Construction of Low-cost Dwellings for Road Workers in Bhutan

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Summary

The objective of this paper has been to analyse and present the reader the various aspects of an on-going project, construction of low-cost dwellings for road workers, under the Division of Roads in Bhutan. The paper focuses mainly on identification of various factors affecting the progress of the project and deducing some strategies to improve the situation.

This project is a World Food Programme (WFP) assisted project under the roads sector of Ministry of Communications in Bhutan. To assist the construction and maintenance of transportation networks, the WFP has supplied food since 1985 as partial wages for workers in the Roads Division of the Ministry of Communications. Deductions, constituting partial payment for the WFP food items, are made from the wages of the workers to raise a fund called **WFP Generated Fund**. The funds so generated are ploughed back into the project, mainly to improve the living and working conditions of workers through the provision of simple housing and work safety equipment. A substantial amount of the WFP Generated Fund is, therefore, used for constructing the dwellings for the road workers.

This project was started with a view to improve the living condition of the road workers by providing them with better housing. Despite the efforts made by the Division of Roads to achieve this objective, the number of dwellings constructed so far is about 500 numbers only and the housing problem for the road workers still remains almost the same. Majority of road workers can still be seen to live in the same roadside huts made of grass, bamboo, mud and tarpaulin.

In this paper efforts have been, therefore, made to analyse the various factors which have hindered the progress of the project and to suggest some strategies and corrective measures to mitigate the various problems experienced during the various stages of the project.

It is seen that some of the main factors, which have hindered the progress of the project, have been the following:

- Drawbacks in the Project Organisation structure.
- Poor planning and poor management.
- Inadequate monitoring and control of physical & financial progresses.
- Problems related to land acquisition for construction sites.
- Inadequate designs.
- Shortage of trained/skilled manpower in the organisation.
- Low level of Information Technology & Computer support system in the organisation.
- Poor Quality Control System in the organisation.
- Ignorance and/or lack of knowledge of various actors involved in the project formulation and implementation.
- Geographic, topographic and climatic condition of the country.

Further, in the past, the Life Cycle Economy and the maintenance aspects of the project were not given adequate consideration during the designing and planning phase of the project. This has led to mounting up of various problems related to maintenance and renovation of the dwellings.

In fact, management of properties, mainly the Government owned apartment buildings, has been emerging as one of the greatest challenges presently facing the government of Bhutan. With the fast pace of development and modernisation the country is undergoing, there has been very high level of demands for infrastructural constructions in the recent past. Various governmental and non-governmental agencies have been gearing up to meet these ever increasing demands. In the process, however, the future of the investments, i.e., the Life Cycle Economy and the maintenance strategies has, in most of the cases, been overlooked. This may be mainly due to the ignorance and/or lack of professional skill of those involved in the formulation and implementation of the project.

Introduction

The construction of dwellings for road workers in Bhutan was started in 1985 with the main objective of improving the living conditions of the road workers. The Division of Roads has employed approximately 4000 workers throughout the road network in the kingdom out of which about one-third constitute the permanent National Work-force (NWF) employee while rest constitute the casual or local workers who are employed, as needed, for a few months at a time. About 30% of the National Workforce workers are women. The dwellings discussed in this paper are meant for the National Workforce family exclusively.

Despite the fact that a couple of years have elapsed since the start of the project in 1985, the housing shortage for the road workers still remains as acute as ever.

The aim of this paper, therefore, is to examine and discuss the various factors hindering the progress of the project and to recommend some relevant strategies to mitigate the problems with special emphasis on Maintenance Planning and Life Cycle Economy of the project. The problems and difficulties associated with constructing and maintaining the dwellings and the experiences gained from the project are studied and the observations discussed in the light of the country's level of development.

Brief Country Information

General Background

The kingdom of Bhutan is a small country lying among the eastern Himalayan Ranges. It is a land-locked country with lofty mountains, deep valleys, swiftly flowing rivers, and rich bio-diversity. It has an area of 46,500 km^2 with 72% green coverage. The population of about 600,000 people,living in close harmony with nature, has a unique identity, derived largely from a rich religious and cultural heritage. Bhutan's literacy rate, as per the latest record, is 46%. Thimphu, the capital city with a population of about 40,000 people, lies at an altitude of 8,000.00 feet. Bhutan is becoming increasingly known for its pure practice of Mahayana Buddhism in the Tantric form, its untouched culture, its pristine ecology and wildlife, and the unparalleled scenic beauty of its majestic peaks and lush valleys.

