Programme 135 Operation and Maintenance Pilots
Field Study and Design of Pilot Model

Contents

Preamble

This report is the second in a series of two reports. The first report covered a review of existing experiences and models used in various situations in Viet Nam. A presentation of this review was made to the Joint Review of Progress Workshop on 27 and 28 September 2005. This report describes the work and findings of the study team following the September workshop.

A number of interesting issues arose at the workshop. The study team has endeavoured to encompass the feedback from the workshop into the design of the pilot programme. In particular, it was confirmed at the workshop that the size of the "maintenance gap is critical". The maintenance gap can be defined as the difference between the resources required to undertake all types of maintenance activities in a timely and professional manner and the resources currently allocated to such maintenance activities. DFID confirmed that there was an urgent need to undertake an assessment of commune inventories and estimate the full O & M requirements in a number of communes to help the design of the pilot models; and offered support for the additional work. The importance of this was confirmed by the Chairman of the workshop. This additional work has yet to be commissioned. However, as an interim measure, the study team modified its work programme and included an exercise in a single commune to identify the size of the maintenance gap. Whilst this exercise was limited and cannot be considered to be statistically significant, it nevertheless gives some guidance in terms of order of magnitude.

This report is divided into three sections. Section one establishes the framework for the design of the pilot models.

The second section documents the field visit to a Programme 135 commune, Phuoc Tra Commune. The commune is located in Quang Nam Province in central Viet Nam and is situated in a remote mountainous area close to the border with Lao. The area is subject to heavy rainfall which was clearly demonstrated during the field visit. Access to the commune was difficult, via a gravel road with a number of sections in poor condition. Indeed, on one occasion the study team four wheel drive vehicle had to be abandoned, a steep section of the road was too slippery as a result of the very heavy rainfall. The study team took to walking and motorbike taxis.

During the field visit, an effort was made to document all the infrastructure in the commune, which consisted of six villages. The condition of each facility was evaluated and the cost of restoring each facility to proper condition was estimated (restoration work). The costs of routine maintenance were also estimated. Commune resources and model possibilities for O & M were discussed with the CPC and village leaders. This fed into the design of the pilot programme.

The third section presents the design of the pilot model, which includes a fully costed and time bound proposal for the implementation of the pilot programme.

Section I Framework for Design of the Pilot Programme

1 Introduction

1.1 Background

Small scale infrastructure in rural Vietnam is considered to be the responsibility of commune authorities once construction is complete and the infrastructure is formally handed over. This means that Commune People's Committees (CPC) are responsible for all aspects of operation, management and maintenance.

Although there is a legislative framework in place which allocates responsibilities and decision making authority to CPCs and local communities, there is little documentation or practical guidance as to how to support CPCs to fulfil their infrastructure O&M responsibilities.

State budget allocations to CPCs are generally sufficient only to cover basic salaries and running costs of the CPC itself, with no funding for infrastructure Operation and Maintenance (O&M). Instead, O&M is dependent on the contributions mobilised from local communities The levels of funds that can be mobilised from poor rural communes are often insufficient to cover the costs of all but the most basic and routine operation and maintenance activities. This is further exacerbated by low population densities which result in higher costs per capita for the same basic infrastructure.

In addition, poor rural communes tend to be located far from provincial and district towns and difficult travelling conditions act as barriers to access to the services provided by such administrative centres, as well as a deterrent to technical field staff of line agencies providing effective services to rural areas.

CPC staff are often responsible for several different areas of work, for example one person may be responsible for road transport, irrigation, and public works. Often the individual has received inadequate technical and management training and is generally overstretched, and not able to provide sufficient time and attention to different aspects of infrastructure O&M despite their best efforts.

As a result of these practical difficulties a number of rural infrastructure assets, including those provided under Programme 135 (P135), have suffered from lack of or inadequate O&M which has meant the infrastructure provided has not been sustained, or in some cases not even generated the full potential benefits anticipated, with many infrastructure investments quickly falling into disrepair.

Increasing investment in the basic infrastructure needs of rural communes is also shifting the focus to making the benefits of such infrastructure more sustainable through the prioritisation of O&M systems, and for more equitable strategies that support the Government's move towards improved community participation and management of their infrastructure.

The purpose of this report is to present a clear strategy for improving O&M management and implementation as well as the detailed design of 'Pilot' O&M systems to be implemented within the P135 framework, taking into account the special characteristics and needs of poor and remote communes.

In order to achieve this, a review of current O&M practices and of a range of infrastructure construction projects that adopted approaches that provide a sound basis for the future O&M of rural infrastructure was undertaken. This review was followed by consultations with central and local authorities to assess the applicability of such approaches to P135 and to develop a detailed proposal for the 'pilot' O&M systems.

1.2 Findings from review of existing experiences

During construction under Programme 135, selected commune level representatives form part of a 'Commune Supervision Board' (CSB). The Provincial People's Committee (PPC) provides guidance on the duties, responsibilities and the organisation structure of the CSB while the District People's Committee (DPC) directs the implementation and makes decisions on the establishment of the CSB.

Following construction, the investor should hand over all files and documents relating to the construction of the works to the CPC. The CSB is disbanded. Funding from the State Budget is ring-fenced for construction. It is not permitted to use this fund for anything other than construction and related activities, though it may be used for training of CSB members and their basic costs.

This is the standard model for infrastructure investment projects, and does little to support sustainable post construction O&M. However, there are several investment projects that are supporting 'pilot' models that, although they do not specifically support post construction O&M, do include extensive training, community participation and management of the infrastructure construction which provides a sound foundation for future O&M management and implementation.

Table 1 summarises the 'pilot' models currently being implemented in Vietnam by different investors for different types of rural infrastructure.

In addition to these experiences, it should be noted that Sector Strategies, in particular for the irrigation sector, have already resulted in policies to support the wider implementation of these pilot models, such as MARD Circular No. 75/2004/TT-BNN (December 2004), which provides guidelines for establishment, strengthening and development of Water User Associations, and No. 248/BNN-TL (January 2005) concerning a National Action Programme for reform and effective enhancement of management and exploitation of irrigation structures.

Table 1: Current Best Practice Examples

Infra-structure Sector	Projects/Funders/ Line Agencies Consulted	O&M Management	O&M Implementation	Comments
Irrigation	• Oxfam, • ActionAid, • CWRDE(IWRR) • HRDP (IFAD)	• WUA is a separate entity with own bank account. • Contracts made with irrigation companies for water supply. • Watering schedules, management, annual maintenance plan prepared by WUA	• 2-3 people contracted by WUA for O&M – each responsible for supply system to 10-25 ha fields. • Collection of user fees to pay irrigation companies and WUA costs.	• Sector strategy stipulates WUAs nationwide. • Direct relationship between user benefits, fees and O&M
Water Supply	• RWSS(UNICEF DANIDA), • PCERWASS (Ha Tinh) • ActionAid	• WUG – similar to irrigation WUA	• CPC contract individual to implement O&M. • Collection of water fees from users	• RWSS endorses WUGs nationwide. • Direct relationship between user benefits, fees and O&M

Markets	• HRDP (IFAD)	• Market Management Board responsible for O&M	• MMB have a contract with CPC to collect fees from stall holders and make monthly payments to CPC. • Fees often higher than O&M needs and provides additional revenue to CPC for other items.	• Risk to MMB if don't collect enough fees, but high incentive to do O&M well to encourage payments.

Infra-structure Sector	Projects/Funders/ Line Agencies Consulted	O&M Management	O&M Implementation	Comments
Roads	• HRDP (IFAD), • RT2 (World Bank)	• Road User Association (RUA) for Commune Roads. Similar to WUA, but all members are CPC staff and funding managed through CPC. • Commune regulations on how to protect and look after roads (Routine 1 only).	• Repair work as need arises. • Labour contributions plus cash contributions from local community. • Barrier gate installed – overloaded vehicle fine collection and occasional toll collection.	• Road users are not all local residents, and distances from population centres make O&M management difficult. • Impacts of RUA weaker – O&M of roads more technically difficult and expensive.
Electricity	• (Quang Nam) Electricity Department	• Electricity Management Board (EMB) with regulations based on requirements of Province Electricity Department. • Operates either under Commune Service Cooperative or CPC	• 2-3 people in commune O&M team for household connections. • O&M of line and sub-station by technical staff of local electricity company. • EMB contract an electricity company to supply power based on KWh consumption. EMB collect household fees on behalf of company.	• Safety issues means all O&M done by technical staff of electricity company. • Direct link between fee payment and supply delivery. • High user demand also supports effective O&M.
Schools	• ActionAid, • IFAD, • DANIDA	• Commune Schools Council becomes owner for O&M. • Usually Pupil Parent's Association support includes O&M management.	• School head responsible to set up O&M regulations and nominate individuals to undertake O&M activities. • Contributions per pupil each year.	• Larger families have larger contribution burden. Large sums required in one annual payment may be difficult to meet.
Health Stations	• ADB, • World Bank	• Commune Health Staff responsible for O&M management – similar to schools.	• None	

2 Key Concepts

The findings from the review of existing experiences show that there are several key concepts that are essential to support sustainable and equitable O&M of rural infrastructure. This section briefly explains these key concepts.

