

# FUTURE DIRECTION OF JAPAN'S OFFICIAL DEVELOPMENT ASSISTANCE (ODA) IN INFRASTRUCTURE DEVELOPMENT

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**ABSTRACT:** Japan's official development assistance (ODA) has been providing the major resources for socio-economic development in many developing countries. Japan's contribution in hard infrastructure development has been dominating other soft development like human resources and technology development in recipient countries. Recipient countries especially low-income developing countries are ever dependent on developed countries for human resources and technology for their domestic infrastructure development. In addition, the insulated project execution system of the Japanese grant aid projects has influenced the international competitiveness of Japanese contractors and consultants to expand overseas business. The new scheme developed in this study, based on the Nepalese and Cambodian contexts, integrates the perspectives of recipients as well as donors. Strengthening universities and technology development system in developing countries, and using alternative project delivery system in ODA project execution have been recommended to address recipients' as well as donors' industries issues and to improve the efficiency and efficacy of ODA. The new ODA scheme has been started to implement in Cambodia and it has enabled to produce a new product for Cambodian rehabilitation.

*Key Words: ODA/Official development assistance, donors, recipient countries, human resources development, technology development*

## 1. INTRODUCTION

Official development assistance (ODA) since its adoption has become the major resources for socio-economic development of the developing countries. The ODA amounts since 1990 contributed by the main members of Development Assistance Committee (DAC) are shown in Figure 1. Japan's ODA was the largest among the donors in the 1990s, and still occupies second position since 2000. The developed countries have already spent about USD\$ 1 trillion for the development of developing countries. However, the development of some of the low-income developing countries is insignificant as seen in the Figure 2. In addition, the construction industry of low-income developing countries is still not able to develop their domestic socio-economic infrastructure and is dependent on

developed countries for human resources and technology.

Japan's contribution in hard infrastructure development has been dominating other soft development like human resources and technology development in recipient countries. In addition, Japanese consultants' overseas business was mainly from the Japanese finances in the overseas. Despite the large ODA amount from Japan and long time involvement in ODA projects Japanese firms' overseas business in international organizations and other governments is significantly lower than their counterparts from some of the developed countries like the USA, UK. The authors argue for reforming Japan's ODA system in order to enable low-income developing countries able to develop human resources and technology themselves for

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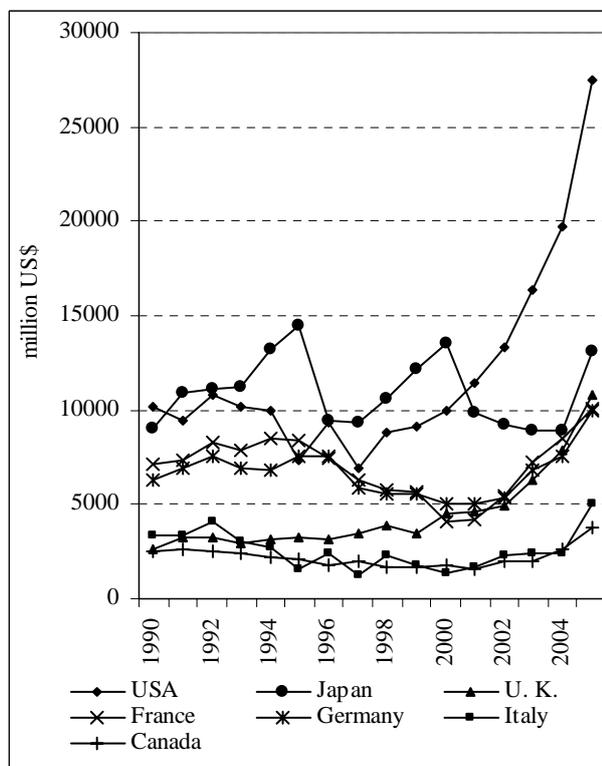
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infrastructures development and to enhance the competitiveness of Japanese consultants and contractors for expanding their overseas business. This paper discusses some of the issues in Japan's ODA and their influence on local construction industry of recipient countries as well as on overseas business of Japanese contractors and consultants, and explains a new ODA scheme based on the Nepalese and Cambodian contexts.

## 2. OFFICIAL DEVELOPMENT ASSISTANCE (ODA)

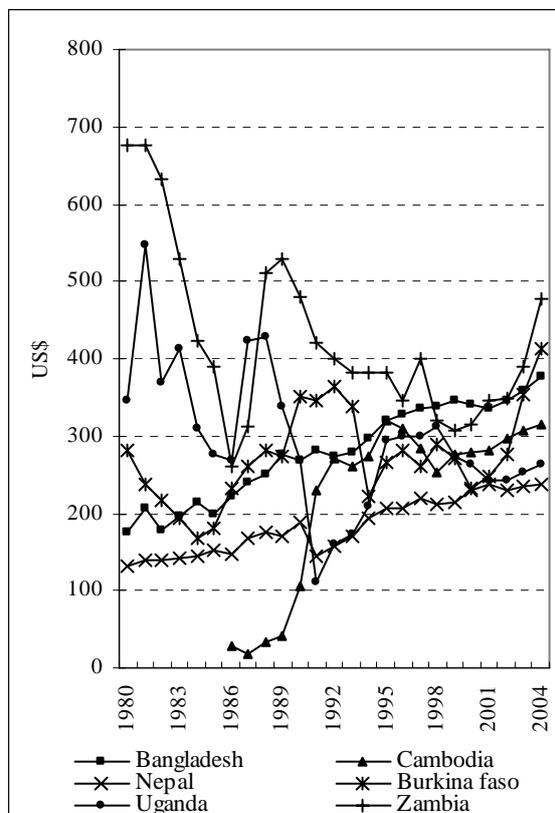
The historical beginnings of official development assistance were the development activities of the colonial powers in their overseas territories, the institutions and programs for economic co-operation created under United Nations auspices after the Second World War. In 1950, the Colombo Plan ("Council for Technical Co-operation in South and South-East Asia") was initiated by the Commonwealth with 7 founding member: Australia, Canada, New Zealand and the UK as donors. The US and Japan joined the plan in 1951 and 1954 respectively. In 1955, Japan started reparation payments to Burma (now it is known as Myanmar), the Philippines and Viet Nam. Development assistance group (DAG) was formed in 1960 as a forum for consultations among aid donors on assistances to less-developed countries.



**Figure 1:** Amount of ODA from main members of DAC  
Source: OECD, figures for 2005 are preliminary

Further, the organization for European Economic Co-operation (OEEC) established in 1948 was reconstituted as Organization for Economic Co-operation and Development (OECD) in December 1960. Many countries started to establish their aid cooperation agencies in 1961 like Kuwait fund for Arab Economic development, United States Agency for International Development (USAID), Japan Overseas Economic Cooperation fund, Swedish International Development Authority (SIDA) and so on. However Official Development Assistance (ODA) concept was adopted by DAC established in 1961 in OECD separating ODA from "Other Official Flows" (OOF) and identifying as ODA those official transactions which were made with the main objective of promoting the economic and social development of developing countries and the financial terms of which were "intended to be concessional in character"<sup>1)</sup>.

