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## Global Infrastructure Projects as the Factor of National Economies's Development (the case of the Turkish Stream Gas Pipeline)

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**Global Infrastructure Projects as the Factor of National Economies's Development (the case of the Turkish Stream Gas Pipeline)**

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## **Global Infrastructure Projects as the Factor of National Economies's Development (the case of the Turkish Stream Gas Pipeline)**

**JEL Classification:** *B16; C18; F02; F21; F63; H54*

**Keywords:** *global infrastructure projects; economic development; international investment; globalization*

### **Abstract**

**Research background:** The current stage of the economy's development differs from the past ones in that the role of global infrastructure projects acquires ever more importance and that forming and designing of such programs becomes now a much more sophisticated process, all of this has led to a situation where we have to revise our system of economic methods of the evaluation benefits of a global infrastructure project for all involved countries. The existing methods and ways of evaluation influence global infrastructure projects on socio-economic development of the participating countries are to be complemented by new approaches reflecting the market changes and the advent of new financial instruments and stratagems.

**Purpose of the article:** The aim of the paper is to evaluate influence the global infrastructure project on socio-economic development of the participating countries in the globalized world economy with respect to its main economic and social consequences and synergy effects (the case of the Turkish Stream gas pipeline).

**Methodology/methods:** The authors crated methodological approach to the study of infrastructure projects influence on socio-economic development of the members based on the identification, evaluation and prediction of the influence of factors external and internal environment on the changing economic potential of the infrastructure projects participants.

**Findings:** Adequate investment in the development of infrastructure is an important driver of long-term economic growth. Traditionally, infrastructure has been funded mostly through public investment. However, in view of scarcity of budgetary resources and lack of capacity within the government to implement these ambitious programs, the strategy of the government relies significantly on promoting investment through a combination of public investment and private participation (include foreign investors). The presented methodological approach allows to define and early diagnose the global infrastructure projects which facilitate a multiplication effect within the national economy.

## **Introduction**

The phenomenon of global infrastructure projects use as an instrument of countries' development has not been studied thoroughly by the economic science that has as its direct consequence the deficit of research directed to an integrated evaluation of creation and realization of such projects. The authors of the article set the goal to partly fill in this gap. A large-scale infrastructure project can obtain the status of a global project only if it represents a long term funds consuming project characterized by complexity, high costs, systematic character and relevance of the realized targets for all involved countries (Mitrofanova (2015)).

The current stage of the economy's development differs from the past ones in that the role of global infrastructure projects acquires ever more importance and that forming and designing of such programs becomes now a much more sophisticated process, all of this has led to a situation where we have to revise our system of economic methods of the evaluation benefits of a global infrastructure project for all involved countries. The existing methods and ways of evaluation influence global infrastructure projects on socio-economic development of the participating countries are to be complemented by new approaches reflecting the market changes and the advent of new financial instruments and stratagems.

Thus, the aim of the paper is to evaluate influence the global infrastructure project on socio-economic development of the participating countries in the globalized world economy with respect to its main economic and social consequences and synergy effects (the case of the Turkish Stream gas pipeline).

## **Literature Review**

An enormous body of (empirical) literature exists on the determinants of economic development. Even though the findings of these studies are not always consistent, most studies confirm a positive relation between investment in infrastructure and economic growth (Aschauer (1989); Esfahani & Ramirez (2003); Calderon & Serven (2004)). The level of influence depends on type, location and context of infrastructure projects. Several studies show how the complementarity and synergy of different types of infrastructure stimulate economic growth and how the efficiency in maintenance and operation of infrastructure services contributes to economic growth (Hulten (1996)).

Calderon & Serven (2004) show that infrastructure not only has a positive effect on economic development, but also on income distribution. The authors found significant effects of both quantity and quality of infrastructure. They reported large effects of infrastructure on economic growth: a standard deviation increase in the sectors included in the model (telephone, power supply and roads and railways) would raise growth rates by 5,7 percentage points.