2.1 Levels of maintenance

O&M is a complex concept which covers a wide range of activities from technically simple and relatively low cost tasks that need to be undertaken on a regular basis, to technically difficult and expensive tasks that only need to be carried out every few years. The variations in O&M tasks therefore need to be broken down into levels that reflect these variations in technical difficulty and costs of works

The Ministry of Construction's Regulations on the Construction Project Quality Management (Decision No. 18/2003/QD-BXD, Article 2, item 14) classify maintenance into four levels. These correlate with the four grades of maintenance stipulated in Ministry of Construction Guidance on Maintenance of Works (Circular 05/2001/TT-BXD). Table 2 shows these four levels, the equivalent terminology used internationally (in particular in the road sector) and a description of the kind of activities included within each level as well as the condition or quality of the infrastructure at which this level of maintenance is required and an indication of which level (commune, district or province) that can undertake each maintenance level.

Level 1 is the most technically simple, low cost and low technology level that should be carried out frequently; a matter of simple 'housekeeping' of infrastructure. Each increase in level is associated with an increase in technical difficulty and cost, but with a reduction in the frequency required.

Table 2 Levels of Maintenance

	MoC Level	International Level	Description	Quality / Condition	Who can do.
1	General Maintenance (18/2003) Work Renovation (05/2001)	Routine 1	Activities to be carried out regularly (several times a year) that require minimal technical training and can be carried out by local communities using locally available materials and tools. For example, clearing ditches and channels of debris, lubricating mechanisms. Little support required from district level, except training.	Good	Commune
2	Minor Repairs (18/2003) and (05/2001)	Routine 2	Activities to be carried out regularly (1-2 times a year) that require some technical training but can be carried out by trained members of the local community if provided with the necessary tools. May also require provision of materials not locally available. Requires support from district level or above.	Fair	Commune / District
3	Medium Repairs (18/2003) and (05/2001)	Periodic	Activities to be carried out every few years that require substantial technical training and provision of materials and tools. Cannot be done by local communities, requires trained specialists from district or province levels. Local communities can undertake some unskilled labour activities but most activities require skilled or semi-skilled labour.	Poor	District / Province
4	Major	Rehabilitation	Although a form of maintenance, the	Very Poor	Province

	Repairs (18/2003) Work Overhaul (05/2001)		requirements are similar to new construction. Must be implemented by trained specialists. Local communities can undertake some unskilled labour activities but most activities require skilled or semi-skilled labour.		

For levels 1 and 2, the project investor should develop annual plans for maintenance activities, with technical instructions for the CPC to implement the plan.

The need for level 3 maintenance can be reduced if levels 1 and 2 and implemented well and in a timely manner. The sooner repairs are made, the lower the extent of repair required and hence the lower the cost. However, there are certain activities that need to be undertaken every few years which will be needed even if level 1 and 2 maintenance has been implemented well. For example, gravel or earth roads need to be re-graded and re-gravelled every 3-5 years depending on the climate, topography and traffic levels.

Level 4 maintenance or rehabilitation should not be required if levels 1-3 have been implemented well and in a timely manner. Level 4 is required if a structure has deteriorated to the extent its operation is adversely affected or has become unsafe. Rehabilitation needs to be designed and managed in a similar manner to new construction.

2.2 Restoration work

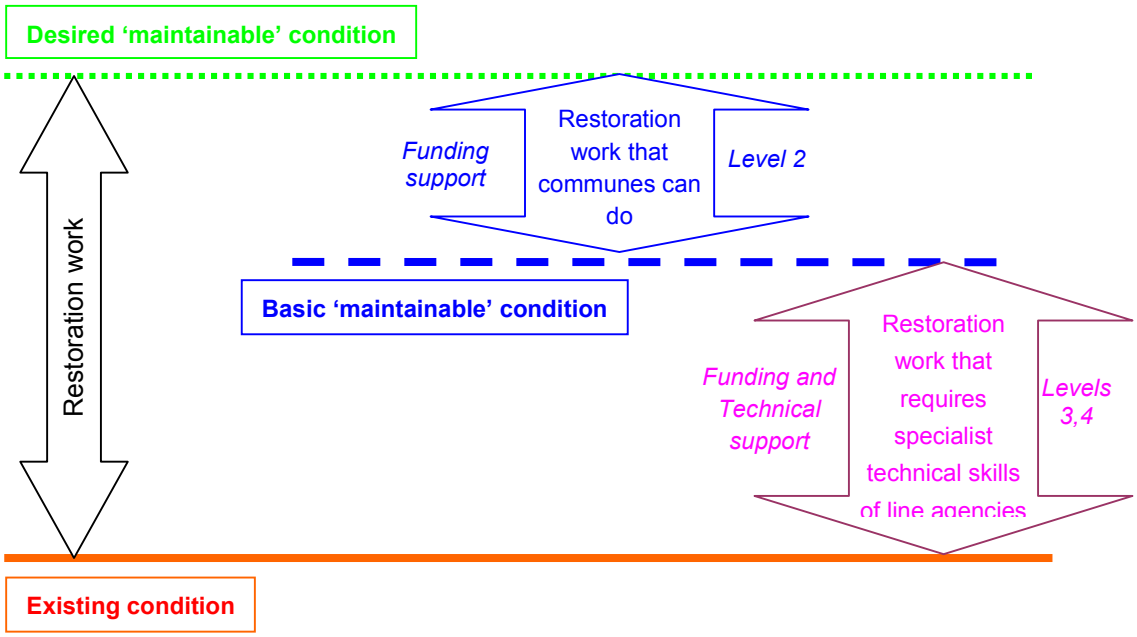
Because O&M has been neglected in the past, rural communes are faced with a problem of being responsible for infrastructure that has deteriorated since first constructed. In some instances the quality of construction was poor in the first place. The key issue is that a commune cannot maintain a structure that is not already in a maintainable condition, i.e. in good working order.

Table 2 above shows that communes can only undertake levels 1 and 2 maintenance activities. If a structure is in poor or very poor condition, the level of maintenance required is beyond their technical and financial ability. Unless all infrastructure is brought up to a maintainable standard, routine maintenance will be ineffective and the structure will deteriorate until it is inoperable or unsafe.

Bringing infrastructure back to a maintainable standard is essentially ‘backlog’ maintenance - making up for the maintenance activities that should have been carried out previously.

In order to plan and implement restoration work, first an inventory and condition survey of the infrastructure must be carried out. From this the ‘existing condition’ and ‘desired maintainable condition’ can be determined; shown graphically in Figure 1. The amount of restoration work required is the difference between the existing and desired condition.

Figure 1 Restoration work



In order to achieve the desired condition, maintenance levels 3 and 4 need to be undertaken by district and province level sector line agencies or their companies that have the specialist skills required. This will require substantial funds and technical inputs. Some activities requiring unskilled or semi-skilled labour can be undertaken by local communities under the direction of higher levels. Levels 3 and 4 bring the infrastructure up to the 'basic maintainable condition'.

Once this basic maintainable condition is achieved, the remaining repairs can be undertaken by local communities (level 2 maintenance) provided the funds for the labour, materials and basic tools are available. Some basic training will also be required if it has not been provided already during construction. Level 1 maintenance should also be implemented to reach the 'desired maintainable condition'.

At this stage all infrastructure should be in good working order, and the commune can take full responsibility for O&M of the infrastructure, having developed its annual maintenance plans for levels 1-3 maintenance.

