

Evaluation Report

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# **Quantitative Assessment of Development Impact of the EDCF Support for Vietnam**

**The Export-Import Bank of Korea**

**Government Agency for EDCF**

**Evaluated by**

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The evaluation was entrusted to Kyung Hee University by EDCF for the purpose of an independent evaluation. The opinions, findings and conclusion or recommendations expressed in this report are those of the external evaluator and do not necessarily reflect the views of EDCF.

## 1. Evaluation Scope and Method

- EDCF has committed KRW 2.9 trillion and disbursed KRW 1.37 trillion in Vietnam over the past 30 years from 1987 to 2016. Among EDCF's recipient countries, Vietnam has been the largest beneficiary with 19.2% of the total commitment amount and 20.9% of the total disbursement.
- This report aims to analyze the impact of EDCF's 30-year support for Vietnam's development, particularly for the country's transportation infrastructure sector.
  - The scope of analysis is limited to transportation infrastructure sector for more accurate estimation of effects. If the characteristics of each sector are disregarded by estimating impact merely based on the total amount of support, the reliability of such estimation will be highly likely compromised. In other words, the estimation generated in the afore-said manner is not based on a strong logical sequence from input through impact, i.e. how EDCF projects could affect the growth of the recipients. However, if an analysis focused on one sector, the logic of the process to economic growth and development can be clarified, and thus, the credibility of the results can be enhanced. Moreover, traffic infrastructure is the most representative sector in EDCF's support for Vietnam because it occupies an overwhelming proportion of 60% of total support.
- This Report employs both macro-level and micro-level analyses, as well as quantitative and qualitative analyses, in evaluating the development impacts of EDCF's concessional loans.
  - **Macro-analysis** is performed for measuring the major national economic indicators, e.g. productivity, production, employment, poverty rate and FDI, while micro-analysis is to identify specific impacts using the representative projects.
  - **Quantitative analysis** uses panel regression analysis, input-output approach, and estimation of direct benefits from transportation infrastructure projects. And **qualitative analysis** adopts multiple methods, including survey, stakeholder interviews, and expert interviews. As each of the afore-said analytical methods has its own strengths and limitations, this Report will derive balanced results by using multiple complementary methods.

## 2. Evaluation Results

### 1) Grant Equivalent

- As EDCF loans were highly concessional, they resulted in a substantial transfer of financial resources to Vietnam. The total grant equivalent is estimated to be around KRW 2.62 trillion, or USD 2.26 billion, at a 2016 constant value.
  - The grant element (GE) and the concessionality level (CL) of EDCF-supported projects in Vietnam are 79.77% and 68.49% on average, respectively. When applying the CL instead of the GE, the amount of net transfer to Vietnam is around KRW 2.23 trillion or USD 1.92 billion.

### 2) Support in Transportation Infrastructure

- By the end of April 2017, approximately KRW 836.7 billion was disbursed to transportation infrastructure. When 13 approved projects are completed, Vietnam will have newly constructed bridges with total length of 33.26 km and national roads with total length of 143.91 km, either newly built or refurbished. These roads are equivalent to 0.87% of national highways or

expressways under the control of the Vietnamese central government in 2015.

- The local procurement ratio of EDCF projects was 64% on average in the transportation sector. Basic statistics on EDCF's contribution to the transportation sector were used to estimate the macroeconomic impacts of EDCF support in Vietnam.

### 3) Panel Data Regression Results

- Taking into account the studies which indicate that improved transportation infrastructure increases income and productivity, this Report estimates the effects on various macroeconomic indicators.

- First, the average effects of improved transportation infrastructure on economic indicators, e.g. income and productivity, are estimated on the basis of the panel data of developing countries. Next, the impacts of EDCF's transportation contribution to Vietnam's economic indicators are calculated by multiplying the estimated coefficient by EDCF's contribution to Vietnam's transportation. That is,

*Economic impacts of EDCF support = coefficient of transportation infrastructure on an economic indicator × EDCF contribution to transportation.*

- This estimation is based on the assumption that the effect of improved transportation infrastructure in Vietnam is generated at the same rate as that in all the developing countries on average.