Thus a global infrastructure project can be considered as a complex target program involving several countries. It is usually carried out consequently or simultaneously within the same life cycle of the project and is aimed at the achievement of a more serious synergy effect compared with the projects that are realized autonomously (Altshuler & Luberoff (2003); Gunton (2003); Priemus & Flyvbjerg (2007)).

We intend that, by this study, to expand the scope of investigation regarding the field of infrastructure project evaluation. We will analyze the global infrastructure projects influence on economic potential of members under the conditions of globalization. The purpose of the study is development of methodological approach to the evaluation of infrastructure projects influence on socio-economic development of the members based on the identification and prediction of the influence of factors external and internal environment on the changing economic potential of the infrastructure projects participants.

## **Methodology of the Research**

The authors propose a methodology for evaluation of infrastructure projects influence on socio-economic development of the members based on the identification and prediction of the influence of factors external and internal environment on the changing economic potential of the infrastructure projects involved countries.

For each project, we conduct an assessment of its economic potential impact on involved countries. So the assessment covers not only economic development impact, but ecological development impact, and social development impact. This assessment is carried out at the start of a project and repeated after five years. The basis for the evaluation of economic potential factors became a set of indicators, divided into three groups and included in the proposed model:

- 1) Economic Development Impact;
- 2) Ecological Development Impact;
- 3) Social Development Impact.

Table 1 presents the different categories and their weights.

**Table 1.** Economic potential impact analysis

| <b>Development Impact Type</b>                                   | <b>Indicators of economic potential</b> | <b>Target / Future value (differ for all countries)</b> | <b>Nature of effect indicator</b> | <b>Weight indicator</b> |
|--|---|---|-----------------------------------|-------------------------|
| <b>group 1 - Economic Development Impact</b>                     |   |   |                                   |                         |
| Financial sustainability / impact on shareholders and financiers | NPV (Disposable Income)                 |   | Direct                            | 0,20                    |
| Impact on employees  | Employment                              |   | Direct                            | 0,20                    |
| Impact on customers and final consumers                          | Reducing Energy Costs                   |   | Direct                            | 0,15                    |
| Impact on suppliers of inputs and services                       | Reducing Energy Import Dependence       |   | Direct                            | 0,15                    |
| Impact on suppliers of complementary products                    | Productivity                            |   | Direct                            | 0,05                    |
| Impact on society through taxes and tariffs                      | Public Budgets                          |   | Direct                            | 0,15                    |
| Impact on the balance of payments                                | Current Account Balance                 |   | Direct                            | 0,1                     |
|  | Weight group 1                          |   |                                   | <b>1,0</b>              |
| <b>group 2 - Ecological Development Impact</b>                   |   |   |                                   |                         |
| Eco-Efficiency   | Reduction in GHG                        |   | Direct                            | 0,30                    |
| Initial Environmental Risk Score                                 | Environmental Risk Score                |   | Return                            | 0,40                    |
| Exploitation/Conservation of Non-Renewable Resources             | Energy Asset Savings                    |   | Direct                            | 0,30                    |
|  | Weight group 2                          |   |                                   | <b>1,00</b>             |
| <b>group 3 - Social Development Impact</b>                       |   |   |                                   |                         |

|                                    |                               |  |        |             |
|------------------------------------|-------------------------------|--|--------|-------------|
| Initial Social Risk Score          | Social Risk Score             |  | Return | 0,30        |
| Community Development Impact       | Health Level (Mortality Rate) |  | Direct | 0,40        |
| Labor Relations Development Impact | Social Well-being             |  | Direct | 0,30        |
|                                    | Weight group 3                |  |        | <b>1,00</b> |
|                                    | <b>Total:</b>                 |  |        | <b>3,00</b> |

Source: own work

Under the proposed approach, the method of infrastructure projects influence assessment on socio-economic development of the members, comprising the following stages:

1. The formation of the indicator system to evaluate global infrastructure project impact on economic potential for different stakeholder groups (countries, investors).