2.3 Restoration work versus annual maintenance

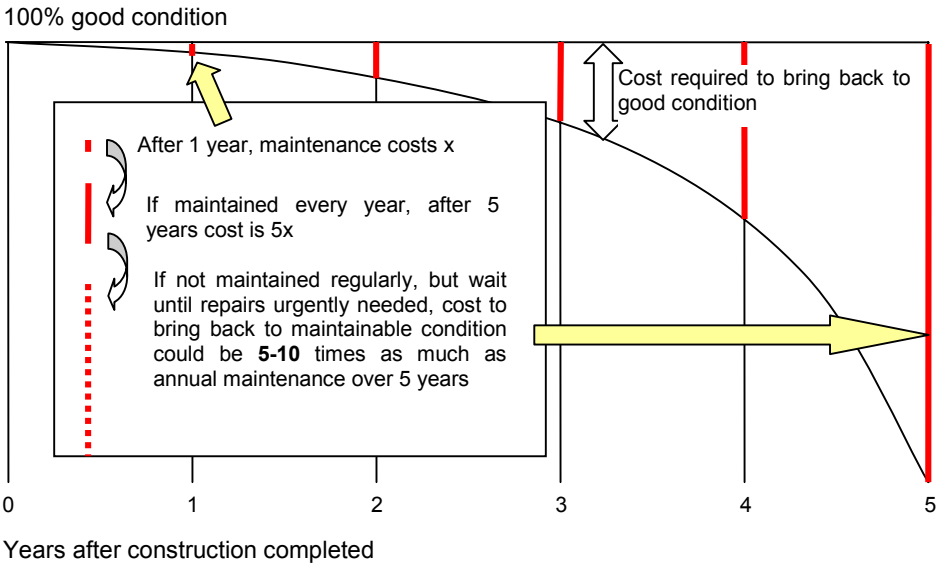
Restoration work is usually the result of poor routine and periodic maintenance (levels 1-3) and comes with a high price tag. Unfortunately, current attitudes and funding arrangements in Vietnam mean that maintenance is not routinely implemented after construction. Instead, works are left to deteriorate without routine or periodic maintenance until it further rehabilitation is required (level 4). This is not an unusual situation in many developing countries. The logic of this approach is that there is no need to spend money on maintenance when external support will fund rehabilitation.

This is an extremely costly approach which has a negative impact on the local and national economy and in achieving the country's socio-economic development plans for economic growth and poverty reduction. Unfortunately the State Budget allocation system further supports this approach as state budget funds are only provided for construction or rehabilitation, but not for Operation or Maintenance. However, Ministry

of Construction Circular 05/2001 states in Article 5, paragraph 5.3, that "Capital Sources used for the work maintenance at the medium repair and overhaul grades shall be determined according to the projects". This relates to maintenance levels 3 and 4 and suggests that capital funds can be used for these higher levels of maintenance. This has been taken into account in the design of the pilot programme and the potential sources of funding.

Figure 2 shows how the condition of infrastructure deteriorates over time if maintenance levels 1-3 are not implemented, and the relative costs of a routine annual maintenance approach compared with a restoration work approach to demonstrate the cost savings that can be made if an annual maintenance approach were supported.

Figure 2: Condition deterioration and maintenance costs



If maintenance levels 1 to 3 are implemented well, the typical annual maintenance costs will be x. Over 5 years, the total maintenance cost would be 5x, and the infrastructure would still be in good condition (the top line in Figure 2). The curved line in Figure 2 shows how the condition of infrastructure would deteriorate over time, and how the relative costs of 'backlog' maintenance increases exponentially each year. After 5 years, the curve shows that the cost of bringing the infrastructure back to a good condition could be in the range of 25x to 50x which is 5 times to 10 times as much as a 5 year maintenance plan.

This is a theoretical example, but the results of the field work in Phuoc Tra Commune, demonstrate the reality of this hypothesis. Details are included in Section II of this report.

2.4 Sustainability - User Groups

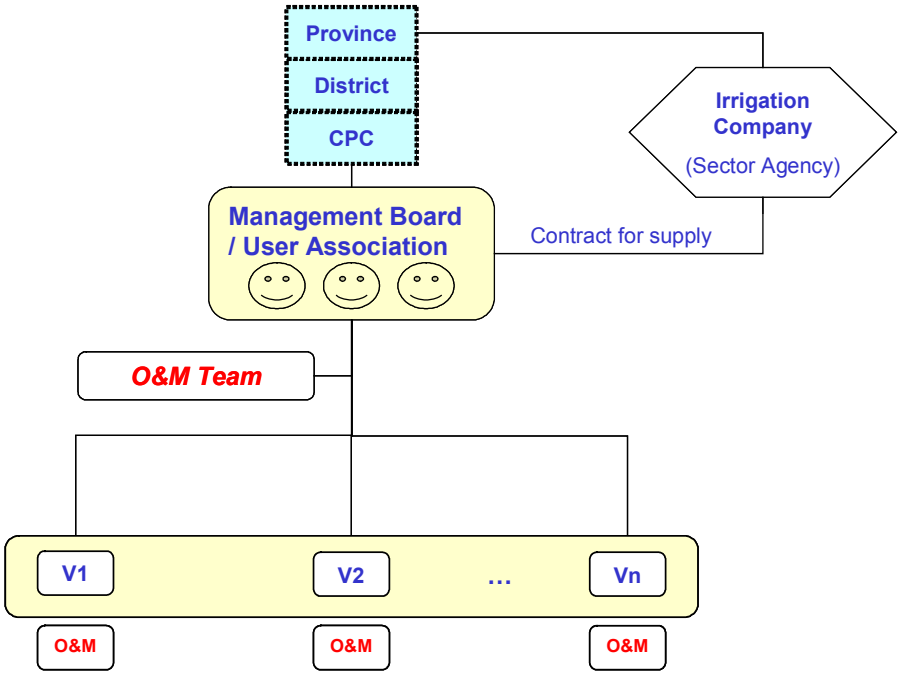
All the pilot models for infrastructure construction that were studied as part of this review and were found to support effective O&M adopted a 'user group' approach. Prior to construction, Management Boards were established to participate in and manage the design and construction phase as well as to manage the O&M after handover of the infrastructure. Table 1 includes some examples.

In addition, most management boards established a supervision team with specific responsibilities for supervising the construction phase, and were given appropriate technical training including how to maintain the infrastructure.

Following construction, the management boards continue to manage the O&M of the infrastructure, whilst the members of the supervision teams become O&M implementers.

Figure 3 shows the generic model adopted by the various pilot models. This modal was discussed in the field trip with Phuoc Tra Commune, Hiep Duc District and Quang Nam Province CEM.

Figure 3 Generic Model of Management Board



Further details on management boards and supervision / O&M teams are given in Section II and Section III of the report. Programme 135 also establishes management boards and supervision teams for infrastructure construction, as in fact do most infrastructure construction or rehabilitation projects, but with much more district level involvement and control.

Under the current pilot models, the management and supervision boards are wholly from the commune; are given extensive and practical training in technical and management areas; are given technical support from higher levels through project facilitators / field workers; and are empowered to manage their own infrastructure and O&M funds. Basically much more effort is made under the pilot models to support communes in establishing management boards, supervision / O&M teams and providing the necessary training and support through informal and on-the-job training.

The concept of establishing empowered management and supervision boards supports the implementation of Decrees 79 and 80 on grassroots democracy and community supervision.

Consultation with communes in which the pilot models were being implemented, and with project field staff, resulted in the following strengths and weaknesses being defined by the CPC and local community representatives, as well as some recommendations for P135.

Strengths:

- Local people empowered to manage infrastructure at all stages of design, construction, operation and maintenance
- Improved quality control and supervision of construction
- Better ownership of and sense of responsibility for infrastructure; improved awareness and motivation to look after the infrastructure provided
- User group discussions lead to democratic decision making and establishment of local conventions / regulations for management, operation and maintenance of infrastructure
- More efficient and equitable distribution of infrastructure benefits
- Reduced conflict over distribution of user benefits and cost recovery
- Regulations can include provision for reductions or exemptions from user fees for poorest households
- Improved accountability of revenues and expenditures

Weaknesses:

- User fees and community contributions are generally insufficient to cover all O&M costs, even for levels 1 and 2. Funding required and funding available within the commune vary greatly among communes, but generally in P135 communes there will be a funding gap. No project has yet solved the issue of providing funds for all levels of O&M.

Recommendations for P135:

- Management Boards should be established at the very beginning of the project cycle to identify their particular infrastructure needs and select the most appropriate type and level of infrastructure to be provided
- Management boards should be empowered to be the 'Client' for construction contracts
- A budget for establishment and training of management and supervision boards should be included as part of the construction investment costs. This is permissible under current policy and legislation.
- Training must be competency based hands on training and fully participatory; not the traditional 'lecture' style of training.

Section II: Field Study

3 Introduction

Phuoc Tra Commune is a poor commune in Quang Nam Province in central Viet Nam. It is located in the mountains between the coastal strip and the Lao border. It is one of the most difficult communes in Hiep Duc District and consists of six villages. Most of the population belong to the Mnong ethnic minority.

4 Objectives

The main objectives of the field visit were: to identify the maintenance gap; and to identify the suitability and acceptability of the generic O & M model for small scale infrastructure.

The study team worked with CEM (Committee for Ethnic Minorities) and the Programme 135 Steering Committee of Quang Nam Province to understanding the current situation of O & M of infrastructure within the Commune; and to identify the level of support (training, guidelines, etc.,) provided by CEM and P 135 Steering Committee of the province and the district to communes for O&M.

