pollution. At present more than 25 billion tons of waste production and consumption, not including oil recovery waste, are accumulated in Kazakhstan. [2] Third, storage and ground disposal of environmentally hazardous waste is also carried out improperly.

Global trends in terms of solid waste lead to two conclusions. First, the amount of solid waste will continue increasing rapidly until the volume of waste reduction will lead their production. Secondly, the most common way of dealing with waste is burial ground disposal. Consequently, the pollution danger

of waste air, soil, ground water will rise for the greater part of world's population. [3]

The integration processes of Kazakhstan into the world economic community cause the interest to competitive recovery and the transition to a resource-conserving and environmentally friendly technologies. Involvement of industrial waste and consumption in the economy as RR can more effectively solve the problems of environmental protection and resource conservation, as the use of wastes as raw material in many cases is advantageous both from an economic and environmental point of view. Practice has shown that the production of paper may reduce air pollution by almost 2 times, water sources - more than 40%, the amount of solid waste is reduced by 40%. 20 kg of wastepaper is amount to 1 kg of wood, i.e. the use of recycled paper saves 40 tons of cutting down 10 acres of timber forest, and a ton of waste paper is 25 thousand notebooks. Actual costs of steels melting from scrap are in an average 20 times lower than its production of ore and iron, and one car or 25 bicycle can be produced of tons of scrap. [4]. Currently, the scale of waste production and consumption are such that they should be talked about as a valuable raw materials source, due to their recycling.

Practically the only currently effective element of economic encouragement in the activity of RR treatment are environmental payments and fines for waste disposal, which are not so much promoted the introduction of low-waste technologies and waste minimization as lead the users of natural resources to withhold the actual evidence on waste formation to reduce the amount of environmental payments for waste disposal.

It does not support the complete disposal of produced recoverable resources, i.e. it has not yet solved the basic problem - there is no direct and effective interaction between government agencies and major players in the market of recoverable resources.

The absence of the interaction leads to a lack of objective information about the changes in the market of recoverable resources, which often involves the making not sufficiently competent and timely decisions on RR management. Efficiently organized RR management will optimize material and energy pathway between the productive processes and the environment, increase the number and range of recyclable waste in the production and ensure sustainable development not only of the company but also in the region and the country as a whole. In this regard, the development of theoretical principles of RR management and their practical commercialization is relevant and timely.

The aim of the paper is to develop the scientific study of RR management, realization methodology on RR management principles providing the optimization of material and energy flows between the production processes and the environment.

Objects of research: industrial undertakings, including iron and steel works, which use in their activity or can potentially, use waste production and consumption formed on the territory of Kazakhstan and South Kazakhstan.

2. Material and Methods

The theoretical and methodological basis of the research are the basic principles of economic theory, general scientific notations in the RR management, the works of domestic and foreign scientists and economists on the principles, laws and methods of formation and development of material resources, including recoverable, in conditions of market system, legal acts, Government regulation, Decrees of the President of the Republic of Kazakhstan on the issues of environmental protection and rational nature management, and ways to improve the efficiency of resources recovery.

The methods of systems, logical, statistical, balance analysis and EMM were used as a part of study.

3. Results and discussion:

Speaking about the concept of recoverable resources, it should be noted that it does not make sense without the conditions of its use. The object resource is determined namely by conditions of use and management.

For this purpose it is necessary to define the concept of recoverable resources. V.F. Korelski [5] provides a definition of "waste products which, after recycling and appropriate processing can be re-used as

a raw material in the production." This definition does not mention the waste consumption. So, present-day economic dictionary [6] states that the major sources of RR are waste production and consumption of products, and RR defines as single use of material resources or their part newly involved in production, or finding application waste products .

In our opinion the concept of RR expands the following definition - it's raw materials, products and wastes of production and consumption, which are formed during the production process, as well as its consumption, which, can be used in accordance with scientific and technological developments in the national economy as a primary / secondary raw materials or energy resources at the present time or in the future.