- **(Income Growth)** It is estimated that GDP per capita in Vietnam has increased by about 0.21% owing to the road extension projects supported by EDCF based on the previous researches revealing that a 10% increase in road extension in developing countries raises GDP per capita by 2.4%.
- **(Poverty Reduction)** On account of the afore-said contribution on the income growth, EDCF support is estimated to have reduced the poverty rate by 0.12%p in the country. Literatures on per capita GDP and poverty reduction suggested that a 10% increase in per capita GDP leads to a 5.8% poverty reduction in developing countries on average. This result was used to find how EDCF support helped lessen poverty in Vietnam..
- **(Labor Productivity)** Owing to road extension, labor productivity in is estimated to have increased by about 0.2% in Vietnam. A 10% increase in road extension in developing countries was found to increase labor productivity by 2.3%. The productivity improvement effect of EDCF support is derived from this result.
- **(Increase in Economic Growth Rate)** As road extension projects have increased capital stock and productivity, Vietnam's growth rate is estimated to have increased by 0.064%p cumulatively. This is supported by the statistical analysis showing that a 10% road extension resulted in an increase of 0.74%p in next year's growth rate in developing countries.
- **(FDI Inflow Promotion)** Road extension projects have also known to increase the net inflow of FDI by about USD 174 million cumulatively in Vietnam. This finding is based on the statistical analysis showing that a 10% increase in road extension leads to an increase in FDI net inflows of about USD 2 billion.

**[Table 1] Estimated Economic Effects of EDCF’s Transportation Infrastructure Support in Vietnam  
(Based on Panel Data Analysis)**

| Effect                           | Size  |
|----------------------------------|---|
| Income Increase                  | Increase in GDP per capita by 0.21%         |
| Poverty Reduction                | Decrease in poverty rate by 0.12%p          |
| Labor Productivity Growth        | Increase in labor productivity by 0.2%      |
| Increase in Economic Growth Rate | Increase in Economic growth rate by 0.064%p |
| FDI Inflow Promotion             | Increase in FDI stock by USD 0.174 billion  |

#### 4) Input-Output Analysis Results

- The input-output approach analyzes EDCF’s contributions, under the logic that EDCF’s support will induce final demand in the relevant industries in Vietnam and that this effect will spread to the relevant industries consecutively and then generate more production, more employment and higher added value.

**[Table 2] Estimated Economic Effects of EDCF’s Support in Vietnam  
(Based on Input-Output Analysis)**

| Effect                        | Effect of All Approved Support                  | Effect of Transportation Support Only          |
|-------------------------------|---|--|
| Production Inducement Effect  | USD 7.13 billion<br>(3.5% of GDP)               | USD 3.92 billion<br>(1.96% of GDP)             |
| Value-added Inducement Effect | USD 1.98 billion<br>(0.98% of GDP)              | USD 1.13 billion<br>(0.57% of GDP)             |
| Employment Creation Effect    | 1.12 million jobs<br>(2.1% of total employment) | 0.6 million jobs<br>(1.2% of total employment) |

Note: GDP and total employment in Vietnam are 2016 statistics.

- To estimate the examined effects, the authors used Vietnam's latest Industrial Input Table (2007). However, the results need to be interpreted with caution since Vietnam’s industrial structure has been rapidly changing in the recent years. In the course of analysis, this Report assumed that EDCF-supported projects will directly create final demand in two sectors, i.e. the construction industry and the machinery and equipment industry. The relevant EDCF projects include engineering works such as civil design. However, as such engineering works are mostly performed in and by Korea, they are deliberately excluded from the local demand inducement.
- **(Production Inducement Effect)** Overall, the approved EDCF projects are expected to bring about production inducement of about USD 7.13 billion at a 2016 constant price in Vietnam, i.e. about 3.5% of Vietnam's 2016 GDP and about 3.3 times of EDCF’s support amount. Looking at EDCF support to the transportation sector only, the afore-said projects are expected to create USD 3.92 billion in production, which is equivalent to 1.96% of Vietnam's GDP.
- **(Value-added Inducement Effect)** The combined effect of all the approved EDCF projects

is appeared to induce value added of about USD 1.98 billion at a 2016 constant price in Vietnam, i.e. about 0.98% of Vietnam's 2016 GDP and about 0.93 times of EDCF's support amount. In the transportation sector, these projects are expected to create value added of USD 1.13 billion, which is equivalent to 0.57% of Vietnam's GDP.

- **(Employment Creation Effect)** All of the approved EDCF projects are expected to create about 1.12 million jobs in Vietnam, i.e. 2.09% of Vietnam's total employment in 2016. In the transportation sector, these projects are estimated to create an employment inducement effect of 660,000 jobs, which is 1.2% of the total employment in Vietnam.

