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ECOLOGICAL ASPECTS OF PROCESSES IN THE CONSTRUCTION PRODUCTION

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A b s t r a c t

The influence of productive processes for environment quality means some changes, disadvantageous as well as advantageous, which indicate in integrity or particularly they are caused by operations within these processes. Production processes are fundamental sources of ecological risk, in view of multiaspect relationships with natural environment. Due to their specificity, investment building projects are characterized by high complexity. The specific features of such projects relate both to products – structures as implants of the human environment, and to the course of a development process, implemented in the environment along with the logistic processes. Logistics is often associated with wide activities offered by companies like offering comprehensive logistics services – transport - distribution - warehousing. It is rarely exposed in construction projects, which proves an underestimation of its role in project management. Where management methods based on logistics have been introduced they have had a positive impact on a process of the construction investment projects. A reduction in costs and an improvement of project management - that was primarily indicated by project managers - both can be emphasized. Tasks of building and logistic processes appearing in the execution stage of the construction investment projects were presented in the article. There were shown the problems of rationalization of fuel and energy consumption. The energy accounting as a tool for energy savings is described.

Introduction

Any investment regardless of location interferes with the natural environment to a greater or extent. This intervention can be manifested at the stage of carried-equipment works, at the stage of operation of the facility, as well as when the location of the object in the vicinity of protected areas, where the investment affects the proximal and distal environment, emitting gases, noise, waste discharge, contributing to the area to lower the groundwater level (Połowski, 2008).

When establishing the guidelines for the implementation of investment, technological and economic requirements have to be taken into account along with the ecological requirements. It is essential to identify

areas requiring special protection, and performance at certain times of the year.

To minimize interference with the investments in the environment it should analyze the impact of investment on the environment, which should be preceded by collection of information about the natural values of the area in which its activities are being done.

All production systems, regardless of the type of products is the primary source of environmental risk due to the multifaceted relationships with the natural environment (Bizon-Górecka, 2001).

The definition of ecological risks can be based on the concept of ecological damage, while "for the ecological damage should be considered the negative environmental effects caused by excessive pollution environmental components: air, water and soil, or changes in the ecosystems within range of influence perpetrators" (Baranowska- Dutkiewicz, 1993). The probability of environmental damage can be treated as ecological risk.

The specific features of construction activities have an essential influence on the shaping of the character of investment building projects. Undertaking them is connected with a deep and long-term interference in the natural environment, is inconvenient for the neighbourhood, both at the stage of erecting the structures, and during their maintenance. It requires using considerable amount of material resources, as well as an engagement of a range of specialists and institutions, which make decisions in various stages of the life of the erected structures.

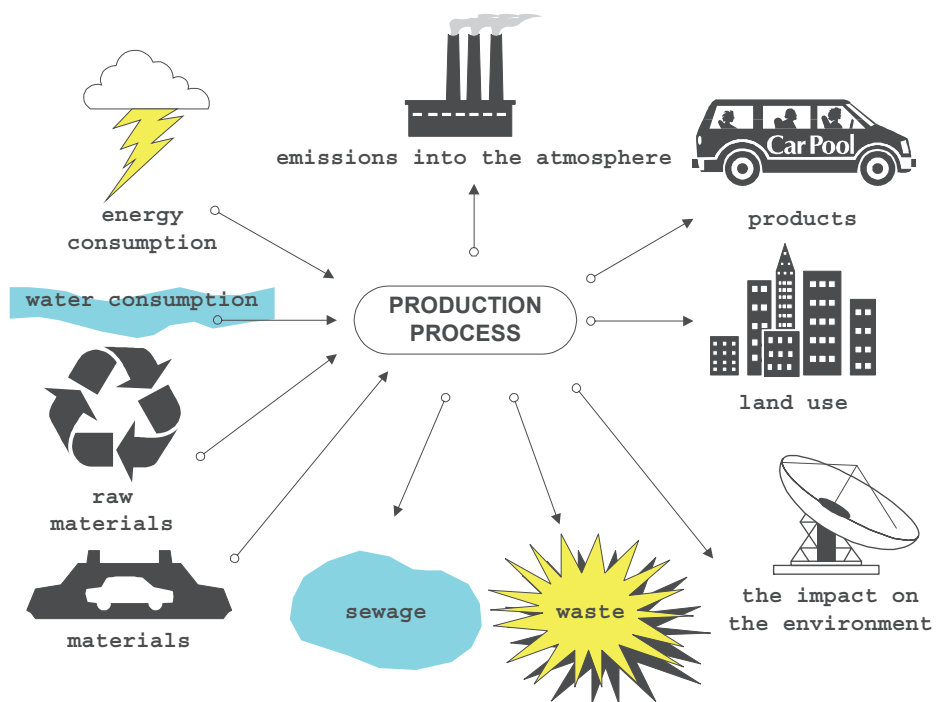
In the realization of construction investment projects, there is a need for logistics management made by outsourcing companies. These companies functioning independently, may have a separate area for joint decisions logistics, mainly in the field of supply policy with the pricing policy, played out on a global scale. This implies the need to take into account the rules of logistics on the level of cooperation between enterprises (Bizon-Górecka, 2011).

