

# Implementation structure of the project applying the Labor-Based Technology (LBT) for road construction and maintenance works

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Labor-Based Technology (LBT) is a method of construction works utilizing the local resident labors to reduce local poverty by delivering cash earnings directly to them in developing countries, which first applied in 1971 mainly for the rural/feeder road construction and maintenance works. A number of the donor organizations/countries have gained momentum to introduce LBT, of which purpose and method have recently become diversified through accumulated experiences. This paper first clarifies such diversified LBT projects by nature such as road hierarchy (the rural roads vs. the sub-provincial roads) and construction method, then focuses on incentives and advantages to the local residents as well as the local governments (the road administrators). This paper finally proposes the appropriate implementation structure of the LBT projects to effectively and efficiently promote them, which are crucial issues for both the recipient countries and the donor organizations/countries.

*Key Words : Labour-Based Technology, Road Construction and Maintenance, Developing Countries*

## 1. INTRODUCTION

Labor-Based Technology (LBT) is a method of construction works utilizing the local resident labors to reduce local poverty by delivering cash earnings directly to them in developing countries (**Figure 1**). This method was first investigated its applicability to developing countries by the International Bank for Reconstruction and Development<sup>1)</sup>, one of the World



**Figure 1** Labour-based road construction works.

Bank group, implementing mainly for the rural/feeder road construction and maintenance works in 1971. Since then, the World Bank as well as many other donor organizations/countries have recently implemented the LBT projects.

The unique definition of LBT is yet to be clearly determined, even though various LBT projects have been accumulated by many donor organizations/countries. The LBT projects have been observed for the purposes of solving various problems, which occurred at community-level in developing countries. For example, the LBT projects funded by the International Labour Organization (ILO)<sup>2)</sup> mainly focus on job creation for the local residents. On the other hand, Department for International Development in the United Kingdom (DFID)<sup>3)</sup> published the “Manual for the labour-based construction of bituminous surfacings on low-volume roads” which indicates that the purposes of the LBT projects are not limited to job creation but also extended to the administrative maintenance cost reduction of the low-volume roads.

The purpose and method of the LBT projects have been recently diversified. This paper first clarifies such diversified LBT projects by nature e.g. road hierarchy (the rural roads vs. the sub-provincial roads) and construction methods, then focuses on incentives and advantages to the local residents as well as the local governments (the road administrators). This paper finally proposes the appropriate implementation structure of the LBT projects to effectively and efficiently promote them, which is a crucial issue for both the recipient countries and the donor organizations/countries.

## 2. PREVIOUS STUDIES ON LBT

Many studies on LBT have been conducted from the various viewpoints. Specifications/standard documents of the LBT road projects are published by several organizations, which consist of design, construction, quality control, unit cost, etc. The LBT projects have been implemented taking these documents into account.

Some papers were made focusing on applicability of LBT. For example, Fukubayashi and Kimura<sup>4) 5)</sup> introduced the empirical studies on the rural/feeder roads which were constructed and maintained by Do-nou (Sandbag) method, and they also examined tensile strength of the sandbag was sufficient by laboratory and in-situ test. Jon Hongve<sup>6)</sup> also examined appropriate specifications of labor-based bituminous surfacing by introducing the case studies of South Africa.

On the other hands, only a few papers were made on implementation structure of the LBT projects. ILO<sup>7)</sup> introduced the construction organization of the LBT road construction works, which was limited to the general inputs of the construction works.

## 3. CLASSIFICATION OF LBT BY NATURE

Most of the rural/feeder roads in developing countries, which are low-volume and serve as “the daily life-essential roads”, are maintained in a poor

**Table 1** Examples of the LBT projects in developing countries. (Modified by the authors based on JICA<sup>8)</sup>)

| Area          | Country     | Outline   |
|---------------|-------------|---|
| Asia          | Cambodia    | LBT was applied for the securement of access for the return of refugee in 1992. ILO and Asian Development Bank (ADB) have supported for the purpose of poverty reduction from 1998.   |
|               | Mongol      | LBT including penetration macadam pavement had been conducted with an aid of Japan International Cooperation Agency (JICA). Trial works with three (3) kinds of road structure had been done.   |
|               | Philippines | Road construction using LBT is first introduced in 1981 with an aid of World Bank (WB). Project supported by United States Agency for International Development (USAID) conducted comparison research between LBT and Equipment-Based Technology (EBT).   |
| Latin America | Guatemala   | LBT was applied for the reconstruction of infrastructure caused by typhoon “Stan” in 2005.  |
|               | Honduras    | Trial works had been conducted with an aid of WB in 2003.   |
| Africa        | Botswana    | LBT is first introduced in 1980’s with an aid of WB, Norwegian Agency for Development Cooperation (NORAD) and Swedish International Development Cooperation Agency (SIDA), and it produced 3,200 employees. Labour-based bituminous surface dressing has been implemented in 1999 with an aid of NORAD. |
|               | DR Congo    | LBT project supported by JICA was conducted for the purpose of peace-building.  |
|               | Ghana       | International Training Course is established in Koforidua with an aid of WB. In 1992, University of Science and Technology in Kumasi (KNUST) had started a course of LBT.   |
|               | Tanzania    | Several projects are conducted with an aid of WB, USAID, NORAD, SIDA etc. JICA conducted “The Project for Capacity Strengthening of LBT Training at ATTI” from 2006 to 2011.  |
| Middle East   | Iraq        | Application of LBT was proposed in the international conference whose main theme was production of employment in 2004.  |