As distinguished from our country abroad, e.g. in the countries of European Community (hereafter referred to as EC) the term "waste management" is often used rather than "waste management (treatment)". In fact, the two terms are similar, but the term "waste management" includes the concept of "waste management".

The term «Waste Management» has become a regular fixture of waste management to the beginning of the XXI century firmly. The first legislative document in the field of waste management is European Union Directive 75/442/EUD of 15 July 1975 [7], where principles of waste management were first formulated and legislated - the so-called Hierarchy of waste management.

The principles of the waste management Hierarchy are internationally legislated on the International Conference on the Sustained Development in Johannesburg in September 2002, where the improvement of waste management system has been recognized as the major problem in the field of environmental protection [8]. At the conference, it was underlined that the main strategic goal of the international community on the way toward sustained development is to break the link between economic growth, resource use and waste generation. Within 30 years the waste management Hierarchy of waste management continually transformed in a variety of national and international legal documents. Development of waste processing and disposal technologies allowed expanding and elaborating them. However, Hierarchy is essentially the only theoretical basis of waste management and manual to the action in dealings with them.

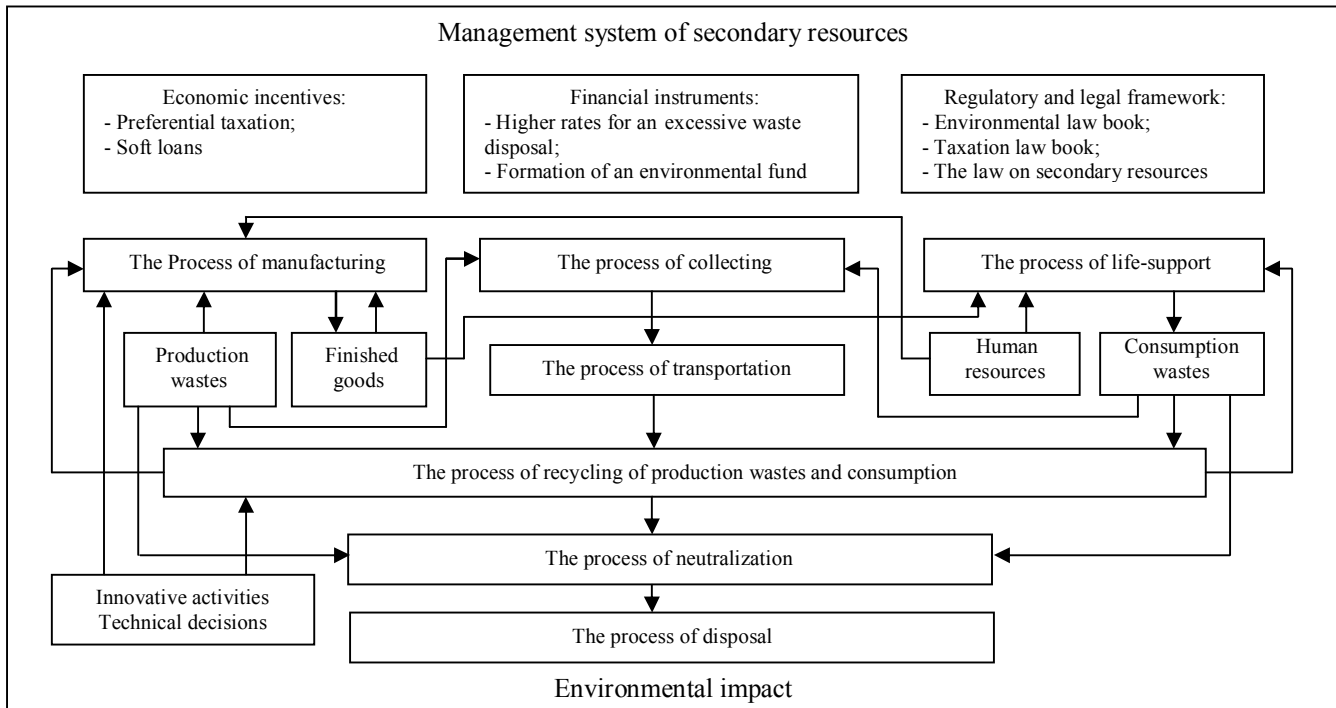
"Two planets will be needed for humanity to meet their natural resources requirements by 2030" is said in the report of WWF (World Wildlife Fund). International Organization warns of ecological disaster, the consequences of which would be worse

than the financial crisis, which is currently in decline through the whole world.

