INTRODUCTON OF USER'S VIEWPOINT INTO POST EVALUATON FOR ODA INFRASTRUCTURE PROJECTS FOCUSING ON APPROPRIATE TECHNOLOGY

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ABSTRACT: DAC /OECD criteria for evaluating development assistance consists of relevance, effectiveness, efficiency, impact, and sustainability. The criteria is widely used by other donors, too. Looking into the criteria, it seems to emphasize the donor's viewpoint at what socio-economic effects the assistance has brought about with its investment. On the other hand, this criteria does not have user's viewpoint to evaluate technologies devised to satisfy user's needs. Users are defined as benefitted local people and host country's administrative organizations which implement / operate the projects. Evaluation from users' viewpoint also lacks in JICA's evaluation method which basically follow DAC's. Post evaluation from user's viewpoint is expected to appeal projects' contribution brought with technologies, improve the quality of ODA, strengthen the competitiveness of engineering entities that participated, and to motivate engineers who yielded valuable ideas. In this paper, various technologies customized according to local environment to satisfy the needs of users in Japan's ODA, have been presented as below.

1) Multipurpose sabo dams, Indonesia: sabo dams are designed not only for disaster mitigation but for bridges and intake weirs of irrigation water for regional development.
2) Sabo soil cement, Indonesia: Soil cement was used in a large scale utilizing river sediment at the construction sites of sabo dams and official technical guideline was made through the experience.
3) Gabions, Nepal: Gabions are used in a large scale, 0.3 million m^3, for slope protection of a national road, due to its easiness both in procurement of materials and in construction technology, resulting in excellent sustainability.
4) Causeways, Cambodia/Nepal: In River Mekong's flood plain, causeways, which are road structures allowing flood flow over its top, was designed not to interfere the flood flow and to prevent damages on road embankment. Causeways are also effective in reducing construction cost as river crossing structures.

Such technologies should be appropriately evaluated. Advanced technologies are not necessarily applicable under unique local environment and appropriate technologies have to be devised. It is proposed that post evaluation methodology different from the present DAC / JICA criteria needs to be introduced.

1. INTRODUCTION

In the post evaluation of development assistance, the Development Assistance Committee (DAC) of the Organization for Economic Co-operation and Development (OECD) has its criteria consisting of validity, effectiveness, efficiency, impact, and sustainability. JICA also conducts post evaluation using these five items in compliance with DAC. This criteria focuses on the results of investment from the viewpoint of donors, to evaluate mainly the appropriateness of aid administration and socio-economic effects. However, it lacks the viewpoint of users[1]. The users refer to the local people who utilize the project's products such as infrastructures or the host country's government staff who implement the project and operate or maintain the infrastructures.

Various ideas have been devised to respond to the needs of users of the projects that Japanese engineers implement in Japan’s ODA. However, the current evaluation system, as explained above, are not able to clarify and evaluate those technologies. By evaluating technologies properly from users’ viewpoint and feeding back the results to future projects, it will be possible to increase the users’ satisfaction and improve the quality of the assistance. Furthermore, it is expected that encouragement will be given to engineers who participated in the projects, and with its driving force, a good circulation will be created for improving the quality of the infrastructure and competitiveness of the engineers.

In this paper, regarding the sector of infrastructure implemented by Japan's ODA, actual projects to which such technologies as mentioned above have been applied, are explained, and needs of post evaluation from the user's point of view discussed.

2. EVALUATION METHODOLOGIES OF DONOR ORGANIZATIONS

(1) Outline of evaluation methodologies

a) DAC / OECD [2)]

An organizational and objective evaluation is carried out on the projects being implemented or completed. The purpose of the evaluation is to feed back the lessons learned to future policies, programs and projects, providing information to citizens and fulfilling accountability. The five items as evaluation criteria are listed in **Table 1**.