We discussed with CEM and P 135 Steering Committee of province and district the setting up of a Participatory Management Team at the Province CEM and a Community Facilitator Team at district level in order to support an O & M pilot programme.

The study team undertook a quick survey of all infrastructure in Phuoc Tra managed by the Commune People's Committee in order to:

- make an inventory of the infrastructure,
- assess the condition of the infrastructure,
- assess the operation and maintenance status,
- prepare a plan for the Operation and Maintenance of all infrastructure,
- present the O & M plan and suggest models for O & M to CPC and village heads,
- discuss with CPC and village heads the potential application of O & M in Phuoc Tra, and
- provide feedback to CEM on the findings and comments from the commune surveyed.

A list of consulted people from the provincial CEM of Quang Nam, Hiep Duc District People's Committee and Phuoc Tra Commune and the work programme can be seen at Appendix 1 of this report.

5 Maintenance costs of infrastructure in Phuoc Tra commune

5.1 Maintenance activities

Routine and periodic maintenance activities vary with the type of infrastructure. In the review of condition of the infrastructure and the maintenance needs, the engineer considered all the activities usually required for the appropriate level of maintenance. These same activities were also considered when estimating the costs of repairs and the costs for regular routine maintenance. The activities are listed below, for reference.

Roads 17 activities of Routine maintenance and periodic repair (as said in Rural Transport maintenance Handbook, RT2)

Clinics, School

Routine Maintenance:

- Roof: Remove litter from roof, clean gutter system
- Wall: Clean and dust, spider webs, creeper etc.
- Door: Shut the door on storm and when out of working hour, apply grease onto lock, hinge; replace any broken bolts or locks.
- Floor: Sweep and clean the floor, patch any damaged spots, replace any broken tiles.
- Toilet: Daily clean, dispose of toilet tissue, waste and litter.

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Routine Maintenance:

- Roof: Remove litter from roof, clean gutter system
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- Floor: Sweep and clean the floor, patch any damaged spots, replace any broken tiles.
- Toilet: Daily clean, dispose of toilet tissue, waste and litter.

Periodic maintenance:

- Roof: Check and repair the upper material. Trim big, tree branches overshadowing the roof to avoid roof damage if branches break and fall. Replace damaged tiles or roofing material, replacing rusted bolts and water seals. Spray termite poison onto brace frame. Apply anti-rust paint onto metal struts.
- Wall: Fill and patch cracks, broken corners, repaint.
- Door: Replace broken glass, repair the door
- Floor: Repave and polish the floor, replace broken tiles.
- Toilet: Maintain the water supply, drainage valves, floating valve (change bolt). Add in the clearing additive specified for toilet; discharge the sediment.

Irrigation system

Routine Maintenance:

- Replace damaged pipes and accessories
- Re-plaster eroded, broken facilities
- Remove sand, stone and litter from the channel and pipes after flooding
- Regularly monitor to detect and repair defects which can threaten the safe operation.
- Repair defects found in valve and in discharge gates

Periodic maintenance :

- Dredge channels before the crop
- Replace worn out pipes
- Maintain the supporting pier and cable system of the pipes
- Dredge mud and reinforce the drainage ditch at dam foot
- Turf on dam surface
- Repair break water (stone) on dam surface
- Periodic maintenance for flap gate

Clean water supply

Routine Maintenance:

- Prevent buffalo, cow and other animals from making water source dirty
- Remove rubbish outside protection net
- Clear sand from inside the sedimentation tank
- Protect head forest in order to protect the water source
- Check and protect transmission pipes and discharge valve from damage by animals or humans.
- Clean the tank walls and clear vegetation

Periodic maintenance:

- Dredge alluvial ground so that there are no obstructions on the water course
- Repair or replace broken or leaking pipes, valve or joints
- Check for erosion around pipe-supporting piers
- Clean filter substance, refill sand into the gritting chamber
- Check for erosion, leading to tank crack
- Dewater the storage tank by discharge valve to clean the tank and remove sedimentation in collection pit at tank bottom

5.2 Survey of infrastructure

Condition

A discussion with CPC to get information related to history of infrastructure was organised with members of the CPC. Following the discussion, a quick survey of all the infrastructure in the commune was undertaken with the participation of CPC staff and with technical assistance of the district staff from the Infrastructure Development Unit and the Infrastructure Projects Management Board.

Criteria for the assessment of the quality of the infrastructure were used in accordance with Ministry of Construction Guidelines (Circular No 05/2001/TT-BXD). This provides 5 grades of quality deterioration, as follows:

- **Good:** The work's quality endures its operations, exploitation and use; the work has not deteriorated yet, its initial quality status has been maintained.
- **Satisfactory:** The work's quality endures its operations, exploitation and use; but there appears signs of minor damage in several details or parts of the work.
- **Unsatisfactory:** The work's quality has deteriorated; damage is seen in several parts of the work.
- **Old and ruined:** The work's quality has severely deteriorated; the work's parts have been simultaneously damaged.
- **Unusable:** The work's quality has severely deteriorated and it must be demolished.

These five grades are broadly consistent with the four maintenance levels listed in Table 2, with grades four and five above both constituting Major Repairs.

Comments on infrastructure condition

It was observed that infrastructure in good condition was built or renovated in 2004 or 2005. Water supply infrastructure in village 4 was built in 2003 and is still in good condition and operating effectively because the organisation of this water supply system is different from other systems. The water pipes extend up to each household rather than many other systems which simple feed communal water storage tanks. Therefore protection for pipes and water outlets are undertaken indiviually by each family. This system is easier and more secure. It provides strong incentives for each family to provide effective protection, use and maintenance of the system; whereas big communal tanks in the village are shared by groups of 5 to 10 families with no clear operation or maintenance responsibilities, and weaker incentives.

Maintenance status of infrastructure:

According to the chairperson of the CPC neither routine nor periodic maintenance was undertaken for any infrastructures in the commune. The stated reason was just because the commune did not get any fund for this kind of work. Local people in some cases used their labour to repair some minor damaged parts of the road. Neglected maintenance had a greater short term impact on some infrastructure types, for instance the water supply system of village 6 and the irrigation system in village 6 could not be used.

In the case of the irrigation system in the village 6, a part of the feeder pipe was broken resulting in no water at the outfall for irrigation of the fields. Replacement of the broken pipe is not so difficult or costly but the situtation has not been corrected. The head of village 6 said that they had already reported the fault to the commune but no action had been taken by the CPC. The CPC in their turn said that the CPC had no fund for fixing this problem.

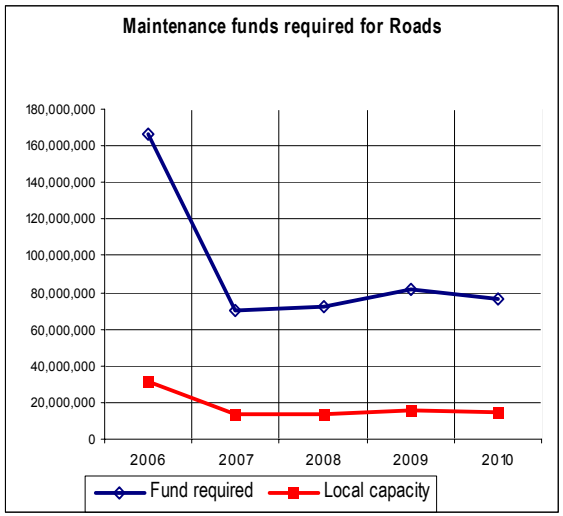
Summary of infrastructure condition

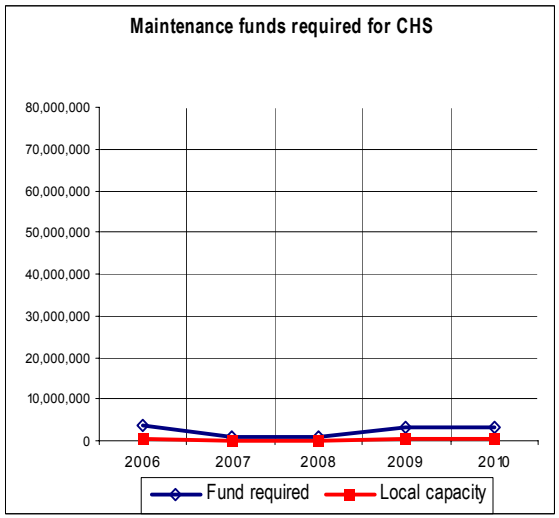
The infrastructure observed is listed in Table 3, along with the condition, value, year of completion and maintenance costs. Figure 4 shows graphically the Maintenance Fund requirements, year by year for five years, 2006 to 2010, consistent with the SEDP five year planning period. The graphs also show the restoration work, assumed to be undertaken in the first year, the local fund available and the funding shortfall. Figure 5 shows a summary of the observed condition of all infrastructure in the Commune. Notwithstanding the comments above, Figure 5 shows that over 70 % of the facilities (not weighted by value, simply as a percentage of number of facilities) are in satisfactory condition or better. This suggests that normal routine maintenance addressing general maintenance needs and minor repairs would enable the 70% of the installations to be retained in a satisfactory condition.

