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Dr. Davit Narmania,

Proffesor of Management Department,
Iv. Javakhishvili Tbilisi State University
E-Mail: davit.narmania@tsu.ge

Dr. Eka Chokheli,

Associate proffesor of Management Department,
Iv. Javakhishvili Tbilisi State University
E-Mail: eka.chokheli@tsu.ge

EFFICIENCY MANAGEMENT OF PUBLIC INFRASTRUCTURE

Abstract. *Public infrastructure is a universal consumption product that must be provided for the population by the government. For State, regional administration or municipality planning and implementation is the significant task. Ensuring public infrastructure (construction as well as its further exploitation) requires substantial financial resources. Therefore, the main task and challenge for the government is to create the infrastructure with the limited resources and with the term of maximum exploitation.*

It is also important to insure projects from the corruption facts. For this purpose, the transparent spending of funds should be ensured by active involvement of the public and proper financial management. Furthermore, it is substantial that we used innovative approaches during the project

implementation process and to create more productive and high-quality products with the same or less expenditures. Finally, the project should be accompanied by a risk management system in order to avoid undesirable event during the project implementation or its further exploitation period and to minimize potential threats of the project.

Key words: *Public Infrastructure; Efficiency; Investment; Management.*

The Essence and Characteristics of Public Infrastructure

Public infrastructure in modern scientific and practical literature is defined as the basic systems and facilities of universal consumption (Latin. *infra* — below and *structura* — structure). Thus, all citizens use public infrastructure uniformly and without any limitation. In addition, funding of public infrastructure is mainly done through taxes paid by civilians. In other words, public infrastructure is also called public good. The goods that are not produced within the market system and government should ensure people with it, creates sectors of public use goods and services¹.

Public infrastructure includes buildings, structures, networks, systems, factories, properties, equipments or physical assets and enterprises where they create public goods and are used afterwards. In most countries public infrastructure is a fundamental component for delivering public goods².

According to modern scientific and practical literature, there are several features for public infrastructure:

- Creation of public infrastructure requires a large investment (is capital-intensive);
- Infrastructure assets can provide long-term benefits and / or income;
- Investments made in infrastructure is nonliqued and in the future technological innovations introduction are limited;
- Created assets are public and is characterized with the natural monopoly (since the service provider is often one);
- Investment in public infrastructure always creates visible and solid goods;
- Public infrastructure is universal.

Roads, bridges, tunnels, hydro and other power plants, water supply and gas supply networks, sewerage facilities and drainage systems, transport networks, hospitals, social houses, stadiums and

¹ Zarnadze N., Narmania D. Fundamentals of Public Administration and Public Administration in Georgia, Tbilisi State University (2009), pp. 81-84.

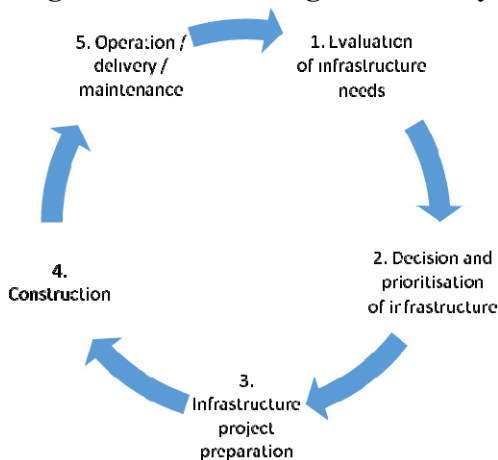
² Towards a Framework for the Governance of Infrastructure, OECD (2015), p. 2.

internet infrastructure are the most widely used examples of public infrastructure. The development of telecommunication infrastructure across the country is one of the most important issue¹. However, this list is not exhaustive and we see different types of infrastructure in different countries.

Planning and Organizing Public Infrastructure

For State, regional administration or municipality public infrastructure project planning and its implementation is the most significant task. For this it is necessary to make research and prioritize the existing needs. Afterward a specific infrastructural project is prepared and based on this construction is carried out. Operation / service delivery and maintenance is the final stage (see Figure. 1).

Fig. 1. Infrastructure governance cycle



Source: Towards a Framework for the Governance of Infrastructure, OECD (2015), p. 8.

