

The Method of Analyzing the Effectiveness of Economic Infrastructure

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The great leader Comrade **Kim Jong Il** said as follows.

“In promoting technological development and investment into capital construction, too, it is important to organize economic work to the last detail on the basis of scientific calculation, with a main emphasis on raising economic effectiveness.” (“**KIM JONG IL SELECTED WORKS**” Vol. 11 P. 347)

To correctly analyze and estimate the economic effectiveness of economic infrastructure(EI) is the important issue to ensure the real profit in construction.

Generally, infrastructure is the sector that is investment-intensive, doesn't directly create the actual product, and effectiveness of investment in infrastructure isn't found at once. Thus, we might pay little attention to construction and operation of EI and fall into deviation that doesn't allocate the material resources to infrastructure in time.

However, in view of rapidly increasing production by means of effective use of existing economic foundations, we can't mobilize the existing economic potentials effectively without developing the EI in advance.

From this, to study and analyze the effectiveness of the EI is of important significance in establishing measures to increase social production.

The effectiveness of EI can be estimated in kind according to elements of infrastructure.

At this time, all the actual economic effects by infrastructural services in all sectors of national economy must be included in economic effect due to establishment and use of infrastructure.

In order to analyze and estimate the effectiveness of EI, we ought to estimate not only the effectiveness of individual infrastructural establishment in kind but also the economic effectiveness(EF) of infrastructure as a whole comprehensively.

However, it is impossible to calculate the EF of infrastructure as a whole, so it is possible to calculate the EF of infrastructure as a whole only in value.

We must consider its specific features correctly in calculating and analyzing the effectiveness of EI comprehensively.

In general, effectiveness is the concept of characterizing the correlation between input and output. For its example, we can take output per unit of input of human and material resources in production process, output per capital investment in construction, and the like.

Similarly, we can characterize the EF of infrastructure with output per unit of infrastructure as well.

However, indicator of effectiveness of infrastructure seems to be same as indicator of effectiveness in production and construction in mathematical algorithm, but the former differs from the latter in economic contents.

The purpose of establishing and using the EI is to ensure the normal reproductive ties among enterprises, sectors, and regions.

In other words, we must analyze and estimate in what rates production grew and in what

quantities new products were created in whole society thanks to establishment and use of productive infrastructure.

It is needless to say that we can analyze and estimate the effectiveness within infrastructure itself.

In this case, we have to study and analyze each component of infrastructure in correlation, because components of EI operate in close relation.

Considering relation between transport and material supply belonging to productive infrastructure, rapid growth of transport reduces the demand for warehouse facility that is one of important facilities for material supply in view of no considering other conditions.

Otherwise, unreliable facilities for productive communications and warehousing raises more strict requirement for transport.

From such correlation among components of productive infrastructure, we can analyze and estimate the productive infrastructure's own EF with decrement of demand for another component in case of further strengthening its productive activities by increasing expenditures for one component of infrastructure, that is, with saving of expenditures for another component.

Such method is of significance in enabling us to establish measures for symmetrical development of internal facilities of EI in correlation between demand and human and material resources for EI.

However, only when the effectiveness of EI is estimated from how EI contributes to economic development of country, the appraisal is coincided with its mission.

Such understanding on the effectiveness of EI enables us to more correctly recognize the economic contents of output in the EF indicator as correlation between input and output.

At this time, we can assume the total amount of EI facilities as input.

First of all, we can calculate and estimate the effectiveness of EI in value by using indicator of output value per won of infrastructure.

From the mission of EI and specific features of EF, the output, that is, the output value on numerator must be calculated as the output value of sectors creating material wealth in kind, not as the value of works of productive character representing the EI's own activities.

We can represent this with following formula:

$$\text{output value per 1 won of EI} = \frac{\text{output value of sectors creating material wealth in kind}}{\text{total amount of EI in value}}$$

In this formula, total amount of EI in value is calculated as indicator of volume by full value.

This indicator enables us to understand how existing EI contributes to production of material wealth.

However, when this indicator is calculated and analyzed dynamically as well as a year, we can more clearly understand how EI affects production.

