

Japan International Cooperation Agency  
Financing Facilitation and Procurement Supervision Department

# **Study on Road Development Projects in African Countries**

## **FINAL REPORT**

### **Summary**

December 2008

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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**ORIENTAL CONSULTANTS CO., LTD.  
JAPAN ENGINEERING CONSULTANTS CO., LTD.**

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## LOCATION MAP

### Study Countries

- Federal Democratic Republic of Ethiopia
- Republic of Ghana
- United Republic of Tanzania
- Republic of Uganda
- Republic of Zambia



| ■ Name of Country                         | Uganda      | Ethiopia     | Ghana        | Zambia      | Tanzania    |
|---|-------------|--------------|--------------|-------------|-------------|
| ■ Population 2004 mil. (IMF)              | 27.8        | 70.0         | 21.7         | 11.5        | 37.6        |
| ■ Population Density pop./km <sup>2</sup> | 141.15      | 69.96        | 95.21        | 15.44       | 42.58       |
| ■ GNI/capital 2005 USD (WB)               | 280         | 160          | 450          | 500         | 340         |
| ■ Economic Growth <sub>2005</sub> (EIU)   | 5.5%        | 13.4% (2004) | 5.8%         | 5.2%        | 7.0%        |
| ■ Road Density (km/km <sup>2</sup> ) IMF  | 0.17(2003)  | 0.03 (2004)  | 0.20 (2003)  | 0.12 (2001) | 0.08 (2003) |
| ■ Ratio of Paved Road (IMF)               | 23.0%(2003) | 19.14%(2004) | 17.92%(2003) | 22.0%(2001) | 8.63%(2003) |

Study Countries

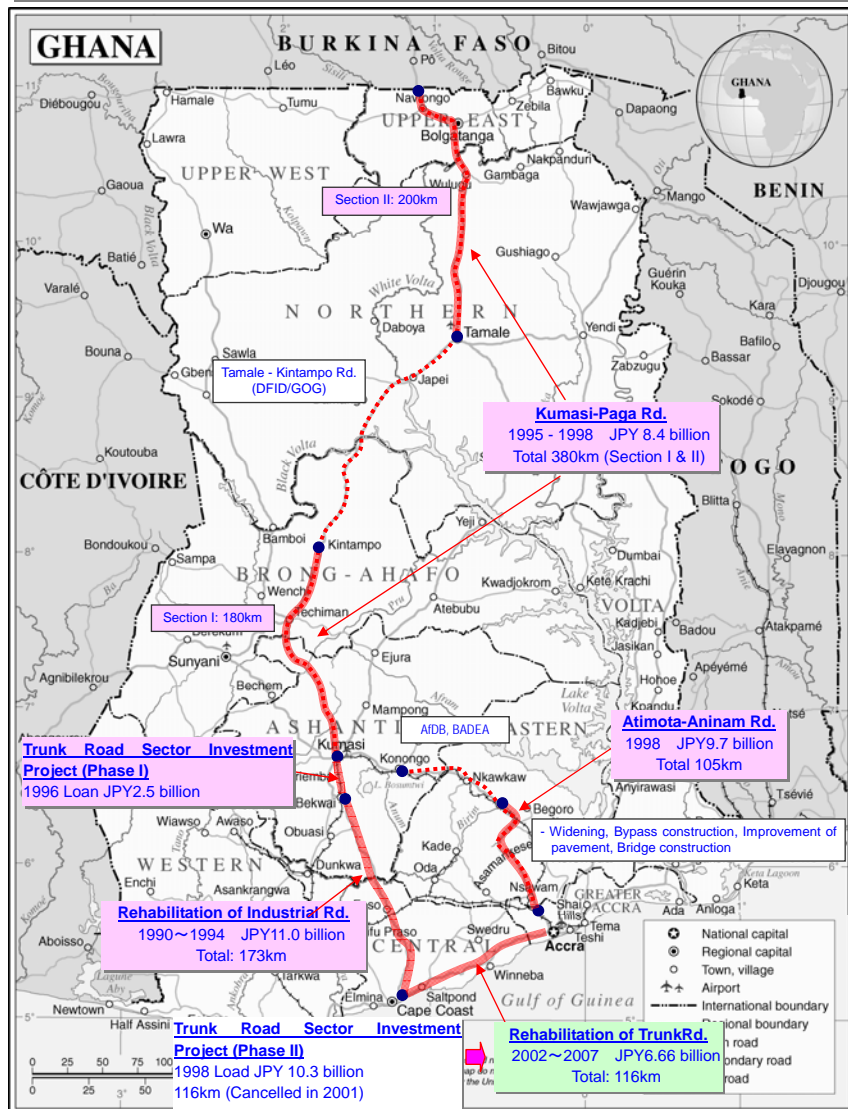
Loan Project (JBIC)

Grant Aid Project (Japan)