Figure-1MAP OF BHUTAN

Economy

The economy, one of the world's smallest and least developed, is based on agriculture and forestry, which provide the main livelihood for 90% of the population and account for about 40% of GDP (gross domestic product) and the per-capita income of US$ 460. The agriculture consists largely of subsistence farming and animal husbandry. The economy is closely aligned with India's through strong trade and monetary links. The industrial sector is small and technologically backward, with most production being of the cottage industry type. Most development projects, such as road construction, housing, etc rely on manual labour. The use of information technology, computer support and mechanisation is below the bare minimum. Bhutan's hydropower potential is one of the key resources besides timber, gypsum and calcium carbide.

Transport & Communications

Being a landlocked country, road network is the only viable means of transport in Bhutan. Therefore, establishment of well-maintained, reliable and cost-effective roads network system in the country has always been the priority of the Government of Bhutan. Bhutan has, as of December 1998, approximately 3,750 km of roads serving almost every part of the country. Mountainous terrain with deep and narrow valleys, steep cliffs, fragile ecosystem and heavy monsoon rains every summer make it extremely difficult to construct and maintain roads in Bhutan.

The Division of Roads (DOR), under the Ministry of Communications, is the sole agency entrusted with responsibility of construction and maintenance of road and road infrastructures in Bhutan.

The roads maintenance works in Bhutan is a labour-intensive work. Bhutan's difficult topographies and extreme climatic conditions make roads maintenance activities very challenging in terms of difficulties, risks, reliability and economy. The Division of Roads is employing manual labourers at the rate of one man per kilometre for the road maintenance activities.

Women's participation in Development Activities

In Bhutan, both men and women are equal before the law and the society. Both are given equal opportunities in all spheres of life such as education, job, business, etc, etc. However, the Bhutanese women, in general, are far behind men in the actual goings of life. In the construction industries, for instance, women are found to occupy more seats at the lower levels of the organisation such as manual workers, peons, typists, etc, while men are seen to occupy more seats at the higher levels, i.e., decision making, designing, planning, etc. However, with the growing awareness of gender equality and sense of equal responsibility in the society, more and more women are being seen occupying respectable positions in the field of medicine, teaching, law, accountancy, business, etc.

Housing in Bhutan

Rural Housing

Bhutanese housing has a distinct characteristic feature from that of other countries in the Himalayan region. Relatively spacious compared with those of neighbouring societies; houses take advantage of natural light and, because of the steep terrain, are usually built in clusters rather than in rows. Timber, stone, clay, and brick are typical construction materials in upland areas.

Family residences frequently have three stories, with room for livestock on the first or ground story, living quarters on the second story, additional living quarters and storage on the third story, and an open space between the third story and the roof for open-air storage. Large stones are used to weigh down wooden roofs against

fierce Himalayan storms. Among Buddhism's contributions to Bhutan are its rich architectural embellishments. The walls of residences and public buildings, inside and outside, are subject to colourful decoration, as are furniture, cupboards, stairs, window frames, doors, and fences. Wooden shutters, rather than glass, are used. Buddhist motifs and symbolic colours also are extensively used. In the eastern region of the country houses of stone and timber are sometimes built on hillsides. The housing in the southern districts mostly consist of bamboo and thatched roof houses and mud and thatch dwellings. In Bhutan the construction of housing, especially in rural areas, often is a co-operative task of the community.

Housing in the urban areas

The housing in the urban areas is rapidly giving way to the latest technologies and developments. The latest architecture and patterns are replacing the old traditional housing patterns. Most of the houses in the town areas are multi-storey reinforced-concrete buildings. The wooden roofing has given way to either CGI sheet or concrete roofing. These buildings, however, still carry the typical construction patterns and paintings typical to the Bhutanese Housing: Bhutanese type cornices and windows are incorporated in almost all the buildings while Bhutanese type paintings are very common sight on the walls of the buildings in Bhutan.

