

Japan International Cooperation Agency (JICA)

Department of Development Affairs (DDA), Ministry of Progress of  
Border Areas and National Races and Development Affairs

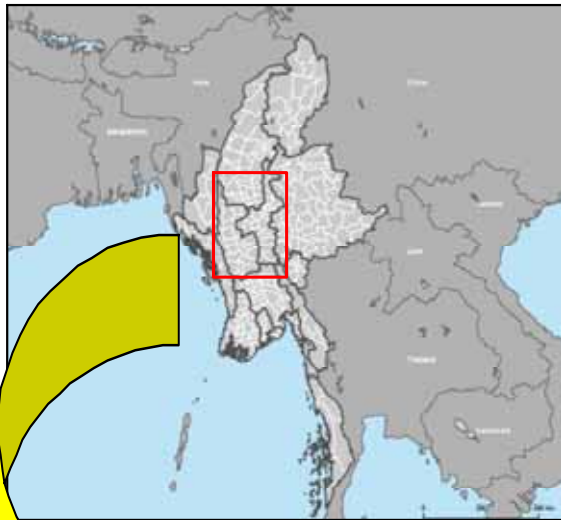
**THE PROJECT OF RURAL WATER SUPPLY  
TECHNOLOGY IN THE CENTRAL DRY ZONE  
IN  
THE UNION OF MYANMAR**