The proposed chain may have additional rings, as there are various important stages, including from planning the infrastructural projects till its exploitation. For example, prior preparing an infrastructural project feasibility study or prefeasibility study is appropriate to develop. Afterwards the company (tendering) is selected in order to implement the project. Construction process includes supervision over the construction activities and the exploitation. The project steps

¹ Chokheli E., Narmania D. Information Technologies in Management and Prospects to Improve Their Use by Georgian Companies, International Journal of Recent Scientific Research 6(9), (2015), p. 6516.

depend on the project difficulties. If the project is big and engineering process is hard, then more steps are taken in the planning and organizing process. The above mentioned infrastructural project life cycle stages have its own challenges, which play a fundamental role in defining the asset's exploitation terms¹.

Public infrastructure is accompanied with the development. However, in practice there is a contradiction cases when the specific area is developed and afterwards the public infrastructure development is followed. The first case is more efficient in financial and planning side than the second one. Therefore, the task of the government is to create public infrastructure according to the territories development general plan and this will be followed the regular territory planned development.

Financial Management of Public Infrastructure

Ensuring public infrastructure (construction as well as its further exploitation) requires substantial financial resources. In addition, the practice shows that infrastructural investments are followed with further development — the environment becomes more maintained and private investment amount is increased.

There are several ways of financing public infrastructure, the most common are:

- **Budget funding** — From state, regional, municipal or other public budget infrastructure construction and management control;
- **Funding attracted from donor organizations** — Credit or grant received from international financial institutions by which the state, party or municipality finances infrastructure and management;
- **PPP (Public-Private-Partnership)** — State / party/municipality and private company jointly finance and manage public infrastructure;
- **BOT (Build, Operate, Transfer)** — A private company is constructing public infrastructure with own funds, operates and after expiration returns it back to the state / party / municipality;
- **DBFOMT (Design-Build-Finance-Operate-Maintain-Transfer)** — A private company creates a project, builds it with own resources, operates and maintains, and after the expiration of the term of the contract transfers the infrastructure to the state / party / municipality.

The models for infrastructure financing and management are more extensive. There are more than 20 different types of models², but the above-mentioned models are the most common ones.

¹ Towards a Framework for the Governance of Infrastructure, OECD (2015), p. 7.

² The National Council for Public-Private Partnerships, Washington DC, www.ncppp.org

Which model is chosen by the state / municipality is based on some efficiency criterion. The most important is to create a long-term infrastructure with more affordable and inexpensive financial sources.

Public infrastructure may be financed by credit (debt) or with increased taxes. It may be also financed with the saved money through the costs reduction. The macroeconomic effect of public investment depends on how we will finance it. To choose a funding model it is possible to evaluate the following specifications:

$$Y_{t,t+k} - Y_{t,t} = \alpha_t^k + \gamma_t^k + \beta^{k+} D_{it} FE_{t,t}^k + \beta^{k-} (1 - D_{it}) + FE_{t,t}^k + s_{t,t}^k$$

$D_{it} = 1$, if public investment is debt-financed, and $= 0$ — otherwise.

$D_{it} = 1$, if $FE_{it} > 0$, and $= 0$ — otherwise¹.

PIMI index (Public Infrastructure management Index) is used to assess the efficiency of investment in public infrastructure. PIMI is multidimensional index of the quality of public investment efficiency for 70 countries. Objective is to capture the institutional process underpinning investment. The Index is used indifferent stages of the investment process. It allows comparison of different countries and helps to determine the priorities of the reform²:

$$\text{Public Investment Management Index (PIMI)} = 1/4 \sum_{i=1}^4 S_i$$

$$S1 = \text{Appraisal} = 1/4 \sum_{i=1}^4 q_i$$

$$S2 = \text{Selection} = 1/5 \sum_{i=1}^5 q_i$$

$$S3 = \text{Implementation} = 1/5 \sum_{i=1}^5 q_i$$

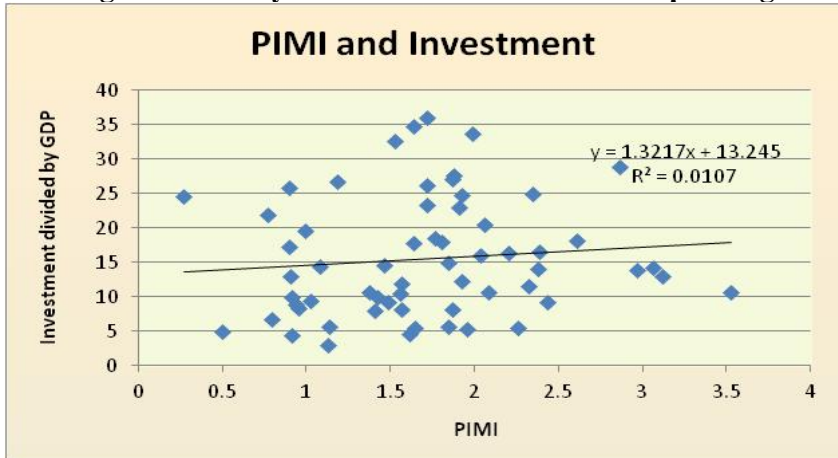
$$S4 = \text{Evaluation} = 1/3 \sum_{i=1}^3 q_i$$

¹ Abiad A., Furceri D., Topalova P. The Macroeconomic Effects of Public Investment: Evidence from Advanced Economies, IMF WP 15/95 (2015), p. 9 and 17.

² An index of the quality of Public Investment Management (PIMI), IMF

In terms of macroeconomic point of view, it is important to apply more funds on infrastructure. Investments in infrastructure directly affects GDP and provides macroeconomic stability (see Figure. 2). In addition, investment in public infrastructure is an important factor for economic growth¹.

Fig. 2. Positively correlated with Investment spending



Source: IMF.

Public Infrastructure Management Challenges

The main task and challenge of public infrastructure management is to ensure efficiency indicators. In assessing the efficiency of public investment, attention is paid to the following key issues²:

- Whether there is a clear, well-established guideline for public investment in central, regional or municipal level;
- Whether there is developed performance and efficiency assessment systems and tools (evaluation agencies, assessment criteria);
- During the project implementation whether there are supervision instruments and supervisory agencies;
- What is the cost of a new project correlation with a current or completed typical public project?
- Over the last five years, according to the main sectors (education, healthcare, water supply and sanitation, roads and energy)

¹ Making Public Investment More Efficient, IMF (2015), pp. 17-18.

² Rajaram A., Minh Le T., Biletska N., Brumby J. A Diagnostic Framework for Assessing Public Investment Management, WB (2010), pp. 14-16.

what is the comparison of the end investment projects with the expenses of the public budget;

- Whether the projects are being implemented within the established timeframes and in case of delay, what are the reasons;
- What is the net present value (NPV) of the completed project and whether it is followed by further evaluation;
- Whether it is implemented the assets registration, inventory making and the the use of accounting-reporting rules by the authorities;
- And other (see the above-mentioned source for more details).

High quality public infrastructure is a long-term public use product. The more we build high quality public infrastructure, the more it will have the exploitation period and afterwards the less money we will pay for its service or further construction. There are many different ways to ensure the quality of infrastructural projects. Firstly, the creation of infrastructural projects should be based on available norms and standards. Then, when the quality check will be done, this will be a benchmarking and we can compare to a created infrastructure.

Public infrastructure project efficiency is achieved through attracting cheap money. It is also important to insure projects from corruption facts in order to avoid project funds extortion and endanger. It is considered that infrastructural procurement is vulnerable toward corruption¹. Therefore, the transparent spending of funds, public involvement and proper financial management is necessary.

One of the most important issue in the efficiency of infrastructural projects is to rise the role of self-government. Financial independence for self-governments will facilitate the development of public infrastructure more quickly and efficiently².

It is substantial that we used innovative approaches during the project implementation process and to create more productive and better-quality products with the same or less expenditures. Finally, the project should be accompanied by a risk management system in order to avoid undesirable event during the project implementation or its further exploitation period and to minimize potential threats.

¹ Towards a Framework for the Governance of Infrastructure, OECD (2015), pp. 14-15.

² Chokheli E., Narmania D. Local Self-Government Peculiarities and Development Prospects in Georgia. Proceedings of International Academic Conferences, 2016. Barcelona (2016), p.73.

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