Housing shortage in Bhutan

Housing shortage has been emerging as a very serious problem in most of the towns in Bhutan. In two of Bhutan's biggest towns, Thimphu and Phuentsholing, many families, especially those in the middle and lower income bracket, are living under difficult circumstances and suffering indignities. The capital city, Thimphu, has a population of about 40,000 people but has only 4500 apartments while Phuentsholing, a border town in the south, has a population of 27,000 people and only 2,100 apartments. The Urban Development and Housing Division of the Communications Ministry is gearing up to begin constructing about 600 new apartments over the next year with a view to mitigate the housing shortage in these towns. It has already been almost too late for the government of Bhutan to realise the problem and to look for effective solution. The population growth at Thimphu is estimated to be about 7.1%. As the housing shortages grow day by day the private house owners and landlords grow more treacherous and unkind by hiking the house rents unlimitedly. An average employee in Thimphu is spending about 30-40% of the monthly income on house rent.

Low Cost Dwellings for Road Labourers

Despite the importance of the role of manual labourers in maintaining roads, it is not unusual to find their living conditions, especially their homes, so pathetically poor. Their homes, the roadside temporary camps, are made of wooden poles, grass, reeds and worn-out tarpaulins. Most of these camps do not even fulfil the basic requirements of keeping out rain, wind, sun and animals.

Having realised the necessity of providing the basic, low- cost accommodation to the National Workforce (NWF) workers the government of Bhutan has started construction of such accommodations (known as NWF Dwellings) along the sides of National Highways throughout the country.

The Project–Construction of NWF Dwellings

The project, construction of NWF dwellings, is a World Food Programme (WFP) assisted project under the roads sector of Ministry of Communications in Bhutan. The objective of this project is to improve the living conditions of the NWF workers by providing them with better housing. The fund for the project comes from the WFP Generated Fund, a fund generated by making deductions, constituting partial payments for the WFP food items, from the wages of the workers.

An important feature of the project is that the project sites are scattered through out the road network in the country. This makes the project more difficult and expensive to implement.

The NWF dwellings have the following salient features:

1. Total floor area of 27.00 sq.metre ,
2. Designed for single-family,
3. Three rooms altogether – two bed-rooms and a kitchen,
4. Utilities such as baths and toilets, thermal and sound insulation, etc are not provided. Water is supplied through pipeline if there is no source within about 200 metre from the dwellings. Heating systems, which uses firewood, are provided to the dwellings situated at altitudes above 6000 feet.
5. Smokeless oven, which burns firewood, has been introduced.
6. Construction materials:

Sl. No	***Part of the Dwelling***	***Construction material***
1	Roof	CGI Sheet-24 swg
2	Floor of bedroom	-timber planks for above 6000 ft -cement concrete
3	Floor of kitchen	Cement concrete
4	Walls	Cement plastered Bamboo-ekra in timber frames
5	Ceiling	Timber- 0.75 inch thick

7. The following table shows the schedule of doors and windows of a NWF Dwelling.

SCHEDULE OF DOORS & WINDOWS			
TYPE	***DESCRIPTION***	***SIZE (mtr)***	***No.***
D	SINGLE-SHUTTER WOODEN DOOR	0.90X1.80	2
D1	SINGLE SHUTTER WOODEN DOOR	0.75X1.80	2
W	GLAZED WINDOW	1.20X0.90	2
W1	GLAZED WINDOW	1.35X0.90.	1
W2	GLAZED WINDOW	1.00X0.90	3

