

QUANG NGAI RURAL DEVELOPMENT PROGRAM (RUDEP) - PHASE 2

Infrastructure Annual Report 2006-2007



VIETNAM-AUSTRALIA

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AusAID

Australian Embassy
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Acronyms

AG	Activity Group
AusAID	Australian Agency for International Development
ASAS	Australian Small Assistance Scheme
ATL	Australian Team Leader
CCG	Commune Contact Group
CPC	Commune Peoples Committee
CPMB	Commune Project Management Board
DCG	District Contact Group
DDOs	District Development Officers
DPC	District Peoples Committee
DPI	Department of Planning and Investment
EIA	Environmental Impact Assessment
GOA	Government of Australia
GOV	Government of Viet Nam
IEO	Infrastructure and Environment Officer
O&M	Operation and Maintenance
PMB	Commune Program Management Board
PDA	Participatory Development Adviser
PMU	Program Management Unit
PPC	Provincial People's Committee
QN	Quang Ngai
RUDEP	Quang Ngai Rural Development Program
VAT	Value Added Tax

SUMMARY

In 2006-2007, RUDEP funded 57 infrastructure projects. Thirteen of these projects were in four communes of Minh Long, belonging to the Intergraded Commune Development Plan (ICDP) for 2006 and 2007.

Funded communes include: Binh Minh, Son Trung, Son Hai, Son Giang, Ba Le, Ba Nam, Tra Lam, Tra Hiep, Tra Lanh, Tra Trung, Long Son, Son Mua, Son Bua, Nghia Son, Nghia Tho, Pho Chau, Thanh An, Long Hiep, Long Mai, Long Mon.

These projects were selected based on RUDEP's priority list for funding, as a result of the CDPs established two years ago.

Each project has an Activity Group. The AG comments on the project design, supervises construction, and instructs and encourages all beneficiaries in the operation and maintenance of the project.

Besides any technical issues; projects must be environmentally safe, easy to operate, and be of low maintenance when finished.

In order to assist the AGs in achieving the above tasks, IEO trained AGs in project supervision and O&M.

IEO, DDO, and PDAs assist the CPMBs in implementing the projects.

1. RUDEP

RUDEP is funded by the Australian and Vietnamese Governments. The inputs comprise a financial commitment of A\$30MILLION from the GOA and A\$3MILLION from the GOV.

RUDEP is located in the coastal province of Quang Ngai, central Vietnam. Quang Ngai was identified as a sustainable location for rural development due to the Province's high percentage of rural poor, slow economic growth, and limited previous Official Development Assistance.

The target groups for RUDEP are poor communes in Quang Ngai Province.

RUDEP has four program components: Income Generation, Capacity Building, Small Scale Infrastructure, and Monitoring & Evaluation.

In the Small Scale Infrastructure component, RUDEP provides assistance for commune-based small-scale infrastructure projects that will enhance income generation capabilities of households.

2. Selection of the projects

Every year, RUDEP in cooperation with individual CPCs of the target communes, facilitates village planning meetings. These meetings provide an opportunity for households to express their needs, difficulties and requirements.

The results of proposed infrastructure projects from all Village Planning Meetings in each Commune are compiled and analysed at Commune Plan Preparation Meetings, and presented in a Commune Development Plan (CDP).

This year, based on the results of CDP findings, the IEO, DCG and CCG surveyed potential sites to identify the feasibility of requested projects and established a priority list. IEO further co-operated with CPMBs to establish CBAs for all potential projects, and calculated perceived effectiveness of investments, using the results as a factor in selection.

A suitable project is one that satisfies the following issues:

- Technical requirements of RUDEP Infrastructure projects
- High economic effectiveness and feasibility for construction
- Construction costs that fall within the annual infrastructure budget
- Assist poor households in increasing their income
- Not duplicate what any other authority has already done in that area
- Easy to operate and low maintenance.
-

3. KEY CHANGES IN 2006-2007

Based on the legal documents from relevant government institutions, RUDEP made the following changes in 2006-2007:

- All E&T Reports must include tax in the cost estimates, as required by letter No. 7711 TC/TCT on 13/7/2004 from General Department of Taxation
- All projects to apply circular No.07 /2006/TT-BXD, concerning the adjustment of manpower costs in project cost estimates.

4. RUDEP infra steps

According to RUDEP Infrastructure Regulations, all infrastructure projects must adhere to the following procedure:

- 1. Review the results of PPP meeting**
RUDEP, CCG, DCG
- 2. Identify, Propose and Agree on Project**
RUDEP, CCG, DCG
- 3. Form Project Management Board (PMB)**
CCG, DCG, CPC, DPC
- 4. Form Activity Group (AG)**
CCG, DDO, beneficiaries
- 5. Choose consultant to do E&T Report**
PMB
- 6. Establish the E&T Report**
Consultant, PMB
- 7. Prepare O&M plan**
PMB, IEO, DDO, Beneficiaries
- 8. Prepare Environmental Impact Assessment**
PMB, IEO
- 9. Submit E&T Report to RUDEP**
PMB
- 10. Discuss design with AG**
RUDEP
- 11. Agree on E&T Report**
RUDEP
- 12. Submit E&T Report to DPC for approval**
PMB
- 13. Approve E&T Report**
DPC
- 14. Select 2 or 3 potential Construction Contractors**
PMB

15. Meeting to select contractor

PMB, DDO, Beneficiaries, Contractors

16. Appoint Construction Contractor

DPC

17. Choose Supervision Consultant

PMB

18. Sign construction and supervision contracts

PMB, Contractor, Supervisor

19. Construction

Contractor, Supervisor, PMB, AG, RUDEP

20. Inspection and Handover

Contractor, Supervisor, PMB, AG, RUDEP

21. Warranty Period

Contractor, Supervisor, PMB, AG, RUDEP

22. Final Inspection

Contractor, Supervisor, PMB, AG, RUDEP

5. RUDEP Infra projects in 2006-2007

In 06-07, RUDEP funded 57 infrastructure projects in eight categories, as described below:

Table 1: Summary of RUDEP funded projects in 2006-2007

No	Type of projects	No. of projects	Total funded
1	Rural Road	16	2,947.985
2	Kindergarten	14	2,133.1
3	Electricity	1	
4	Irrigation and drainage	13	3,586.0
5	Market	1	134.1
6	Water supply system	9	1,590.9
7	Well	1 (04 wells)	43.1
8	Rope bridge	2	156.6
Total		57	10,672.8

Information for all funded infrastructure projects is described in the table below:

RUDEP INFRASTRUCTURE 06/07

Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
1	Binh Minh	505.0	512.6						
	Upgrading Irr.system - group 4 Loc Thanh	190.0	318.8	16-Mar-07	25-Apr-07		Built a concrete dam: HxL=2.5x8.9 (m) with flow divider; concretazation of 58.9 m existing canal; serving area approximates about 6-8 hectares	5-7 ha/115 HHs	None
	Tho Cay Muc Road	165.0	59.7	16-Mar-07	25-Apr-07		Length: 345.2 m; 4.0m wide; maximum of longitudinal slope I=0.6%	41 HHs	None
	Concretazation of Tan Phuoc market ground	150.0	134.1	20-Apr-07	28-May-07		Concretazation of 1,472 m2 market ground by concrete grade 150 of 12 cm thickness; built a vehicle shed 66 m2 used structure by concrete and steel post	35 Merchants	None
2	Son Trung	420.0	412.0						
	Ta Mau irrigation canal	300.0	297.9	2-Apr-07	3-May-07		Built a dam: HxLxW=0.7x3.7x0.5 (W: the top width), grade of concrete is 200. The canal system comprises: 24 m of galvanized steel pipe D100; 381 m concrete canal with inside dimension of cross section are: WxH=0.4x0.5 and 239 m of concrete canal with inside dimension of cross section are: WxH=0.3x0.4	10.5 Ha	The progress of construction is late
	Go Roc KG	120.0	114.0	2-Apr-07	3-May-07		a class room 45 sqm; a toilet 8.6 sqm; a concrete playground 78 sqm; bored a well and installed water supply and drainage system; equipped fully inside furniture	30 Childs - 42 HHs	The proposed site for construction was changed.
3	Son Hai	350.0	350.2						
	Ta Gan - Ba Dao Road	350.0	350.2	6-Mar-07	7-May-07		L=1400.5 m; W=4.0 m; ditch for rain shaped trapezium dimension (cross section): 0.4x(0.4+1.2)/2; 06 gravel spillway; 01 rectangle concrete culvert with inside dimension: 0.75x0.75x7.6 (m); road surface compacted to attain factor 0.95; grassed embankment by Vertiver grass	65 HHs	None, this project was delayed final inspection by the cause of VSCF
4	Son Giang	750.0	638.6						

RUDEP INFRASTRUCTURE 06/07

Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Go Ngoai to Ruong Lo Road	290.0	219.8	6-Mar-07	25-Apr-07		Constructed 02 sealed gravel routes: L1=358.5 m; L2=386.8 m; longitudinal slope: Imax = 9.89%; the width of road: 5.0 m, consisting of 3.5 m of road surface and 0.75 m in each side of road surface; ditch for rain shaped as balance trapezium: $0.4 \times (1.2 + 0.4) / 2$ (m); constructed 03 concrete culvert: 01 culvert D50 at Km 0 + 166.3 on route L1; 01 culvert D75 at Km 0 + 40.3 and 01 culvert D75 at Km 0 + 154.8 on route L2; grassed Vertiver along embankment.	122 HHs	First final inspection was not approved
	Go Ngang - Deo Dinh upgrading road surface and drainage system	110.0	127.3	9-Feb-07	25-Apr-07		Length of sealed gravel route: L=481.5 m; longitudinal slope: Imax = 9.89%; the width of road: 5.0 m, consisting of 3.5 m of road surface and 0.75 m in each side of road surface; ditch for rain shaped trapezium: $0.4 \times (1.2 + 0.4) / 2$ (m); constructed 01 concrete culvert D50 at Km0 + 90.85 and 01 concrete culvert D75 at Km0 + 419.9	30 HHs	None
	Deo Bua - Lang Re road	350.0	291.5	20-Apr-07	29-May-07		Constructed 02 route: * L1=672 m gravel sealed, 5.0 m wide consisting of 3.0 m of gravel sealed surface and 1.0 m in each side of road surface; ditch for rain shaped trapezium: $0.4 \times (1.2 + 0.4) / 2$ (m); Constructed 01 concrete culvert 2xD100 at Km0+156.0 and 01 concrete culvert D30 at K0+184. * Route 2: L2=349 m sealed road; 5 m wide; ditch for rain shaped trapezium: $0.4 \times (1.2 + 0.4) / 2$ (m); constructed a stone spillway 5x10x0.5 (m) at Km0+127. Grassed along embankment in both routes of road. Road surface was impacted	30 Childs/35-40 HHs	None
5	Ba Le	320.0	274.0						

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Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Goi Le Kindergarten	165.0	136.1	21-Mar-07	8-May-07		Consisting of a class room 5.5x7.2x4.25 (m), floor built by ceramic tiles; a toilet 8.1 sqm with water supply and drainage system; installed an electricity system; a 48 sqm concrete yard grade 150 and 10 cm thick; 37 m long of fence; equipped fully furniture inside (table, chairs, black board)	30 Childs/35-40 HHs	The first submitted design was very bad, RUDEP required follow the standard design. But after changed as the standard design, they also added the fence, but it was located at unsuitable position and the fence wasn't closed then no effective at all
	Dong Lau KG	155.0	137.9	21-Mar-07	8-May-07		This KG has the same design with Goi Le KG	30 Childs/30 HHs	Same issues as Goi Le KG
6	Ba Nam	370.0	418.2						
	Lang Dut 1 Kindergarten (main residential)	170.0	141.5	21-Mar-07	7-May-07		This KG has the same design with Goi Le KG	30 Childs/35 HHs	Same issues as Goi Le KG
	Irrigation and water supply system in Mang Tuong hamlet	200.0	276.6	6-Mar-07	5-May-07	21-Aug-07	Consisting of a dam with dimension are: LxWxH = 2.4x1.0x1.0 and bar screen; * Pipeline: 76.5 m long of galvanized steel pipe D100 installed from the dam; HDPE D90: 210.9 m; HDPE D75: 325.6 m; HDPE D63: 119.3 m; HDPE D40: 164.4 m; also constructed 02 air release valve chamber; 02 washout chamber; 04 irrigating chamber; and 01 supply chamber. Whole HDP pipe were laid under the ground at least 0.6 m; except 76.5 m of galvanized pipe on the ground and supported by concrete poles. * Water tank was constructed by reinforced concrete grade 200 with dimension is: LxWxH =5.25x4.5x2.27 and equipped 08 supply taps.	10 HHs&3-5 Ha	None
7	Tra Lam	535.0	547.5						

