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This book comprises the proceedings of the V International Scientific Conference "Advanced Information Systems and Technologies, AIST-2017". The proceeding papers cover issues related to system analysis and modeling, project management, information system engineering, intelligent data processing computer networking and telecommunications. They will be useful for students, graduate students, researchers who interested in computer science.

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Contacts:

Address: AIST conference, Sumy State University
2 Rimsky-Korsakov Str., Sumy, 40000, Ukraine
website: www.aist.sumdu.edu.ua
e-mail: aistorgcom@gmail.com.

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Cluster model of territorial community development program

Alona Starostina

O.M.Beketov National University of Urban Economy in Kharkiv, Ukraine, Starostina-2010@yandex.ua

Abstract. *The mechanism of development program formation for territorial community based on the cluster approach has been offered. The mechanism is based on a conceptual cluster model of programs. This model includes four clusters: cluster of objects that form the capability of territorial community, cluster of objects that form "overcapability" of the community; cluster of objects that define the focus area of the territorial community; and a cluster of objects that do not meet the overall focus area of local community, but generate some profit. Based on different cluster layout in program, four versions of a mathematical model of the program have been developed.*

Keywords: *program, cluster, territorial community development, formation mechanism.*

I. INTRODUCTION

For the moment, the program approach is increasingly used to provide clearly oriented development of territorial communities. This is evidenced by the implemented programs in the region. However, along with this, there is a certain "imbalance" of these programs' outcomes, both within territorial communities and within regions.

All this leads to a lack of so-called "capacity" of territorial communities, which is described in the Resolution of the Cabinet of Ministers of Ukraine No 214 of April 8, 2016 as the ability to "independently or through the appropriate local authorities to ensure the appropriate level of service, particularly in the field of education, culture, health care, social security, housing and utilities sector, given the human resources, financial support and infrastructure of an administrative-territorial unit" [1].

This makes the governing authorities of administrative units look for modern innovative approaches to managing the development of territorial communities that will ensure their "capacity".

After the conducted analysis, in terms of this issue, the author determined that to ensure sustainable development of territorial communities the most appropriate is to apply the cluster approach. And on this basis to improve program management methodology, particularly advisable is to develop a cluster, and on its basis, a mathematical program model of the territorial community.

II. MAIN BODY

In the general theory of cluster analysis, the term 'cluster' refers to a group of similar objects. Many scholars have paid the definition of 'cluster' considerable attention, including the following works of contemporaries [2 – 10]. Since, the management program of territorial community includes systemic and sustainable management of various projects and works, it is advisable to build a conceptual model of the program, which will reflect its structure and the contents. The conceptual model of territorial community development program, based on the cluster approach, is presented on Figure 1.

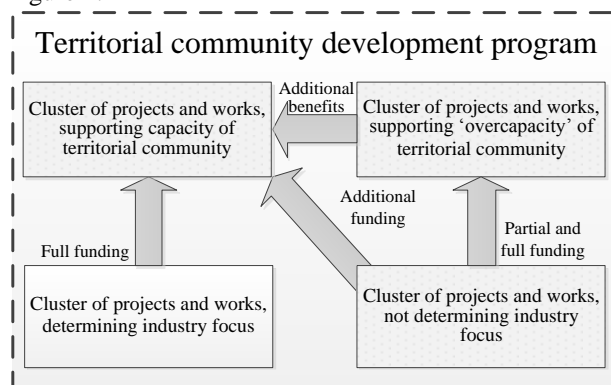


Figure 4. Conceptual cluster model of territorial community development program

According to the presented model of territorial community development program consists of four clusters, which consist of projects and works or so-called cluster objects. The first cluster includes objects that provide "capacity" of territorial community. This cluster includes projects implemented in enterprises, institutions and schools, designed to provide the appropriate level of quality of citizens' life. Moreover, quantitative characterization of the proper level should not exceed the limit set at the national level for similar performance indicators. First of all, public institutions, educational and medical institutions, and other entities that provide vitality of the region. Typically, projects of such a cluster are not profitable, meaning they need grants from other clusters of the territorial community. But along with this, the rejection of the projects of the cluster is not possible, as they are vital for the residents of the territorial community.

The second cluster includes projects that are designed to provide so-called "overcapacity" of territorial community. Meaning that projects and works, which create additional benefits for the residents of the territorial community, but is the sum of profit of territorial community from implementation of projects and works of third cluster, hrn. their absence does not have any critical impact on the life of the population. Such projects are also increasingly unprofitable and therefore can exist only in the case of sufficient funding. This cluster may be missing in the development program of the territorial community, the decision on its availability and feasibility should be made based on the presence of funding for implementation of these projects. By the projects implemented within this cluster include the so-called entertainment projects result in additional income for the local community, improving the indoor climate in the community. The lack of this kind of project is not critical to the functioning of local community as a whole.