The DAC is the principal body through which the OECD deals with issues related to co-operation with developing countries. There are 23 members in the DAC. These are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States and Commission of the European



**Figure 2:** GDP per capita in some low-income developing countries,  
Source: Asian Development Bank, ECONSTATS™

Communities. Among the 23 members the USA, Japan, the UK, France, Germany, Italy and Canada are the major contributors in the DAC.

### 3. JAPAN'S ODA

The history of Japan's financial assistance dates back to 1954 when treaty of peace, reparations and economic cooperation was concluded between Japan and Burma. Since then the Japanese government concluded reparations treaties with Philippines, Indonesia and Vietnam. The quasi-reparations and non-reimbursable financial aid have been provided to Cambodia, Laos, Thailand, Malaysia, Singapore, Korea and Micronesia<sup>2)</sup>.

#### (1) Features of Japan's ODA

Japan's official development assistance (ODA) is classified into three types: i) bilateral grants, ii) bilateral loans, and iii) financial subscriptions and contributions to international organizations.

##### a) Bilateral grant

It includes grant aid that provides funds with no obligation for repayment, and technical cooperation that transfers technology to developing countries.

##### i) Grant Aid:

Japan provides grant aid to countries that have a relatively low income among the developing countries. Grant aid is primarily channeled to support basic human needs (BHN) (such as medical services, public health, water supply, and rural and agricultural development) and human resources development. In addition, Japan provided grants aid to carry out infrastructure projects, such as roads, bridges, and telecommunications. The Ministry of Foreign Affairs implements Grant aid, with the assistance of the Japan International Cooperation Agency (JICA).

##### ii) Technical Cooperation:

Technical cooperation is targeted toward development of the human resources necessary for the economic progress of developing

**Table 1: Japan's ODA to Nepal (1994-2001), Unit: 100 million Yen**

Year	Infrastructure Development									Materials & Equipment	Food aid & Aid for food production	Debt Relief	Miscellaneous	Grant Aid	Loan	Technical Cooperation
	Roads	Bridges	Water supply	Buildings	Airports	Power	Communication	River Training	INFRA Total							
1994		7.66	8.44	4.18	8.76	19.73			48.77	11.52	15.00	11.16	0.20	86.65		33.36
1995	0.75	4.75			23.71	0.77	0.46		30.44	6.43	9.00	11.10	0.46	57.43		23.50
1996	9.94				2.06	19.59	5.95		37.54	5.87	8.50	11.05	0.48	63.44	204.00	27.92
1997	18.49						12.69		31.18	6.19	14.37	10.92	0.16	62.82		23.43
1998	10.52							5.37	15.89		7.00	28.91	0.22	52.02		23.18
1999	16.71			8.27	12.72				37.70	0.37	9.90	19.59	0.36	67.92		19.34
2000	11.73			13.47					25.20	0.47	8.50	19.37	0.80	54.34	54.94	19.87
2001	26.10		10.44	17.10					53.64		7.00	19.13	1.44	81.21		18.37

Source: White paper on Japan's ODA

**Table 2: Breakdown of Technical Cooperation under Japan's ODA to Nepal (2000-2002), Cost in 100 million Yen**

Year	Trainees		Experts		Study Team		JOCV		Other Volunteers		Provision of Equipment	Total Technical Cooperation	% of Nepal's National Budget
	No.	Cost	No.	Cost	No.	Cost	No.	Cost	No.	Cost			
2000	163	3.07	82	5.02	184	7.26	69	2.66	15	0.75	1.11	19.87	1.7
2001	138	2.56	67	5.42	135	5.56	50	2.55	12	1.00	1.29	18.37	1.4
2002	162	3.37	54	5.70	106	3.70	63	2.73	20	1.15	1.07	17.71	1.3

Source: White paper on Japan's ODA

countries. It includes: (1) Dispatch of experts, (2) Acceptance of trainees, (3) Provision of equipment and materials to facilitate technology transfer, (4) Project-type technical cooperation incorporating dispatch of experts, acceptance of trainees and provision of equipment and materials, and (5) Dispatch of the Japan Overseas Cooperation Volunteers (JOCV).

The fields covered by Japan's technical cooperation range widely from basic human needs (BHN), such as public health and medical services, to computer science and other areas of advanced technology. JICA is responsible for most of Japan's technical cooperation activities.

#### b) Bilateral Loan

Bilateral loans are the loans that provide the funds needed for development under long-term and low interest conditions. These loans provide funds to develop and improve the economic and social infrastructure necessary to support self-help efforts and sustainable economic development for developing countries. JBIC: Japan Bank for International Cooperation handles the major part of Japan's ODA loans.

#### c) Financial subscriptions and contributions to international organizations

Subscriptions and contributions for multilateral aid are indirect methods of extending aid by channeling funds through international organizations. Japan provides considerable amount to some multilateral agencies in order to support the developing countries through the agencies.

### **(2) Activities under Japan's ODA**

Japan's ODA has been utilizing for hard as well as soft development in developing countries. It consists of economic and social infrastructure like roads, bridges, airports, building, water supply, sanitation, health care, schools, etc. In addition, it also contains supply of equipment, food aid and debt relief fund. Other social development included under Japan's ODA are human resource development, development study, etc. which are performed under the technical cooperation. A typical Japan's ODA to a least developed country Nepal is shown in Table 1.

Although Japan's ODA incorporates soft development function, the main activities of the ODA is seemed to be hard infrastructure development. Construction of facilities had the prime importance rather than human resources and technology development in developing countries. For instance, all grant aids excluding technical cooperation under Japan's ODA in 1994-2001 to Nepal was used in hard infrastructure development with as much as 3 percent was utilized for educational infrastructure related activities—

materials and equipment for the construction of primary schools<sup>3)</sup> (refer: Japan's ODA Annual reports). Similarly, less than 1 percent of the grant aids to Cambodia in the same period was used for human resources development scholarship<sup>3)</sup>. Technical cooperation which is responsible for human resources and other soft development also has not addressed the issues in the human resources and technology development in developing countries. It provides mere training for a few people usually from clients' organization in Japan or in third country. The major portion of the technical cooperation has been utilized for the experts and volunteers as seen in Table 2. Further, technologies development in aid recipient countries like Nepal and Cambodia was never addressed. Despite the large ODA investment, developing countries like Nepal and Cambodia could not improve the quality of higher education and are not able to develop appropriate human resources and technology for domestic infrastructure development. Donors have been filling the gap of human resources and technology from outside through the ODA rather than helping developing countries to develop themselves.