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Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Tra Xanh Kindergarten (new emigrant residential)	160.0	130.0	2-Apr-07	30-May-07		Leveling area: 164.97 sqm; a classroom 7.4x5.4; a toilet 2.55x2.6 (m) with water supply and drainage system; a hall 7.2x1.5 (m); floor is covered by ceramic tiles; All concrete structure uses concrete grade 200	30 Childs	CPMB selected 02 consultants to do E&T report. The first formal submitted design is very bad, after changed it was late then RUDEP had no time to review the second E&T report, only district approved the second design
	Tra Lac Kindergarten	160.0	142.0	2-Apr-07	30-May-07		Used the similar design as Tra Xanh KG	30 Childs	Same issues as Tra Xanh KG
	Ha Ri Irrigation system	35.0	98.0	9-Apr-07	30-May-07		Constructed a concrete dam LxW=5.5x2.0 (m); a flow control chamber; pipeline consisting of: 86.6 m used PCV pipe DN100 and 23.3 m of galvanized steel pipe DN100; constructed 02 irrigation outlets at Km0+76.9 and Km0+118.5 on the pipeline	0.5-1 Ha	Same issues about consultant, it also was not according to proposal, the final design had a high cost but no effectiveness (serving area too small and dispersed)
	Tra Khuong WWS	180.0	177.5	24-Apr-07	30-May-07		Constructed a concrete dam LxWxH=7.5x1.0x1.25 (m); 16 m galvanized steel pipe D63; 560.6 m long of HDPE D63 and buried 0.5 m under the ground; 161 m HDPE pipe D50; a treatment tank LxWxH=4.75x4.2x1.7 (m); Constructed 08 concrete supply post 0.2x0.2x1.4 (m) consist 02 copper taps for each. All of concrete structures used concrete grade 200	33 - 36 HHs	None
8	Tra Hiep	695.0	654.7						

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Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Na Hu Irrigation system	360.0	322.1	11-Apr-07	31-May-07		Clean the existing water intake; reinforced existing channel at the section K0+00 - K0+40.6 by concrete grade 200 and installed new cover slabs; reinforced 5cm thick the bottom of existing channel by concrete grade 200 at the sections: K0+68.6 - K0+115.1 and K0+124 - K0+165.9; reinforced the right side by concrete grade 150 for the existing sections: K0+40.6 - K0+68.6 and K0+115.1 - K0+124.4; Insteaded existing channel at section K0+380.8 - K0+931 by new concrete grade 150 channel WxH=0.3x0.4 (m). Constructed 06 irrigation outlet at: K0+579, K0+665, K0+798, K0+880, K0+822, K0+896	7 - 10 Ha	Same issues about consultant as happened in Tra Lam
	Cua village KG	165.0	164.5	23-Apr-07	31-May-07		Consisting of a classroom 7.2x6.1(m); room for teacher 3.6x3.78 (m); a toilet 3.6x2.32 (m) with water supply and drainage system; a hall 1.6x10.8 (m); Floor was covered by ceramic tiles; used structure by concrete grade 200 to constructed the poles and the beams and cement mortar grade 50 and bricks for the walls	30 - 35 Childs	None
	Ca village KG	170.0	168.0	23-Apr-07	31-May-07		Leveling area: 117 sqm; otherwise used the same design as Cua village KG	30 - 35 Childs	None
9	Tra Lanh	480.0	532.7						
	Tra Dinh hamlet Road	140.0	149.5	9-Apr-07	30-May-07		L=391.2 m of gravel sealed, gravel layer 20 cm thick and was compacted; road surface 3.5 m wide and 0.75 m each side of road; maximum slope applied for a small section at Km0+272.21 - Km0+391.21; ditch for rain shaped trapezium 0.4x(0.4+1.2)/2; Grassed along embankment.	18 HHs	None

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Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Tra Linh Hamlet Road (group 5&6)	180.0	224.6	9-Apr-07	23-May-07		Consist of 02 sealed routes: * L1=532.67 m; 02 gravel spillway at Km0+227 and Km0+324.5; L2=105 m * ditch for rain shaped trapezium shaped trapezium 0.4x(0.4+1.2)/2; Road surface was compacted; Grassed along embankment.	30 HHs	None
	Tra Linh KG	160.0	158.7	18-May-07	31-May-07		A classroom 6x6.6 (m); a concrete playground 11x8 (m) used concrete grade 150 and 10 cm thick; a toilet 1.5x3.6 (m) with water supply and drainage system; a room for teacher 4.5x3.6 (m). Used structure by concrete grade 200 for all post and beams; the wall constructed by brick with cement mortar grade 50 and covered by cement mortar grade 75. Equipped fully inside furniture	30 Childs and (30 Primary pupils)	First final inspection was not approved
10	Tra Trung	730.0	693.2						
	Dong village Kindergarten	160.0	174.9	21-Mar-07	7-May-07		Leveled 400 sqm for construction; used the same design for Tra Linh KG but used pump and bored a well for water supply	30 - 35 Childs	None
	Dam village Kindergarten	150.0	174.7	21-Mar-07	7-May-07		Used the same design for Tra Linh KG	30 - 35 Childs	None
	Dam village road	130.0	93.0	9-Apr-07	23-May-07		L=185 m, 4 m wide of road surface, road surface was strong compacted; constructed a gravel spillway 2 m long at Km0+118.4; ditch for rain shaped as balance trapezium (0.4+1.2)x0.4/2 (m); grassed along embankment	34 HHs	None
	Xanh village KG	200.0	181.1	18-May-07	29-May-07		Used the same design for Dong village KG	30 - 35 Childs	None
	Water transferring system in group 7&8	90.0	69.5	18-May-07	12-Jun-07		Length of pipeline: 302 m used galvanized steel pipe DN40; Constructed 02 supply poles 0.2x0.2x1.0 (m) included 02 taps for each; and a courtyard 1.0x2.0 (m) , structures by concrete grade 200; constructed a storage tank at the end of pipeline LxWxH=3.6x2.0x2.0 used structure by concrete grade 200	18 HHs	Problem on selection contractor of construction
11	Long Son	740.0	678.4						