condition, and vehicles are easily stuck in rainy season. Consequently, the local residents lose easy access to the medical, educational and social services (e.g. hospitals, schools and municipal offices) as well as to the markets where their agricultural products are traded.

Major reasons of this phenomenon are usually explained by a lack of machinery and equipment together with insufficient budget for the road con-



Figure 2 Stucked car in the rural/feeder road.

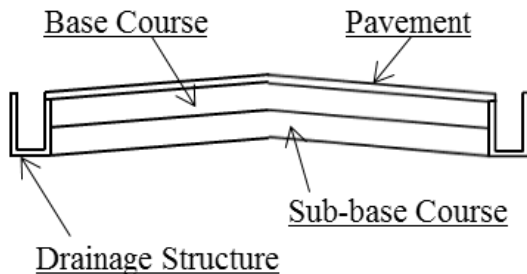


Figure 3 The standard structure of road.

struction and maintenance works in the rural area. Since the low-volume rural/feeder roads are in many cases unpaved and difficult to introduce machinery maintenance methods, however, elaborate LBT maintenance works based on the periodical monitoring at the initial stage are significantly efficient and effective for them (Figure 2).

This is the original concept of LBT to which the donor organizations/countries began to give a considerable attention. At the same time, the LBT projects also deliver cash earnings directly to the local resident labors by nature. As a series of the LBT projects have been implemented in many developing countries, some of them focused on the community development at the beginning of the LBT history as well as job creation to the local resident labors (Table 1).

Hierarchical features of the road networks and their construction and maintenance works are summarized in Table 2. The national and/or provincial roads are expected to receive high traffic volume with high heavy vehicle percentages. Since the standard structure of the national and/or provincial roads mainly consists of sub-base course, base course, pavement and drainage structure (Figure 3), Equipment-Based Technology (EBT), antonym of LBT, is technically effective and efficient for them.

On the other hand, the rural/feeder roads are expected to receive low traffic volume with low heavy vehicle percentages. Since the rural/feeder roads consist of sub-base course and base course without pavement (which is called “the earth road”), LBT is preferably applied to them as a community development tool, which delivers cash earnings directly to the local resident labors by nature.

However, the LBT projects have been extending its scope to the medium-volume sub-provincial

Table 2 Hierarchical features of the road networks and their construction and maintenance works. (Modified by the authors based on Lebo and Schelling<sup>9)</sup>)

|                                 | Village ⇔                     | District ⇔  | Region ⇔                                  | Nation |
|---------------------------------|-------------------------------|---|---|--------|
| Type of Network                 | Rural/Feeder Road             | Sub-Provincial Road                               | National or Provincial Road               |        |
| Traffic Volume                  | Less than 50 per day          | Less than 200 per day                             | More than 200 per day                     |        |
| Road Type (construction method) | Unpaved Road                  | Unpaved/ Gravel/ Surface Dressing Road            | Gravel/ Paved Road                        |        |
| Labour Based/ Equipment Based   | Labour Based/ Equipment Based | Labour Based/ Equipment Based                     | Equipment Based                           |        |
| Administration                  | Community/ Local Government   | Local Government/ Provincial Government           | Provincial Government/ Central Government |        |
| Type of LBT                     | LBT for Community Development | LBT for Administrative Maintenance Cost Reduction | -   |        |

roads, which are categorized between the national and rural levels. Pavement and drainage structures are effective for the medium-volume sub-provincial roads to prevent deterioration caused by surface water flow, and the administrative maintenance cost can be reduced compared to the earth road. LBT is a potential alternative for the medium-volume sub-provincial roads which consist of all the structures.

As mentioned above, the purposes of the LBT projects are categorized into two (2) types: one for community development and the other for the administrative maintenance cost reduction.