### **(3) Overview of ODA implementation system in relation to opportunities for local industry, and overseas business of Japanese contractors and consultants**

Donor assisted projects in developing countries do not provide enough opportunities for the local firms to be the main executor for the execution of medium to large infrastructure development projects. Bilateral grant aid projects in principle and practice are tied to the donors' industry<sup>4)</sup>. Donors deploy consultants and contractors from their countries of origin to execute the bilateral grant aid projects. Although some bilateral loan and multilaterally financed projects in principle allowed local industry to participate through international competitive bidding (ICB) but most of the local firms in developing countries do not have enough capacity to compete with foreign firms due to low technical (human resources and technology) and financial capability and insufficient experience. In effect, the local industry does not have enough access to the foreign assisted project. In addition, donors have been using their own countries' standards for design and construction of the facilities in donor assisted projects. A recipient country therefore has to follow different standards even in building similar infrastructure under different donors. For instance, the USA, French, Australian, etc standards have been following in infrastructure design and construction in Cambodia. Such execution system has not motivated local

industries in developing countries to develop their own standards. In effect, the existing system of ODA execution has made recipient countries without their own standards, and compelled to deploy expensive foreign expatriate to implement infrastructure development projects. As a result, the capacity of local firms has remained unimproved and there were no significant technological development in the local industry in low-income developing countries.

Like in other bilateral ODA, Japanese consultants and contractors are deployed for the implementation of the projects under the Japanese bilateral grant aid. However, their businesses in international finances were very low as seen in Figure 3 and

Table 3. The overseas businesses of Japanese contractors were taken from overseas construction association of Japan Inc. (OCAJI)<sup>5</sup>. Similarly, the overseas consulting business data of Japanese firms were taken from the Infrastructure Development Institute-Japan. A report prepared by the Infrastructure Development Institute-Japan<sup>6</sup> with the survey of the overseas consulting business of 60 Japanese firms showed that nearly 85 percent of overseas business of Japanese consultants' had been under the Japanese finances. Similarly, Japanese contractors' business in the overseas under the multilateral agencies' finances were very insignificant. Japanese enterprises were providing considerable amount of business for the Japanese

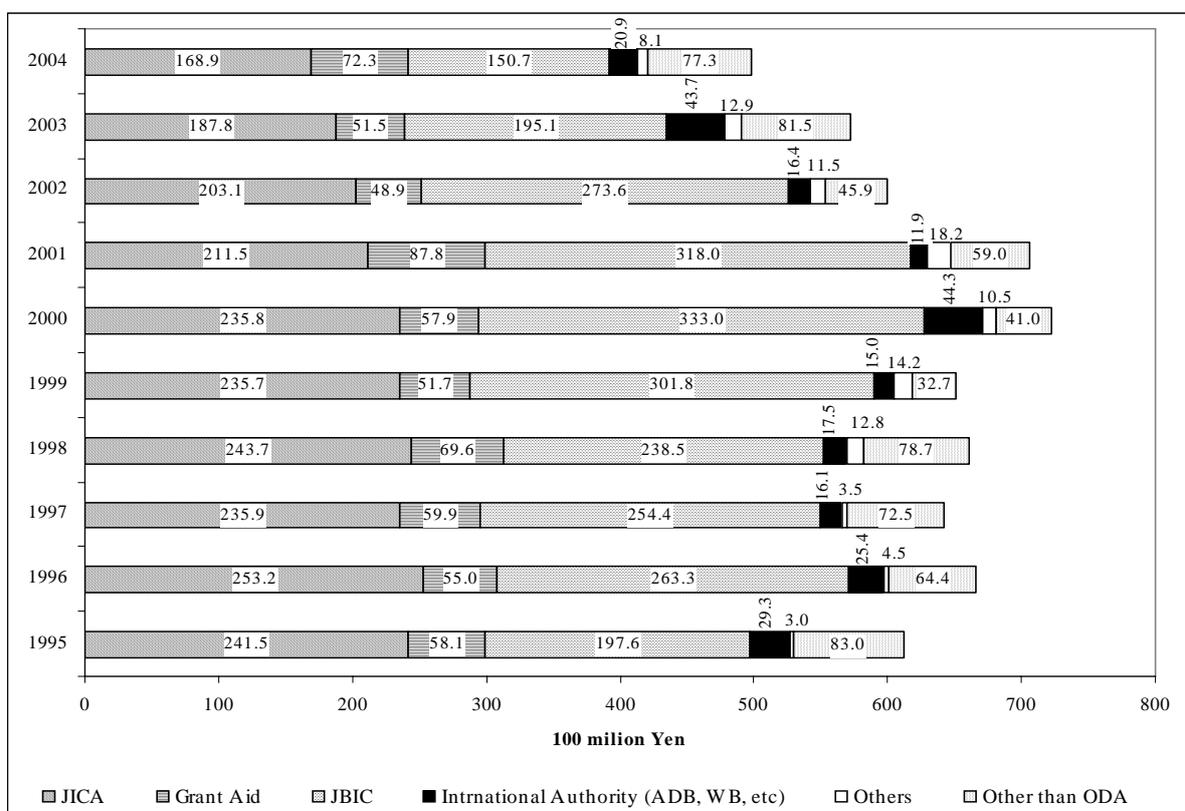


Figure 3: Overseas business of Japanese consultants in 1995-2004 by finance; Source: <http://www.idi.or.jp>

Table 3: Overseas construction contract awarded to Japanese contractors in 1999-2003 by the type of finance. Unit 100 million Yen

Year	Own	ODA Loans (Yen Credit)	ODA (Grant aid)	International Finance	Others	Total
1999	6,374	299	577	47	0	7,297
2000	8,856	539	562	43	0	10,000
2001	5,942	1,500	626	15	0	8,083
2002	6,639	256	416	20	253	7,584
2003	7,090	1,273	375	18	226	8,982

Source: Tomise, M., OCAJI

Table 4: Overseas construction contract awarded to Japanese contractors in 1999-2003 by the type of employer. Unit 100 million Yen

Year	Public	Local private enterprise	Local Japanese private enterprise	Domestic Japanese enterprise	Total
1999	3,037	2,596	1,559	105	7,297
2000	5,411	2,553	1,819	217	10,000
2001	3,902	2,191	1,818	172	8,083
2002	3,712	2,098	1,356	418	7,584
2003	4,045	2,559	2,254	124	8,982

Source: Tomise, M., OCAJI

contractors in the overseas, Table 4. However, Japanese contractors are not able to expand their overseas business beyond the 1983's value except sharp rise in 1995-96 as seen in Figure 4.