According to the “Living Planet report”, an international organization World Wildlife Fund, people use 30% more resources than the planet is able to reproduce. Recourse gluttony leads to forest extinction, soil dehydration, water and atmosphere pollution, as well as sharp decline in the number of fish and other species. As a result, the "ecological debt" of humanity to the nature annually is estimated at \$ 4-4.5 trillion which pass twice the estimated amount that financial institutions have lost because of the financial crisis. This figure is taken from the UN document, where the economic value of services is

calculated, which humanity receive from annually destroyed ecosystems [9].

In this regard, in our opinion there is the necessity to develop techno-eco-economic system, which can be defined as spatial certain set of production components and living organisms unified prevalence environment, interacting through technical, economic, environmental, financial and legal instruments with minimal environment impact. Manufacturing processes and consumer needs are realized inside the techno-eco-economic system, which are the sources of waste generation and the processes of collection, transportation, recycling, waste neutralization and disposal (Figure 1).



In the techno-eco-economic system, as well as in natural ecosystems, material and energy flows are transported between the components into the environment, and there is an information system between them.

The sustainability of the biosphere in conditions of progressive development of techno-eco-economic system can be only provided if they are organized similarly to natural systems. The organization of techno-eco-economic system by analogy with the natural ecosystems is a step out of the biosphere into the noosphere, ensuring their sustainable evolutionary development. The basic principles of eco-techno-economic systems may be summarized as follows:

- Incoming and outgoing flows of the system should be as much as possible close to the natural;
- flow control between the components of the techno-eco-economic system and the environment should be organized in such a way that the amount of produced and transported waste, declined steadily, approaching the baseline for each of the productive process with the maximum economic benefit;
- As a result of production processes minimally possible amount of produced waste is recycled in its techno-eco-economic system, ensuring maximum isolation, in the same way providing production efficiency;
- derived from the techno-eco-economic system waste must be transformed to a familiar form

for these ecosystems, providing environmental benefits before it enters into natural ecosystems ;

- waste disposal of techno-eco-economic system in natural ecosystems should be managed in such a way that not to disturb the existing dynamical equilibrium of ecosystems.

In today's world, in circumstances where evolution of the biosphere into the noosphere is the inevitable emergence of a new scientific field - the science of eco-techno-economic system, the purpose of which is not only a description and explanation of the laws of their development, but also the creation of science-based management of techno-eco-economic system ensuring their gradual approach to natural ecosystems. In our opinion, RR management science is a part of this new school.