Design or Construction Stage

Other Donor's Project

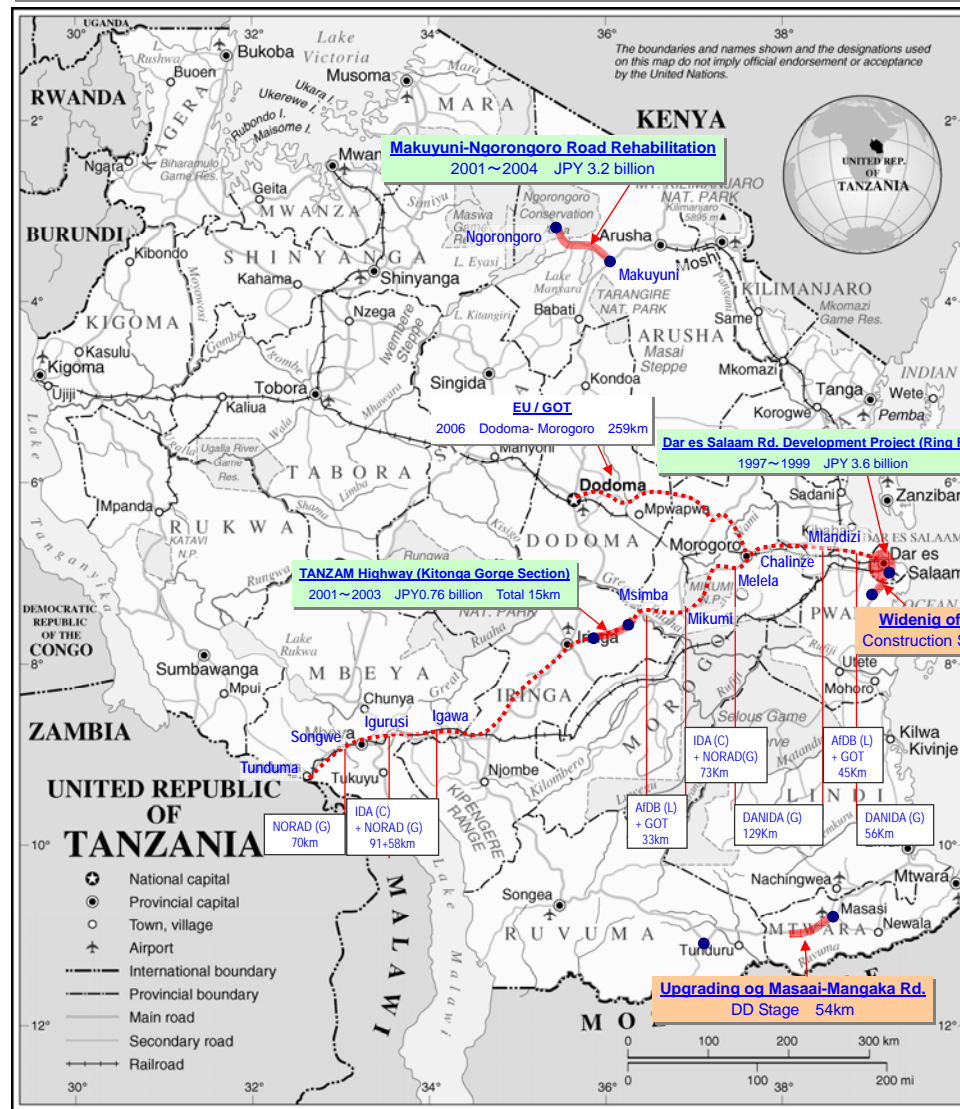
### Ghana



Map No. 4186 Rev. 3 UNITED NATIONS February 2005

Department of Peacekeeping Operations Cartographic Section

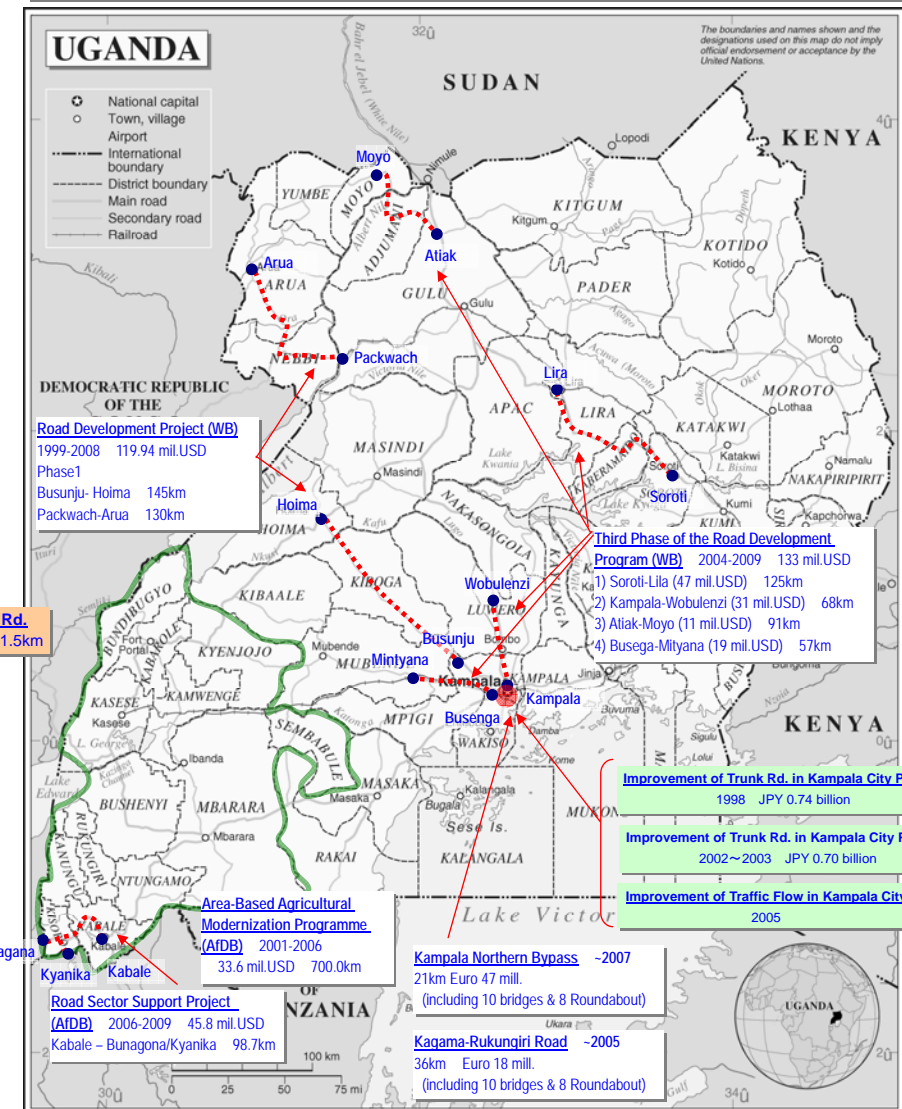
### Tanzania



Map No. 3667 Rev. 5 UNITED NATIONS January 2005

Department of Peacekeeping Operations Cartographic Section

### Uganda



Map No. 3662 Rev. 4 UNITED NATIONS May 2003

Department of Public Information Cartographic Section

Photos of the Study Road