**INCEPTION REPORT**

**FEBRUARY 2007**

**KOKUSAI KOGYO CO., LTD.  
BRIDGE ASIA JAPAN**

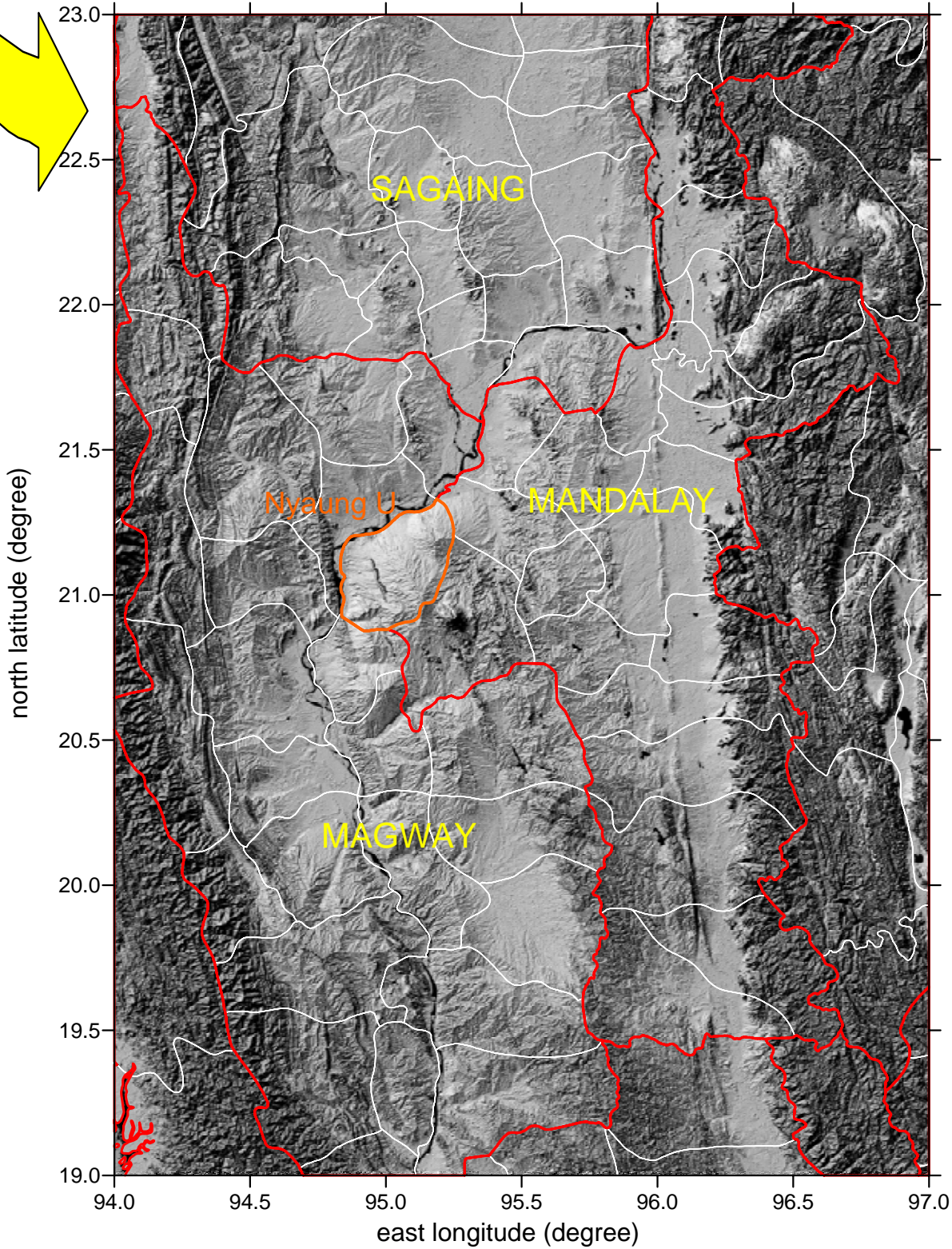
# LOCATION MAP



Union of Myanmar

ပြည်ထောင်စုမြန်မာနိုင်ငံတော်

## Central dry zone



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### Location MAP

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### ANNEX

- Record of Discussions between Japan International Cooperation Agency and Department of Development Affaires, Ministry of Progress of Border Areas and National Races and Development Affaires, the Union of Myanmar on the Project on Rural Water Supply Technology in the Central Dry Zone
- Minutes of Meeting between Japan International Cooperation Agency and the Authorities Concerned of the Government of the Union of Myanmar on the Japanese Technical Cooperation for the Project on Rural Water Supply Technology in the Central Dry Zone

# 1 Introduction

## 1.1 Authorization

The Inception Report was compiled for the Project on Rural Water Supply Technology in the Central Dry Zone in the Union of Myanmar (hereinafter referred to as the Project), in accordance with the Record of Discussions agreed upon by the Department of Development Affairs (DDA), Ministry of Progress of Border Areas and National Races and Development Affairs, the Union of Myanmar and Japan International Cooperation Agency (JICA).

JICA has organized an expert team (hereinafter referred to as the JICA Expert Team), consisting of ten (10) experts in specific fields related to the Project.

The Project commences at the beginning of November 2006 and be completed by the end of October 2009. During the course of the Project, the JICA Expert Team shall implement the work in close cooperation with the counterpart personnel of the Department of Development Affairs (DDA), Ministry of Progress of Border Areas and National Races and Development Affairs, the Union of Myanmar.

## 1.2 Background of the Project

The Union of Myanmar (hereinafter referred to as Myanmar) has a total land of 678,330 square kilometer with a total population of 49.4 million<sup>1</sup>, and the nation's GDP per capita is approximately 270 US dollars<sup>2</sup>. The Central Dry Zone of the Union of Myanmar is a subtropical semi-arid zone with 27 % of the total population with 11.5 million, and its population density is about three times the nation's average population density. Annual rainfall in the zone is 400-800 millimeter and most of the rain is concentrated from May to October. As the residents in the zone mainly depend on the reservoirs where the rain stays within the village, when the water level of the reservoirs falls in the middle of the dry season, they have to go to wells several kilometers away and buy water.

To overcome such a situation, thousands of wells were formerly constructed by international organizations. However, reflecting the current state of affairs in Myanmar, international aid has been suspended in recent years. Many of the wells constructed by international organizations have already been broken because planning techniques and construction techniques in those days were insufficient. Furthermore, since those projects did not aim at transferring techniques, proper engineers were not raised or trained.

The Government of Myanmar has planned and implemented various rural water supply projects, and one of the efforts is "A ten Year Project for Rural Water Supply by Development Committees of Sagaing, Magway and Mandalay Divisions (From 2000-2001 to 2009-2010)". However, the implementing organization, the Department of Development Affairs (DDA), Ministry of Progress of Border Areas and National Races and Development Affairs, have technical problems such as an insufficient technical capacity of the DDA and many defects with wells constructed by the DDA, which break down right after the construction or become out of use due to muddy water.