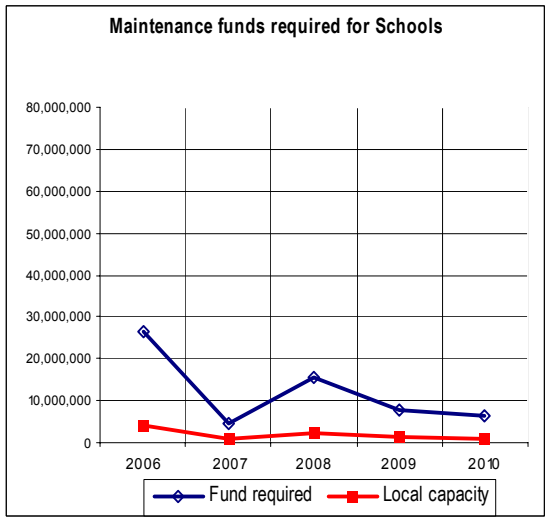
Table 3 Infrastructure observed in Phuoc Tra Commune

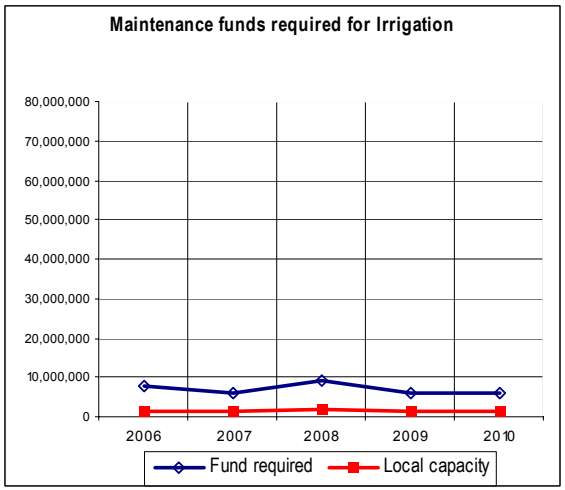
No.	Name of infrastructure	Location	Technical size	Value (1,000vnd)	Fund	Year completed	Current condition	Cost of restoration work (1,000vnd)			Average maintenance cost/year (1,000vnd)			
								Total	Local	Shortf	Total	Local fund		Shortfa
	Roads			**4,607,00**				**96,325**	**17,255**	**79,07**	**74,08**	**14,07**	**19**	**60,005**
1	To centre of Phuoc Tra	Hamlet 4	penmac 1.4 km	1,800,00	**135**	2002	satisfactory	10,740	5,145	5,595	22,00	4,180	19	17,820
2	Commune to village 6	Hamlet 4 -	2,3 km	407,000	**135**	2003	satisfactory	84,590	12,075	72,51	50,00	9,500	19	40,500
3	Tra No Bridge	Hamlet 3 -	40m long, 4.5m	2,400,00	**135/BG**	2003	Good	995	35	960	2,080	395	19	1,685
	Health			**120,000**				**2,850**	**140**	**2,710**	**1,800**	**252**	**14**	**1,548**
1	Commune Health Station	Village 4	4 room	120,000	**State**	1999	satisfactory	2,850	140	2,710	1,800	252	14	1,548
	School			**2,430,00**				**21,995**	**4,470**	**17,52**	**7,800**	**1,248**	**16**	**6,552**
1	Primary school	Village 2	2 room	150,000	**RIDEF**	2001	satisfactory	725	105	620	1,000	160	16	840
2	Primary school	Village 3	1 room	70,000	**WV**	2005	Good	0	0	0	1,000	160	16	840
3	Primary school	Village 4	9 room	1,800,00	**135**	2001	satisfactory	4,260	280	3,980	1,400	224	16	1,176
4	Primary school	Village 5	2 room	80,000	**E&W**		satisfactory	1,510	275	1,235	1,000	160	16	840
5	Primary school	Village 6	2 room	150,000	**RIDEF**	2001	satisfactory	4,390	1,340	3,050	1,000	160	16	840
6	Kindergarten Village 3	Village 3	1 room	60,000	**RIDEF**	2001	satisfactory	325	70	255	800	128	16	672
7	Kindergarten Village 4	Village 4	1 room	60,000	**RIDEF**	2001	U/S	6,785	1,850	4,935	800	128	16	672
8	Kindergarten Village 5	Village 5	1 room	60,000	**RIDEF**	2001	satisfactory	4,000	550	3,450	800	128	16	672
	Irrigation			**564,000**				**1,600**	**280**	**1,320**	**6,600**	**1,320**	**20**	**5,280**
1	Irrigation system Ke Trốc	Village 5	5 ha Village 5	66,000	**State**	1998	Good			0	2,200	440	20	1,760
2	Irrigation system Trà	Village 6		420,000	**State**	2000	U/S	1,600	280	1,320	2,200	440	20	1,760
3	Irrigation system Nà Dớ	Village 4		78,000	**State**	1999	Good			0	2,200	440	20	1,760
	Water supply			**1,523,00**				**90,390**	**12,170**	**78,22**	**12,60**	**1,260**	**10**	**11,340**
1	Gravity flow system	Village 1	2 tank	79,000	**State**	2004	Good			0	2,000	200	10	1,800
2	Gravity flow system	Village 2	1 tank	480,000	**State**	2001	Old and	59,330	10,200	49,13	1,600	160	10	1,440
3	Gravity flow system	Village 3	2 tank	350,000	**WV**	2003	U/S	29,500	1,750	27,75	2,000	200	10	1,800
4	Gravity flow system	Village 4	1 tank, direct	410,000	**135**	2003	Good			0	2,000	200	10	1,800
5	Gravity flow system	Village 5	1 tank, direct	84,000	**WV**	2004	Good			0	2,000	200	10	1,800
6	Gravity flow system	Village 6	4 tank	120,000	**State**	2001	U/S	1,560	220	1,340	3,000	300	10	2,700
			TOTAL	**9,244,00**				**213,16**	**34,315**	**178,8**	**102,8**	**18,15**	**18**	**84,725**

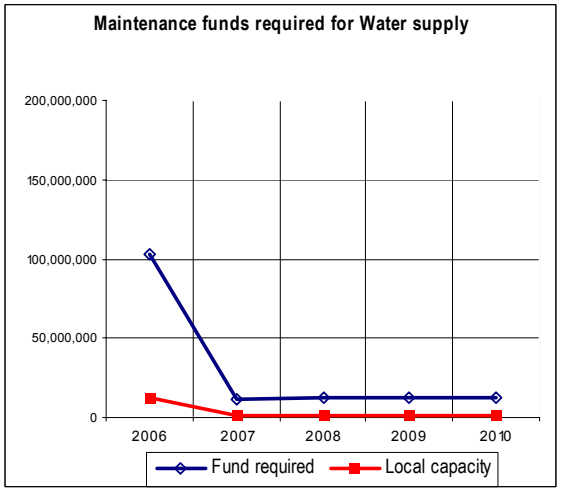
Figure 4 Five Year Maintenance Fund Requirement in Phuoc Tra Commune











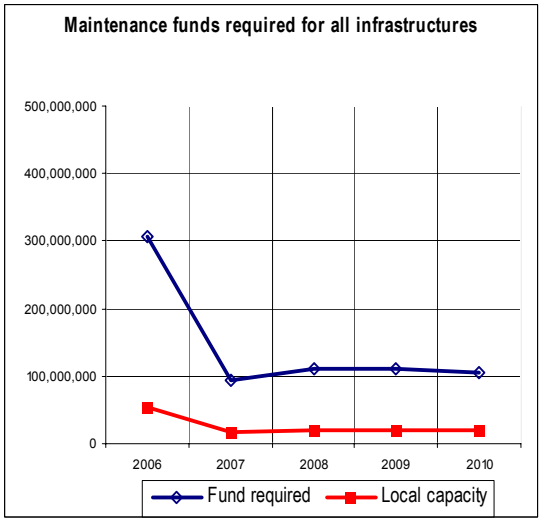
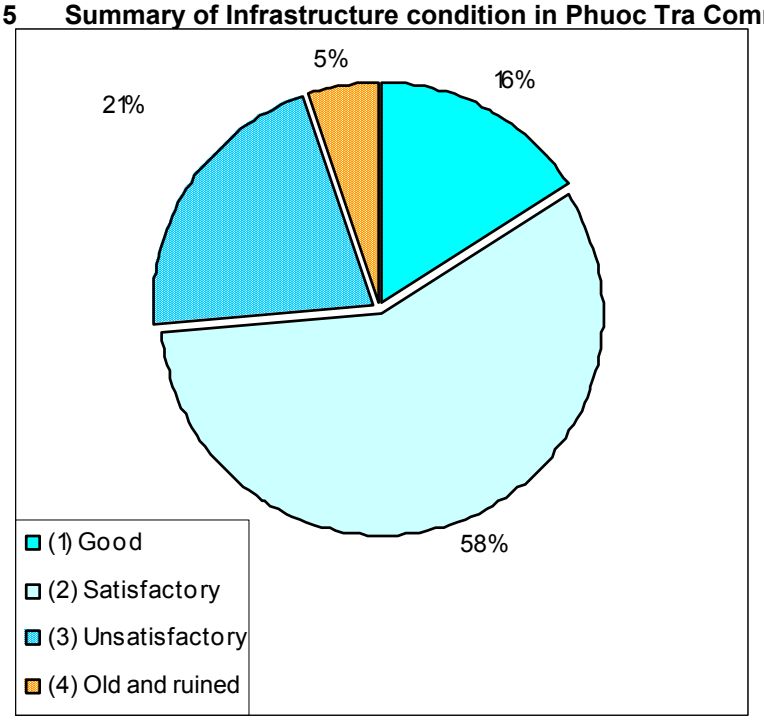