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Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Lac Son Electrical power transferring line	90.0	80.9	26-Mar-07	14-May-07	12-Jun-07	Constructed 350 m long of three phase electricity with 04 wires. Type of wire is insulated wire AV-70; used concrete poles have 8 m high and reinforced by cables	50 HHs	None
	Ruong Men residential road	120.0	106.2	26-Mar-07	14-May-07	24-Jul-07	Consisting of 02 routes: L1=96.8 m, L2=388.6 m; road surface is 3 m wide. Maximum slope is 3.25%, road surface was compacted; Constructed 03 culverts on route L2 at: Km0+44.90 used reinforced concrete grade 200 pipe D50 (cm); Km0+252.6 used reinforced concrete grade 200 pipe D75 (cm); Km0+374.6 used reinforced concrete grade 200 pipe D50 (cm); ditch for rain shaped as balance trapezium: $0.4x(1.2 + 0.4)/2$ (m). Grassed along embankment	50 HHs	First final inspection was not approved
	Upgrading Yen Ngua canal	310.0	286.3	26-Mar-07	10-May-07		Constructed 714 m long of concrete channel, consisting of: K0+00 - K0+438.9 used concrete channel grade 150 with WxH=0.4x0.5 (m); K0+438.9-K0+714 with WxH=0.3x0.4 (m); K0+714 - K1+051 digged and shaped canal as balance trapezium $Hx(w+W)/2=0.4x(0.4+1.2)/2$. Constructed 04 concrete irrigation outlet D20 (cm) at Km0+212.4, Km0+296.9, Km0+438.9, Km0+614 and constructed 02 discharged outlet D80 (cm) at Km0+117.3, Km0+702.5	19.5 Ha	None
	Ho Nghe - Go Ong Lep road	220.0	205.0	16-May-07	30-May-07		Constructed 1218 m long of gravel sealed road, 3.5 m wide and 20 cm thick of gravel layer. Constructed 03 culverts at: K0+046 - reinforced concrete grade 200 pipe D60 (cm); K0+730 - reinforced concrete grade 200 pipe D60 (cm); and a reinforced concrete grade 200 pipe D100 at K1+130. Ditch for rain shaped as balance trapezium. Grassed along embankment	30 - 45 HHs	None
12	Son Mua	400.0	416.6						

RUDEP INFRASTRUCTURE 06/07

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Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Road from Mr Hai house to group 13	400.0	416.6	6-Mar-07	14-Mar-07	23-Jul-07	Constructed 1136.5 m long of sealed road with 4 m wide of road surface. Road surface was compacted as technical requirement. Ditch for rain shaped as balance trapezium $Hx(w+W)/2=0.4x(0.4+1.2)/2$. Constructed 02 gravel spillway at: Km1+106 with dimension are: 4.0x6.0x0.5 (m) and Km0+904 with dimension are: 4.0x4.0x0.5 (m). Grassed along embankment	60 HHs	First final inspection was not approved
13	Son Bua	715.0	664.0						
	Nuoc Dot water supply system	160.0	181.2	1-Feb-07	13-Mar-07	25-May-07	* Constructed a water intake LxWxH=2x0.55x0.45 (m), used structure by concrete grade 200, water was collected through a galvanized steel pipe D150 and was bored. * Pipelines: K0-K0+60 used galvanized steel pipe DN60; K0+60-K0+465 used PVC pipe D63; K0+465-Kc (K0+600) used PVC pipe D32; connected a branch pipe 112.5 m long to supply for small residential. All of pipelines were buried at least 0.6 m under the ground. Connected 50 m long of PCV pipe D32 at K0+533 and constructed a supply pole with 02 taps at the end, constructed another supply pole at the end of branch. * Constructed a treatment tank LxWxH=5.8x2.4x1.48 (m) for sedimentation and filter, constructed a storage divide LxWxH=2.4x2.4x1.68 at treatment block, structure used reinforced concrete grade 200. * Storage tank: Constructed 02 storage tank LxWxH=2.7x2.0x1.85 at K0+272 and K0+375 and equipped 08 taps for each	35 HHs	None

RUDEP INFRASTRUCTURE 06/07

Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Nuoc Tang water supply system	170.0	179.8	31-Jan-07	13-Mar-07	20-Jun-07	* Constructed a water intake LxWxH=3.67x0.55x0.45 (m), used structure by concrete grade 200, water was collected through a galvanized steel pipe D150 and was bored. * Pipelines: K0-K0+46 used galvanized steel pipe DN60; K0+46-K0+320 used PVC pipe D63; K0+320-K0+375 used PVC pipe D40; constructed. All of pipelines were buried at least 0.6 m under the ground. Connected and extended 50m long and constructed a supply pole at: K0+178; K0+272; K0+320; K0+422. ** Constructed a treatment tank LxWxH=5.8x2.4x1.48 (m) for sedimentation and filter, constructed a storage divide LxWxH=2.4x2.4x1.68 at treatment block, structure used reinforced concrete grade 200. * Storage tank: Constructed 02 storage tank LxWxH=2.7x2.0x1.85 at K0+272 and K0+375 and equipped 08 taps for each	35 HHs	None
	Nuoc Ma WWs	225.0	227.5	21-May-07	31-May-07		* Water intake: Used the existing water intake but reinforced to resist infiltration. * Raw water pipelines: K0-K0+034,4 used galvanized steel pipe D50 and was buried; section K0+034.4-K0+106.9 used galvanized steel pipe D50 and laid above ground with supported by concrete poles; section K0+106.9-K0+491 used HDPE pipe D63 and buried under the ground 0.5 m. Constructed a concrete sedimentation divide LxWxH=2.6x1.0x1.28 at K0+106.9. * Treatment tank consisting of 03 divide (sedimentation, filter, storage) LxWxH=4.75x4.2x1.7, used reinforced concrete grade 200. * Clean water pipeline (after treatment tank): total length L=891 m, consisting of: 44 m of galvanized steel pipe DN50; 116.5 m of galvanized steel pipe DN33 and; 730.5 m of HDPE pipe DN50. * Number of supply poles is 11, each water supply pole installed 02 taps with copper valves and constructed a concrete ground 2x2 (m)	42 HHs	None