In addition, the ability of Japanese firms in obtaining overseas consulting business is lower than that of counterparts from some of the developed

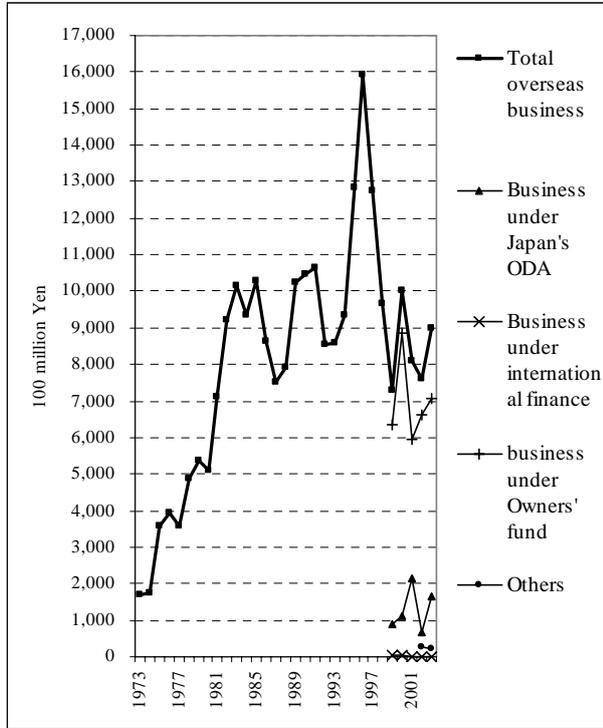


Figure 4: Overseas business of Japanese contractors

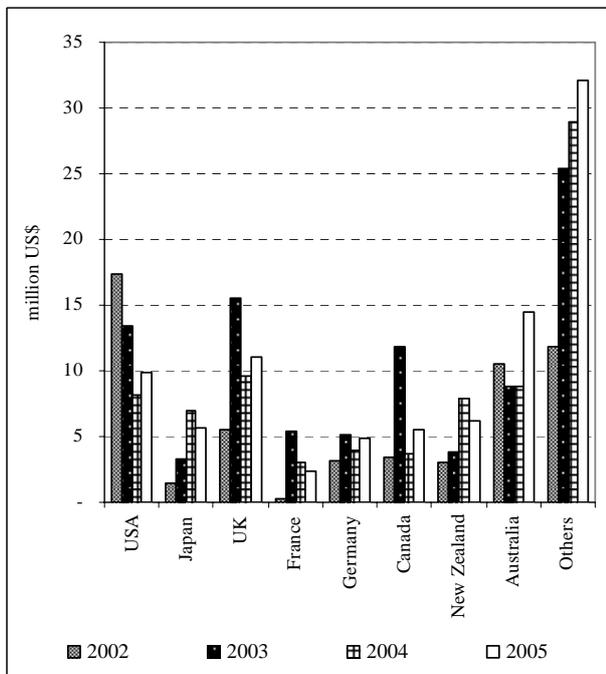


Figure 5: Value of contract awarded for technical assistance under ADB finance with leading consultants' countries of origin.

countries. Overseas consulting businesses of firms from Australia, Canada, France, Germany, the UK and USA were higher than the Japanese firms did. For instance, the consulting contract awarded in 2002-2005 for technical assistance under the Asian Development Bank (ADB) to the main consultants from Japanese origin was lower than consultants from the USA, Australia, UK, Canada and New Zealand, as shown in Figure 5<sup>7</sup>). In addition, Japanese firms showed a mere presence in the consulting works under the World Bank finance. The Figure 6 has shown that firms from Japan had the lowest consulting business among the UK, USA, France, Germany, Canada, Australia, Netherlands, Italy and New Zealand counterparts under the World Bank (WB) funded projects in 2001-2003<sup>8</sup>). Overseas consulting business of Japanese firms in the WB finance was mainly limited in technological consulting for hard infrastructure development, and not in policy, management and administration related works. Japanese firms' consulting business under the WB in 2001-2003 was less than 5% of the USA and UK counterparts' businesses. In addition, although business practices of Japanese and USA contractors

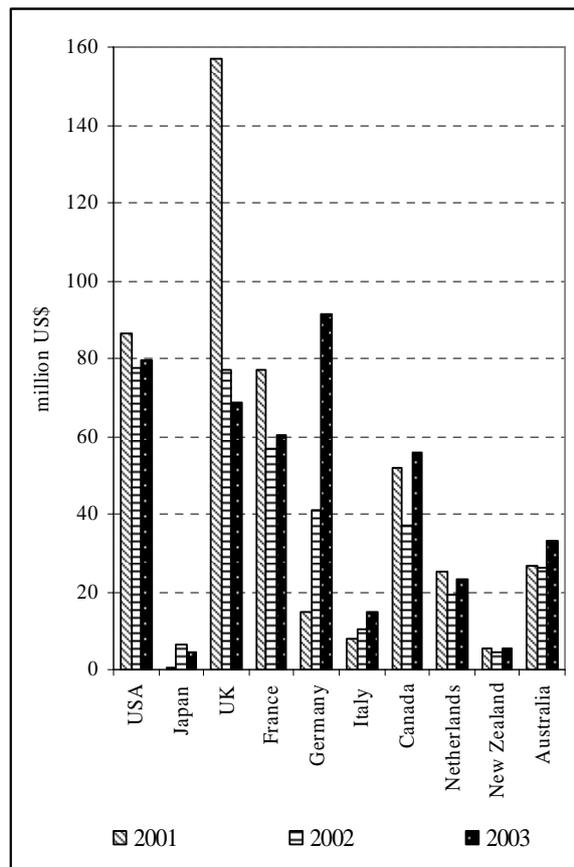


Figure 6: Value of contract for all types of consulting services under World Bank finance with the main consultants' countries of origin.

are different, the overall industrial ability of Japanese contractors in obtaining overseas business was found lower than USA counterparts. For instance, top 9 Japanese contractors in 2003 had about 15 % of their annual turnover from the overseas business whereas the top 8 counterparts from USA could receive 60 % of their annual turnover in the same period. The total international turnover of the top 8 USA contractors in 2003 was more than double of the total international business of top 9 Japanese counterparts<sup>9)</sup>.

#### 4. ISSUES IN JAPAN'S ODA

##### (1) Insulated Execution System

As such the bilateral aids are tied aid and are executed by the deployment of consultants and contractors from donors' countries of origin; the execution of the Japanese bilateral grant aid projects are the responsibility of Japanese consultants and contractors with the cooperation of clients from recipient countries. Like in the Japanese domestic construction industry, the grant aid projects irrespective of the system of execution in recipient countries do use lump sum contracts and do not incorporate the international practice of the construction market like progress payment, claims, and contract administration. The installment payment system is done. The target date of completion and the final product are the only concerned matters for the executor. The insulated execution system has put attention in donors' industry and on technical matters only in project implementation provided limited opportunity for recipients' industry neglecting the importance of international practices including management and administration of contract.