Table 1 DAC Evaluation Criteria

Items	Contents
1. Validity	The extent to which the aid activity is suited to the priorities and policies of the target group, recipient and donor
2. Effectiveness	A measure of the extent to which an aid activity attains its objectives
3. Efficiency	Efficiency measures the outputs – qualitative and quantitative – in relation to the inputs in respect with cost, time and alternatives
4. Impact	The positive and negative changes produced by a development intervention, directly or indirectly, intended or unintended
5. Sustainability	Sustainability is concerned with measuring whether the benefits of an activity are likely to continue after donor funding has been withdrawn

b) Japan International Cooperation Agency (JICA) [3)]

Evaluation is carried out with the 5 items of DAC evaluation criteria in four stages of advance, intermediate, end and after. Its purpose is to utilize it for better project planning and for ensuring accountability, through which citizen’s support is gained and more effective and efficient cooperation be realized. However, depending on the type of evaluation, there are cases in which it evaluates specific subjects in addition to the five.

c) Asian Development Bank (ADB)

Post evaluation on 25% of projects that are over 3 years since project completion has been conducted. As evaluation criteria, there are four items of validity, effectiveness, efficiency, and sustainability. Comprehensive evaluation is carried out in four levels of extremely success, success, partial success and failure. The internal rate of return of 12% or more is regarded as an indicator of very successful.

(2) Characteristics and issues of evaluation systems

In the evaluation systems of international organizations such as JICA, DAC and ADB, evaluation is carried out from donor's viewpoint, and not users'. There is no item to evaluate technologies created or devised to meet the needs of users. Specifically, the following points have not been evaluated.

1) Ideas to capture the needs of local residents and to incorporate the needs into the project contents

2) Methods enabling maintenance with local resources to ensure sustainability

3) Measures that can save construction cost while maintaining product's quality

4) Ideas under circumstances where technologies are not advanced, specialized, or systemized as in donors' countries and their standard manuals cannot be applied.

In this paper such technologies are defined as appropriate technologies. In the following chapters, the cases where Japanese engineers actually invented or devised in Japan's ODA projects are explained.

3. EXAMPLES OF APPROPRIATE TECHNOLOGIES IN JAPAN'S ODA

(1) Multipurpose sabo dams

In Central Java in Indonesia, Melapi Volcano Emergency Disaster Prevention Project was carried out by ODA loan from 2008 to 2011 with the cost of 4.1 billion yen. The volcano is located 30 km north of Jogjakarta City. The volcano often brought about sediment disasters and floods to the downstream communities and the city. The project's main component was the construction of twenty three sabo dams for sediment control. Identical disaster prevention projects had been implemented in the precedent phases and this project was the third phase.

Through the preceded phases, it had been recognized that residents' needs are not only disaster prevention but also for regional development. Over the mountain side, there are fifteen rivers flowing down. The rivers divided the area, therefore bridges had been needed. In addition, local people wanted to use that abundant river water for agriculture. In order to respond to these needs within a limited budget, four sabo dams with function of bridges were constructed. Vehicles can pass over dam tops (**Fig. 1**). At nine dams, intake gates for irrigation water were installed with irrigation canals downstream (**Fig. 2**).

Sabo dams with function of bridges or water intake facilities contribute not only to disaster prevention but also to the daily living of the local residents and agricultural productivity, resulting in the socio-economic development of the area. In Japan, such multipurpose sabo dams are not seen due to its administrative environment. This type of sabo dams are not described in Japanese technical standard. This idea was proposed in response to the local needs without being caught up by Japan's manuals.

Fig. 1 Multi-purpose sabo dam used also as a bridge Merapi Project

Fig. 2 Multi-purpose sabo dam used as a bridge and an irrigation water intake, Merapi Project

(2) Sabo soil cement

In the aforementioned Merapi Project, soil cement was used for sabo dam cores at seven out of twenty three sabo dams. Soil cement is the construction material made with mixing less cement and water with aggregate available at construction sites. This technology contributed to reduce construction period and cost. In Japan, the technical standard of soil cement had been prepared [4)] and the material was widely used while there were few examples of its use in Indonesia. Under this circumstance, this construction material was adopted, since debris flow deposit containing aggregate suitable for soil cement was obtained in abundance over the riverbed at the construction sites.