2. The choice of key indicators and giving them specific weights within each group, based on the specific priorities of stakeholders related to global infrastructure project.

3. The calculation of the integral indicator of the infrastructure projects influence on socio-economic development of the members (EPI) on the basis of valuation of the actual values of key performance indicators according to the following formula:

$$EPI = \sqrt{\sum_{i=1}^n d_{econ} (1 - I_{econ_i})^2} + \sqrt{\sum_{i=1}^m d_{ecol} (1 - I_{ecol_i})^2} + \sqrt{\sum_{i=1}^j d_{social} (1 - I_{social_i})^2}$$

where  $I_{econ}$ ,  $I_{ecol}$ ,  $I_{social}$  - is the normalized value of the indicators of economic potential (economic development impact, ecological development impact, and social development impact);

$d_{econ}$ ,  $d_{ecol}$ ,  $d_{social}$  - weighting factor (set by expert based on the specific gravity of the group of factors relates to the indicator).

It's important to determine key performance indicators and their target / future values (according macroeconomic conditions, and synergy of global infrastructure projects).

Depending on the value of the integral indicator, the authors list the following levels of the economic potential of the infrastructure projects participants:

- 1) [3,00–∞) – high;
- 2) [2,00–3,00) – average;
- 3) [1,00–2,00) – low;

4) [0,00–1,00) – critical.

The level of the economic potential of the infrastructure projects participants is regarded as critical in the case when the global infrastructure project's economic development impact, ecological development impact, and social development impact are very low.

Under the economic potential of the infrastructure projects participants is defined as the condition in which the values of the indicators of economic potential's factors don't reach their target values. If the value of the integral index is closer to the lower boundary of the interval [1,00–2,00), the potential increase in the level of economic potential is not clear, the upper bound shows the existence of the possibility of its increase to the average level.

The average level of the economic potential of the infrastructure projects participants presupposes stable values of the ecological development impact, but also a sufficient degree of economic development impact and social development impact. There is a possibility of increasing the level to high due to increasing financial and investment potential. Special attention should be given to improving the indicators of social well-being.

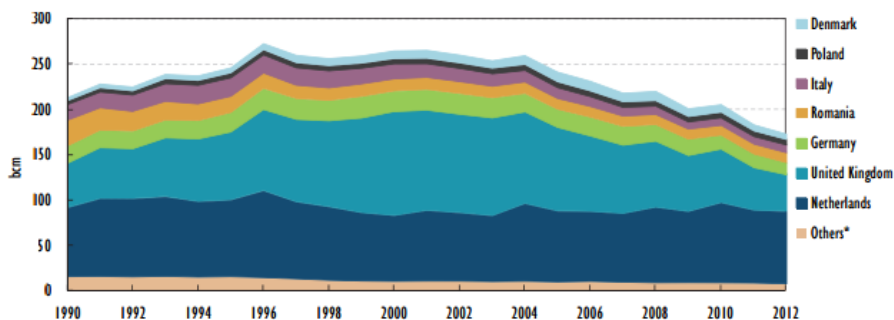
The level of the economic potential of the infrastructure projects participants is considered to be high in the case where their activities are characterized by stable growth of indicators of the economic development impact, ecological development impact, and social development impact.

## **Results of Empirical Research**

Gas output in the European Union has been falling since the mid-1990s due to depleting resources. Production reached its peak in 1997 and has been declining since, with moderate volatility. Natural gas production amounted to 173,7 bcm during 2012. Production has declined by 5,6% since 2011 and by 20,4% since 2007 (Figure 1).