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<sup>1</sup> The World Development Indicator (<http://devdata.worldbank.org/data-query/>)

<sup>2</sup> As of fiscal year of 1997

Under these circumstances, the Government of Myanmar requested the Government of Japan to provide technical cooperation for developing management capacity and training technical engineers of the DDA. Based on the request of the Government of Myanmar, JICA dispatched the 1<sup>st</sup> Preparatory study team in December 2005, the 2<sup>nd</sup> Preparatory study team in March 2006, and the 2.5 Preparatory study team in July 2006 to agree the contents of technical cooperation by the Minutes of Meeting. Finally on 7<sup>th</sup> September 2006 the Record of Discussions (R/D) was concluded.

### **1.3 Objectives of the Project**

#### **a. Overall Goal**

The number of villages in the Central Dry Zone with access to safe drinking water is increased.

#### **b. Project Purpose**

Capacity for construction, repair and maintenance of water supply facilities in the Central Dry Zone is strengthened.

#### **c. Project Outputs**

The outputs expected by the Project are as follows;

1. Advanced technology for construction of rural water supply facilities is transferred.
2. Advanced technology for rehabilitation of deep tube wells is transferred.
3. Advanced techniques for maintenance / monitoring of water supply are transferred.

### **1.4 Scope of the Project**

Based on the Record of Discussions (R/D) agreed upon on 7<sup>th</sup> September, 2006, and Minutes of Meetings (M/M), the following contents of the work shall be implemented in the Project.

#### **a. Project Area & Base of the Project**

The target area in the Project is the Central Dry Zone, as described in the Project Design Matrix (PDM) attached in Annex I of R/D. Although the concrete target villages for the pilot projects (hereinafter referred to as the pilot village) shall be determined by taking account of plans and urgency considered by the DDA, the areas for the pilot projects are targeted within Nyaung\_U Township of Mandalay Division. The following activities shall be conducted in the pilot project areas, mainly at the maintenance workshop in Nyaung\_U Township, as a base of the Project activities, which will be constructed and budgeted by the DDA (based on the facility design drawn during the second Japanese Preparatory Study). Equipment and machinery will be repaired at the newly (to-be) constructed maintenance workshop in Nyaung\_U township.

- 1) Construction of deep tube wells (20 villages)
- 2) Rehabilitation of existing deep tube wells (40 villages)
- 3) Activities for establishing maintenance systems in the above 60 villages

**b. Myanmar Side**

**b.1 Responsible Ministry**

Ministry of Progress of Border Areas and National Races and Development Affairs

**b.2 Counterpart Organization**

Department of Development Affairs (DDA), Ministry of Progress of Border Areas and National Races and Development Affairs

**b.3 Beneficiary**

Direct Beneficiary

- 1) DDA Staff – about 90 persons
- 2) Members of Water Management Committee - 120 persons (2 villagers at 60 villages)
- 3) Villagers receive technical cooperation on water facilities – 60,000 (1,000 villagers at 60 villages)

Indirect Beneficiary

Residents of the Central Dry Zone – 11,500,000 persons

**c. Scope of Work**

- 1) The JICA Expert Team shall carefully examine the results of the Study Report (referred to 3.3) and implement the work outlined in 3.1 (Methods of the Activities) to achieve the above Project objectives. The contents of the work are shown in the “Activities” and “Input” sections in the PDM<sub>1</sub>.
- 2) The JICA Expert Team shall transfer the techniques to the staff of DDA, Ministry of Progress of Border Areas and National Races and Development Affairs
- 3) The JICA Expert Team shall submit the reports or printed materials outlined in 3.3 (Study Reports) in due course in the Project after explanation and discussions with the Government of Myanmar.

## 2 Basic Policy for the Project

### 2.1 Basic Policy for the Project

The basic policies for the Project underlying the Inception Report are as follows.

1. To strengthen the functions of the DDA towards more self-reliable organization, and achieve capacity development, which will be able to establish a consistent water supply system from construction, rehabilitation and operation and maintenance.

As described in the background of the Project (refer to **1.2**), residents of the Central Dry Zone and the DDA, the responsible government body for the nation's rural water supply, are currently facing many issues and challenges in terms of organizational, technical, and equipment and material capacity to increase access to safe drinking water in the area.