The third cluster consists of projects that define the sectoral focus of the territorial community. That cluster now includes a group or group of objects that are most profitable for the territorial community. Besides this cluster projects are closely linked with the national strategic priority vectors, and should not contradict them, thus fulfilling the condition of the common development orientation of the territorial community and Ukraine. Profit from this cluster should provide the full funding of the requirements of the first cluster, providing thus independency of territorial community.

Also on investments of this cluster may fully or partly depend second cluster. The general position of the cluster is an important development program for the local community. as a matter of choice and Inclusion in the cluster is currently high. After all, it formed part of the program profitable.

Since, this cluster is the main sector in determining the direction of local community expedient to propose classification data on sectoral clusters feature. So the author proposed the following classification:

- agricultural cluster;
- heavy industry cluster;
- tourism and recreation cluster;
- building cluster;
- cluster of light industry;
- food industry cluster;
- innovation cluster;
- fuel cluster;
- energy cluster;
- machine-building cluster;
- wood-processing cluster.

Each of the proposed cluster has its own specific activities and needs of various resource supply, which should provide structure and programs of the local community.

The fourth cluster includes projects that do not meet the general branch orientation of territorial community, but bring a profit, which can be used to enhance the effectiveness of performance of the first cluster projects to a level higher than the one adopted at the state level, or for financing projects and works of the second cluster. Similarly to the second cluster, this cluster may be missing in the development program of the territorial community.

However, there are a development of the local community cluster indicates that the community has a number of potential areas of outsiders except those regulated cluster defining sectoral focus of the community. Therefore, the cluster management requires specific ratio, which is the continuous monitoring processes that occur in the community, making their analysis and if necessary corrective measures to local community development programs in general. Due to the fact that all programs of local communities are unique, ie different time implementation, scale, composition and structure, etc., the author believes is appropriate to highlight this issue in a separate scientific study.

A conceptual cluster model of development program of territorial community and the principles of its formation are the basis for building a mathematical model of the program. Given the fact that the program conceptual model shows clusters that can be present or absent in a particular program, it is appropriate to consider different options for application of mathematical models of territorial community development program, elaborated on the basis of cluster approach.

The first version of the mathematical model of territorial community development program is based on the assumption that in this program there are present only the first and third clusters. Therefore, the overall view of the program can be presented as the expression (1):

$$CK_1 \leq PK_3, \quad (1)$$

where CK_1 is the sum of funding required for implementation of projects and works of the first cluster, hrn.;

PK_3 is the sum of profit of territorial community from implementation of projects and works of third cluster, hrn..

This model formalizes a situation in which profits from the objects of third cluster are sufficient for the fulfillment of capacity condition of the territorial community.

The second option of a development program mathematical model of territorial community is based on the assumption that there are first, third and fourth clusters. Its mathematical model has the form shown by (2):

$$CK_1 \leq PK_3 + PK_4, \quad (2)$$

where PK_4 is the sum of profit of territorial community from implementation of projects and works of fourth cluster, hrn.

It is reasonable to note that this model formalizes a situation in which profits from the fourth cluster are directed to provide "overcapacity" of territorial community, and leads to improved quality of residents' life.

The third option of program mathematical model of territorial community is based on the assumption that there are first, second and third clusters, and at that the profitability of the last is at level sufficient to ensure the implementation of projects and works of the first and second clusters. A mathematical model has the form shown by (3):

$$CK_1 + CK_2 \leq PK_3, \quad (3)$$

where CK_2 is the sum of funding required for implementation of projects and works of the second cluster, hrn.;

The last fourth option of program mathematical model is based on the assumption that there are all four clusters, and the model is expressed (4):

$$CK_1 + CK_2 \leq PK_3 + PK_4. \quad (4)$$

The fourth model is usually present in large territorial communities, with a large population.

The choice of a mathematical model the most appropriate for each individual territorial community development programs depends on a combination of projects and works that are included. However, not always a simple division of projects and works into groups can result in an effective development program.

CONCLUSIONS

In the paper, there was developed a conceptual cluster model of territorial community development program, which includes four clusters: cluster of projects and activities that shape the capacity of the territorial community, a cluster of projects and works that form "overcapacity" of the community; cluster of projects and works that define industry focus of territorial community; and cluster of projects and works that do not meet the general branch orientation of territorial community, but generate some profit. Based on different cluster layout there are four versions of the program mathematical model developed. The classification of clusters that are outstanding for the application of the local community, on an industry basis.

Further research require: development of mathematical methods for assessing capacity and "overcapacity" of territorial community; development of profitability assessment of territorial community from

projects and works of third and fourth clusters; development of mechanism for monitoring and control of dynamic processes in the local community environment that affects the development of the fourth cluster mechanism and introducing corrective measures to local community development program; the development of mechanisms for the most efficient distribution of funds between the components of clusters.

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