Environmental policy is currently one of the fastest growing areas of cooperation in the countries belonging to the European Union. EU countries have incorporated environmental policy to the table of their regular tasks and set targets action in the field of environmental protection. The EU environmental policy was initially directed against the effects of environmental pollution. As time began to apply preventive measures. The overall aim is to provide the EU Eco - in the long term - the path of economic growth and improving living standards, which do not lead to the deterioration of the environment.

The impact of production processes on the environment

The progress of civilization carries a number of potential environmental hazards. The resulting production plants operating in the natural environment, enjoy the goods of the environment on one hand and are the source of emissions and waste on the other. The puzzle for the environment are also products of manufacturing processes. Relationships between production systems and the environment shown in Figure 1.

Fig. 1. Diagram of the environmental impact of the production process



Source: own work

Implementation of ecological strategies of environmental management is possible, provided, adequate to reality, information processing system relating to the environment. This applies to both modeling, namely the creation of mapping components production systems, as well as the quality of inputs, mainly specifications of the emergence of risks to the environment. Important are ways of presenting information processed and interpret the results. Especially may be mentioned: how to build a model of the impact of manufacturing processes on the environment (congruence model to reality), complete specifications threats, taking into account the volatility risks, the significance of the impact of risks on the individual

characteristics of ecosystems, the way of estimating the size of critical data accuracy (accuracy of measuring devices, accuracy of readings).

It should be remembered that small changes gradually accumulate in the trends and therefore any reproduction of reality for deciding greening should be dynamic. From the point of view of manifestation of threats that cause ecological risk, it is possible to classify the factors of environmental hazards from production systems, as in Table 1.

Table 1. Characteristics of sources of environmental risk in the production system

Type of impact factor	Location and source of the emergence of threats						
x	The environment of the production system			The interior of the production system			
		<i>Processes driven by human activity</i>	<i>Ecological catastrophes</i>		<i>Increase in consumption of natural resources</i>	<i>Unreliability of the components of the system</i>	<i>Unreliability of decision makers in the system</i>
x	<i>Natural processes</i>			<i>Forces of nature</i>			
Systematic factors	Changes in the environment in cumulative trends (eg. the greenhouse effect)	Increase in emissions of solid pollutants, dusts, gases, radiation, noise (at the entrance to the system)	-	Renal forces of nature to scavenge waste	Resource depletion, increased waste	Damage in the technical system	Environmental policy
Unsystematic factors	Incorrect estimation inputs to the system	Development of new techniques and technologies generating new threats	Sudden failure of technical systems in the environment (eg. the explosion at the nuclear power plant) anomalies (eg. floods)	Anomalies of nature	The cumulative nature of the effects of the consumption of resources (including water, energy)	Damage avalanche systems of technical	Errors in modeling phenomena and estimating data

Source: own work

Energy accounting as a tool for energy savings

A general purpose of accounting is to provide information if units meet the need for energy savings.

In construction projects, investment energy accounting energy, as management accounting relating to the prospects of the energy industry will be a system of collection, aggregation, classification, analysis and presentation of information (financial and non-financial) supporting stakeholders of construction projects, investment decision-making and control of their implementation. It will support the search for solutions, incentives to rationalize energy management. Its implementation requires a conduct of energy audits within particular phases of the project life. The results of audits can help to decide on the solutions adopted in various stages of construction investment projects.