In order to overcome the current situation, it is necessary to reinforce the regional functions of the DDA, and establish a consistent water supply system, which includes not only construction of new wells, but also operation and maintenance (i.e. rehabilitation of wells as a hard component; operation and maintenance system in community as a soft component). In due course in the Project, if the close cooperative relationship at a community level is established, it is assumed that the organizational roles of the DDA shall be further clarified as well as an improvement in the individual technical capacity of the DDA staff. In other words, the Project provides an opportunity to achieve capacity development, such as the functional reinforcement of administrative organizations and empowerment of villagers. A conceptual diagram of the consistent water supply system is drawn in Figure 2-1. The JICA Expert Team provides technical support on capacity development for not only the DDA but also the water management committees and villagers, enabling them to take each one's share of responsibility in the water supply system.

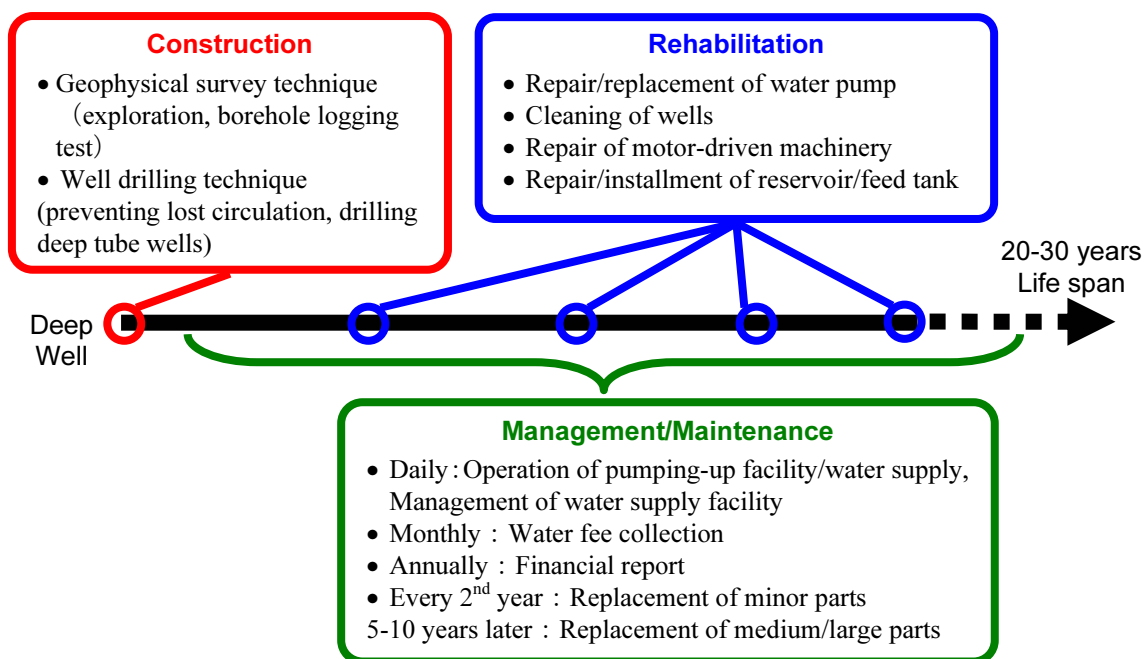


Figure 2-1 Consistent Water Supply Management System of Deep Tube Well

In regard with the establishment of operational structure and personnel input, the Myanmar side needs to take necessary measures for the following matters in order to enable the DDA to establish a consistent water supply system, working together with the JICA Expert Team.

#### **1. Arrangement of counterparts**

A list of counterparts, which includes not only the project directors and managers but also several members from Sagaing Division and Magway Division, outside Mandalay Division, was submitted in the Project. It is important that these members of the list are assigned securely, because it is expected that the DDA staff of Mandalay Division who are trained by the Project extend its results of training to other divisions, and the outputs and instructions of the Project will be shared through the counterparts allocated from the other divisions.

#### **2. Secure arrangement of C/P teams**

Although the organizational chart of C/P teams who would participate in the Project was shown to the Preparatory study team when the Record of Discussions was concluded on 7<sup>th</sup> September, 2006, it is necessary to establish those teams in each section securely. The main sections need to be composed of drilling and groundwater survey, rehabilitation, maintenance and monitoring, and maintenance workshop.