**Figure 1.** Natural gas production, 1990-2012.



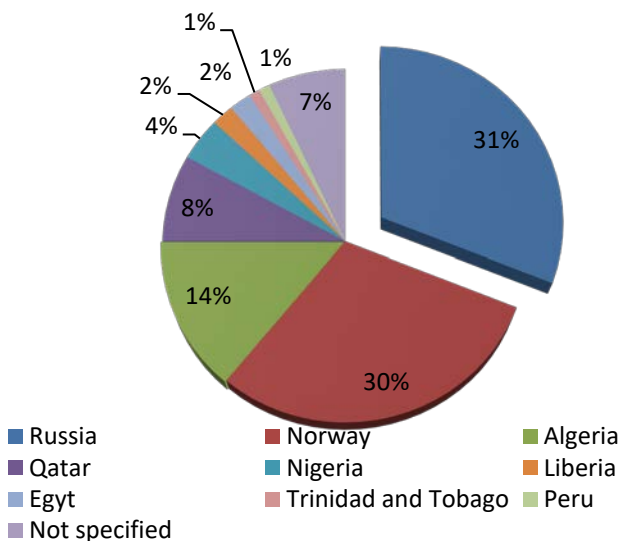


\* Others includes other European Union member states which produced gas in each year.

Sources: IEA (2016), World Energy Outlook 2016, OECD/IEA, Paris, [www.iea.org/bookshop/720-World\\_Energy\\_Outlook\\_2016](http://www.iea.org/bookshop/720-World_Energy_Outlook_2016).

In 2013, the European Union was the largest natural gas importing region in the world with an import bill amounting to EUR 87 billion in 2013 (Eurostat Comext database, 2014). The European Union is increasingly exposed to demand and supply trends in regional gas and global energy markets. The majority of imports reaches the European Union by pipeline. In 2014, imports were sourced from Russia (31%), Norway (30%), Algeria (14%) and Qatar (8%) as well as 17% coming from other countries, notably from Nigeria (4%), Trinidad, Tobago and others (Figure 2).

**Figure 2.** Gas imports to the European Union, 2014.



Source: EU (2014), EU Energy in Figures, Statistical Pocketbook, 2014.

Russia who sells its gas to Europe via Ukraine, aimed at transferring its gas through alternative routes after having problems with the country. The Turkish Stream project was established with this aim. The natural gas line will carry the Russian gas below the Black sea to Turkish soil and from here will reach Europe passing through Greece.

The estimated carrying capacity of the pipeline is 63 billion cubic meters per year. Turkey will purchase about 14 billion cubic meters of gas and the remaining 49 billion will be exported to Europe. Russia's Gazprom will be responsible for the construction of all of the pipelines passing below the Black sea. The stretch through Turkey will be built jointly.

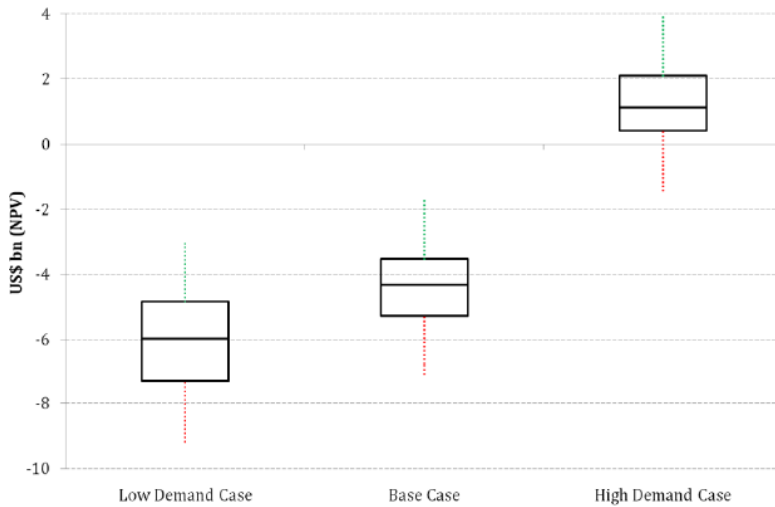
The total cost of the Turkish Stream project will be about 19 billion dollars.

Turkey will build the sections of the pipeline that run across its territory and receive a 10,25-percent discount on Russian gas purchases. An inter-governmental agreement on the gas transit pipeline remains to be ratified by the Turkish parliament.