Work procedure was : ① collect aggregate from riverbed, ② adjust particle size by feeding it into a steel sieve placed at the site, ③ Put aggregate into a steel box and mix with water and cement (**Fig. 3**), ④ Place the mixed materials into the formwork of the sabo dam. The steel box was placed next to the work form, ⑤ Compact it with vibration roller (**Fig. 4)**. Works through ① Collect aggregate ~ ④ Place the mixed materials, were all done with solely hydraulic excavators except water and cement added manually into the steel box. Therefore the work of concrete production was carried out efficiently with a single kind of machinery. The steel box has capacity of mixing up to 5 m^3 of soil cement at a time. Steel boxes and sieves were manufactured locally at an iron workshop in Jogjakarta City.

Since soil cement's potential as sustainable technology in Indonesia was prospected, a committee with members consisting of the faculties from Bandung Institute of Technology and the officials of Ministry of Public Works was established to create Indonesian technical standards [5)] .This is an example of good practice that a technology suitable for the local environment was introduced from Japan and pathway for dissemination was prepared.

(3) Gabions with iron wire

Sindhuli Road in Nepal was constructed by Japan's grant aid through 1995-2015 with project cost of 26 billion yen. The total length of the road is 160km, connecting Terai Plain and Kathmadu. In the project, a total of 306 thousand m^3 of retaining walls were constructed with gabions (**Fig. 5**). Gabion was also used for river embankment protection around sabo dams in Merapi Project. Only two kinds of material are required for gabions; iron wire and cobble stones. They are locally procurable and inexpensive. Since much machinery or advanced technology is not required for its construction, it is excellent in workability and maintainability. **Fig. 6** shows local residents of Nepal repairing gabions for the retaining walls of roads. **Fig. 7** shows the stone piling found in paddy fields at the foot of Mt. Merapi. Structures made of gabions can be constructed and maintained with application of such local technology.

In Japan, although the design and construction technology standard of gabion exist, its structural reliability is not fully understood. However, in Asian countries, its usefulness is recognized as sustainable technology. it is often used in Japan's

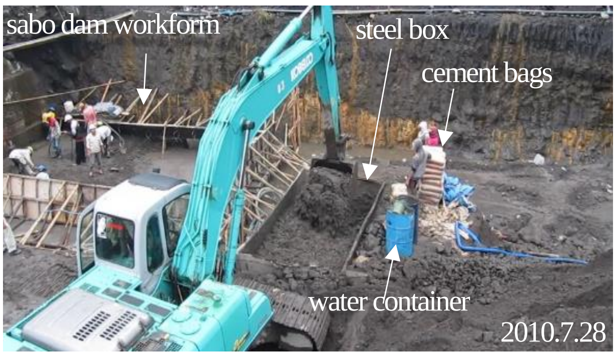

Fig. 3 Soil cement production, Merapi Project

Fig. 4 Compacting of soil cement at sabo dam construction Merapi Project

ODA projects.

(4) Causeways

a) Planning of bridges over rivers without embankment

Many of the rivers in the Asian countries are natural rivers without embankment. In such rivers, channels are unstable and its flow direction is unpredictable. Availability of hydrological data are not sufficient and it is difficult to predict the high water level and discharge with statistical method. Therefore in such rivers, it is difficult to determine the bridge's length, height and abutments' positions.

Along Sindhuli Road in Nepal, there are 54 river crossing points, among which causeways were constructed at 39 points and solved the problems (**Fig. 8**). The causeway is a river crossing structure, identical with a low weir or riverbed solidification. Vehicles pass through its top and flow is allowed to overtop during flood. As the structure doesn't exist in Japan, the design standard for riverbed solidification was applied accordingly. The causeway became a solution for crossing structures of rivers without embankment and was also effective in reducing construction cost.

b) Measures for flood flow control in the flood plain roads [6)]

In Cambodia, rehabilitation of National Road 6's Siem Reap section with length of 17.5 km was completed in 2002 with a project cost of 1.4 billion yen by grant aid from Japan.