#### **3. Construction of the facilities necessary for implementing the Project**

The provision of office buildings and facilities necessary for the Project by the DDA was listed as the measures to be taken by the Myanmar side. Within the measures, construction of maintenance workshop is most important matter in order to establish a base of operation for the Project. Furthermore, within the materials and machinery for the maintenance workshop, materials and machinery to be prepared by the Myanmar side, which was agreed on the M/M with the 2<sup>nd</sup> Preparatory study team, need to be set up in urgent manner in conjunction with the construction of maintenance workshop.

#### **4. Budget allocation necessary for the Project**

Expenses necessary for official trips and participating in seminars related to the Project by the counterpart of the Myanmar side shall be paid by the Myanmar side. Maintenance and monitoring teams among the C/P teams is required to monitor the villages after the construction of wells and sustainable water use of the water facilities. Therefore it is necessary to guarantee the budget for enabling the team to visit the villages.

#### **5. Other measures to be taken by the Myanmar side**

It is necessary that the Myanmar side take necessary measures concluded in the Record of Discussion on 7<sup>th</sup> September, 2006.



2. To make all the activities collaborated for the JICA Expert Team based on systemic cooperation between an NGO, which has practiced persistent rural water supply projects in the Central Dry Zone, and Consultants, who have comprehensive techniques.

One of the JICA Expert Team members, namely Bridge Asia Japan (BAJ), a Japanese Non-Profit Organization, has implemented rural water supply projects at Nyaung\_U Township in the Central Dry Zone since March, 1999. BAJ also conducted JICA’s grassroots technical cooperation for three years since July 2000 in the same area, and has established good relationships with the community as well as the regional office of the DDA. As indicated earlier, the Project aims at not only improving the techniques of DDA staff but also establishing an operation and maintenance system for rural water supply facilities. From the point of view of sustainable water use, support for community empowerment is also important. Therefore, it is expected that BAJ will utilize the persistent project experience as one of the JICA Expert Team members in this Project. On the other hand, another JICA Expert Team member, namely KOKUSAI KOGYO CO., LTD, a Japanese consulting company has comprehensive technical skills. As the BAJ, who has the experience to establish good relationships between both the regional offices of the DDA and the community, forms a joint team with KOKUSAI KOGYO CO., LTD., as a JICA Expert, the Project provides the support, putting more regards on deepening the relationship between the government and the community as well as effectively transferring techniques and know-how.