Construction Law introduced the obligation to prepare energy audits of buildings and apartments. It shows an attention to the essence of the problem. But takes it quite fragmentary, referring to the exploitation phase of buildings. According to systemic approach the energy intensity of construction projects requires consideration of the problem of energy consumption in all phases of the life of the project. This will allow preparing variants of buildings in terms of construction and materials, and processes execution on the construction site. It will also note the relationship between the various stages of the project life from the perspective of energy consumption, depending on the adopted variants of solutions.

The introduction of energy audits to construction investment projects will enable the implementation of energy accounting, serving to motivate the search for solutions to rationalize energy management. Significant energy savings in construction investment projects, may be obtained by auditing energy expenditures in a holistic, covering the entire project life cycle. This will enable the modeling of management of construction investment projects with the criterion of energy. Modelling of auditing energy system should be based on the energy performance of the project in all phases of the life cycle of a construction project investment. This approach will allow for optimization of design solutions for buildings with energy efficiency criterion and allow multi-criteria evaluation of solutions in construction projects, suitable to appropriate a rank of the problem of energy saving.

It is necessary to search for the determinants of the growth of energy efficiency progress of construction projects, throughout the lifecycle of a construction investment project of any type (construction of buildings and

structures). Implementation of construction investment projects should be considered in terms of their holistic energy efficiency.

Architectural design environmentally friendly

Futuristic visions of the buildings by for example Daniel Libeskind, Greg Lynn, Eloy Celaya, Norman Foster, Nicholas Grimshaw, Santiago Calatrava, John Chapel and Ken Yeang could remain a dream forever if not a research and development activities conducted in international corporations focused on improving existing and searching for new material solutions possible to implement in construction. Innovative approach to design is characterized not only by unusual form of buildings or their ultra-modern equipment, but also, and perhaps above all, the ecological aspect.

One of the trends of modern architecture in the twenty-first century, is searching for a response to the question: "What will the future look of the city?" And "What will be characterized by buildings of the XXI century?" So called. bionic architecture (from gr. bios - life and mimesis - mimic), a trend based on the imitation of living organisms, seeks to establish harmony between urban development and the environment. Bionic architecture breaks with existing schemes of designing buildings with regular, often repetitive shapes. Based on the natural design and biological structures, it implements a more interesting design solutions, including, curved edges of solids. As a result of the analysis of biological and mathematical issues there were created the world's most unique designs and intelligent buildings.

Among the pioneers of the so-called. green design (taking into account the ecological) can indicate Belgian architect Vincent Callebaut (b. 1977). The architect attempted to create the concept of friendship-city inter-related environment, where intelligent buildings use mechanisms derived directly from nature (eg. Photocatalysis). These are urban visions of the XXI century (some even claim that the XXII century). Callebaut, probably was inspired by the story about the Old Testament Noah's Ark, combining biblical motifs with modern technology, developed the concept of Ecopolis, which is self-sufficient metropolis, called Lilypad (*lily pad* - a large round leaves water lily floating on the water surface).

The project was created under the Work Programme: "*Floating on the surface of water Ekotown (Ecopolis) for climate refugees*". It provides for the creation structures like atolls with a total area equal to 500,000 m². Artificial lagoon will be able to use all known and possible to use renewable energy sources, and namely wind, water and sun.

The project author believes that the first realization of the project should appear in the oceans already in less than 100 years.

Fuel and energy consumption in logistics processes

Logistics in the implementation of construction investment projects has a specific nature, resulting from the specific nature of these projects. It must be seen at the macroeconomic level, because it supports projects implemented in different places, "global village", as well as microeconomic, since it applies to individual organizations - executors of processes (construction and investment), grouped around specific projects. Construction projects require a significant degree of logistics procurement and logistics-related considerations. The logistics processes, supporting basic construction processes, the dominant importance are those that protect construction mass materials. This means a considerable size energy is used by transport processes.

With regard to the logistics supply construction projects can be divided three ways: independent supply chains of individual performers, centralized supply of the entire project by the general contractor and the use of logistics organizations. Also noted a use of a mixed model of the above methods (Sobotka, 2010).