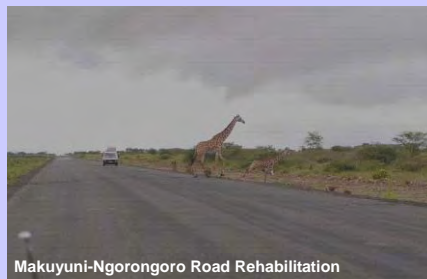
Kumasi-Paga Rd.



Rehabilitation of Industrial Rd.



Makuuni-Ngorongoro Road Rehabilitation



Makuuni-Ngorongoro Road Rehabilitation



Dar es Salaam Rd. Development Project (Ring Rd.)



Dar es Salaam Rd. Development Project (Ring Rd.)



TANZAM Highway (Kitonga Gorge Section)



TANZAM Highway (Kitonga Gorge Section)



Improvement of Trunk Rd. in Kampala City



Improvement of Trunk Rd. in Kampala City

Study Countries

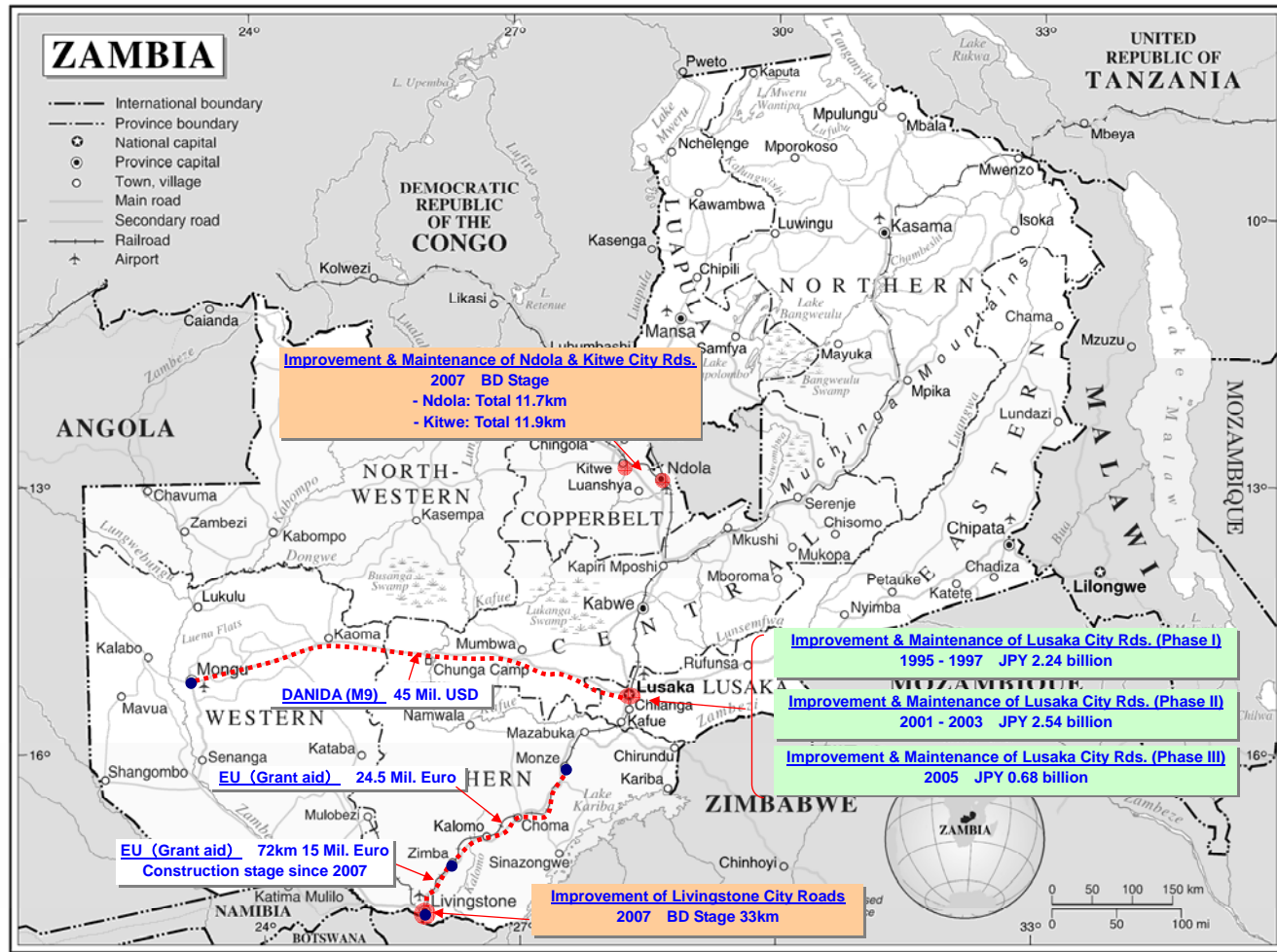
Loan Project (JBIC)