Next, we can calculate and estimate the EF in value by using indicator of output value per investment in productive infrastructure or indicator of social net income per investment.

We can say that output value per investment has some limitations in reflecting EF because it includes the cost of product.

Thus, it is more rational to use the indicator of social net income per investment than output value per investment.

That is why social net income per capital investment makes possible to calculate EF of infrastructural investment in connection with enterprise and state interests.

The indicator of social net income per investment in establishing EI can be calculated in sphere either of individual enterprise creating the material wealth in kind, or of sector and national economy.

The possibilities of calculating EF of investment in sphere of sector and national economy are concerned with situations that productive infrastructure brings effects equally to all sectors not any one sector of national economy.

This means that investment in creation and reconstruction of infrastructure and economic successes from its realization are calculated reflecting not only themselves but also economic successes of all factories and enterprises being provided the productive services of this infrastructure.

For example, in case of building new automobile road, we must calculate economic effect including loss amount, saving amount reduced, and amount of newly created net income in all factories and enterprises using this road with transport expense saved due to new construction of this road.

Denoting such process with a general expression, it is as follows;

$$E_i = \frac{M}{K_i} \quad M = M_i + \sum_{j=1}^n \Delta M_{ij} \quad \Delta M_{ij} = a_{ij} \Delta Q_{ij}$$

where is,

E_i — effectiveness of i th infrastructural expenditure(capital investment)

K_i — i th infrastructural expenditure(capital investment)

M — total amount of social net income in sphere of a sector and national economy created by establishment of i th infrastructure.

M_i — effect(net income or saving amount) created directly by establishment of i th infrastructure

a_{ij} — coefficient of social net income per output value of j th product being produced additionally by means of effect created directly by establishment of i th infrastructure $a_{ij} < 1 (j=1, 2, \dots, n)$

ΔM_{ij} — social net income created additionally by establishment of i th infrastructure in j th sector.

ΔQ_{ij} — annual increment of j th product produced additionally by means of effect of i th infrastructure.

EI has its own service life, so in certain moment, we can analyze and estimate the EF of infrastructure dynamically. In this case, the service term by moment appraised according to given component of infrastructure, or its service life at the moment that finished its life affect the indicator of social net income per infrastructural investment.

From this, we can formulate the indicator of social net income dynamically as follows;

$$M^T = M_i t + \sum_{j=1}^n \Delta M_{ij} t$$

where is,

M^T — total amount of social net income by moment of analysis and estimation

t — service term or service life according to infrastructural components(or establishments)by

moment of analysis and estimation.

In case of analyzing EF dynamically, we must consider not only investment but also expenditure of operating costs for given infrastructural establishment. In this case, the value on numerator must be the value of converted expenditures that includes both the capital investment in establishment and expenditures of operating costs for operation of infrastructure.

We can calculate and analyze the effectiveness of EI comprehensively in sphere of national economy, as we have seen above, and also can estimate the effectiveness of EI by concretely analyzing how individual infrastructural sectors have effect on sectors creating material wealth in kind. In this case, we can calculate the indicator of EF standard, the criterion which enables us to select the most effective and reasonable program among various programs for establishing infrastructure in future.

There are standardized compensation term and its reciprocal number, that is, standardized coefficient of effectiveness in the indicators of EF standard of capital investment. Thus, in order to calculate the indicator of EF standard, we can calculate any one indicator among the standardized compensation term or standardized coefficient of effectiveness and can define another indicator with one indicator's reciprocal number.

The standardized compensation term is the standardized indicator of characterizing the economically favorable limit of compensation term. In other words, it is the socially averaged term needed for compensating capital investment by means of economic effect attained.

Defining the standardized compensation term according to infrastructural sectors based on statistical data is base for building infrastructural object based on favorable program by infrastructural objects.

To calculate and analyze the effectiveness of EI like this enables us to deeply understand the role of infrastructure in ensuring the development of national economy and the economic ties among enterprises, sectors, and regions and establish measures to further develop in accord with mission of EI.