#### 4. LBT AIMING AT COMMUNITY DEVELOPMENT

LBT aiming at community development is mainly applied to the low-volume rural/feeder roads, of which users are limited to the local residents who can not live without these roads. This fact means that the local residents along the rural/feeder roads may have a strong incentive to improve their quality of services, which are ensured by appropriate construction, and maintenance works. Since the low-volume ru-

ral/feeder roads are constructed and maintained under supervision of the road administrators such as the local governments, however, the road administrators are lack of sufficient budget and human resources, resulting in poor road management. From this viewpoint, LBT is regarded as a potential method to efficiently and effectively manage the low-volume rural/feeder roads by the local residents themselves,

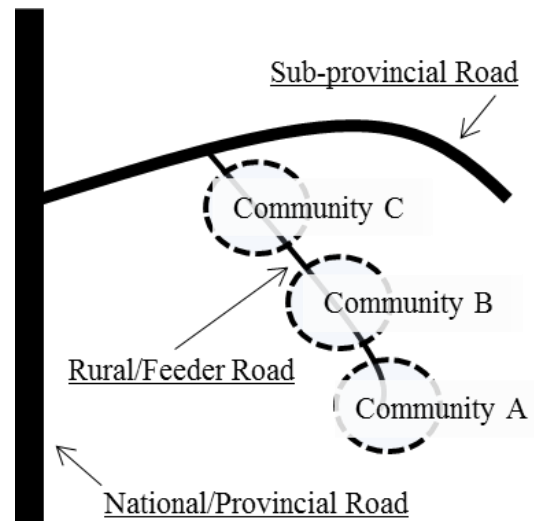


Figure 4 Hierarchical structure of road networks.