Figure 5 Summary of Infrastructure condition in Phuoc Tra Commune



5.3 Forecast deterioration of infrastructure

The rate at which the quality of infrastructure deteriorates is both a function of the level, quality and timeliness of all types of maintenance and a function of the local environment, rain, wind, temperature, flood, soil conditions etc. Other factors, such as level of use, quality of initial construction and respect paid by users and non-users all have an impact on the deterioration rate of the individual facilities. Therefore, the actual rate of deterioration cannot be precisely determined with any degree of certainty without a very extensive and reliable database. The best estimate of the deterioration rate can be made by an experienced engineer who is familiar with the local environment, local construction practices and local approaches to use and maintenance of the facilities. This was the approach used by the study team.

The forecast deterioration of infrastructure was estimated based on the case of Phuoc Tra commune and broad experience of the local engineer. He made observations of the condition of the local infrastructure built at various times over the last few years. He then made calculations of deterioration levels for each type of infrastructure individually; noting that the deterioration levels depended very much on the quality of infrastructure upon the completion of the construction.

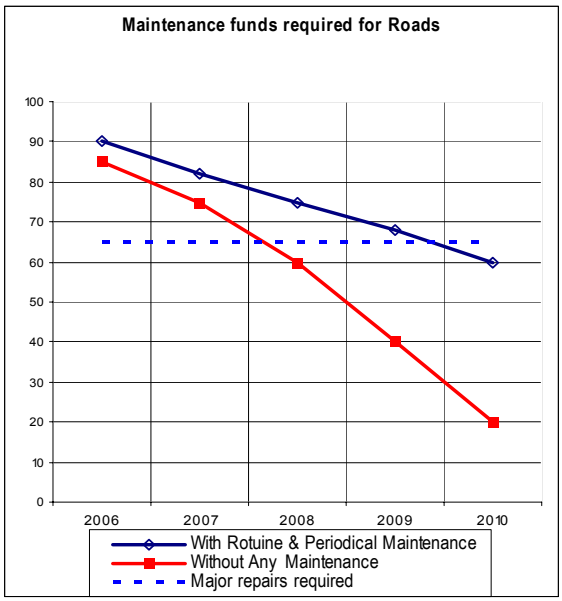
Operation, use, maintenance and deterioration of the infrastructure was very dependent on the particular model, for example:

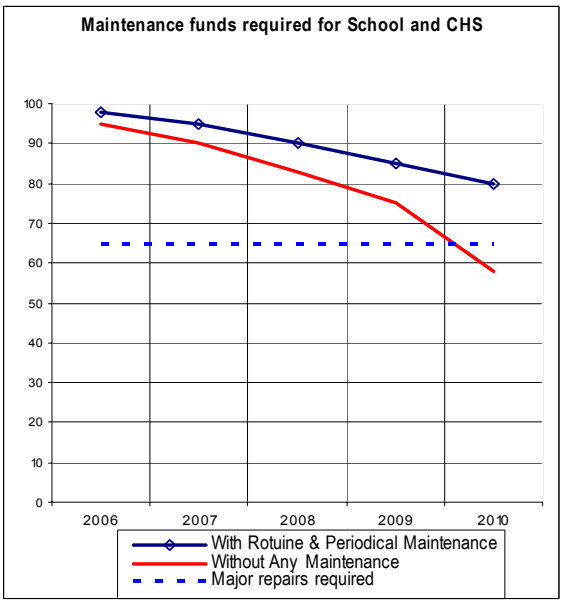
In village 6, local villagers could get water from 6 to 8 outlets from big tanks which were built in the central places of groups of households. Local people could use the system in the first year only and later it

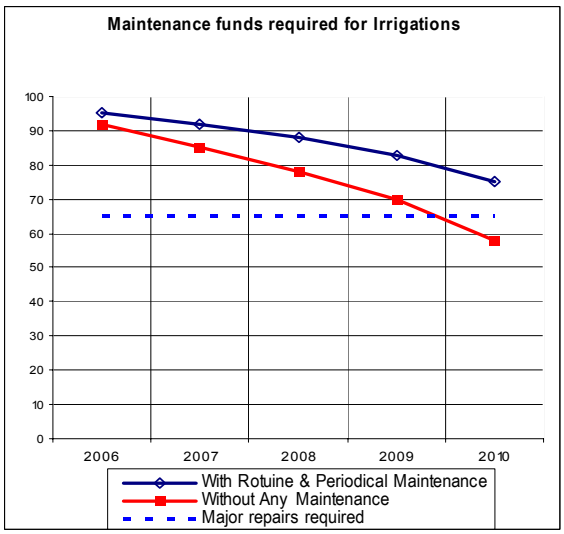
deteriorated very quickly. This could be clearly seen at all outlets where taps were broken or missing and the tanks contained no water.

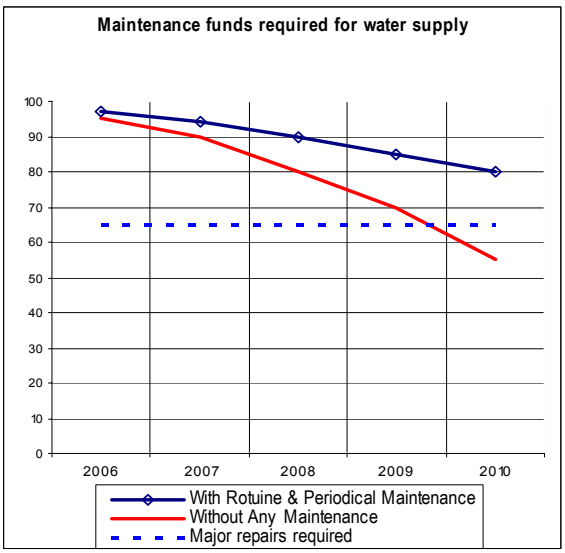
In comparison, in villages 4 and 5 instead of using outlets from a big tanks for groups of households, connecting pipes were built for supplying water directly to each household. The system cost more initially but it was more convenient for household to use and so far it has run properly. For this type of facility, responsibilities, incentives and benefits are much more closely related and clear.

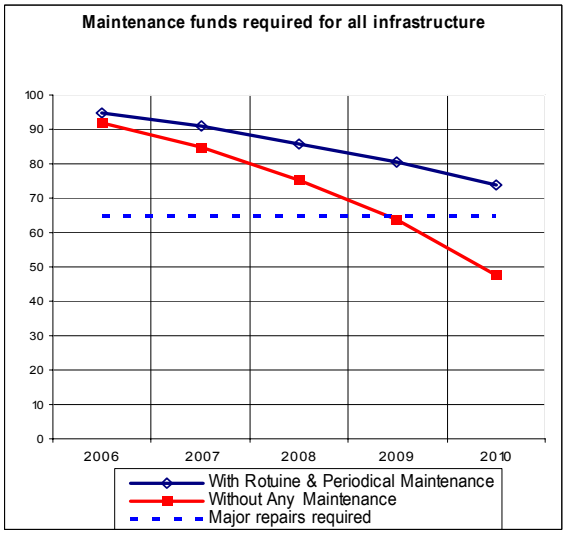
Figure 6 Deterioration with and without maintenance











6 Capacity of local people and CPC for maintenance

6.1 Living conditions of local people

Phuoc Tra is one of the most difficult communes of Hiep Duc district, Quang Nam province. The majority of the population is Mnong, one of ethnic minority groups living in Quang Nam province. With the support of P 135 and other target programmes for application of agricultural progress for rice crops, together with basic infrastructure for agricultural development, the commune people have been introduced to rice cultivation. However its production is limited. According to the statistics from the CPC, average local production is about 85 kg / person / year.

