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Procedia Engineering 153 (2016) 208 – 216

Procedia Engineering

www.elsevier.com/locate/procedia

XXV Polish – Russian – Slovak Seminar "Theoretical Foundation of Civil Engineering"

Modelling of processing construction waste management system

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Abstract

through the process of refining the control system simulation of construction waste. This system includes two major subsystems. The first subsystem - the collection, sorting and transportation of construction waste. The second subsystem - recycling of construction waste. Specifies the required input data, a clear view of the model and algorithm of the system development process through the relationship of subsystems with the definition of the volume of construction waste and related production facilities.

Peer-review under responsibility of the organizing committee of the XXV Polish – Russian – Slovak Seminar "Theoretical Foundation of Civil Engineering".

Keywords: resources; construction waste management system; collecting; sorting; transporting; processing; production capacity.

1. Introduction

The actual problem of the present time - the rational use of natural resources. The scale of consumption are rising, leading to the depletion of natural resources. In this regard, secondary resources become popular. To date, a number of concepts proposed for this problem [1], for example, the concept of an integrated waste management system [2]. The development of this concept is continued in the creation of the concept of 3R (reduce - the reduction of waste generation, reuse - reuse, recycle - Recycling as secondary waste resources) [3, 4]. Construction waste is a type of secondary resources.

Every year in the world is recycled more than 5-6 billion m3 of construction waste per year [5]. The resulting waste of raw materials for the construction of secondary resources, usually 2-3 times cheaper than a specially manufactured or mined raw materials [6, 7]. In this direction, we accumulated a wealth of theoretical and practical experience. Specifically, for example, the Austrian road services have developed a number of new documents, and

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Peer-review under responsibility of the organizing committee of the XXV Polish – Russian – Slovak Seminar "Theoretical Foundation of Civil Engineering".
doi:10.1016/j.proeng.2016.08.104

US researchers have shown that the quality of the rubble of concrete waste is better than the quality of the rubble of the many rocks. For recycling of construction waste is produced in many countries of the modern efficient equipment, used advanced technologies, evolving legislative and regulatory activity [8-10]. In some countries (Germany, Holland, Japan, and others.) There are no landfills for storage of construction waste [11]. Their regeneration is done on-site liquidation of buildings and structures. In other countries (USA, France, Russia, and others.) Are special grounds, including and related power processing plants. For such applications, forms of waste management system, which includes a set of compulsory processes such as waste sorting, transporting and processing them [12-14]. The functioning of such a system based on appropriate legislative and regulatory framework, calculation of projected figures disposal volumes, linking all members of such a system. However, in this field of knowledge has not been studied potential construction waste management system.

The aim of the work is the formalization of the construction waste management system, including the processes of collecting, sorting, transporting and processing.

2. Research method

Program-targeted model of construction waste management system development is determined by the dominance of the objectives of the system subsystems goals.

The main stages of model building include original data, the mathematical model, algorithm.

Initial data:

- Identifier range of construction waste - $l = \overline{1, L}$.
- The code construction site (company) - provider of construction waste - $i = \overline{1, n}$.
- The code of company (polygon), disposing construction waste - $j = 1, m$.
- The code a time interval projected time period - $\tau = 1, T$.
- System current cost allocation functions to the collection, sorting and transportation of construction waste l-th nomenclature of the i-th construction site in the time interval τ - $\left\{Q_{li\tau}^{(1)}\right\}$.
- The system of capital investment distribution function invested in the development of design documentation, unify and manufacture of containers, vehicles, etc. for the l-th range of construction waste on the i-th construction site in the time interval τ - $\left\{Q_{li\tau}^{(2)}\right\}$.
- Distribution functions of the current system costs for the acceptance and processing (disposal) of construction waste nomenclature of the l-th to j-th enterprise (polygon) in the time interval τ - $\left\{G_{li\tau}^{(1)}\right\}$.
- The system features the distribution of capital investments in the j-th enterprise for recycling construction waste l-th nomenclature in the time interval τ - $\left\{G_{li\tau}^{(2)}\right\}$.
- Volume of distribution functions system of construction waste l-th nomenclature on the i-th construction site (company) in the time interval τ - $\left\{V_{li\tau}\right\}$.
- System of distribution functions of growth of construction waste volumes l-th nomenclature on the i-th construction site in the time interval τ - $\left\{\Delta V_{li\tau}\right\}$.
- Volume of distribution functions system of construction waste l-th nomenclature processed (to be disposed) in the j-th enterprise (polygon) in the time interval τ - $\left\{W_{lj\tau}\right\}$.
- System of distribution functions of growth of construction waste volumes l-th nomenclature processed (to be disposed) in the j-th enterprise (polygon) in the time interval τ - $\left\{\Delta W_{lj\tau}\right\}$.
- The total cost of the collection, sorting, transport and recycling (disposal) of construction waste l-th nomenclature in the time interval τ - $\left\{\Phi_{l\tau}\right\}$.
- Volume ratio proportion of l-th in the range of one tonne (m^3) of construction waste $\{\alpha l\}$.
- The coefficient of growth of the share of the l-th in the range of one tonne (m^3) of construction waste $\{\sigma l\}$.
- Volume ratio proportion of l-th nomenclature in the processing of (burial) of one ton (m^3) of construction waste $\{C_l\}$.
- The coefficient of growth of the share of the l-th nomenclature in the processing of (burial) of one ton (m^3) of construction waste $\{d_l\}$.

Mathematical model