Grant Aid Project (Japan)

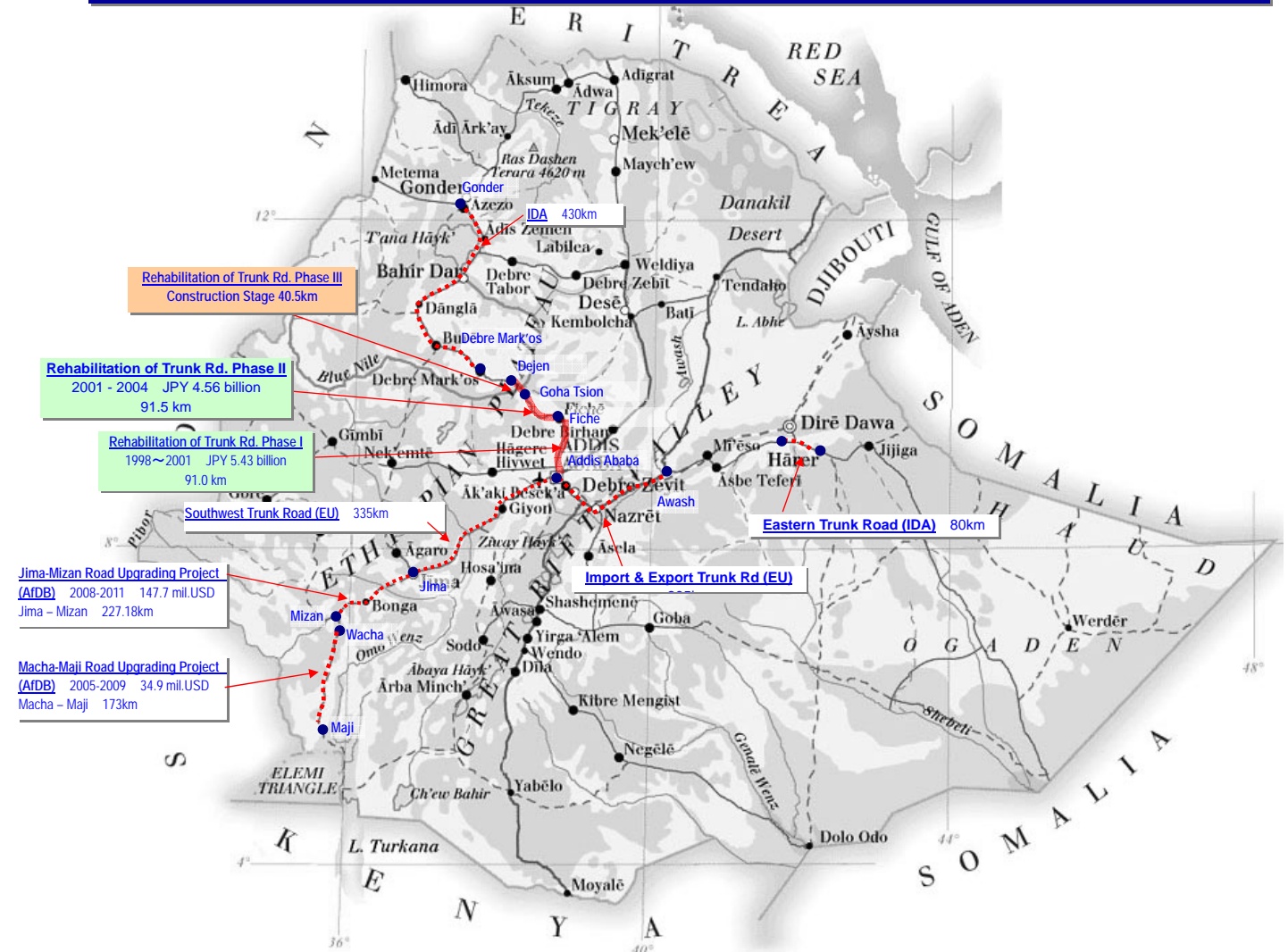
Design or Construction Stage

Other Donor's Project

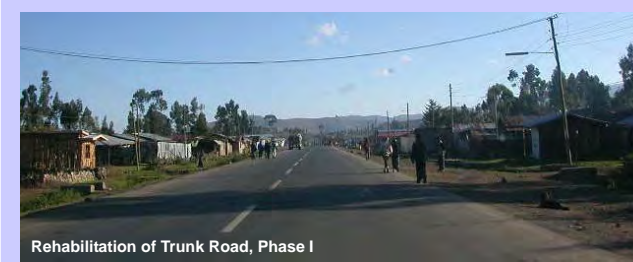
Zambia



Ethiopia



Photos of the Study Road



It is widely recognized in African countries that road transport plays a major role in promoting economic and social development. Recently in Africa, infrastructure development has been emphasized as a way to accelerate economic growth, and major development partners including the Government of Japan (GOJ), the World Bank (WB), African Development Bank (AfDB) and European Union (EU) have provided support for creating reliable transport infrastructure.