##### (i) Effects of the system on Japanese consultants:

The Japanese consultants perform the basic & detail design and construction supervision of the Japanese grant aid projects. The supervision works usually limited to the mere certification of the contractors' work but not the real administration of contracts and supervision of works. Many of the resident engineers sent by consultants only approve what the contractors have done and do not supervise in a real sense. Such situation comes from the lack of tension between the parties because no claim is submitted<sup>10)</sup>.

As such the contracts do not incorporate progress payment and claim, the consultants do not have to put attention in contract administration including work-process, claim and variation. Such situation has made Japanese consultants deprived from exercising international practices in the Japanese grant aid projects. In addition, the Japanese

domestic construction industry also does not require contract administration. This is one of the reasons due to which Japanese consultants have lower chances compared to the western counterparts to get management and administration contracts in the international construction market.

Thus international competitiveness of Japanese engineers has been influenced by the uniqueness of the Japanese construction industry and the insulated execution of the Japanese ODA projects. Galloway, P.D. (2005) has commented as "*the current Japanese consulting engineer simply does not possess many of the needed skills such as communication, project management, dispute resolution and so forth in order to compete internationally or to move domestic construction market ahead in Japan. Moreover, Japanese consulting engineers are being treated as "support staff" and not as professionals such as in the medical and accounting profession*"<sup>11)</sup>.

##### (ii) Effects of the system on Japanese contractors:

Japanese firms deploy most of the skilled workforce from Japan and unskilled labors from the recipient countries. They do all the major works themselves, and simple work through sub-contracting to local firms. As such main contracts do not incorporate progress payment and claims, the main contractors do not need to put attention in process control and variation. In addition, since the simple works are subcontracted, sub-contracts do not also demand for contract administration including claim and dispute resolution. Thus construction contracts under the Japanese grant aid do not provide Japanese contractors enough opportunities to exercise rigorous contract administration including claim management and dispute resolution. Thus Japanese contractors could not gain enough experience from the grant aid projects to enhance their competitiveness in the area like management, administration which are required to expand overseas business such as in project management. Further, Nielsen, K.R. (2005) has also pointed out that "*Japanese engineers need contract administration, dispute resolution and risk management skills in order to be competitive in the global construction market*"<sup>12)</sup>.

##### (iii) Effects of the system in local construction industry from recipient countries:

Since simple works are only subcontracted to local contractors, local construction industry does not have enough opportunities to acquire modern technology and execution management skills from the Japanese firms in order to enhance the capacity. Moreover, donors' assisted project usually requires

following donors' standard for design and execution of a project. Such system has made lack of motivation for technological development and innovation in recipient's industry, and the capacity of local construction industry remained unimproved. As a result, local construction industry from low-income countries is not yet able to develop the domestic infrastructure themselves. The dependency of low-income developing countries on the foreign firms for human resources and technology has not been decreased.

In order to improve the situation in the low-income developing countries and to provide the Japanese firms opportunities to enhance their international competitiveness, the project execution system in grant aid projects, as discussed later in subsequent chapters, should be changed.

### (2) Inefficient Technology Transfer

Since the locals do not have enough opportunities to be involved in execution of the foreign assisted projects, the final product delivered to the beneficiaries enabling them to use the products but lacking the technology and process for reconstruction or rehabilitation. Japan's ODA had been more oriented to the clients than industries in the recipients' countries. However, there are many executing agencies for infrastructure development in low-income countries like Nepal and Cambodia without proper coordination. Further, there is no horizontal movement of human resources across the executing agencies. A technology transferred to an executing agency therefore will flow only in vertical direction if not died out, and there is no medium for horizontal diffusion. For instance, ministry of physical planning and works, ministry of water resources ministry of local development and some other organizations have been involved in infrastructure development in Nepal. However, there is no flow of manpower across the ministries. Thus, a technology or trained manpower within a ministry remains within its boundary without significant spill over. A technology for a specific purpose, say bridge design/building, transferred to one ministry is equally applicable to other ministries, but there is no medium for dispersion to other agencies.

There is a need to introduce additional stakeholder in order to facilitate the transfer and diffusion of a technology in developing countries. Universities as proposed in the new scheme as discussed below would provide better transfer, absorption and internalization in a recipient country.

### (3) Inefficient Human Resources Development System

The major activities of the human resource development under Japan's ODA are dispatch of

experts and acceptance of trainees from developing countries. The experts are dispatched upon the request of the recipient governments to assist clients. Dispatch of experts in developing countries dominates the human resources development activity of Japan's ODA. Table 2 showed that less than 20 percent of the technical cooperation provided to Nepal in 2000-2002 was utilized for training the trainees from Nepal. The training in Japan is at least 10 times expensive than the similar trainings in developing countries do. As a result, there was insignificant human resource development compared to the technical cooperation amount extended to a recipient country. In addition, the JICA offers training for human resources development mainly for the clients' people. However, JICA trainings are provided in an equitable manner and are generic in nature. It does not provide an organization of a country for regular participation and rarely addresses the country specific needs.

Training in a particular area for a few people from an organization in a long-year gap does not improve the performance of the organization. Thus, training for a few people in a discrete manner does not affect the skill level of an industry where hundreds of untrained people enter to the industry. This can be further illustrated with the help of Table 5: about 8 people from Cambodia and 13 from Nepal had gone for infrastructure sector training under Japan's ODA but the universities in Cambodia and Nepal are producing about 300 and 800 civil engineers respectively every year. Thus, even JICA's contribution in training is significant, a few trained people such as 8 from Cambodia and 13 from Nepal in a year are not sufficient to improve the

**Table 5: Numbers of trainees in infra sector in JICA training from Cambodia and Nepal**

Year	Cambodia		Nepal	
	No. of trainees (infra)	Training Cost (1000 yen)	No. of trainees (infra)	Training Cost (1000 yen)
1994	5	6,347	12	29,816
1995	4	10,469	17	46,671
1996	4	4,768	24	230,884
1997	13	32,702	11	30,314
1998	10	19,043	15	32,043
1999	12	12,911	12	31,368
2000	8	16,117	11	17,958
2001	5	5,877	7	11,933
2002	9	13,566	10	18,391
<b>Total</b>	<b>70</b>	<b>121,800</b>	<b>119</b>	<b>449,378</b>

Source: JICA

performance of the Cambodian and Nepalese construction industry respectively unless the quality of higher education and in-house technology development system were improved. The existing clients' oriented JICA training has merely facilitated the individual benefits rather than improving organizational performance.

The technical cooperation should be directed to improve the human resource development system like strengthening higher education so that the local universities in the recipient countries could conduct research and training themselves at lower cost and improve the quality of education.

## **5. NEW SCHEME FOR FUTURE ODA**

A new scheme has been developed in this study in order to improve the efficiency and efficacy of ODA system and to enable developing countries able to develop appropriate human resources and technology domestically for their infrastructure development. Unlike in the existing ODA system, the new scheme primarily utilizes university functions for human resources and technology development. Universities collaboration followed by establishment of center of excellence where research and technology/ product development is performed and deployment of human resources, technology and product in development projects are the main features of the new system. A schematic diagram of the new system is shown in Figure 7.