The commune has population of 1,280 people with 268 households of which 224 are classified as poor households1. Details of the population, households and poverty levels are shown in Table 5.

Table 5 Population and Households in Phuoc Tra Commune

Village	Population	Households	Poor Situation			
			Population	%	Households	%
Village 1	164	28	150	12%	25	9%
Village 2	145	25	110	9%	18	7%
Village 3	199	37	157	12%	31	12%
Village 4	246	55	214	17%	44	16%
Village 5	172	54	243	19%	49	18%
Village 6	354	69	314	25%	57	21%
Total	**1,280**	**268**	**1,188**	**93%**	**224**	**84%**

Due to difficult living conditions and the very low incomes of local people in Phuoc Tra commune, the Province and District Government has a policy to exempt local people from making a number of contributions that are normally made by all citizens, regardless of where they live, such as 10 man-days of compulsory labour each year. At present the local people have to contribute to the following funds: the fund for sponsoring children, the emergency fund for natural disasters, the fund to support families of people who died in the liberation of Viet Nam (den on dap nghia) and the fund for national security. The actual collection of such contributions is difficult in comparison with plan, for example in actual figures for 2004 show about 68 % for fund for people devoted to the liberation cause of the country and 37 % for the fund for national security.

[1] According to CPC poor criteria applied (Decision No 170/2005/QD-TTg) in commune is incomes equivalent money less than 200,000 vnd per person per month in rural areas and 260,000vnd per month in urban areas.

Example of Household Mr. Ho Van Dien, head of village 2

The family of Mr. Ho Van Dien has 10 people (husband, wife and 8 children). Their main activity for generating incomes is rice cultivation. Average yield from rice is about 100 ang (equivalent to 500 kg of wet rice or 250 kg husked rice). This amount of food is only enough to feed the whole family for 3 months. The rest of the year, the family has to eat cassava or sweet potato. The husband and wife have some work with the Rubber Plants Enterprise for cash income. According to Dien, he and his wife are paid 130,000 Vnd for taking care of 1 ha of rubber plantation for weeding and fertilising in accordance with an agreement with Rubber Plants Enterprise. In order to receive this amount of money he has to spend 20 man-days for 1 ha of rubber plantation. The chairman of the CPC and himself complained that the payment rate to their man-day is too low; worth only about 6,000 vnd per day, whilst the usual rate for unskilled labour man-day is between 25,000 vnd and 35,000 vnd but they have to accept this work since it is so difficult to have an income source in this extremely difficult commune.

6.2 Annual Commune Budget

General regulations of Commune Budget:

- Financial operation of commune is stipulated by the State Budget Law and the revised State Budget Law; the decree No. 87/CP dated 19/12/1996 and the revised version of the decree No. 87/CP- the decree 51/1998/NDCP dated 18/7/1998 of the Government on decentralisation of management, implementation and authorised expenditures of the state budget with guidelines circulars accordingly.
- Commune Budget is a component of the state budget is built and managed by the Commune People's Committee. The Commune People's Council has the function of decision and supervision. Management of Commune Budget and other commune financial operations is based on the principle of saving, democratic and disclosure basis.

Management of Commune Budget

Source of revenue for commune budget

- Incomes of 100% from contributions of organisations or individual persons including (i) voluntarily contributions for investment of infrastructure construction; and (ii) non-returned aid of foreign organisations or individual persons directly to Commune Budget.
- Incomes sharing with higher levels Budget and
- Supplementary incomes from higher levels Budget

Expenditure from Commune Budget

- Recurrent expenditures:
  - Operations for commune office;
  - Allowances and operations for political and mass organizations;
  - Social and Health insurance
  - Social and Cultural activities
  - Management, repairs, renovations of public infrastructure
- Expenditure of investment for development. Expenditures on social and economic infrastructure decentralised by the Province with fund source from State Budget and contributions of organisations or individual persons for some specific project.

The Case of Phuoc Tra Commune:

Budget Items: Main annual budget of Phuoc Tra commune is for CPC operations and salary for commune staff, mass organisation staff. The CPC chairperson confirmed that there is no budget line for

new construction and maintenance of any infrastructure in the commune. Although some new infrastructure facilities have been built in the commune, the funds for this construction was directly managed by the District Infrastructure Projects Management Board.

Estimate of commune Budget: By October every year, the Commune People's Committee will estimate the Annual Commune Budget in accordance with the guidelines of the Provincial People's Committee and the leaderships of the District People's Committee. The estimate of the Annual Commune Budget then is then submitted to Commune People's Committee for approval. Upon the Commune People's Council approval of the Estimated Annual Commune Budget, the Commune People's Committee will submit the Estimate of the Annual Commune Budget to District People's Committee and District Financial Department for final approval. According to the deputy chairman of the Hiep Duc CPC, communes get normally about 50 % to 60 % of budget requested.

An example of the annual budget for 2004 of Phuoc Tra commune is shown in Table 6.

Table 6 Phuoc Tra Commune Budget for 2004

Revenue	Budget	%
Local contributions	297,000	0.1%
Other collections	5,155,000	2.0%
Supplementary allocation from district	238,354,000	92.1%
Balance carried forwards from 2003	15,114,115	5.8%
Total	258,920,115	100%

6.3 Local resources for O&M

Coincidentally, the study team had a chance to meet with more than half of the household in Village 6 at a village meeting. Replying to the question of contributions for O&M, several people at the meeting said that it was very difficult for villagers to make contributions due to the low yield of rice cultivation and lack of revenue earning opportunities. They all agreed that they could not make any money available for O&M; but they could provide their labour and make in kind contributions of 1 or 2 kg of rice to put in a village fund for O&M and this would be acceptable. The picture below shows a member of the study team working with the residents of village 6.

With a situation like this in a commune, where local people's incomes are very low, it will be very difficult for collection of contributions for operations O & M. All feasible contributions of villagers are labour which is mostly suitable for routine maintenance activities. Furthermore, members of CPC said that in case of road maintenance they also need money for routine maintenance of the gravel roads since they have to use unsuitable soil for filling potholes. This is always a problem for gravel roads, they are very easily damaged in rainy seasons, particularly in the case of communes where slope of terrain is high.

According to the CPC chairman some top-up fund for O & M must be arranged by higher levels for annual commune budget otherwise O & M issues only exist in documents and meetings rather than in reality.

7 Feedback from Field Study on O&M models

7.1 Current Organisation for O & M for Programme 135

Provincial level:

The Steering Committee of Programme 135 in Quang Nam Province was set up by Decision No. 2423/QDUB dated 26 July 2002 of the Quang Nam Provincial People's Committee. The Steering Committee has the main functions of co-coordinating with different departments, local government and mass organisations to implement the following tasks:

- Making master plans, short-term plans and annual plans on construction of infrastructure at extremely difficult communes, submitting to higher authority levels for approval.
- Studying stipulation documents of the government and the practical situation of the province, advising Provincial People's Committee to issue suitable policy and mechanisms to executing effectively Programme 135.
- Instructions to districts involved with Programme 135 for preparing investment procedures, organising the implementation of properly targeted infrastructure construction and ensuring the duration, quantity and quality are appropriate.

- Mobilisation of all local resources in the province, local person-day resource in the extremely difficult communes to contribute for construction of infrastructure in principle: communes having infrastructure, local people having jobs and incomes increased.
- Regularly organisation of checking, supervision and evaluation of construction quality in order to have time to rectify shortcomings or mistakes in the preparation and implementation processes.
- Reporting to Provincial People's Committee on the progress of P 135 to Province and to Ministries on a quarterly, 6-monthly and yearly basis.

At the CEM, there is a Secretary Board for follow-up implementation of Program 135 that works as an assistant to the Steering Committee. The Steering Committee is a body which provides leaderships to lower levels, not a management body like the popular model of Project Management Units. Therefore, at present CEM does not have sections and people charged with specific work such as training, M & Eor O & M. Two staff have to deal with all issues regarding the implementation of P 135. Their tasks are not clearly defined among training, M & E and O & M.

District level:

In Hiep Duc District, previously District People's Committee had one District Management Unit for managing only implementation of projects funded by Programme 135. However, in order to improve management and harmonisation of different fund sources in the district, in 2003 a Projects Management Unit was established to manage all projects regardless of the source of the funds, including Programme 135. None of the communes covered by P 135 has been decentralised for direct management of project implementation of Programme 135 due to, according to the district departments at the meeting, lack of knowledge and experience in the communes in relation to management and construction.