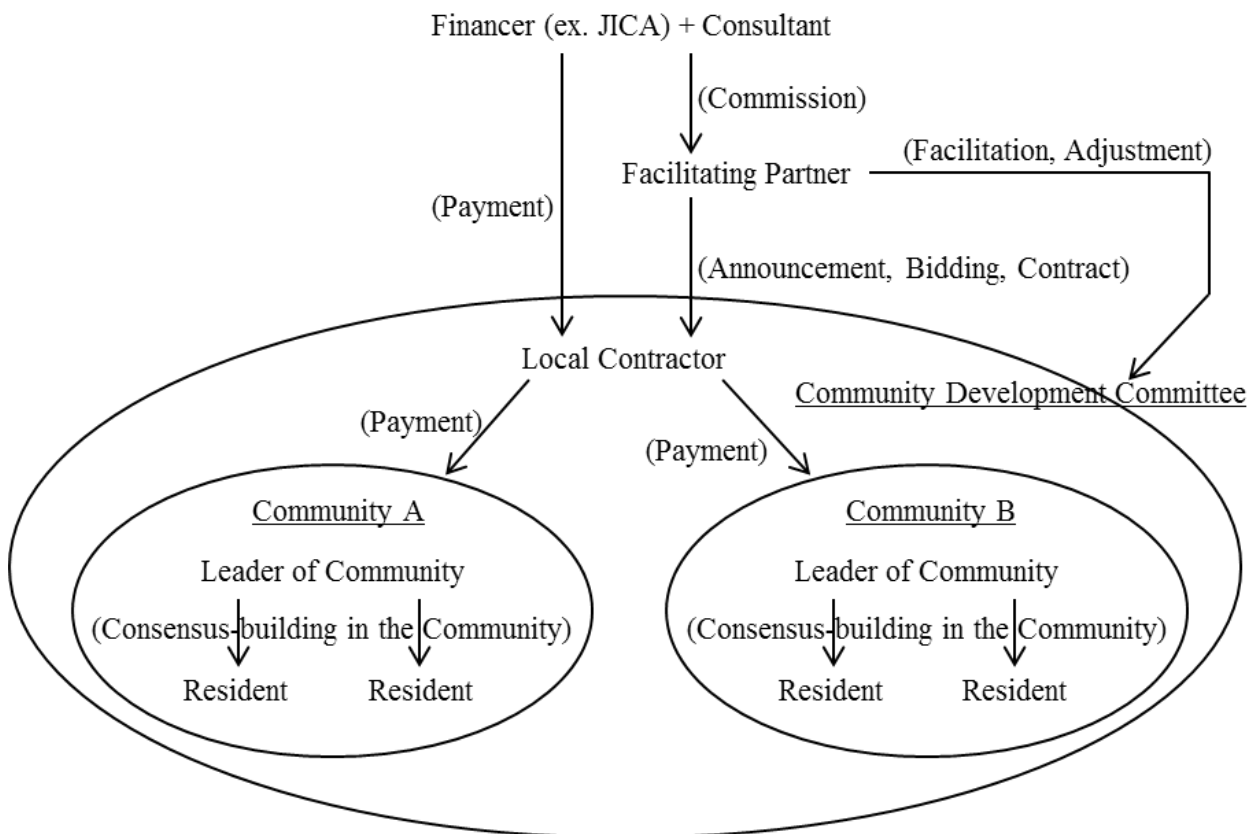
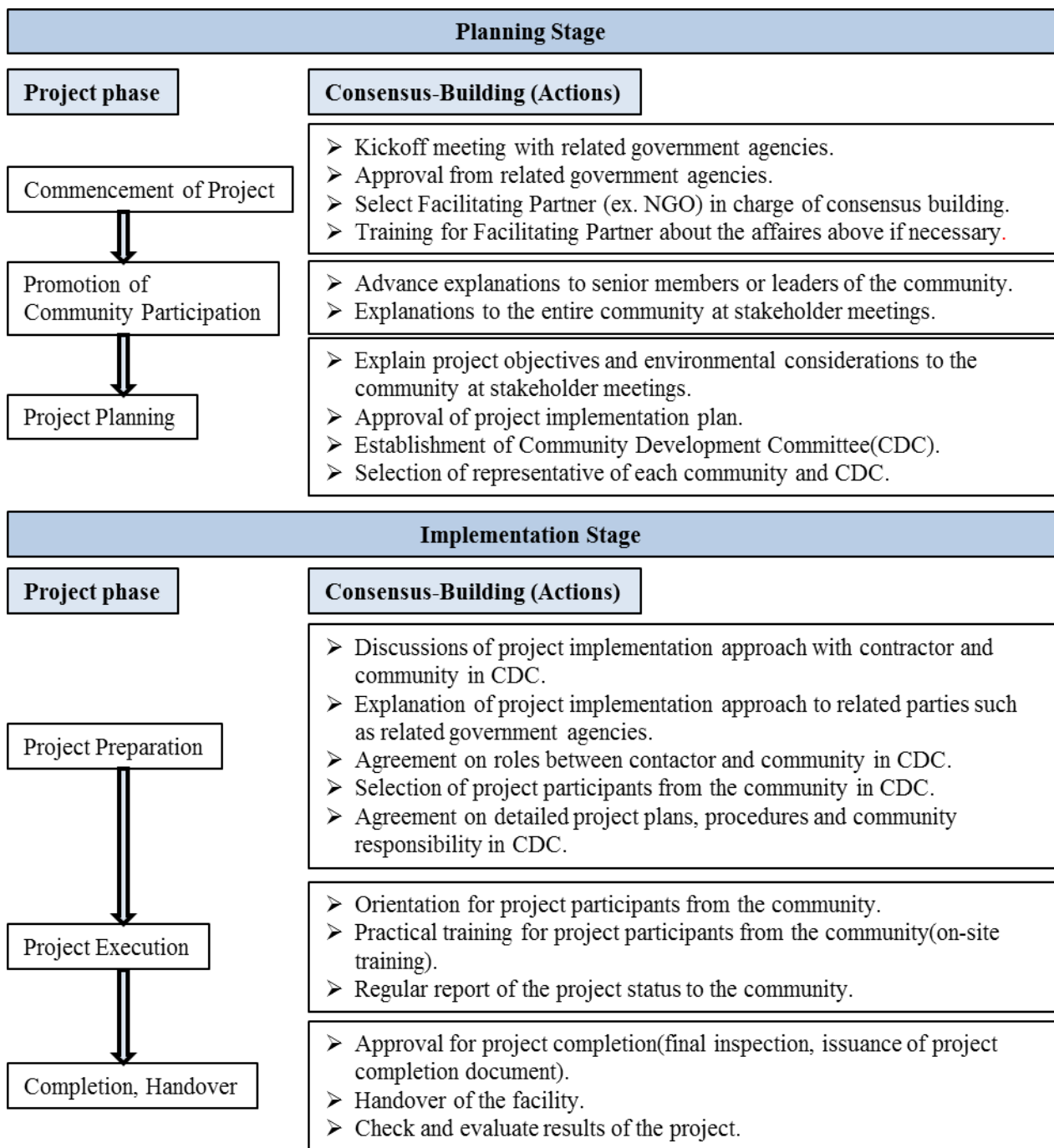


Figure 5 Structure of consensus building.



**Figure 6** Necessary activities for consensus-building. (Modified by the authors based on JICA<sup>8)</sup>)

if technology transfer of LBT is successfully prepared and consensus is appropriately built within the communities (**Figure 4**).