Using the strategic gas market simulation model described in (Chyong and Hobbs, 2011), the NPV of the Turkish Stream gas pipeline investment is derived. Figure 3 shows the NPV of the Turkish Stream gas pipeline investment to Gazprom under the three demand scenarios. The black boxes with solid lines represent the minimum, average and maximum economic values of Gazprom's investment in the Turkish Stream gas pipeline system, assuming average investment, operational and maintenance costs for the project (thus, the variability is due to the variance in discount rates only). The dotted lines show the impact on the project's maximum and minimum NPV of capital and operational expenditures reaching their maximum and minimum values.

The preceding results show that only if gas demand in Europe grows at more than 2% per year up to 2030 will the NPV of the Turkish Stream gas pipeline investment be positive, albeit marginally (about 1.1 billion US dollars over 25 years). However, that does not mean that there is no case for the Turkish Stream gas pipeline, only that the justification might largely rest on other considerations.

**Figure 3.** NPV of the Turkish Stream gas pipeline under Different Gas Demand Scenarios



Source: Chyong, C. K (2011) The Economics of the South Stream pipeline in the context of Russo-Ukrainian gas bargaining Available: <https://www.usaee.org/usaee2011/best/chyong.pdf>

However, this project is in the interest of Europe as a [gas] consumer, Turkey as a consumer and provider, and Russia as a provider and producer.

The dynamics of the integral indicator EPI during the period of 2019-2029 varied by different countries (Table 2). But during the whole period of analysis, the level of the EPI will increase. So all involved countries receive some benefits from the Turkish Stream gas pipeline.

**Table 2.** Dynamics of the the Turkish Stream gas pipeline influence on the economic potential involved countries (EPI) in the period of 2019-2029 years

| Country | Impact     | 2019 | 2024 | 2019 |
|---------|------------|------|------|------|
| Russia  | Economic   | 0,6  | 0,9  | 1,1  |
|         | Ecological | 0,9  | 1,03 | 0,98 |
|         | Social     | 1,1  | 1,06 | 1,01 |
|         | EPI        | 2,6  | 2,99 | 3,09 |
| Turkey  | Economic   | 0,5  | 0,7  | 1,3  |
|         | Ecological | 0,8  | 1,01 | 0,95 |
|         | Social     | 1,3  | 1,34 | 1,44 |
|         | EPI        | 2,6  | 3,05 | 3,69 |
| EU      | Economic   | 0,4  | 0,8  | 1,2  |
|         | Ecological | 0,88 | 1,05 | 0,99 |

|        |      |      |      |
|--------|------|------|------|
| Social | 0,9  | 1,01 | 1,04 |
| EPI    | 2,18 | 2,86 | 3,23 |

Source: own estimates based on various sources.

## Conclusions

Infrastructure is one of the drivers of sustained growth and acts as an enabler for a country's competitiveness. However, infrastructure development will not drive economic growth unless it is fully aligned with the country's economic, industrial, social and environmental priorities, and is delivered efficiently and effectively.

It was shown here that only if Ukraine increased its transit fee considerably, the economic value of the Turkish Stream gas pipeline investment would range between 1 billion and 10 billion US dollars, depending on assumed demand scenarios. Thus, as insurance against future bargaining from Ukraine, the Turkish Stream gas pipeline has far greater value than its value as insurance against transit interruptions and/or its value as a demand-driven project. The expert analysis and media commentary concerning Gazprom's investment in the Turkish Stream gas pipeline miss this important dimension. Gazprom's bypass strategy is not primarily about meeting future demand in Europe while eliminating transit risks. However, this project is in the interest of Europe as a [gas] consumer, Turkey as a consumer and provider, and Russia as a provider and producer.

The dynamics of the integral indicator EPI during the period of 2019-2029 varied by different countries. But during the whole period of analysis, the level of the EPI will increase. So all involved countries receive some benefits from the Turkish Stream gas pipeline.

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