The Management Projects Management Unit has three people, one director, one engineer and one accountant. Nobody is in charge of training, M & E or O & M. The investment fund from Programme135 accounts for 40 % of the District expenditure and about 50 5 to 60 % in the communes involved in Programme 135.

Budget of the district:

The Vice chairman of Hiep Duc People's Committee showed that all local revenue in the district has not been enough to meet the expenditure of the district. For instance, in the year 2004 revenue was 4 billion dong but expenditure was about 45 billion dong. The deficit was made up by the Province.

Funds for construction of infrastructure as allocated on the principle of ratio: 50 : 30 : 20, which means that 50 % of the funds will be used for paying previous year's debts to contractors; 30 % of the funds will be for on-gonging construction and 20 % of the funds will be spent on new construction. The district has a very limited fund in a contingency budget that can be used for emergency repairs of infrastructure in some special cases; for example infrastructure seriously damaged after a typhoon; but no funds earmarked for maintenance or operation of infrastructure.

7.2 Feedback on model

A generic model for the organisation of O & M was presented to the CPC, village heads and Province and District staff. The model requires participation of Commune People's Committee as owner, the villagers as users, district staff from the infrastructure projects management unit and Province CEM staff as support to O & M issues. All levels attended the presentation and discussion in the commune, but

individual presentations were made at each level upwards to consider possible and practical participation by each of level in the process of O & M. The key comments on this model are discussed below.

Commune level

With support from CPC for organising a meeting at the CPC office with participation of key members of the CPC, chairwoman of the Women's Union and 5 village heads (out of 6 villages of the commune), the study team had a chance to present the current conditions of all infrastructure in the commune and estimated costs for repairs in order to bring them back to a standard condition for applying routine and periodic maintenance. The presentation was followed by a lengthy discussion on the topic of how O & M could be implemented in the Phuoc Tra, which is considered a very poor and difficult commune. The photographs below show the participatory meeting.

Members of CPC and village heads had a chance to review all inventoried infrastructure in their villages and then participated in the discussion about 3 key elements that contribute to the maintenance process of all infrastructure in the commune: organisation of management, technical issues and financial funding.

- Organisation of management:
  - Stakeholders believed that this kind of organisation might be applied in the commune and village. Village meetings to get opinions and agreements of villagers who get direct benefits from specific infrastructure is fundamental for setting up O & M Boards and their regulations.
  - Technical support from district or province level for making detailed guidelines dealing with functions and responsibility of the O & M Board and its members (at commune and village level) should be clearly elaborated to support the CPC and local villagers in formulation and implementation of O & M.
  - A template of user's regulations for each type of infrastructure should be provided to CPC and village heads by some training, which should be flexible and tailored to fit with local ability and culture. The CPC will facilitate and organise village meetings to discuss the establishment of O & M in the villages and agreements of regulations in the villages.
  - Allowance to people directly working in the O & M like key members of the commune O & M and village heads must be planned and fund sources to pay for this item must be clear. According to members of chair of the CPC, it will be difficult or impossible to collect contributions from local people to pay allowance for members of commune and village O & M.
- Remarks on water supply systems:
  - According to the members of CPC and 5 villages O & M will be more practical and effective if some direct contract or agreement is made between the O & M Board of the commune and an individual household for daily operation and routine maintenance, such

as fixing minor problems of tanks and pipes connected to the tank which have arisen during use by the groups of households in the village.

- Remarks on irrigation systems:
  - In the low land areas, irrigation systems normally consist of a commune main canal to connect with the irrigation system managed by an irrigation company. The commune to buys water and there is a system of sub-canals to supply water to villages where local people cultivate the land. On the contrary, in mountainous areas, local ethnic minority usually live together in a village which is close to water sources, such as streams, although sometimes not so close. Water from such sources is used for their daily living, animal husbandry activities and cultivation. Some small scale irrigation systems and water supply systems have been supplied to meet the needs of local people. In poor communes, villagers do not have to buy water from anybody. The chairman of the CPC raised the key role of village heads that have to take primary responsibility for organisation of O & M. He should know who can work with him in a team of O & M. Of course, legal formulation and an incentive to the village O & M teams will be essential for their operations be successful.
- Technical issues:
  - In general so far the CPC and local users have not received any training on for O & M of their infrastructure. Practical training is required if local people are to work effectively, such as O & M planning, funds mobilisation, implementation, operation and maintenance activities. The only basic training received to date was based on the Handbook for Rural Road Maintenance provided by RT2 for commune transport staff. However, it's application in the commune appears to be very limited.
  - Training and materials for awareness raising of the need for O & M by local users and leaders, together with Basic training to O & M Board, particularly to village heads is essential to ensure that local people have the basic knowledge and skills to deal with simple and minor problems during operation and use of the infrastructure. According to the CPC chairman, awareness of not only the local people but also in many of leaders of commune and village level is the weakest area which needs to be improved first and become a condition before any technical activities for O & M can be started.
  - CPC's members and village heads showed their preferences to get such training from districts since they are close to the district and it would be easy to get on-the-job backstopping when necessary.
- Funding:
  - Lack of funds for operations of the Commune O & M Board and for specific O & M activities are a key constraint in many communes, especially poor communes. It is recognised that this is a difficult issue in this commune where local people do not have enough food to feed themselves, let alone more contributions for O & M.
  - CPC members and village heads said that their local people could make some contributions for O & M but in form of labour days only, not in cash. They believed that if higher levels, or external agency, funding directly to commune for O & M of infrastructure was not arranged, the models of O & M would collapse, even if the commune and users receive support for training for O & M.
  - In low land areas, farmers have been familiar with payments for infrastructure service, for instance, paying irrigation fees for their cultivated areas watered or paying for clean water consumed by households. On the contrary, application of payment for infrastructure service in mountainous areas seems more difficult than in the low land areas. Free of charge use of infrastructure service is inveterate in the culture of ethnic minority people. This situation will not be easily improved and is considered as a disadvantage when considering factors for the collection of contributions to be used for O & M.

District level

The vice chairman, members of Hiep Duc District Management Projects Management Unit and other related departments agreed with the model and will support introduction of the model of O & M organised at commune level. They all agreed that a connecting bridge for O & M between district and commune has not been constructed and therefore it should be built as a component in the Management Projects Management Unit to provide better management and technical support to communes.

Regarding personnel issues for O & M, the vice chairperson showed that two staff from technical sections of the district could be arranged as secondment in principle carrying out their routine assignments and additional assignments of O & M. These two people should be given the necessary training, salary and allowance. The institutional arrangements for personnel and allowances should be made from the province level, since district has no fund for this work. The institutional arrangements can be similar to the CIBRIP model which was used in Que Son district, a neighbouring district. The funds for O & M should be included in the Annual Commune Budget.

Province level (Provincial CEM)

They considered that the problems of O & M for infrastructure in general, and under Programme 135 in particular, are big gaps, which needs to be filled, in the provision of infrastructure service to community. They were Impressed with the table of the current conditions of all infrastructure of Phuoc Tra Commune and the calculations for estimation for routine and periodic maintenance of these infrastructure facilities. Based on their experience they agreed with the rough technical calculations and agreed that they reflected the actual situation, including the capacity of the local people and government to participate.

- Generic model of O&M:
  - A very popular phenomena to all communes which participated in P 135 is that the Commune Supervision Board was set up to carry out the functions of community supervision specific for the construction process. The roles of these Supervision Boards made positive contributions to increase the role of projects ownerships of local people and government towards infrastructure, which later on would be handed over to them for use. However, these boards were disbanded when the infrastructure was handed over to the Commune. Therefore, if these boards can function as O & M Boards after the completion of the construction, this will improve O & M status of infrastructure in communes.
  - Decentralisation of O & M has been included in handover documents to communes but means of implementation for O & M has not been elaborated. The generic model of O & M can be considered as a tool to support the decentralisation of O & M to commune level. If the implementation of the O & M model is successful, it will bring advantages to communes not only for improved operations and longer life of infrastructure but also gradual establishment of a maintenance culture for commune government and local users.
  - In principle, CEM Quang Nam agreed that it is necessary to have some, at least one, staff to be in charge of O & M training and support to Districts and Communes. This qualified staff for O & M can be arranged within CEM.
  - Additional training not only knowledge of O & M and its management but also training methods should be focused to support staff of O & M of CEM and District Project Management Unit. Material for O & M must be compiled and tailored accordingly to each type of infrastructure and localities, particularly in areas with ethnic minority people.
  - Funding is a key issue for O & M because in low land areas farmers can cultivate with high yield resulting in easier contribution for O & M rather than ethnic minority people. Therefore, arrangements for some earmarked fund for O & M to communes through their

recurrent budget is a condition for communes to implement O & M and by doing this way O & M can be considered as a regularly work in communes.

Section III Design of Pilot Programme

8 Lessons Learnt from Review and Field Study