8. The standard drawings of a NWF Dwelling are shown in figure-2a and 2b below.

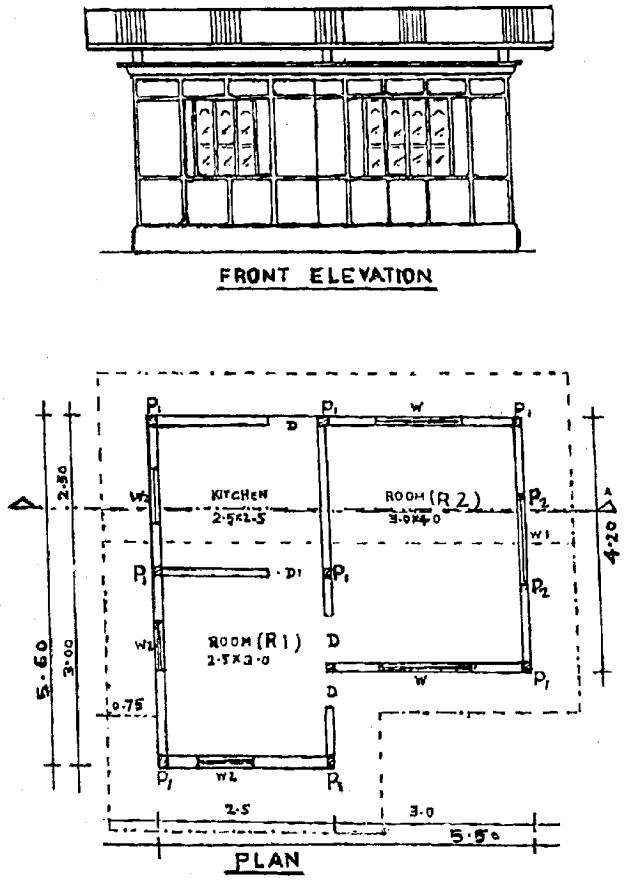


Figure 2a
PLAN & FRONT ELEVATION OF A NWF DWELLING

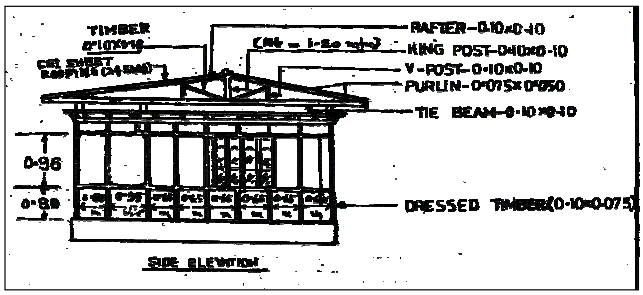


Figure 2b
SIDE ELEVATION OF A NWF DWELLING

Actors in the Project

Client
The Division of Roads, under the Ministry of Communications, is the client of this project. It is the objective of the Division of Roads to have as many dwellings as possible completed within the shortest possible time so as to have a dwelling for each family of the NWF.

The DOR, a Government organisation under the Ministry of Communications, comprises of the DOR Head Quarter based at Thimphu, the eight Field Divisions under the three maintenance circles based at certain strategic locations along the National Highways and the Central Stores Division located at Phuntsholing. The Organisation Structure of the DOR is given in figure-3 below.

Funding Agency
The World Food Programme (WFP) is financing the construction of the NWF Dwellings through WFP Generated Fund scheme. The WFP, during its previous programme (Project BHU 2117/02) and current programme
(Project BHU 5822/00), has been providing food aid to Bhutan to expand and enhance the sustainability of its road
network. Deductions, constituting partial payment for the food items, are made from the workers´ wages to raise a fund called ***WFP Generated Fund.*** This fund is used for providing better housing and other amenities for the road labourers. The amount of WFP Generated Fund available for use from the previous programme BHU 2117/02, estimated at the closer of the last fiscal year (i-e, June 30,1998), was Nu. 15 million ($392,000.00). An estimated total of at least Nu. 30 million ($783,000) will be generated through wage deductions during the current programme BHU5822/00.

Executing Agency
In the past mostly the Division of Roads itself used to execute the works through its field divisions. But the recent trend has been to get the works executed through local contractors in line with the government's policy of promoting maximum private participation in the development activities.

Project Management
The field divisions are responsible for managing the actual execution of the work at site.

The field divisions of the Division of Roads consist of the three Maintenance Circles. Under each Maintenance Circle, there are two or more Maintenance Divisions and under each Maintenance Division there are two or more Maintenance Sub-divisions.