The existing fragmented human resource and infrastructure development system will be integrated together with technology development in the new system. A part of ODA will be forwarded through universities for human resources and technology development, and other part will be utilized through executing agencies of the recipient countries to construct the facilities. Universities from donor country first provide higher training/research opportunity for faculties from recipient country, and enable local university/institution able to establish center of excellence for education and research (COE&R) with adequate research and development facilities. The COE&R will establish linkage with local as well as international industry. The center with the support of universities from donor's country will provide training opportunities for local practitioners. The local industry will be made familiar with international practice and technology through the cooperation from the donor's industry. In this way human resources and technological support will be availed at the COE&R in order to enable local university to develop appropriate human resources and technology required for the

domestic industry.

### **(1) Universities Collaboration for Enhancing Capacity of University**

Tertiary education is the source of the skilled workforce. However, universities in many developing countries including Nepal and Cambodia did not have enough number of faculties with advanced degree/knowledge and lack appropriate facilities to deliver practical and research oriented education. Industry professionals had been complaining the quality of graduates for not acquiring enough practical knowledge and skills from the university education<sup>2)</sup>. As such training for a few clients' people cannot improve the performance of the industry unless the local universities in developing countries were able to deliver quality education.

In order to enhance the capacity of university the new scheme has universities collaboration function to provide faculties from least developed countries opportunities for higher studies in developed countries in the industrial needy areas. Unlike the general cooperation, the collaboration under the new scheme will enable universities able to deliver quality education/training, conduct researches and develop appropriate technology/product for the domestic infrastructure development. The faculties during the capacity enhancement will acquire the knowledge and skills for technology which are appropriate for their domestic infrastructure development. The seed technology for the development of new technology/product in the least developed countries is also transferred through universities collaboration. It is required to refer authors' paper<sup>2)</sup> for the model of universities collaboration proposed for the new scheme which has also been adopting for the collaboration between KUT (Kochi University of Technology), Japan and ITC (Institute of Technology of Cambodia), Cambodia for enhancing the capacity of ITC, Cambodia, and developing human resources and technology for Cambodian rehabilitation.

### **(2) Development of Human Resources and Technology/Products in Recipient Countries**

Unlike in the existing system, trainings for human resources will be conducted through the local universities in the recipient countries. The faculties trained under the universities collaboration supported by the universities/industries from developed country will provide training for the local graduates and practitioners through the center of excellence for education and research (COE&R).

Center of Excellence for education and research is an entity established at university with non profit making operation in order to promote education, research and development. The universities

collaboration will enable local university able to establish the COE&R with adequate research and development facilities where faculties could deliver advanced training, conduct research and develop new technology/products for domestic infrastructure development. The center will have human resource, technology and product development functions.

**a) Human resource development**

The human resources development includes the production of skilled workforce ranging from technicians to advanced professionals, and the activities extend from providing basic training to technicians/skilled labors to the advanced training for industry professionals and researchers. The center establishes strong linkage with domestic as well as international construction industry in order to feed industry practice in education and international practices and technology to the domestic industry. It will continuously feed university the industrial needs and activities in order to update curriculum and to provide the graduates

opportunities to acquire practical knowledge/skills through internship and training. Similarly, the center with the help of universities and industries from donor's country will provide local professionals advanced training and research opportunities.

**b) Technology development**

The existing ODA system has not addressed technology development in recipient countries instead feeding from outside. However, the new system has envisaged technology development functions of the COE&R. Since many developing countries like Cambodia do not have their own standards, the center in cooperation with executing agencies and local industry will develop standards for design, construction and management of infrastructure and introduce the new technology for the deployment. The system/equipment technology development function of the COE&R incorporates technology development for planning, design, construction, management and material production. Thus there will be parallel development of technologies and standards in recipient countries