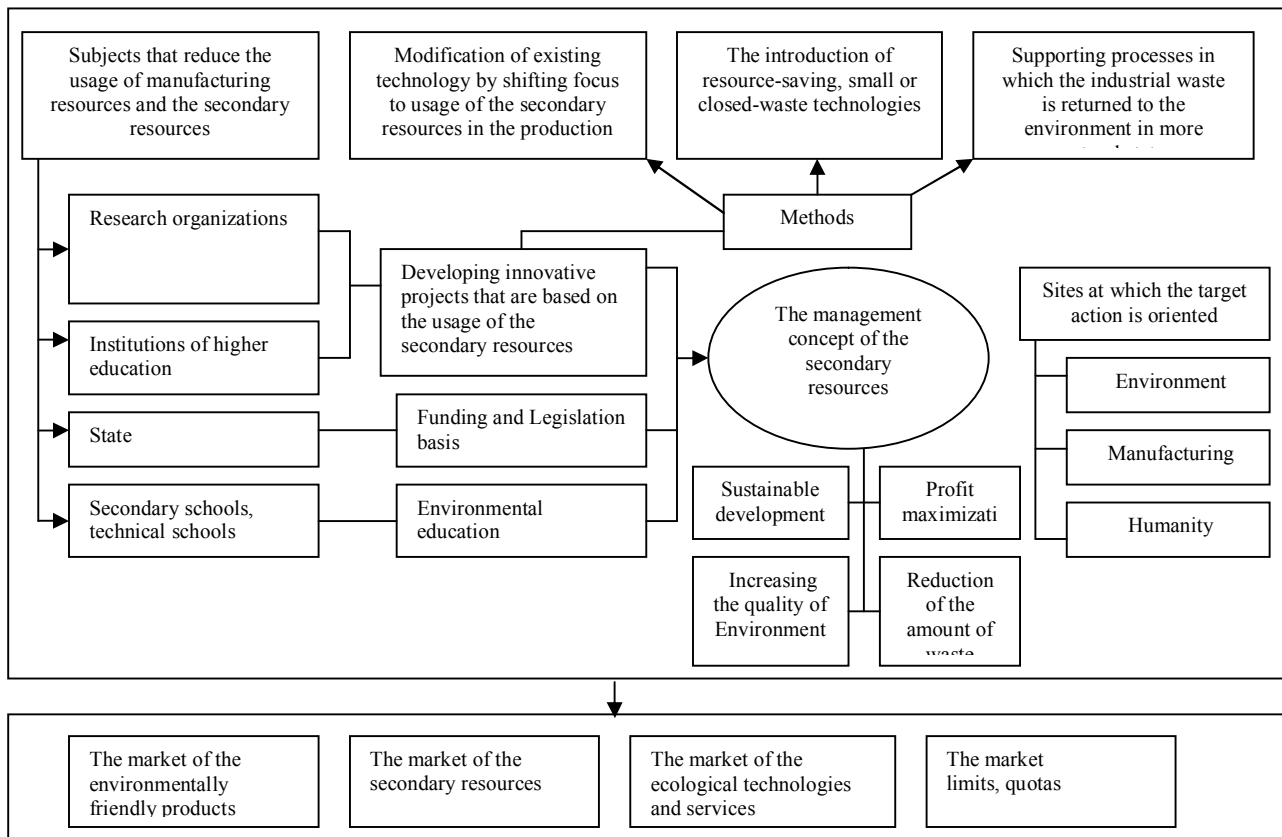
RR management system is a part of the overall techno-eco-economic management system and must organize it in a similar way to natural systems in accordance with the above principles.

RR management system (MSRR) of techno-eco-economic system can be defined as a system of information and economic interaction between its components and the environment, carrying out the management of material flows, energy pathway and traffic and ensuring self-organization of techno-eco-

economic system and its sustainable development on maintaining of biosphere stability. Components of techno-eco-economic system are the objects of RR management, which form the waste or participate in further processes of subsequent management (collection, transportation, recycling).

MSRR is to organize the techno-eco-economic system in such a way that it has always aspired to a stable equilibrium with the surrounding natural ecosystems in its evolutionary development.

Infrastructure of techno-eco-economic system is shown in Figure 2 and is constructed in such a way that the society has been able to withstand the resource crisis. It is impossible to restore and recycle energy sources, which are mainly used by non-renewable resources, as well as the atmosphere. Therefore, now there is the risk of total extinction of natural resources, which is not considered by humanity due to the current contradictions. In this aspect, it is proposed the following definition of the term "resource crisis": this is the achievement of a physical limit of resource consumption further growth of which can not even partially restore the natural amount necessary for the continued existence of humanity.



4. Conclusions

The resource crisis situation will be million times worse than humanity has experienced during financial one. The worst thing about it is that economists predicted the financial crisis due to the inflated financial flow and many other factors, but no one could ever intend that the situation will be so global. The same thing happens to prognostics of resource crisis. Humanity will realize the existence of the problem properly when it happens and will reach a critical point. In this context, the construction of eco-techno-economic system becomes number 1 among the problems to be solved by society today.

Declaration of Conflicting Interests

The author(s) stated no probable conflicts of interests with respect to the authorship and/or publication of this article.

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