Design & Planning Stage

Project Planning & Goal Setting

The Field Divisions are asked to submit their proposals, before the closing of the running financial year, regarding the number of dwellings they can take up during the following fiscal year. The proposals are then compiled along with other relevant information to arrive at the number of dwellings each division can take up. The WFP Co-ordination Cell of DOR also plays an important role in setting the yearly goal of the project.

The DOR Head Quarter, after having assessed the number of dwellings to be completed under each Division during the current fiscal year, issues Technical Sanction.

Standard drawings of the dwelling showing its plan, elevation, side views, typical cross-section, etc., prepared by the DOR Head Quarter, are circulated to the concerned field divisions. The field divisions have to stick to the specifications and the drawings circulated by the Head quarter during the execution of the work. Slight modification in flooring and windows are applied depending upon the altitude of the site: timber flooring and five windows are required to be provided for dwellings above altitude of 6000 feet while concrete flooring and six windows are to be provided for the dwellings at lower altitudes.

Tentative work plan for the execution of the work is prepared and circulated by the Design & Planning Cell of the DOR Head Quarter for the concerned Field Divisions to follow. If felt necessary, the Field Division can modify the work plan to suit the site conditions under intimation to the DOR Head Quarter at Thimphu.

Procurement & Supply of Materials

The Central Stores Division, Phuentsholing, is responsible for procuring and delivering the construction materials to other divisions of the Division of Roads. The Field Divisions are required to submit their annual requirements of materials to the Central Stores Division. The Central Stores Division, then, compiles the annual requirements of all the divisions and procures in bulk through competitive bidding process.

While timber products, cement, gypsum products etc. are available in the country, the materials such as steel parts, glass, corrugated galvanised iron (CGI) sheets, synthetic paints, bitumen and other petroleum products, etc. are imported usually from India.

Economy & Budget Control

Towards the beginning of every fiscal year both physical and financial achievement of the previous year's budgeted activities are compiled and reviewed. Budget forecasting and budget allocation for the proposed and prioritised activities during the current fiscal year is then done as per the findings of the review. Cost Estimates are then prepared using the Bhutan Schedule of Rates (BSR) and the Technical Sanction (T.S.) issued as per the budget allocated under the concerned division. The Field Divisions are required to limit the expenditures within the T.S. amount. The allowable deviation of expenditures is 20% above/below the T.S. amount. The estimated cost of one unit dwelling, as of December 1998, is Nu. 150 thousand (US$ 3570.00) approximately. The Accounts & Finance Division, Roads, under the Ministry of Communications functions as a controller and advisor on matters related to budget and expenditures under the Division of Roads. The Financial Manual-1985 and its subsequent amendments are the main controlling and guiding tools for this aspect of the project.

Conclusion

The following have been observed in the design and planning process of the project: -

- The objective and the target of the project are not well defined,
- No efforts have been made to incorporate the various interest groups, especially the contractor, the field divisions who are managing the construction, and the end-users, i.e., the road workers, in the design and planning process.
- The dwelling sites are never investigated for safety against landslides, floods, etc, which are very common phenomena in the hilly country like Bhutan.
- Database of past experiences, feedback from various actors and interest groups, etc are never maintained. Hence, no use of feedback in the design and planning process of the project.
- The level of information technology and computer support in the organisation is very low.
- The maintenance strategies and the Life Cycle Economy of the project have always been overlooked in the design and planning process.
- The problems faced during Production Stage such as non-availability of construction sites are not dealt with adequately during the design and planning process.

The above listed short comings have been the major reasons for inadequate and poor planning of the project which have resulted in many instances of unsuccessful project in the past.