Road projects under Japan's grant aid scheme are characterized by: (i) the high quality of facilities due to meticulous supervision and construction work, (ii) punctual completion, and (iii) the high durability of facilities after completion of construction. However, there are some issues that need to be considered regarding the creation of an efficient and effective future road network. In most African countries the population is dispersed over a large rural area, making it difficult to realize economic benefits from a road project due to low traffic volumes. The low economic internal rate of return of such road projects also makes it difficult to attract public or private investment. On the other hand, the provision of access roads to economic activities and social services is indispensable for eradicating poverty for the majority of people living in rural areas.

In order to explore effective approaches to the abovementioned issues, the Japan International Cooperation Agency (JICA) decided to dispatch a study team to five selected African countries to undertake the necessary surveys and data collection for further analysis as part of the "Study on Road Development Projects in African Countries" (hereinafter called "the Study"). The outcome of the Study is expected to be incorporated into future Japanese policy and strategy on road development in Africa. The objectives of the Study were as follows.

- Verification of Validity of Project Cost for Road Development by Japan's Grant Aid
- Examination of a Suitable Scheme to Improve the Efficiency of Road Improvement Projects
- Examination of the Policy of Assisting Road Improvement by Japan's Grant Aid Schemes

The following five countries were selected to be the focus of the Study as they are major recipients of assistance for the road sector, not only from Japan but also from other donors. Accordingly, it was anticipated that information and data about road development projects would be readily available.

- Federal Democratic Republic of Ethiopia
- Republic of Ghana
- United Republic of Tanzania
- Republic of Uganda

- Republic of Zambia

An analysis on the first objective of the study was not conducted for Zambia because the first survey results revealed that there was no appropriate road project funded by other donors comparable to the one under Japan's Grant Aid. The study included two sets of on-site surveys carried out between 24<sup>th</sup> November and 17<sup>th</sup> December, 2007 for the 1<sup>st</sup> survey and between 16<sup>th</sup> February and 23<sup>rd</sup> March 2008 for the 2<sup>nd</sup> survey in addition to analysis in Japan. The final report was submitted on 19<sup>th</sup> December, 2008.

In the on-site surveys, the Study Team visited the relevant ministries, road authorities, local governments and donors for the following purposes:

- Assess the present status of the road sector via questionnaires and interviews with stakeholders (including the private sector).
- Comprehend the policies and strategies of the major donors regarding road sector development in the study countries.
- Collect project data and conduct road condition surveys including International Roughness Index (IRI) surveys on completed road development projects compare projects of Japan with those of other donors with respect to construction costs, Life Cycle Costs (comprised of the initial construction costs with the total maintenance costs within the evaluation period of 30 years), contract conditions, design specifications, and other features.

Based on the on-site survey results and collected data, the analysis was undertaken in Japan in order to obtain findings with respect to the original objectives. The Study method and findings of the Study and analysis for each objective are described below.

- (1) Verification of validity of project cost for road development by Japan's grant aid

#### Study and Analysis Method

In each of four study countries, a pair of study roads of similar road class, design specification and completion year were selected. One was a Japan-funded project and the other was funded by another donors. The comparison was made for a pair of roads for both initial construction cost and life cycle cost (LCC) in addition to the cause of differences if observed. Furthermore, other criteria including design standard and specifications, construction period, contract conditions and supervision structure were examined to grasp the characteristics of road projects under Japan's grant aid for verifying the validity for road development project by Japan's grand aid.

Note that the results of the analysis of costs for the Tanzanian case study were not utilized for verifying Japan-funded road projects. This was because the comparison road constructed by

DANIDA, which was categorized as an urban road, was comprised of both urban and rural sections and it was difficult to separate the two sections in the total costs.

### Findings from Analysis

#### 1) Comparison of the cost component (initial cost and LCC) (see Table-1)

Table-1 Comparison of project cost

|  | Rural Trunk Road                         |                        |                          |                                | Urban Road             |                       |
|--|--|------------------------|--------------------------|--------------------------------|------------------------|-----------------------|
|  | Ethiopia                                 |                        | Ghana                    |                                | Uganda                 |                       |
|  | Japan                                    | EU                     | Japan                    | KfW                            | Japan                  | World Bank            |
| Road Name  | Addia-Goha Tsiyon, North-East Trunk Road | Addis-Mojo -Awasa Road | Accra-Sitepon d, N1 Road | Tema-Sogacope Section, N1 Road | Natete Road in Kampala | Katwa Road in Kampala |
| Total Length (km)  | 91.0                                     | 263.4                  | 57.2                     | 81.5                           | 3.8                    | 1.7                   |
| Length by lanes 2/4 (km)                                 | 91.0 / 0.0                               | 263.4 / 0.0            | 57.2/0.0                 | 81.5/0.0                       | 3.8/0.0                | 1.7/0.0               |
| Average SN Value   | 2.81                                     | 3.39                   | 2.58                     | 4.65                           | 4.51                   | 2.89                  |
| Construction Cost (US\$)                                 | 33,100,132                               | 61,172,753             | 32,761,601               | 38,215,581                     | 2,582,052              | 1,297,182             |
| Adjusted Construction Cost <sup>1</sup> (US\$)           | 33,100,132                               | 61,111,453             | 32,761,601               | 38,215,581                     | 2,582,052              | 1,278,623             |
| <b>Result of Initial Construction Cost</b>               |  |                        |                          |                                |                        |                       |
| Unit Construction Cost (US\$/1lane/1km)                  | 192,281                                  | 116,005                | 275,437                  | 234,451                        | 339,744                | 245,889               |
|  | 1.00                                     | 0.60                   | 1.00                     | 0.85                           | 1.00                   | 0.72                  |
| Unit Cost for Pavement works (US\$/1m <sup>2</sup> /1SN) | 12.9                                     | 7.01                   | 16.3                     | 10.1                           | 11.2                   | 9.1                   |
|  | 1.00                                     | 0.54                   | 1.00                     | 0.62                           | 1.00                   | 0.81                  |
| Pavement works/Total cost                                | 42%                                      | 61%                    | 62%                      | 72%                            | 56%                    | 78%                   |
| <b>Result of LCC Analysis</b>                            |  |                        |                          |                                |                        |                       |
| LCC : (US\$/km)  | 606,536                                  | 505,010                | 918,064                  | 914,306                        | 1,017,061              | 905,338               |
|  | 1.00                                     | 0.83                   | 1.00                     | 1.00                           | 1.00                   | 0.89                  |
| Maintenance Cost <sup>2</sup> (US\$/km)                  | 221,975                                  | 273,000                | 367,190                  | 445,404                        | 337,573                | 413,560               |
|  | 1.00                                     | 1.23                   | 1.00                     | 1.21                           | 1.00                   | 1.23                  |