## 5) Results of Case Studies

- As part of the efforts to complement the macroeconomic effects at the national economy level, this Report analyzes one highway construction project, i.e. Hanoi-Haiphong Expressway (HHE) and one bridge construction project, i.e. Vinh Thinh Bridge (VTB).
  - Improved transportation infrastructure is expected to shorten travel time, reduce environmental costs, expand investments, improve the regional economy and improve the quality of life of residents and further create jobs in the regional neighborhood and transfer technology to local companies in the construction process. To examine these effects, this Report employs the following methods: calculation of direct economic benefits, beneficiary survey, literature survey, and stake-holder interview.
- Quantitative Analysis of Direct Benefits from Hanoi-Haiphong Expressway
  - **(Benefit of Vehicle Operation Cost Reduction)** Vehicle operation costs between Hanoi and Haiphong is estimated to be reduced by approximately USD 5.6 million annually (only for the 18.4-km segment supported by EDCF). As the average speed is up to 100 km/h from 40 km/h when using the pre-existing National Highway 5, vehicle operation costs have been greatly cut down. Since the effect of shortened distance is excluded in this estimation, the actual effect will be very likely much larger.
  - **(Benefit of Travel Time Reduction)** HHE construction supported by EDCF contributions in 480 thousand USD per year saved travel costs equivalent to USD 2.75 million per year. Users responded that HHE reduced Hanoi-Haiphong travel time from 138 to 68 minutes.
  - **(Benefit of Air Pollution Reduction)** Air pollution costs are estimated to have been curtailed by USD 990 thousand per year due to improved travel speed (only for the EDCF-supported segment).
- Quantitative Analysis of Direct Benefits from Vinh Thinh Bridge
  - **(Benefit of the Vehicle Operation Cost Reduction)** VTB is estimated to have saved about USD 610 thousand a year in terms of operating costs after the construction of VTB in length of 5.4 km. This estimation does not consider fuel and maintenance costs incurred by the ferry operation before VTB was built, as well as benefits from less motor bikes. As such, the relevant cost reduction would be much larger.
  - **(Benefit of Travel Time Reduction)** The construction of VTB is estimated to have saved travel costs of about USD 470 thousand per year. Users reported that the average travel time

was shortened from 37.5 to 9.4 minutes after the construction of the bridge.

- **(Benefit of Air Pollution Reduction)** Air pollution costs would be down by USD 100 thousand thanks to increased speed.

[Table 3] Estimated direct benefits of HHE and VTB

(Unit: USD 1 thousand)

| Effect                             | HHE (EDCF-supported segment) | VTB |
|------------------------------------|------------------------------|-----|
| Vehicle Operation Cost Reduction   | 5,600                        | 610 |
| Travel Time-related Cost Reduction | 480                          | 470 |
| Air Pollution Cost Reduction       | 990                          | 100 |

○ Qualitative Analysis of Indirect Benefits of HHE and VTB

- **(Financial Support)** According to ADB’s assessment, Vietnam needs USD 16 billion between 2011 and 2020 to expand its transportation infrastructure. However, given the country’s very constrained budget, EDCF support with highly concessional financial conditions seems to have contributed to Vietnam’s ability to secure financial resources.
- **(Local Job Creation)** As the localization ratio of VTB and HHE was 77% and 66%, respectively, the local manpower and purchasing effect of both projects were very high. Most of construction works, other than project management, were performed by local companies and more than 95% of the workforce who participated in these two projects were locals.
- **(Technology Transfer)** The HHE or VTB construction projects, as for general-purpose technologies, helped local companies and workers obtain further recognition and capabilities of indirect ripple effects, such as project management, safety and environmental management and quality management, rather than direct construction technologies. However, in the case of the Vam Cong Bridge Project, which required medium and high technologies such as cable-stayed bridge construction, various construction technologies and methods (e.g., linear management, steel bridge construction and pylon construction technology) were directly transferred to local subcontractors. In addition, these subcontractors were able to win many domestic and overseas construction projects as their brand recognition and awareness were promoted by their participation in landmark projects as well projects led by Korean companies.
- **(Improved Quality of Life of Residents)** Shortened travel time has had the most positive impact on residents' lives and further greatly improved accessibility to neighboring cities. In particular, access to quality hospitals in large cities has significantly improved on account of the traffic system improvement. HHE users were able to feel the effects of environmental improvement, such as less traffic risk and cleaner air quality. However, in the case of HHE a BOT type project, more transportation costs incurred by expensive tolls and conflicts in the course of settlement relocation and land compensation have caused dissatisfaction among residents.
- **(Stimulus for Local Economy)** It is difficult to estimate the direct effect on the local

economy, but HHE has had a substantial positive impact on attracting FDI in the surrounding area. Despite expanded foreign investments and revitalized industrial complexes, residents have not yet felt increase in employment, whereas drivers and companies located in industrial complexes have greatly recognized the positive effect of HHE. However, in the case of small towns around VTB, the more rapid pass through of traffic through towns, where it neither stops nor stays, may have produced a relatively negative impact on the local economy of the surrounding areas, especially around the marina, after the construction of the bridge.