Execution/Production Stage

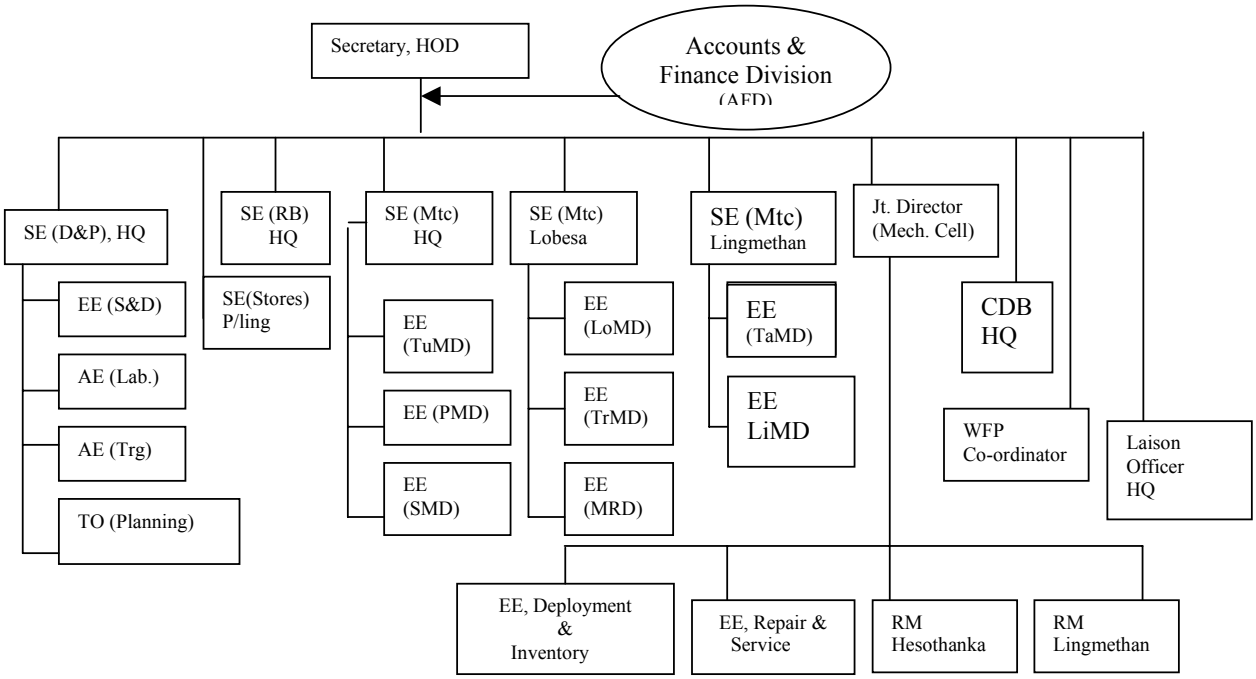
Tendering and Contract

The works are awarded to local contractors through competitive public bidding on price. In Bhutan, contractors are classified as *Class-A, Class-B, Class-C* and *Petty* contractors. The classification is based on the capability of the contractors, which depends on the plants & equipment, key personnel, past experiences and the financial strength of the contractor. The Construction Development Board (CDB), which is also under the Division of Roads, maintains a database of contractors' records. The CDB, therefore, plays an important role in the tendering and contracting process. The guidelines contained in the Financial Manual 1985 and the Construction Development Board (CDB) Manual are strictly followed during tendering and awarding of works.

The most widely followed practice of tendering and contracting in Bhutan is the Item Rates Contract in which the Bill of Quantities (BoQ) of the work, prepared by the division concerned, forms the main part of the tender document. The contract is drawn between the contractor and the Executive Engineer of the Field Division concerned.

The present practice of tendering and contracting in Bhutan, especially in the Division of Roads, has been observed to be a very long and time-consuming process. It has been observed that the time consumed in the process from the date of Notice Inviting Tender (NIT) to the actual start of the work is normally two months.

Figure-3
ORGANISATION STRUCTURE OF DIVISION OF ROADS IN BHUTAN



Abbreviations and their full forms:

HOD- Head of Doivision/Department
LiMD- Lingmethang Maintenance Division
RM- Regional Manager
PMD- Phuntsholing Maintenance Division
TO- Technical Officer
LöMD- Lobeysa Maintenance Division
Trg.- Training
SE –Superintending Engineer
TrMD- Trongsa Maintenance Division
EE – Executive Engineer
CDB – Construction Development Board
SMD- Sarpang maintenance Division
D&P- Design & planning
RB- Road Bridges

Production/Execution Planning

The Field Division concerned is responsible for managing the construction process in addition to its normal responsibility of managing the road maintenance activities under its jurisdiction.