The national road runs from east to west along the northern shore of Lake Tonle Sap. During rainy season, streams flowing down from the upstream area along the north side of the road is blocked by the road embankment and is flooded occasionally. The flooded water is drained downstream passing under the road through bridges and culverts. If the amount of runoff is too large and the water level of the upstream of the road embankment keeps rising, flood finally overtops the road. This occurred

Fig. 5 Retaining wall constructed with gabion Sindhuli Road, Nepal

Fig. 6 Local people repairing gabions, Nepal

Fig. 7 Stone piling work seen at paddy fields on the hill side of Mt. Merapi, Indonesia

Fig. 8 Causeway, Sindhuri Road, Nepal

along the sections with the road surface altitude lower than 14.5m. The total length of the overflowed sections were 3 kilometers. If the height of the road embankment is raised to prevent overflow, the upstream water level would further rise and the flow velocity at bridges and culverts increases, causing scouring on the riverbeds and river banks, and washing of the farmland downstream was also predicted.

There was an alternative of building bridges with sufficient length to allow flood be discharged safely, but this idea was not feasible due to increased construction cost. For this reason, height of the road embankment was designed such that hydraulic condition of the flooded water on the upstream of the road is not changed to minimize the flood damages as mentioned. The same idea as causeways that allow flooded water overtop the road surface was adopted.

According to interviews to the local residents in surrounding areas about the floods that overtopped the road, the maximum water level elevation on the upstream during the past 30 years was found 14.5 m in 1997. Therefore, in the sections where the existing road height was 15 m or less, adding 0.5m as allowance, the height of the road embankment was not changed and the road profile was kept as it had been. This is a case that the problem of road planning was solved as a subject of river engineering.

4. DISCUSSIONS

1. In the previous chapters, various technologies devised in accordance with the local environment to respond to user's needs in Japan's ODA projects of the infrastructure sector, have been explained. Such technologies should be properly evaluated.
2. Post evaluation from the user's viewpoint is expected to motivate engineers, increase their international competitiveness and improve the quality of Japan's ODA projects.
3. In order to implement post evaluation from the user's viewpoint, it is necessary to create a criteria different from DAC's.
4. In connection with infrastructure projects, following points are to be particularly noted [7].
   1) It is important to think how to customize Japanese technical standards from user's viewpoint. Advanced methods / latest technologies are not necessarily the optimal solution.
   2) Ideas that make maintenance easier and sustainability possible by utilizing local resources are important.
   3) Construction of infrastructures requires abundant funds in general. Therefore, ideas that yields the same quality and function with less cost should be properly appraised. Less construction cost leads to less maintenance cost and sustainability

5. CONCLUSION

1. The DAC evaluation criteria focuses at the result of investment, with emphasis on the donor's viewpoint of what effects has been achieved by inputting the amount of funds. However, this standard does not have a viewpoint to evaluate the technology applied to satisfy users' needs. So is the JICA's post evaluation that applies the DAC standards, which lacks in the analysis to clarify the technology's contribution.
2. Evaluation system is a tool to be constantly reviewed. It is proposed to introduce user's viewpoint into post evaluation of Japan's ODA, as well as international donor's projects so that the ingenuity of technologies be evaluated properly.

REFERANCES

1) Thomaz Chianca: The OECD/DAC Criteria for International Development Evaluations: An Assessment and Ideas for Improvement, Journal of Multi -Disciplinary Evaluation, Volume 5, Number 9 ISSN 1556-8180, pp. 41-51, 2008
2) DAC CRITERIA FOR EVALUATING DEVELOPMENT ASSISTANCE, OECD, www.oecd.org/dac/evaluation

3) Japan International Cooperation Agency: Practical Evaluation Method, JICA Project Evaluation Guidelines, International Cooperation Publishing Association, pp. 18, 88, 2002
4) Hiroyuki Ohno: Effective utilization of the soil generated on the site in the sabo works part 8, Sabo and flood control 32 (6), pp. 42 - 43, National Foundation of Sabo Society, 2000
5) Ministry of Public Works: Pedoman, Bahan Konstruksi Bangunan dan Rekayasa Sipil, Tata cara pelaksanaan, 2011 penggunaan semen tanah sebagai komponen utama bangunan Sabo
6) Japan International Cooperation Agency · Katahira Engineering Co., Ltd.: Cambodia National Route 6 Route Improvement of Siem Reap Section Basic Design Survey Report, p. 3-4, 1999
7) Moriyasu Furuki: Lecture Material, Infrastructure Study Group, JICA, 2015

(Accepted as of Sept. 30, 2018)