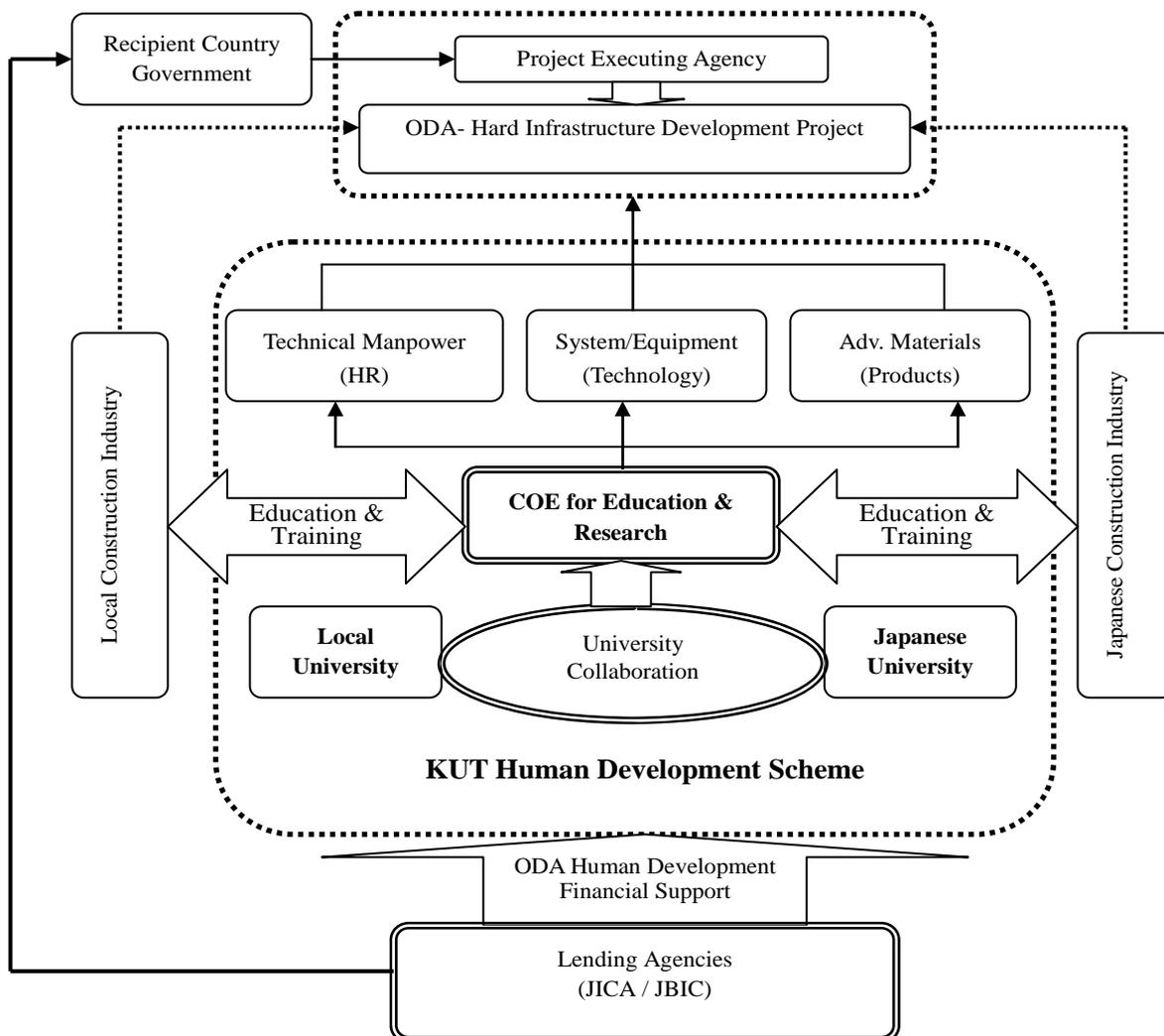


Figure 7: Model for New ODA Scheme

which would enable the stakeholders to implement infrastructure development project efficiently. The development of standards and technology at the COE&R would consequently help decrease the deployment of expensive foreign expatriate in infrastructure development in developing countries.

### **c) Product development**

In addition to the human resources and technology development, the COE&R has product development functions in order to introduce advanced construction materials for infrastructure development. The seed technologies transferred through the universities collaboration are materialized at the center and new technology and products are then introduced to the industry. The standardization of the new technology and product is done through the cooperation from the industry and implementing agencies. The center through university collaboration, researches and cooperation from local and donor's industry will first absorb the seed technology and develop the appropriate product suitable for the local environment. For example, researchers from Institute of Technology of Cambodia and Kochi University of Technology, Japan through the universities collaboration with were able to produce high strength concrete with self compacting concrete using local materials in Cambodia. The same technology was used to produce high strength pre-stressed pre-cast concrete girder/beam using self-compacting concrete for facilitating short span bridge rehabilitation in Cambodia.

### **(3) Deployment of Human Resources, Technology and Products in Development Works**

The proposed new scheme has envisaged deploying human resources, technology and products developed in the COE&R in development works. Deploying human resources, technology and products of COE&R in development works would provide faculties to experience industry practice, encourage university to develop more new technology and products and enable university to provide graduates industry and research oriented education. The cost reimbursement system for the deployment of the services and products from the COE&R would help lower the cost of infrastructure development and consequently lowers the loan burden of poor developing countries. The returns from the services of COE&R could be utilized for further research and development and to deliver quality education at reasonable cost. Such system further enables local universities to be self-financed and able to develop appropriate human resources and technology domestically.

## **6. IMPLEMENTATION SYSTEM FOR**

## **NEW ODA SCHEME**

Unlike in the existing system, the new scheme requires the involvement of universities from donors as well as recipient countries to actively take part in ODA implementation. The functions of different stakeholders in the different stages of implementation of the grant aid projects will be as follows.

### **(1) Project Preparation Phase**

The new scheme requires identifying appropriate quality of human resources and type of technology required for the execution of the projects under consideration. Unlike in the existing system, the executing agencies should include, in addition to the project features and feasibility, the quality of human resources and technology for construction, material production and management required for the execution of the projects under consideration. The universities, industry and concerned engineering institutions can supply the information regarding the human resources and technology available in the country. The complete project proposal should then be submitted through the local agencies of the donors following their prescribed process.

### **(2) Request-Approval Phase**

The consultants designated for the basic design study of the appraised projects should recommend the appropriate university/institution from the recipient's as well as donor's country of origin in making availability of required human resources and technology at the time of execution of the projects under consideration. The basic design study report for the new ODA project should include not only the scope of work, cost estimate, schedule of execution but also the human resources and technology development plan. The consultants should recommend the possible universities/institutions from the recipient and donor country of origin to be deployed for the development of human resources and technology in the recipient country. The donor agency while extending approval to carry out the project also recommends the university/institution which will go for the collaboration and engage in development of human resources and technology as explained in preceding chapters.

The single fiscal year contracting system under the Japanese grant aid should be changed to multi-year approach with rolling programs and budget. The basic and detailed design period should be extended in order to make the project execution plan compatible with the human resources and technology development plan. A researcher has also recommended for the extension of the design period

citing the prevailing design period was not enough to investigate and to collect sufficient data for the detailed design and estimate, and contractors had been suffering from losses due to the encounter of unidentified site condition during the execution of the projects<sup>10</sup>. Thus extension of the design period making multi-year contract will enable not only consultants to investigate all necessary data but also the universities/institutions able to develop and supply required human resources and technology at the execution stage of the projects. The new scheme requires allocating a part of the existing technical cooperation fund in order to support universities collaboration and to enable recipient able to establish and run the center of excellence for education and research.

### (3) Execution Phase

The new scheme has envisaged an alternative project delivery system as shown in Figure 8. An alternative management contracting system has been proposed for the execution of the projects. Unlike in the existing execution practice, the consultants/contractors from donor country in the proposed scheme will perform the contract management/administration/supervision rather than real construction of the hard infrastructure.

The consultants/contractors selected for the execution of the project will be paid for their services including overhead and contingencies. It will be still required to get the supervisions carried out by consultants and/or contractors from the donor's side, however, the construction of the hard infrastructure will be done through the local consultants, contractors and suppliers.

The important activity in the execution of a project under the new scheme is deployment of the special resources such as competent human resource, technology, and products from the COE&R in order to ensure the acceptable quality and productivity for the projects.

Local competitive bidding will be used for the selection of the constructors and the contracts shall allow incorporating international as well as local practices of the construction industry like progress payment, contract administration including claims and dispute resolution.

## 7. IMPLEMENTATION OF THE NEW SCHEME IN CAMBODIA

KUT (Kochi University of Technology), Japan with its own resources has been implementing the human resources and technology development components of the new scheme of ODA in Cambodia. KUT has established collaboration with Institute of Technology of Cambodia, Cambodia in 2003, and the extended collaboration has been made on April 2006 in order to implement the new scheme of ODA in real project. The extended KUT-ITC collaboration is intended to develop human resources and technology for bridge rehabilitation in Cambodia.