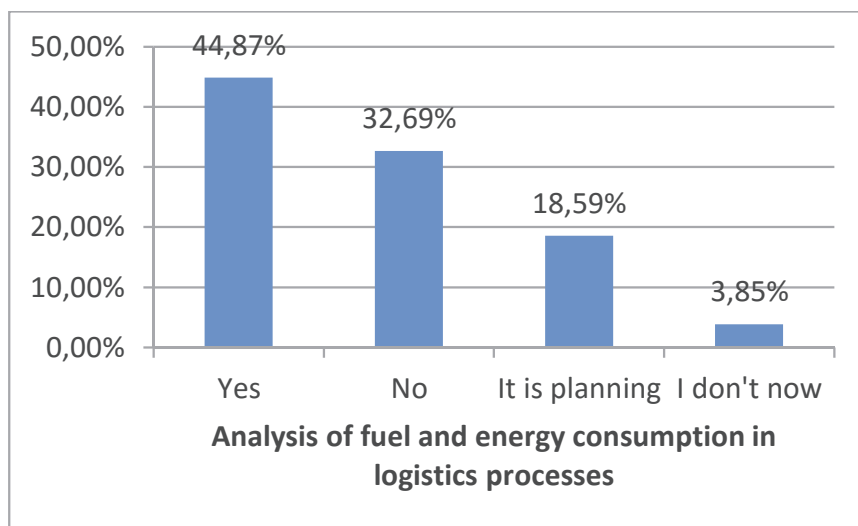
The tasks of the logistics supply implement specialized service supply. It attaches great importance to the delivery organization to minimize inventory levels of materials. This means that the need for precise planning of supply in terms of quantity and time limits (Ficoń, 2001).

The most commonly used form of transport is a road transport. It is essential mainly in terms of total road transport on short and medium distances, as well as participate in combined transport process, acting extension of air transport or water.

Research is about contractors and analysis of their fuel and energy consumption in logistics processes. It was carried out in the period from October 2015 until January 2016. Interviews were conducted with owners and managers of 156 construction companies in the Kuyavian-Pomeranian region.

The results are summarized in Figure 2.

Fig. 2. Applying the analysis of fuel and energy consumption in the planning of logistics processes in the construction



Source: own research

The surveyed companies were engaged in the most complex construction (more than 55% of respondents), but also occur as a subcontractor for design tasks (almost 42% of respondents). Nearly 45% of respondents said that their companies are analyzing fuel and energy consumption in their logistics processes.

Conclusions

In summary, before people will gather at the lagoons created in complete harmony with nature, they have to deal with the problem of energy, which has the environmental nature - must therefore be considered in a holistic.

Growing demand way on energy of individual and institutional customers contributes to the increasingly rapid consumption of non-renewable energy sources, and thus to increase the share of relative expenses incurred in connection with the consumption of energy in global spending of households and businesses.

Energy demand in the construction industry is particularly high. The introduction the construction investment projects of an energy accounting can make energy efficiency throughout the project life cycle.

Principles of EU environmental policy indicate inter alia, the need to take into account conditions and environmental impacts in all economic activities, and in all its phases.

Effects on the environment and human objects of different areas of economic activity are varied depending on the type of industry (eg. construction, energy, chemical, metallurgy, agriculture, sewage treatment plants, landfills et al.). Everywhere, however, such mechanisms can be observed the effect of stimulating production has an impact on the environment.

Businesses in environmental efforts should use the optimal strategy for the complex, which is a set of elementary strategy (partial), used in the right proportions and in the right order, in relation to specific business processes. There is also a need for an attention to the relationship of individual processes, which affect the level of environmental threats.

A part of the accounting of energy should be implemented to measure energy efficiency as well as energy-saving activities. Accounting energy can also be understood as a system of accounts used for finding directions of energy efficiency. Information supplied by the energy accounting should be relevant, reliable and future-oriented. Practically accounting might be a formalized system for measuring, collecting, analyzing and transforming data of financial and non-financial, features enabling to support and to coordinate the activities undertaken from the perspective of energy savings.

The implementation of each project can be seen in different scope of the impact of manufacturing processes on the environment. Their impact on the environment and humanity varies depending on the investment made, which result in different kinds of objects. Analysis of these processes shows that they are all present in almost every enterprise. Environmental risks so different in terms of the subject of threats, force of impact and the effects are generated by these processes. It should be added that although the direct emissions to the environment form the basis of the manufacturing processes, the indirect effects they have on their types and sizes of virtually all other processes, including supporting investments, and in particular the processes of management, organization and improvement.

The way to reduce the environmental risks can be use in business management total enterprise risk management. Indeed, improved legal and economic instruments of the state administration, aiming at implementing the National Environmental Policy, will be more and better results put up ecological risk at the forefront risks in the enterprise. This creates the chance of serious treatment of environmental issues in business organizations, which contributes to increase the quality of the natural environment.

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