RUDEP INFRASTRUCTURE 06/07

Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Tu Pa Pang rope bridge	70.0	75.5	21-May-07	30-May-07		L=79 m; 1.2 m wide; Constructed 02 double poles in the middle of bridge, each double pole have height is 10.5 m and foundation are 3.1x1.6x0.5 (m) used structure by reinforced concrete grade 200, the spans are hanged by 06 steel wires Φ6 (mm) in each side and supported by 03 steel wires Φ6 (mm) at the bottom of each side; constructed 02 abutment LxWxH=3x2x2 (m) at two tips of the bridge, used concrete grade 150 and abutment was buried and high compacted	26 HHs	None
	Mang He - Nuoc Bua rope bridge	90.0	-	20-Jul-07			Used the same design of Tu Pa Pang rope bridge but the length is 78 m	31 HHs	None
14	Nghia Son	590.0	478.9						
	Water SS for group 3 of village 2	120.0	151.2	27-Feb-07	21-Mar-07	15-May-07	This project is continued with 05-06 projects, connected the new pipeline to the 05-06 water supply tanks. Total length of pipeline: 1193 m used HDPE DN60 and buried at least 0.6 m under the ground. Constructed 03 valve chamber on the pipeline for operation; Constructed a supply tank at the end of pipeline, size of the tank are: 4x3x1.95 and installed 08 taps with copper valves, structure is used reinforced concrete grade 200	36 HHs	None
	Water SS for group 1 in village 1	140.0	168.8	27-Feb-07	21-Mar-07	14-Jun-07	Constructed a treatment tank at water resource by reinforced concrete grade 200, dimension are: 7.3x2.4x1.83 (m); Length of pipeline is 894 m, used HDPE pipe DN60 and the pipe was buried 0.6 m under the ground. Constructed a supply tank at the end of pipeline by reinforced concrete grade 200 with dimension are 3.0x2.0x1.95 (m). Built washout chamber and air release chamber at Km0+419.8 and Km0+627.4 m	17 - 20 HHs	None

RUDEP INFRASTRUCTURE 06/07

Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Electricity system for group 4,5 in village 2	150.0	-					This project was canceled because the design was not according to proposal	
	Water supply system group 5 village 2	180.0	158.8	23-Apr-07	25-May-07	19-Jul-07	Constructed 107.5 m of galvanized steel pipe from existing water intake, section K0+107.5-K0+959 used HDPE pipe DN60. The pipeline was buried at least 0.6 m under the ground. Constructed a treatment tank 7.4x2x1.25 (m) with 03 divide (sedimentation, filter, and storage), installed 06 taps for water supply and connected some pipe for the groups of HHs from storage divide. Implemented washout and air release chamber in the pipeline	34 HHs None	
15	Nghia Tho	395.0	367.2						
	Bore 04 well and bathroom	45.0	43.1	21-Mar-07	12-May-07	5-Jul-07	Digged 04 wells for peoples. Each well is 10-12 m depth and used reinforced concrete grade 200 tubes with 8 cm thick each tube. Constructed the concrete yard in shaped circular D=2.5 (m) and 8 cm of thickness for each well	15 HHs None	
	Dong Sinh irrigation system	350.0	324.1	6-Feb-07	20-Mar-07	30-May-07	Constructed 724 m long of concrete channel WxH=0.3x0.4 (m), used structure by reinforced concrete grade 150. Constructed 04 irrigation outlet at: Km0+81.6, Km0+194, Km0+339.9, Km0+555; constructed 02 discharged outlet D80 at Km0+266.4 and Km0+692.5	7-9 Ha None	
16	Pho Chau	75.0	73.4						
	Extension of Tan Loc canal	75.0	73.4	24-Apr-07	12-Jun-07		Concretization of 151 m long of canal; Cross section of concrete canal as balance trapezium $Hx(w+W)/2=1x(0.8+2.8)/2$. Used structure by concrete grade 150; Constructed 02 span bridge 2.8x2.3 (m) at K0+009 and K0+096, used structure by reinforced concrete grade 200	18 HHs The progress of construction is late	
Total		8,070.0	7,711.9						

RUDEP INFRASTRUCTURE 06/07

Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
04 COMMUNES IN MINH LONG 2006 PROJECTS									
1	Thanh An	250.0	264.3						
	Reinforcement canal system in Hinh village	250.0	264.3	5-Dec-06	22-Mar-07	5-May-07	Total length of channel: 604 m, consisting of: 592 m long of reinforced concrete grade 150 channel and 126 m of channel has cover slab, a spillway 0.6x0.6 (m) by reinforced concrete grade 200. Arranged the irrigation outlets at the suitable positions	7 - 8 Ha	None
2	Long Hiep	250.0	191.9						
	Dam Dan Ruong Muong in Ha Liet village	250.0	191.9	5-Dec-06	20-Mar-07	5-May-07	Constructed a dam: LxWxH=9.25x1x1.4 (m), structure by concrete grade 150 inside and covered by reinforced concrete grade 200. constructed sand outlet by reinforced concrete grade 200 LxWxH=1x1x1.2; Constructed an water inlet 11.85x0.5x0.5 by reinforced concrete grade 200; Implemented 271.5 m of reinforced concrete channel 0.3x0.3 (m)	9 Ha	None
3	Long Mon	250.0	192.5						
	Upgrading Bai Vet-Ca Xen Road	250.0	192.5	16-Nov-06	12-Apr-07		Constructed 409 m long of gravel sealed road and 5 m wide, road surface was compacted as standard; constructed 01 culvert D150 and 02 culvert D75, used structure by reinforced concrete grade 200; ditch for rain shaped as balance trapezium $Hx(w+W)/2=0.4x(0.4+1.2)/2$. Grassed along embankment	29 HHs	First final inspection was not approved. The progress is very late
4	Long Mai	250.0	263.9						
	Kindergarten in Mai Lanh Thuong village	120.0	122.6	18-Nov-06	15-Mar-07		Constructed a classroom with toilet, construction area: 8x6.7=53.7 sqm; Equipped fully furniture inside	30 Childs	The progress is very late
	Upgrading road in Mai Lanh Trung village	130.0	141.4	18-Nov-06	15-Mar-07		Consisting 02 gravel sealed routes: L1=214 m, L2=280.5 m; road surface is 4 m wide, road surface was compacted. Ditch for rain is reinforced by concrete.	32 HHs	The progress is very late