Note: <sup>1</sup> The adjusted cost means the costs of some items that were not included in the project cost of the other study road were deducted from the total construction cost.

<sup>2</sup> LCC is comprised of the initial construction cost and the total maintenance costs within the evaluation period

- In all case studies, it was clarified that both indicators of “cost per lane per km” and “cost per area of pavement per structural number (SN) value” from the other donor funded projects were superior to the Japan funded ones—the other donors’ values being 60-85% of Japan’s for cost per lane per km and 54-81% for SN Value. The differences were narrower for the LCC comparison, in which the other donors’ costs were 83-100% of those of the Japanese funded projects. Note that in comparing the total maintenance costs within the evaluation period, the projects funded by other donors were inferior to the Japanese funded ones with a ratio of 121-123%.
- The indicators of unit construction cost for road projects showed that urban roads obviously have higher costs than rural trunk roads, regardless of the source of funding.



- The lower share of the total construction costs for pavement works, which means a higher share for other facilities such as drainage and road furniture works, is one of the reasons why the cost indicators of the Japanese funded project are higher than those of other donors. In addition, it could be assumed that since the projects funded by other donors have a larger project scale than the Japanese ones, the share of the indirect costs in their total construction costs would be reduced, contributing to lower total construction costs. However, we could not clarify this assumption due to the different cost items of indirect costs between the other donors' projects and the Japanese ones.
- On the one hand, In the LCC analysis, the reduced deterioration in speed of pavement and less number of surface cracks resulted in lower total maintenance costs for the Japanese funded projects because road deterioration is mainly dependant on environmental conditions surrounding roads, the existence of surface cracks, and its progress speed. This result seems to prove the high quality of road construction by Japanese contractors, which leads to roads of high durability.

## 2) Comparison in the design conditions and specifications

- It was observed that there were differences in the application of design standards and design life in each study country. If the same design standards were applied, there were differences in the values of input data including coefficient of layer and index of reliability/serviceability. From this analysis on the design conditions, there does not appear to be a tendency towards uniformity in the adoption of design conditions in each study country.
- Efforts to reduce the construction cost were observed in some of the Japanese funded projects. The existing pavement structure was utilized as a part of the new pavement after evaluating the residual strength of the existing pavement structure.
- Although there was little difference in the types of road furniture installed in the study projects funded by Japan and other donors, there was some difference in the specifications for shoulder surfacing and safety facilities in some of the study countries; the Japanese specifications were inferior to the donor's ones.

## 3) Comparison of construction periods

- In regards to punctuality to the original construction schedule, the Japanese funded projects appeared to be superior to the ones funded by other donors. Delays to project completion occurred in only two of the Japan-funded study projects, due to a delay in land acquisition by the recipient countries in one case and the effects of abnormal weather in the other. In the weather-affected project, all study projects experienced delays in the completion time from the original schedule. Although the major causes of

delays in projects of other donors were due either to an increase in work volume caused by unexpected site conditions or to abnormal weather conditions, one delay was caused by an incompetent contractor.

- The average construction speed of the projects funded by other donors was slightly higher than the Japanese funded ones. Furthermore, in the Japanese funded projects, similar levels of construction speed were found in both rural trunk road and urban road projects. This means that the construction speed of the Japanese funded projects was properly determined by work volume per day and the number of working days specified in the guidelines of the construction cost estimate.

#### 4) Comparison of the contract conditions and construction supervision systems

- Since the study projects were funded by Japan, the EU and DANIDA under grant aid schemes, there was a similarity in the eligibility requirements for bidding and procurement and payment currency. However, there were large differences in the payment method and timing and the procedures for amendment of contract conditions. The EU and WB have their own standard contract conditions and those documents describe the detailed procedure for settlement of disputes. Their procedures are characterized by the introduction of the “Supervisor” or “Adjudicator” instead of “the Engineer”, which both positions are partially restricted the power which the Engineer originally owns.
- Japan’s grant aid projects have unique contract conditions: application of a lump-sum contract, payment at specified times based on achievement of designated milestones, and a high ratio of advance payment. Those characteristics result in easier financial management at mobilization and simplified administrative procedures for payment of both the contractor and the client. However, this system exposes the contractor to higher risks of unexpected sharp rises in construction materials or equipment prices.