KUT under human resource development activities has provided 2 faculties from ITC opportunities to study in doctoral program on concrete technology and management in order to enhance the capacity of ITC in infrastructure design and development. Further, KUT-ITC collaboration under technology development function intended to introduce high strength pre-stressed pre-cast concrete girder/beam using self-compacting concrete in the Cambodian construction industry in order to facilitate Cambodian rehabilitation. The basic research using the local materials in Cambodia for the same has been already completed, and a pre-stressed T-girder with heavy flange, span 20m, using high strength self-compacting concrete was successfully casted on April 2006, and is shown in Figure 9. This was the first high-strength pre-stressed pre-cast concrete girder using self-

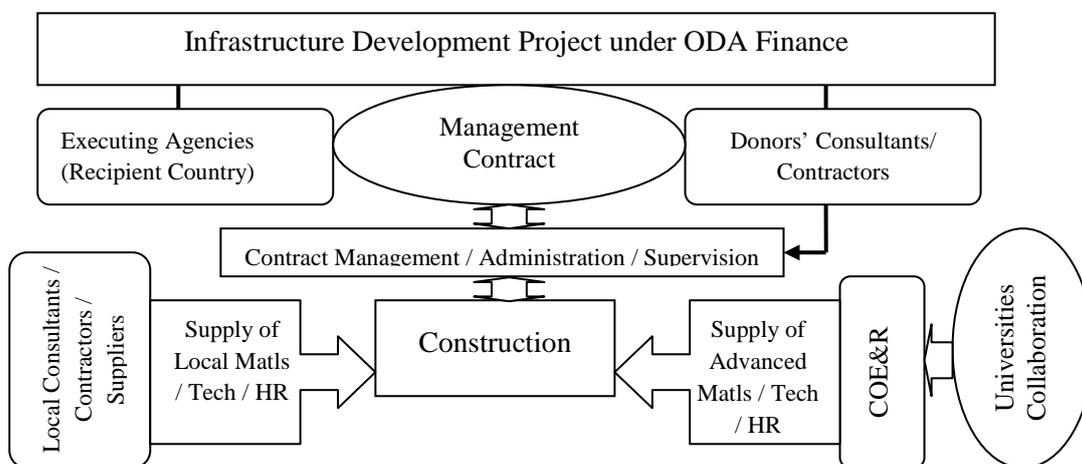


Figure 8: Execution system of Infrastructure development works under new ODA scheme

compacting concrete produced in Cambodia. Now the process of standardization with the cooperation of implementing agencies in Cambodia has been initiated. Thus, KUT-ITC collaboration until now able to transfer the high-strength self-compacting concrete technology to ITC and the extended collaboration will enable ITC able to commercialize the new product in the Cambodian construction industry. It has been envisaged that the girder developed through KUT-ITC collaboration to supply for the short span bridge rehabilitation in Cambodia. Similarly, ITC through collaboration with KUT will provide advance training opportunities for the industry practitioners in Cambodia on concrete technology and management. However, additional collaboration would be essential to enable ITC able to deliver advanced training and to develop appropriate technology required for integrated infrastructure development and rehabilitation.

Thus, the proposed universities collaboration system under the new scheme will enable local university like ITC able to deliver advance training and to develop technology themselves in recipient countries.

## 8. EXPECTED EFFECTS OF THE NEW SCHEME

The recipient country as well as donor's industry would be benefited from the proposed scheme. The universities collaboration would enable local universities capable enough to develop appropriate human resources and technology for their domestic infrastructure development. The functions of the center of excellence for education and research would help increase the skill level of the skilled workforce by improving the quality and number of technical manpower and make availability of more technologies in the local industry.

The training cost in Japan is very high due to the high living, accommodation and transportation cost. A typical JICA group training cost per person per month excluding living, accommodation and transportation cost was about 226,000 Yen<sup>13)</sup>. Allowing for living, accommodation, and transportation cost the cost would reach to 616,000 Yen per person per month. However, the cost of training estimated on the basis of Cambodian environment would become about 65,000 Yen per person per month<sup>14)</sup>. Thus, around 10 times people could be trained in developing countries with the same resources used for training in Japan if local faculties were trained and universities were strengthened. The construction opportunities under the Japanese management would provide local



**Figure 9:** Pre-stressed T-girder with heavy flange, span 20 m, casted with high strength self-compacting concrete in Phnom Penh, Cambodia; Source: Vong, S. and Prof. Shima, H., KUT, Japan

industry to acquire modern Japanese execution technology and working culture of Japanese industry. Such execution system would help local industry absorb and internalize modern technology and materials including the Japanese execution management. In addition, involvement of the universities in technology development would help radial diffusion of technology. The increase in skill level and availability of more technologies would consequently help increase the productivity and output from the recipients' local industry. This scheme would consequently make developing countries self-sufficient in human resources and technology required for their domestic development, and helps reduce the loan burden.

Since only 19 out of 209 Japanese universities involved in civil engineering education do provide some part of the construction and project management education and many of the faculties did not have international project execution experience, the involvement of Japanese university in the development works in developing countries through the new scheme would provide Japanese faculties and graduates opportunities to experience international construction practices which would help improve the quality of graduates as well as competency of faculties. This would also help Japanese universities to enhance construction and project management education in order to make their graduates prepare for the international project execution. Similarly, the management contracting system for the ODA project execution would provide Japanese consultant and contractor opportunities to execute with the international practices in multicultural environment and to enhance their project management and administration skills including communication, negotiation, and dispute resolution. The increase in project management and administration skills would help Japanese firms to be more competitive in the international market and able to expand their

overseas business in policy, management and administration fields in which there is currently insignificant business in the overseas compared to the USA, EU and Australian counterparts.

## 9. CONCLUSIONS AND FUTURE RESEARCH

Japan's ODA has been providing the major sources for developing countries in their socio-economic development. However, despite large ODA volume, poor developing countries have not been able to develop appropriate human resources and basic technologies for their domestic infrastructure development. Human resources development has been inefficient and technology development in recipient countries was not evidently addressed under Japan's ODA. The existing ODA implementation system could not provide recipient's industry enough opportunities to absorb and internalize modern technology and Japanese execution management in local industry. Similarly, the Japanese firms were deprived from experiencing the international practices while implementing the ODA projects.

KUT-ITC collaboration was able to train ITC faculties on concrete technology and management and to introduce a new high-strength self-compacting concrete technology/product for infrastructure rehabilitation in Cambodia. The progress of the KUT-ITC collaboration until now has shown that the proposed new scheme would be appropriate and successful in enhancing the capacity of local university like ITC and in developing/introducing advanced technology for infrastructure rehabilitation in developing countries. These evidences have shown that the new scheme is appropriate and implementable in other developing countries. However, the complete scheme needs to be implemented to provide the integrated benefits to recipients' as well as donor's industry. Japanese civil engineering universities as well as construction industry should move for the proposed new system in order to enhance their international competitiveness. The ODA should be taken as opportunities in order to improve the competitiveness of both the recipients and donors.

The proposed scheme can be applied in other engineering field also with necessary modification in the role of stakeholders.

Future research includes implementing the KUT-ITC collaboration to enable ITC able to standardize and commercialize the new technology to produce high strength pre-stressed pre-cast concrete girder/beam using self-compacting concrete in the Cambodian construction industry and to deliver

advanced training in concrete technology and management in Cambodia. The impact of the human resources and technology development through KUT-ITC collaboration in the Cambodian construction industry will be evaluated.

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