RUDEP INFRASTRUCTURE 06/07

Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
Total		1,000.0	912.6						

04 COMMUNES IN MINH LONG 2007 PROJECTS

1	Thanh An		500.0	495.8					
	Duong Chon dam and irrigation system	350.0	409.4	21-May-07	29-May-07		Constructed a dam LxWxH=10x1x3.3 (m) used concrete grade 150 inside and covered by reinforced concrete grade 200; constructed sand outlet by reinforced concrete grade 200 LxWxH=2x1.2x1.3; Constructed an inlet 11x0.4x0.9 by reinforced concrete grade 200; Implemented 301 m of reinforced concrete channel 0.4x0.4 (m)	15 Ha	None
	Thanh Mau village road	150.0	86.3	18-May-07	29-May-07	20-Aug-07	L=414.5 m long of gravel sealed and 3.5 m wide, road surface was compacted. Constructed a gravel spillway crosses the stream with 5 m wide and 10 m long. Ditch for rain shaped as balance trapezium $Hx(w+W)/2=0.4x(0.4+1.2)/2$. Grassed along embankment	41 HHs	None
2	Long Hiep		500.0	477.4					
	Go Nhuoc road in village 1	280.0	164.3	17-May-07	29-May-07		To routes of gravel sealed road: L1=395 m, 4 m wide; L2=395 m, 3.5 m wide. Road surface was compacted. Ditch for rain as balance trapezium $(0.4+1.2)x0.4/2$ (m). Constructed 04 culvert D60 by concrete	45 HHs	None
	Nuoc Xuyen Dam and Irrigation system	220.0	313.1	17-May-07	30-May-07		Constructed a reinforced concrete dam LxWxH=7x1.4x2.3 (m); * Channel: K0-K0+16 used concrete channel 0.5x0.5 (m) structure by reinforced concrete grade 200; K0+16-K0+193 used channel 0.4x0.5 (m); K0+193-K0+437.5 used concrete channel 0.4x0.4 (m); Constructed 03 irrigation outlet D50 at: K0+26, K0+210, K0+344	12 Ha	None
3	Long Mon		500.0	498.2					

RUDEP INFRASTRUCTURE 06/07

Updated: 29-Aug-2007

Commune	Project	GOA Cost (VND mill)			Contract signed	Complete	Description	Benefit	Issues
		Intended	Contract value	Approved					
	Reng village Dam and irrigation system	350.0	311.2	21-May-07	30-May-07		Constructed a reinforced concrete grade 200 LxWxH=6.3x1x2.3 (m); * Channels: Total length of channel is 889.2 (m) used reinforced concrete grade 150 consisting of: K0+12-K0+24 used reinforced concrete grade 150, WxH=0.4x0.5; K0+24-K0+312 used channel WxH=0.35x0.4; K0+312-K0+843.2 used PVC pipe DN140; K0+843.2-K0+889.2	6-9 Ha	None
	Giua village Kindergarten	150.0	187.0	21-May-07	30-May-07		a classroom 7.2x7.3 (m); a toilet 3.45x4.12 (m), constructed the fence which is 88 m long, used structure by reinforced concrete grade 200 for all poles and beams, otherwise used grade 150	30 - 35 Childs	None
4	Long Mai	500.0	495.7						
	Upgrading Dong Xoi irrigating channels	350.0	375.5	16-May-07	30-May-07	20-Aug-07	Constructed a main channel Lm=367 m long, cross section: 0.4x0.4 (m) used structure by reinforced concrete grade 150. Constructed 02 branches: L1=551 m, 0.3x0.4 (m); L2=34 m, 0.3x0.4 (m). Arranged irrigation outlets along channels at suitable position.	15 - 18 Ha	None
	Mai Lanh Thuong village road	150.0	120.2	16-May-07	30-May-07	20-Aug-07	L=423 m, 4 m wide of road surface. Constructed 04 reinforced concrete culvert D60 and 01 reinforced concrete D100. Ditch for rain is balance trapezium (0.4+1.2)x0.4/2 (m)	36 HHs	None
Total		2,000.0	1,967.1						

6. RUDEP requirements

a. Activity Group

Each project must comprise an Activity Group (AG). The AG is selected by beneficiaries in a meeting with CCG and the DDO. The members of AGs must voluntarily contribute time and power to the project.

AGs provide the opportunity for all beneficiaries to comment on the design, choose a contractor, supervise construction and attend the final inspection. In order to do this, they are trained in the main aspects of supervision and O&M.

However, some upland AGs were not active; did not supervise, and their participation in the RUDEP Infrastructure component was not strong.

AGs also encourage people to operate and maintain the project once completed. However, to date, the AG has not been active in this requirement. RUDEP needs to implement a plan to improve this type of situation.

b. Environmental Impact Assessment

In accordance with Vietnam Environment Protection Law and Environment Management Guide for Australian Aid Program's, all infrastructure projects funded by RUDEP must establish EIAs. This ensures that natural environments continue to be sustainable following the implementation of any project activities.

Based on the Environmental Impact Assessment Checklists and Environmental Management Guidelines of the Environmental Adviser, the IEO and AGs monitor the impact on the environment in their planning and design, implementation, and operation phases.

A designer will use the results of the assessment to revise the design if there are any problems. The designer will manage the construction and operation phases of the project to minimize any negative environmental impacts.

c. Operation and Maintenance

CPMB and AGs must prepare an O&M plan for each project in the design phase. The O&M plan outlines procedures for monetary collection in aid of maintenance works and associated costs. It further outlines the labour of local people, towards the operation and maintenance of the project.