### **Verification of the Validity of Road Development Projects under Japan’s Grant Aid**

From the preceding information, road projects under Japan’s grant aid can be considered justified in validity for the following reasons.

- 1) Provision of project roads with high durability that relieves the recipient country of the burden of maintenance by reducing the total maintenance cost

Although the road projects under Japan’s grant aid are almost equal or inferior in both initial construction costs and LCC at present value, they are clearly superior in the total future

maintenance costs, which are 81-83% of other donors' projects according to the results of the LCC analysis. This high durability would result from attentive consideration to drainage facilities in the design stage as well as a high level of quality control during the construction stage. It can be said that these project roads provide the advantage of reducing the maintenance burden on recipient countries that have insufficient road maintenance system, including performance of road fund.

2) Punctuality of completion of the project that arouses reliance on Japan's grant aid project from a recipient country

The road projects under Japan's grant aid are characterized by their punctual completion within the original construction time. On the one hand, all the study projects by the donor funds faced delays in the completion time of 125-171% from the original completion time. This punctuality of the Japan-funded projects mainly results from appropriate setting of the construction time based on detailed scheduling of each work items in the design stage as well as meticulous supervision by the contractor during construction. This has contributed to creating a reputation for reliability of road projects funded under the Japan's grant aid.

3) Payment method that facilitates the contractor to concentrate the implementation of the project

A lump-sum contract method with a high proportion of advance payment (40% of the contract price) and a small number of payments (3 or 4 times within the contract period) are differentiate projects under Japan's grant aid from ones funded by other donors. This unique payment method facilitates the smooth mobilization of the contractor to the site at the initial stage and simplifies the payment procedure resulting in allowing the contractor to concentrate on implementing the project. This also helps secure the punctuality of the project completion mentioned above.

(2) Study on a Suitable Scheme to Improve the Efficiency of Road Improvement Projects under Japan's Grant Aid

Study Method

Since there is an on-going high demand for improving the rural road network in African countries, the "Grant Aid for Community Empowerment<sup>1</sup>" may be a useful scheme for

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<sup>1</sup> A scheme introduced from FY2006 to develop communities by empowering them with the capacity to realize sustainable development and to overcome various threats and thus enhance their security. Multiple components can be combined to effectively meet community needs. Contractors, suppliers or consultants not confined to Japanese firms. Construction can be based on local methods.

responding to such demand. For this reason, the study team assessed not only procurement conditions but also the capacity of both local contractors and consultants in each study country and summarized the points to be considered when examining the applicability of the scheme at the project formulation stage.

### Findings of the Study

#### Local contractors

- Due to a lack of both technical and operational capability, local contractors continue to be restricted to the role of sub-contractor in road projects funded by donors. However, they have gradually developed capability through the experience of working with international contractors on donor-funded projects, and now some of the top-ranked local contractors can undertake major types of pavement works including asphalt, DBST and gravel paving as well as road structure works (but not long-span bridges requiring pre-stressed concrete technology). However, due to the limited financial capacity of local contractors, it is necessary to set certain limits to the scale or cost of road projects that can be entrusted to them under the said scheme. In addition, technical support to the local contractors still needs to be provided for quality and schedule control and procurement management.

#### Local consultants

- Although the local consultants have been obtaining much opportunity to participate in the road projects funded by donors together with international consulting firms, they have not been given major roles within the project team. Accordingly, they have not acquired sufficient skills and knowledge in planning and design for implementing by themselves. In construction supervision, it has been pointed out that they lack skills and knowledge on quality control.

### (3) Study on Formulating a Road Development Policy for African Countries by Applying Japan's Grant Aid Scheme

#### Study Method

Based on the study results mentioned above, this sub-chapter examined application criteria for determining a scheme type either "General Grant Aid" or "Grant Aid for Community Empowerment" among Japan's various aid schemes for road development projects. The former scheme has been applied to various types of projects in developing countries, and a major characteristic of it is that the implementation, including planning, design, construction and construction supervision, is conducted by Japanese contractors and consultants. In the

process of examination, the characteristics of roads in African countries including road class and specifications and road conditions were taken into consideration.

### Findings of the Study

- “Road class”, “project scale”, “technical difficulty” and “surrounding environment of construction market in the country” can be applicable criteria for determining either “general grant aid” or “grant aid for community empowerment”.
- In terms of the criterion of the project scale for the latter scheme, it is desirable to set a project cost with a range from US\$1 million to US\$6 million for one package of a project depending on the country where the road project is implemented, considering the annual revenue of contractors in each country. Therefore, it is possible to formulate a project composed of several packages with project costs within the said amount when applying the latter scheme.
- Regarding the criterion of technical difficulty, whereas all types of pavement works except concrete pavement can be included in a project in all study countries, for structural works, only reinforced concrete bridges with a span length of less than 15 m (but not pre-stressed concrete bridges), ditches, pre-cast cross-drainage, and box culverts with up to two-cells can be included in a project in all study countries. However, if the project includes such structures, it is necessary to confirm that the local contractors have sufficient past experience under similar topographical and geological conditions with either other donor or local funds.
- With respect to the criterion of the surrounding environment of the construction market in the recipient country, it is indispensable to secure a sufficient number of bidders, at least three contractors, who have the capability to implement the project technically and financially. For this purpose, the registration system of the recipient countries can be useful to check the eligible number of contractors. In addition, it is necessary to consider the payment conditions in order to ease the severity of financial conditions on contractors because in all study countries, it was reported that loan conditions set for contractors are severe as the construction industry has been regarded as one with high risk.
- In regard to the criterion of the road class, it is desirable for the grant aid for community empowerment to apply to rural and community roads but not trunk roads in both urban and rural areas from the viewpoint of capability requirements of the contractor and project scale. However, this does not limit the application of the scheme to major trunk roads.
- In regard to the utilization of local consultants under the said scheme, since they still have insufficient skills in planning, design of road and structural work, it is necessary to judge its application based on the past experience of local consultants in both design and construction supervision in road projects funded by other donors or the government of the recipient country.