## 6) Limitations

- Due to a lack of statistical data and time as well as budget constraints, the analysis results in this Report have the following limitations:
  - (Difficulty in Identifying Comparison Group) For an accurate analysis of the effect of EDCF support, it is necessary to compare such support with the counter-factual situation; however, as the assumption of such counter-factual situation is virtually impossible, this Report uses the before-after comparison method.
  - (Assumption of Average Effect) The impact of support, such as transportation infrastructure, may vary from country to country. However, due to lack of statistics, the panel data analysis of this Report assumes that the effects of improved transportation infrastructure in Vietnam are equal to the average effects in all developing countries.
  - (Estimation of Certain Sectoral Effect) Although EDCF loans have been directed to diverse sectors, it is difficult to reflect the unique characteristics of each sector. The panel data analysis of this Report is thus limited to the effects of support in the transportation infrastructure sector.
  - (Non-reflection of Recent Industrial Structure) The latest input-output table of Vietnam was prepared in 2007 and therefore the results of the industrial linkage analysis of this Report do not reflect any industrial structure changes thereafter.
  - (Brief Case Study) In this Report, two EDCF projects are examined for the case study. However, since the case study is not a rigorous evaluation of specific projects, the survey was conducted for a limited number of respondents, and the indirect effects of the projects were also evaluated in a narrow regional scope.

## 3. Implications for Country-level Impact Assessment

- **(Usefulness)** Quantitative analysis of aid impact assessment at the country level is necessary and useful for both assessing the effectiveness of aid and creating accountability. Such analysis can be useful as a discussion material for sharing the effect with the recipient country and seeking for some ways to improve effectiveness.
- **(Limitation and Caution)** Despite usefulness and visibility, country-level quantitative analysis should be conducted with awareness of limitations and caution of accuracy. Quantitative evaluations of aid impacts at the country level have the following constraints:
  - (Uncertain Channels) Aid support, such as EDCF loans, exerts its impact on the recipient economy through multiple, complicated channels. However, quantitative analysis cannot cover all channels and mechanisms of growth, development and welfare.

- (Country-specific Characteristics) Even when there is an established theory on the mechanism through which aid affects the recipient economy, an empirical model hardly incorporates characteristics specific to the recipient country. Therefore, the calculation based on the average effects in all the developing economies will deviate from the real impact on a certain recipient.
  - (Unquantifiable Effects) As many development effects cannot be quantified, no country-level impact assessment covers all the relevant effects.
  - (Insufficient Statistics) Whereas Vietnam, the subject of this study, is a relatively prepared in terms of data availability, information necessary for estimation does not exist or is insufficient in many developing countries.
  - (Diversity of Projects) If projects are very heterogeneous in terms of sector and modality, accurate assessment requires considering sector- or modality-specific impact mechanisms. However, such mechanisms are highly complicated or difficult to construct on account of limited availability of data, budget and time.
- **(Reliability)** Given the afore-said limitations in accurate estimation, how much the logic postulated by the estimation model is relevant to reality is the most crucial to the reliability of the results. Various economic models may be considered for quantitative evaluation of aid impacts at a country level. It should be noted that even if some estimations may produce statistically significant results, statistical significance is merely one of the requirements for reliability. The compatibility of the estimation model with the aid impact mechanism in practice is much more important.
- If the model is rather irrelevant to reality, estimation results may undermine the reliability of evaluation. Estimation results only based on available data and models also have various limitations. Therefore, it is essential to state the limitations of analysis as well as results. As there is no perfect model to estimate all country-level impacts, results must be verified by using multiple analysis methods and by presenting a reasonable range of estimates.
- **(Selection of Countries for Evaluation)** The following factors should be considered when selecting a country for quantitative impact analysis. First, it is desirable to select a country which receives a relatively large amount of loans and thus is assumed to be subject to significant effects on the national economy or at least on a particular industry. Second, data on basic economic indicators and statistics of major industries should be available for at least a 10-year period. The availability of an input-output table is one of the minimum requirements for quantitative analysis at the country level. Third, any countries for which the supported projects are relatively homogeneous should be selected so that enabling a reasonable assumption of a logical mechanism on the impact generation