In upland communes, there has been no financial contribution from local people. CPCs have not devised a budget for maintenance and failed to request any budget from relevant DPCs. The one exception was an irrigation project, where the beneficiaries agreed to pay for a person to control the irrigation flows to protect the whole system. Other projects are only maintained by using workdays of local people. Compared to other infrastructure projects in the commune, RUDEP projects are always in better condition because of allocated funds for maintenance, while other projects have none.

In some communes, O&M plans are never implemented properly. Any damage is not correctly repaired. So the commitment of local people and local authorities about contribution for operating and maintaining the projects after they were funded by RUDEP is necessary.

d. Water Quality

To ensure that all proposed projects are feasible and that safe water for daily use is possible, RUDEP test the water quality of existing water sources in the area. Before the construction of any water supply project or system commences, the IEO collects water samples in proposed areas and has them tested. Water supply for household usage must satisfy MoH requirements, regarding the E.coli Index.

e. Erosion Protection

All batters on the road must be protected from erosion. Local grasses or vetiver grass can be used for protection and to help stop erosion caused by the rain.

The outlet of the culverts and spillways must also be protected. River gravel combined with vetiver grass is the preferred option to prevent water from carrying dirt onto the road which can run into the paddy fields.

7. Capacity Building

a. Investment and management of construction Training

Following its success in 2005-2006, commune construction management skills for 2006-2007 further improved. RUDEP was only required to support 4 communes in Minh Long. This was achieved by improved guidelines for infrastructure construction. Furthermore, regular field visits provided technical support and assistance to Minh Long DPC and CCGs.

b. Environmental Impact Assessment Training

As AusAID requires all RUDEP activities to be environmentally safe, RUDEP invited an Australian Environment Advisor to assist in the monitoring of environmental issues.

The advisor prepared Assessment Checklists and Environmental Management Guidelines to assist IEO and CPMBs in managing the impacts of infrastructure activities on the environment. CCG and DCG representatives were also trained on this subject.

On completion of each project draft design, the CPMB, AG and IEO were required to assess the Environmental Impact. The design must be further revised if there exists any potential for negative environmental impacts.

As communes had already received Environmental Impact Assessment training in 2005-2006, there was no training course on this topic this year.

c. Operation and Maintenance Training

RUDEP has developed an O&M Infrastructure Project Manual.

The O&M plan must be prepared simultaneously with the draft design.. The plan outlines the methods of fund collection for O&M works and a timeline.

Some O&M plans only described methods to maintain the project and did not discuss operation procedures. To assist beneficiaries in understanding O&M, the IEO trained them in simple operations when in the field. The construction contractor also demonstrated how to best operate the system during construction supervision and on final inspection.

d. Supervision Training

Training for CCGs and AGs. In contractor selection meetings, IEO trained CCGs and AGs on how to follow project construction and ensure the quality of the project. They were provided with general construction knowledge; such as the mix-design for different kinds of mortar and concrete, and; maximum thickness of each embankment layer to ensure full compaction. Technical drawings help provide beneficiaries with a visual reminder and demonstrates how they may supervise the infrastructure projects.

CCGs and AGs were also trained on how to operate and maintain the project correctly. They contributed ideas to individual project's O&M plan.

e. Study Tour 06-07

In 2006–2007 RUDEP organised study tours to Nghe An Province and Ha Tinh Province.

In Nghe An, the RUDEP study tour visited Quy Chau Rural Multi Sector Development Project, funded by a Belgium grant. Their infrastructure component was implemented mainly as community construction. The project engineer was responsible for the design; signed a contract with a technical supervisor, then local people were responsible for the project construction. The construction skills of the local people was quite good, but their implementation procedures and the participation of local people was not good.

In Ha Tinh, RUDEP visited Ha Tinh Rural Development Program. The procedures of the construction component was similar to RUDEP. This Program also funded infrastructure projects using local construction contractors and tender procedures. However, general economic well-being in Ha Tinh is higher than in Quang Ngai. The budget for each commune and project was bigger than for RUDEP projects. Therefore, the type of infrastructure projects varied - they funded the construction of primary and secondary schools, and large dams for irrigation. However, as with Nghe An, the participation of local beneficiaries was not very good and did not match RUDEP.

8. Issues

a. Design

As in 2005-2006, this year in some communes, the CPMB again selected some bad designers to conduct the E&T reports. Some designers did not take the job seriously, and used E&T reports from other projects (some projects used WB project design). The quality was very poor, in communes such as: Ba Nam, Ba Le, Tra Lam, and Tra Hiep.

In selecting the designer, some CPMB members did not work closely with others in the commune and in two communes, Tra Lam and Tra Hiep, they selected two designers to design the same projects. It took a lot of time for checking and approval.

As per the annual funding plan, RUDEP provided information on budgets for each project, based on the CBA results to CBPM. Regardless, some E&T reports were well over budget. In other cases, CPMB did not fully understand the budget report, thinking it included VAT and did not use all of the allocated budget. However, when notified of their mistake, they wanted to spend the remaining money. These types of problems have affected the progress of construction and their timelines of approval.

b. O&M

As required by RUDEP Infrastructure guidelines, the communes must establish an O&M plan for each project. In order to provide support in their knowledge of operation

and maintenance, RUDEP organised some training courses, however the implementation of O&M plans in some communes was unacceptable. In some communes, O&M plans were done only when RUDEP required the CPMB to submit one. This year, as required, Nghia Tho, Nghia Son, Binh Minh and Son Giang had implemented O&M plans with support from the IEO as a reference for future projects. However, it is difficult to determine how O&M plans will be established and implemented in the future once RUDEP funding has gone.

c. Quality of infrastructure projects

In an effort to follow up the required quality of last year's projects, (many projects were inspected several times for their 'final' inspection), this year there was considerable improvement in the quality of infrastructure projects. The supervision of CPMB, AGs and the supervisor was implemented in a developed way, while the construction contractor also demonstrated a high level of competency.

However, certain issues need to be addressed: the contractor must ensure higher quality of the projects, AGs need to be further involved in the supervision of construction and participate more actively in the design phase. Some E&T reports were missing the necessary issues that had to be covered during the construction period and this took time and trouble to arrange the budget)

d. Supervision

Supervision was implemented effectively in some communes. However, in some construction sites far away, the supervisor did not visit often and the involvement of beneficiaries was low.