The concerned divisions can start the work (tendering or actual execution) as soon as the Technical Sanction is received from the Head Quarter. But many a times quite a number of factors come into play and, so the execution of the project gets delayed/hindered. The most prominent of these factors is the non-availability of suitable site. Since the roads are usually found to run through steep cliffs and mountainous terrain, it is, most of the time, very difficult to find suitable sites for the dwellings. As per the *one man per km* norm followed by the DOR in road maintenance activities, the workforce is to be distributed evenly along the length of the Highway. To meet this requirement the locations of the dwellings have to be such that they are as evenly distributed as possible along the roadsides. But due to non-availability of suitable site for the dwellings it is quite usual to find a number of dwellings constructed in cluster at one location and no dwellings along quite a long stretch of road. Most of the labourers, therefore, have to walk long distances to their worksites daily. Further, to have the dwellings as evenly distributed as possible along the highways the DOR is, very often, required to acquire /purchase private lands along the roadsides for constructing the dwellings.

Quality Assurance & Economic Control

The Field Divisions are responsible for timely completion, quality control and making the expenditure. The Section Officer and the Assistant Engineer, under whose section the work is being executed, are the site-in-charges. The site-in-charges are required to see that the work is carried out properly with regard to specifications and time. The Accounts and Finance Division under the

Ministry of Communication always keeps an eye on the Divisions to assure that the budget/fund is utilised properly and efficiently. Any activity that involves financial transaction has to follow the Financial Manual 1985. The Royal Audit Authority of Bhutan (RAA) also plays a very important role in Quality Assurance & Economic Control of the project by carrying out regular audit of all relevant accounts and records.

The absence of advanced quality control system, shortage of skilled manpower, non-availability of advanced testing equipment and lack of adequate computer support in the organisation have been recognised as some of the major hurdles to the quality management in Bhutan's construction industries.

In the past, many instances of unsuccessful contracts such as extension of contract period, termination or rescinding of contract, cost over runs, etc, have been experienced. With a view to mitigate such problems the Construction Development Board (CDB) is actively involved in the tendering and contracting process of the project. The tenders are evaluated in close consultation with the database of records of contractors maintained by the CDB to assure that the work is awarded to eligible and capable contractor.

Further, to assure quality and economy during execution, the successful bidder (i-e, the contractor whom the work is awarded) is required to deposit, at the time of drawing the contract, a Security Deposit equal to 7% of the total contract amount with the Chief Finance Officer, Ministry of Communications. The Security Deposit is refunded after successful maturity of the **defect liability period.** The defect liability period is taken as effective from the date of completion of work and varies with the total contract amount.

Conclusion

Some of the important observations drawn from the production phase of the project are as follows: -

- Tendering and contracting procedure followed by DOR has been observed to be a very time-consuming, long and tedious process. A good part of the production time is always wasted in this process. On an average, the time taken from Notice Inviting Tenders to Start of Work has been estimated to be about two months. This may be mainly due to inadequate computer support and shortage of trained staff in the organisation.
- It can be seen that the field divisions are over burdened. They are made to manage the construction of the dwellings in addition to their normal responsibility of maintaining of roads. This could adversely affect the project.
- Acquisition of land for construction of dwellings is processed on case-by-case basis. This is very time-consuming and, most of the time, unsuccessful.
- Management of quality of the project is left in the hands of the field divisions which are already burdened with their normal responsibility of maintaining of roads.
- Regular review and monitoring of progress of the project are not done adequately.

Property Management

Maintenance & Life cycle Economy

There is no specific plan for the maintenance or renovation of the dwellings. Despite the importance of maintenance and renovation strategies, and the aspect of the Life cycle economy of the investment, this aspect of the project has always been overlooked during the design and planning of the project. As such, many of the dwellings constructed during the earlier years of the project have already deteriorated badly. The maintenance requirements are mounting up day by day while many of the dwellings are already in need of renovation.

Conclusion

The aspects of Routine Maintenance, Periodic Maintenance and renovation of the dwellings seems to have been neglected. Many of the already completed dwellings are already in poor conditions.

Further, the future of the investments appears to be very bleak. There are no economic strategies to safeguard the future of the investments.