So as to realize the applicability of LBT to community development, some pilot projects are recommended to explore the practical problems and find out solutions by the donor organizations/countries. When the local residents take an initiative of the LBT projects, consensus-building is essential both within and among the communities. For example, crucial issues must be cleared for smooth implementation of the LBT projects, such as “who takes the readership

of the LBT projects within the communities” or “how to select the labors within the communities and deliver the direct cash earnings among the local resident labors”.

Consensus-building is essential for each phase of the LBT projects during the project implementation, from the planning to the implementation stages. Structure and necessary activities for consensus-building in each phase are illustrated in **Figure 5** and **Figure 6**. Committee of the decision-makers within or among the communities is very important. Consensus-building procedures are organized mainly



in two (2) ways, one is the committee based on the traditional system such as Shura or Ashar in the case of Afghanistan, the other is the committee organized by the donor organizations/countries which is called as Community Development Committee (CDC). Although these organizations should be selected by nature of the projects, a combination of several organizations is applicable in some cases.

## 5. LBT AIMING AT MAINTENANCE COST REDUCTION

LBT aiming at administrative maintenance cost reduction is mainly applied to the medium-volume sub-provincial roads, which are illustrated in **Figure 4**. Compared to the low-volume rural/feeder roads, for which LBT is applied as community development, users of the sub-provincial roads are not limited to the specific communities of the rural/feeder roads. Similarly, responsibility of the road administrators for the sub-provincial roads is much stronger



**Figure 7** Leveling of aggregates on the prime coat.



**Figure 8** Bitumen brought with a bucket.

than that of the rural/feeder roads. Furthermore, incentive of the sub-provincial road construction and maintenance works for the local resident is less stronger than that for the rural/feeder roads. However, the surrounding conditions of the sub-provincial roads are relatively poor due to their insufficient budget and human resources, while medium-volume is expected for them. From this viewpoint, the road administrators of the sub-provincial roads tend to apply LBT for administrative maintenance cost reduction, by highly evaluating the potential of the successful LBT projects for the low-volume rural/feeder roads.

Photos of pavement and drainage construction by LBT are presented in **Figure 7** and **Figure 8**. The technical features of the LBT projects for the medium-volume sub-provincial roads aiming at administrative maintenance cost reduction are different from those of the LBT projects for the low-volume rural/feeder roads aiming at community development.

- Classification of aggregate is much more important, because water shielding function is required for the pavement structure of the sub-provincial roads.
- Sub-base course and base course have to be constructed for the sub-provincial roads in an appropriate way.
- Asphalt and cement, which are usually imported goods, are necessary for the sub-provincial roads.

Since the local resident labors are not well-trained for technical matters as described above, the local/sub-provincial governments must take an initiative for the construction and maintenance works as the road administrators. For the implementation of the LBT projects for the medium-volume sub-provincial roads aiming at administrative maintenance cost reduction, the donor organizations/countries have to carefully investigate in advance the capacity of the local/sub-provincial government as the road administrators.

## 6. CONCLUSIONS

This paper focused on how incentives of the LBT projects work among the communities, the road administrators and the donor organizations/countries, and classified the LBT projects into two (2) types. One is the LBT project which gives a strong incentives to the local resident, targeting at the

low-volume rural/feeder roads. The other is the LBT project which gives a less incentive to the local resident labors, rather to the local/sub-provincial governments as the road administrators, targeting at the sub-provincial roads.

For the implementation of the former LBT projects, consensus-building plays a key role within and among the communities. In each stage of the LBT projects, several activities have to be conducted under the leadership of the communities, such as preparing a committee for consensus-building. Consensus-building procedures are organized mainly in two (2) ways, one is the committee based on the traditional system such as Shura or Ashar in the case of Afghanistan, the other is the committee organized by the donor organizations/countries which is called as Community Development Committee (CDC).

For the implementation of the latter LBT projects, the capacity of the local/sub-provincial governments plays a key role. The donor organizations/countries have to pay a significant attention to 1) whether the local governments obtain sufficient capacity of both constructing sub-base course and base course in an appropriate way, 2) whether necessary imported materials such as asphalt and cement can be secured by the local/sub-provincial governments, and 3) whether quality control concerning water prevention can be carefully conducted.

**ACKNOWLEDGMENT:** This paper was written based on the discussion of the Committee of JICA

LBT guidelines<sup>8)</sup>. In this Committee, JICA received a great support from Prof. HANAOKA Shinya of Tokyo Institute of Technology (TIT) and Prof. KATO Hironori of the University of Tokyo. The authors deeply appreciate their precious and helpful comments.

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(Received May 7, 2013)