The arrangement of Counterpart funding was late, therefore, the enthusiasm of the supervisor decreased over time.

e. Cost

There was no issue.

f. VAT

As required by letter No. 7711 TC/TCT on 13/7/2004 from General Department of Taxation, relating to guiding VAT management to ODA projects, all ODA projects must include VAT on expenditure. The main contractor is then able to claim from Department of Taxation (D.O.T). However, due to the operation of RUDEP, a different procedure is followed. The Quang Ngai D.O.T organised a training course on this issue, but it was not clearly understood and difficult to apply. When lodging claims, contractors had difficulties in satisfying D.O.T requirements.

VAT is a complicated issue for RUDEP infrastructure projects. The Commune doesn't have the funds to pay; the provincial government had not prepared a budget including VAT, and the Australian grant did not incorporate VAT costs. The construction contractor could not perform the final acquittal until the submission of VAT, however no resources covered this cost. This affected the quality of projects.

g. Community construction

After the successful community construction of a rope bridge in Mang He-Nuoc Bua, Son Bua, in 2006-2007 RUDEP again funded Son Bua for two additional Rope Bridges. This time around, more money was allocated for this project to ensure better quality. Currently, these two projects are under construction. All beneficiaries are working very hard to guarantee the success of this project.

Issues here is the lack of technical knowledge of the community. The district engineer must support them on concrete works, and check the quality of structure. This is also a good way to increase their ability in construction.

9. Recommendations

- CPMB should select a better designer to ensure the quality of E&T Report to save time on modifications, if required.
- The CPMB and Designer should work more closely with beneficiaries to ensure the project meets beneficiaries expectations. In some cases of 06-07 projects, beneficiaries expressed concern that they were not consulted on ideas.
- Sometimes the commune's accountant provided incorrect details on the commune bank account, and this delayed the transfer of payments from RUDEP, and payments had to be sent several times in several cases (and five times for one commune). CPC administration and accountants should take more care in the future.
- DCGs should provide stronger support to communes on approval procedures. It took a long time to obtain district approval, then, when the project was implemented, other factors made construction difficult.
- CPMB and beneficiaries should pay more attention to site supervision to ensure project quality.
- CPMB and beneficiaries should undertake O&M planning more seriously.

Annex: Technical requirement of RUDEP Infrastructure projects

Technical Requirement of RUDEP projects

RUDEP just agrees to fund for the projects as following:

1. Road: new or upgraded dirt road only, no concrete or sealed road. The road must be significant and can be used to help local people to improve their livelihood.
2. Kindergarten: can be a full day or a half-day kindergarten; new construction or upgrading existing building.
3. Irrigation: upgrade the existing system to improve the capacity of the canal or construct a new irrigation system
4. Well/bathroom: new or upgraded well with a new bathroom to be used by a group of local people in order to supply water with an appropriate hygiene level to local people and also help people to ensure the personal hygiene.
5. Water supply system: Build a new or upgrade an existing self-running system that supplies water directly to HHs. Build a system to water tank to provide water with an appropriate hygiene level for people and help them to save time in collecting water every day.
6. Market: upgrade an existing market or construct a new one.
7. Electricity system:
 - Expand Power Line: Linking commune centre with villages (if commune has national electricity network). Suitable projects are public electricity systems, transformers (one per village). Voltage of village electricity stations will be reduced to 220/380 V. With the main line, HHs invests in electricity-wire and -meters linking to each of HHs.
 - Build hydraulic electricity stations at small scale: the stations have capacity of from 2 - 8 KW, serving 8 - 35 HHs.
8. Bridge: Build a new single span bridge, rope bridge or suspension bridge.

All the RUDEP projects must be cost effective, less maintenance and safe to environment

1. Road

- The gradient of the road should not exceed 10% to reduce the surface erosion.
- All batters must be protected by grasses, combining local grass and vetiver to prevent erosion.
- All drainage systems, such as side drain, culvert, and spillway must be protected from erosion.
- The side drain where the longitudinal is greater than 3% must be planted with grass.
- The culvert and spillway's outlets must have stilling well or gravel apron and grass (vetiver) to prevent the washout of the outlet channel as well as the deposit on the paddy field at downstream.

2. Kindergarten

- The kindergarten must be fully equipped. It is required to have these below items (put in priority order):
 - i. Classroom with tables and chairs
 - ii. Toilet with water supply system including a water tank and pumping system. Water source is a bore or a covered well
 - iii. Playground

- iv. The fence (The fence must be very simple to save money. The fence is just used to keep the children in. Not build a huge beautiful fence at high cost)
- v. The classroom should be constructed with ceramic tile floor and ceramic tile wall.

3. Irrigation

- Designs suitable with actual conditions, requiring low costs, and making full use of local labour and locally available materials
- Solutions proposed should be accepted by HHs; and they are able to do operation and maintenance fully.

4. Well/bathroom

- The well must be lined from top to bottom. There is no hole on the wall of the well.
- The area around the pipes must be filled by sand up to 2.0m below the ground and the section from the ground to 2.0m below must be filled by compacted clay.
- It is required to have a sand filter in the well.

5. Water Supply system

- Water pipe connecting to the water tank or to houses must ensure minimum output water-head to be 3 meters. The flow velocity inside the pipe should not be less than 0,6 m/s to 0,75 m/s to prevent the settlement.
- Water pipe should be along a plane, and avoid meanders which result inside losses, and reduce water running ability.
- Water pipe should be laid at an appropriate depth level to avoid being broken during using.

6. Market

- It is required to have a proper place to dispose the garbage of the market. It should have two separate chambers to treat the garbage before take it away, one for green garbage and another for garbage that cannot self-disintegrate.
- The market must have a toilet and water supply.
- The sewage of the market, especially from the fish and the meat shops must be treated before going out the market. It is suggested that they must be collected in the latrine pit of the toilet and go out after filtered.

7. Electricity system:

- Follow standards and criteria guiding designs of electricity supply systems.

8. Bridge:

- Construct a single span bridge using wood materials for canals and streams which is 5-8 meters of wide. Bigger ones (8-20 meters in width) can be constructed rope bridge.
- For big rivers (20-100 meters in width) can be constructed a suspension bridge
- Follow standards and criteria guiding designs of bridge