## **Knowledge Obtained from Site Visit and Interviews in the Study Countries**

Through the site visit and interviews with stakeholders of road projects in the study countries, the following knowledge and observations were acquired.

### **(1) Knowledge on Road Projects under Donors Assistance**

- In general, road improvement projects under Japan's grant aid are highly appreciated from implementation agency of recipient countries because of attentive traffic control during construction and high quality of facilities completed. Particularly, high reputation has been given to urban road projects because the Japanese contractor made an effort to minimize adverse impacts on road users by providing well-planned detours for traffic control during construction.
- It was found that construction costs for road projects in the study countries have been sharply increased in recent years and an analysis on the cause of sharp rise was conducted by a donor. The report pointed out several causes: namely, 1) hike of construction materials such as re-bar and cement, 2) increase in land transport cost due to rise of fuel price, 3) lack of competition among contractors in bidding in a country that has only small market of road investment.
- Other donors seems to shift their strategy on specification of pavement structure, which considers overloading of vehicles in pavement design, based on the lessons learnt from previous road projects. As a result, the road design with higher specifications than those applied to the Japanese projects is observed in the projects funded by other donors (e.g. EU funded project).
- Although there are different aid policies applied to the road sector among donors, the main strategy is gradually shifting from project-based support to a sector-wide approach, primarily led by the EU. However, the World Bank seems to take a sceptical stance on this shift at present.

### **(2) Knowledge on Issues of the Road Sector in Study Countries**

- It was observed that the achievement level of the road sector reform program seems to be closely associated with the capacity level of the road sector in all study countries. For instance, in the study countries that the reform program was introduced in the earlier stage such as Ethiopia and Ghana, the road investment plans have steadily progressed compared to other study countries.
- The delay in payment from the client to the contractor has been a major issue in the construction industry in study countries except Ethiopia. This results in depriving desire of

an owner to invest in the firm development, which leads to preventing development of the industry.

- It is observed that the entry of Chinese contractors into study countries has caused adverse impacts on the development of the local construction industry because Chinese contractors are not only going to monopolise the domestic market by winning a project with low bidding prices, but they also do not utilize local contractors for project implementation.
- It is confirmed that the government of study countries have focused on consolidating road maintenance system by introducing "Road Fund", and promoting application of labour-based technology to road maintenance activities.

### **Recommendations**

Based on the analysis results and findings from the Study, the following recommendations are made for more efficient and effective implementation of road projects under Japan's grant aid in future.

- **Necessity for Continuity of Providing Road Improvement Projects with Appropriate Level of Design Specifications**

In order to maintain the high reputation of road projects under Japan's grant aid, it is important for road projects under Japan's grant aid to continue to adopt appropriate levels of specifications on the basis of both existing and future road conditions while maintaining an effort on reduction of construction cost.

- **Necessity of Improvement of Assessment Method for Road Improvement Projects under the Japan's Grant Aid and Continuation of the Assessment Activities**

We believe that this study offered more accurate quantitative assessment for the road projects done by both Japan and other donors. However, the study only provided four case studies and it seems still too difficult to generalize the assessment results of the road projects by donors in terms of construction cost. For this reason, it is recommended that continuous assessment activity should be conducted to obtain more accurate assessment results. Particularly, it is indispensable for the Japanese side to propose the recipient country to conduct IRI survey at the completion inspection stage because LCC, which can be estimated on the basis of a change in IRI values over the years, is a useful indicator that can clarify the quality level of road projects funded by Japan's grant aid.

- **Necessity for Establishment of a Comprehensive Approach for Road Development Projects in African Countries**

In order to achieve more efficient and effective implementation of road projects under Japan's grant aid, it is necessary to provide support to road maintenance programs and axle control programs in parallel to providing road improvement projects.

- **Necessity for Provision of Strategic and Systematic Road Development Plan in African Countries for Attracting Japanese Contractors**

Japanese contractors, which are the main player of road projects under Japan's grant aid, have been losing their interest in road projects funded by Japan's grant aid in African countries, not only because of large-scale projects flourishing in the Middle East and North Africa but also because of intermittent project implementation in African countries, which prevents contractors from efficient usage of equipment and machinery. To rectify the situation, it is recommended to formulate well-planned and comprehensive road assistance plans covering an area comprising some of countries with time schedule. It would motivate Japanese contractors to participate more in bidding for projects in African countries as well as contribute to reducing the risk of inefficient usage of machinery and equipment.

- **Necessity for Improvement of Japan's Grant Aid Scheme in terms of Contract Conditions**

Considering the difficulty of procurement management for contractors on site due to the current situation of the sharp rise of prices of construction materials, it is vital for Japan's grant aid scheme to modify the contract conditions that enable both the contractors and the clients to equally share risks against the unforeseen cost increase.