The above mentioned shortcomings show that this project is not in line with the sustainability of development. These shortcomings can be attributed to various reasons resulting in poor planning of the project during the Design & Planning Phase.

Observations & Conclusions

Site for construction of dwellings

It has been observed that non-availability of suitable construction sites is one of the major constraints to the progress of the project. Acquisition of land, i.e., construction sites, along the roadsides are processed by the Field Divisions on "as and when required" basis. This process has been observed to be very time-consuming, uneconomical and, most of the time, unsuccessful. This is one of the main reasons behind the slow progress of the project.

Although the government has fixed the land within 100 feet on either side of the roads as Road's Right of Way and categorised as government owned land, some of the lands, which could provide good site for construction of dwellings, are still illegally occupied by private organisation/individual. Such problems as illegal occupancy or illegal encroachment have usually been seen to come to light only during the execution stage of the project. Such disputes are usually very complicated and sometimes can stretch to many years. This problem has been recognised as a very serious hindrance to the project.

Interest-groups in the planning process

The views and interest of various actors – client, funding agency, executing agency, end users, etc – involved in the project at various stages are not taken into account during

the design and planning stage of the project. The deciding factor has almost always been the present necessity and the budget. It is seen that the comfort, safety, climatic conditions, etc are never given adequate consideration during the design and planning stage of the project. The orientation, ventilation, heat and sound insulation, skylight, etc, of the dwellings have never been incorporated in the design. Furthermore, the dwelling sites are never investigated for safety against landslides, floods, shooting boulders, etc.

Tendering & Contract

Most of the contractors are uneducated. They are ignorant of the tendering procedures, sense of responsibility and importance of the quality of works. Most of them are inclined to maximisation of profit. These weaknesses are recognised as some of the causes leading to: -

- conflicts among various interest groups such as that between contractor and supervisor/manager,
- poor quality product,
- time and cost over-runs,
- termination/rescinding of contract, etc, etc.

Further, the tendering & contracting procedure followed by the Division of Roads is very clumsy and inefficient. The time consumed by various steps during the tendering process has been roughly estimated as follows:

- Floating of NIT to submission of tenders –1 month(min)
- Submission of tenders to evaluation of tenders- 10 days
- Tender evaluation to issue of acceptance letter- 10 days
- Issue of acceptance letter to start of work - 10 days

It is observed that under normal circumstances the time consumed from the date of NIT to the start of work is approximately two months. A good portion of the work period is, therefore, wasted only on tendering process.

Maintenance & Life-cycle Economy

Although the present practice of maintaining or renovating the existing dwellings on adhoc basis appears to be adequate, at least for the present, it can give rise to unplanned management problems in the near future. The number of dwellings is multiplying rapidly. This will lead to mounting up of the need to maintain/renovate increasingly larger number of dwellings in the years to come. Moreover, postponing the maintenance to future will result in higher maintenance cost, and sometimes even total reconstruction, in the succeeding years.

Despite the fact that the construction of NWF Dwellings is a long-term investment project, no emphasis has been given on the on the life cycle economy of the project. Strategies for routine and periodic maintenance, renovation, etc, have always been overlooked during the design and planning stage of the projects. Most of the decision makers, designers, planners and others involved in the design and planning of the project are ignorant of this aspect of the property while others are indifferent to the problem.

Therefore, it is high time that a long–term strategic plan was set for running and maintenance of the existing dwellings and for replacement of the dwellings after their useful lives. As can be seen from the foregoing discussions, the aspect of running, routine and periodic maintenance, life cycle economy, etc. were all overlooked during the design and planning of the project.

Recommended Strategies

To improve the present situation and to achieve long-term interests in future, it is suggested that the following strategies be followed.

- Formulate and adopt a sound Management System,
- Focus more on Institutional Capacity Building and Human Resource Development
- Promote use of latest available Information Technologies in the organisation,
- Strengthen the computer support system in the organisation,
- Do long-term planning of the project,
- Set up database for feedback & experiences.
- Give due importance to Maintenance Planning & Life Cycle Economy of the project during design and planning of the project.
- Involve and co-ordinate all the interest and target groups in the planning process.
- Review and monitor the progresses on regular basis.