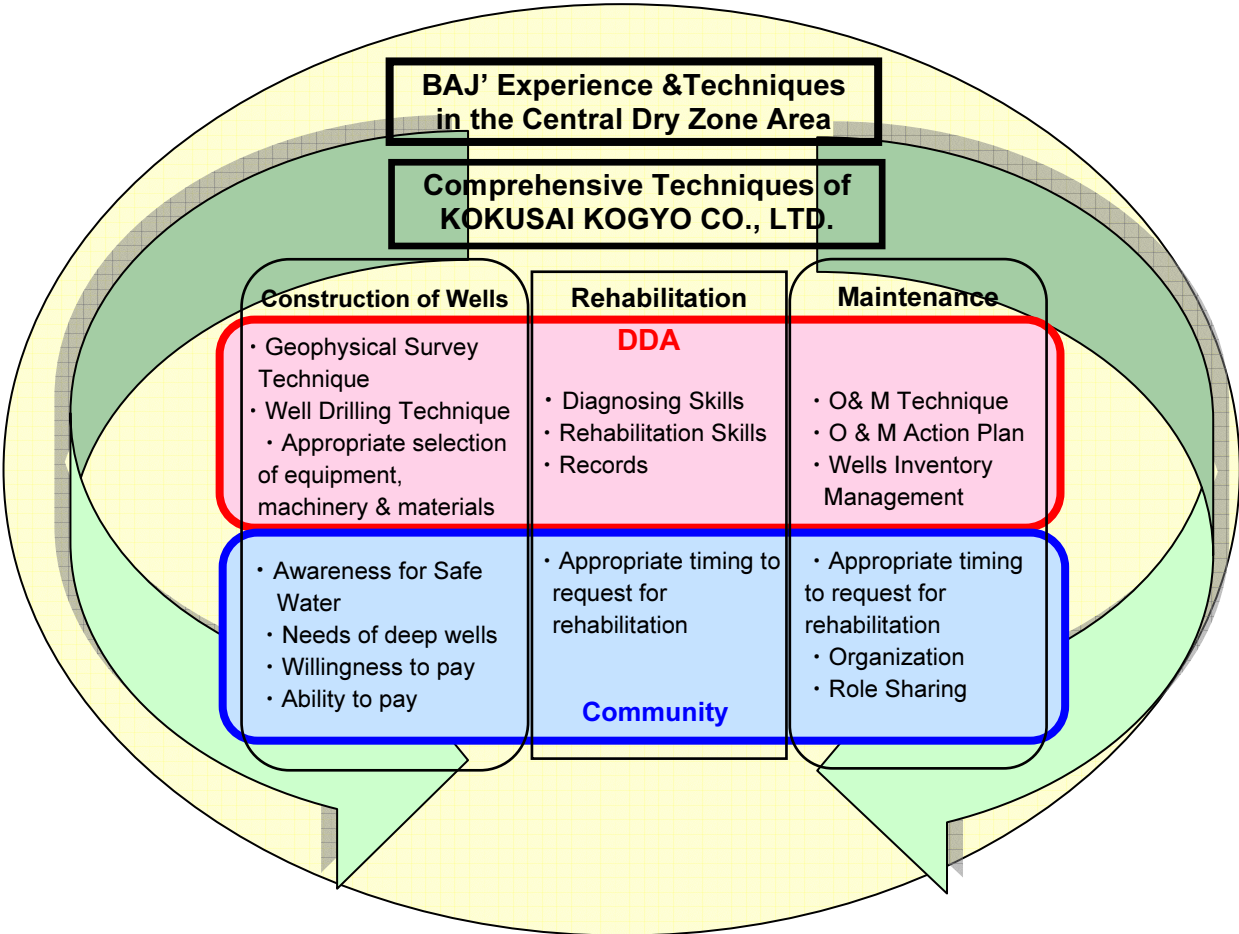


Figure 2-2 Collaborating Working Framework of the JICA Expert Team

## 2.2 Approaches to the Activities

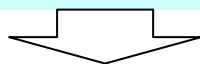
Based on the basic policies of the Project, the work of the Project shall be approached from the following aspects.

### Basic Policies of the Project

1. To strengthen the functions of the DDA towards more self-reliable organization, and achieve capacity development, which will be able to establish a consistent water supply system from construction, rehabilitation and operation and maintenance.
2. To make all the activities collaborated for the JICA Expert Team based on systemic cooperation between an NGO, which has practiced persistent rural water supply projects in the Central Dry Zone, and Consultants, who have comprehensive techniques.

### Approaches to the Work

1. Applying Project Cycle Management (PCM) for Effective Technical Support of Strengthening Capacity
2. Conducting Effective Training Programmes for Strengthening Self-reliability and Sustainability of the DDA
3. Providing Maximum Support on Capacity Development
4. Providing Technical Support to Establish a Sustainable Operation and Maintenance of Water Supply Facilities
5. Sharing the Contents and Experience of the Project and Working in Close Cooperation with Other Donors
6. Utilizing C/P Training Programmes in Japan for Increasing the Effect of the Project
7. Implement safe and smooth field activities, considering other important remarks



### Output of the Project

1. The advanced technology on construction of rural water supply facilities is transferred.
2. The advanced technology on rehabilitation of deep tube wells is transferred.
3. The advanced technique on maintenance/monitoring of water supply is transferred.

Figure 2-3 Outline of Basic Policies and Approaches

**Approach 1: Applying Project Cycle Management (PCM) for Effective Technical Support of Strengthening Capacity**

Monitoring and management of the Project shall be based on Project Cycle Management (PCM). PCM has the following merits; for example, clarification of the objectives and outputs of the project in the planning stage of the PCM helps control and manage the activities effectively and accurately. PCM also makes it possible to design the project based on the needs and cooperation with the counterpart agencies, ensure accountability of aids and promote communication throughout implementing the Project. By monitoring and analysing the progress of the project as well as taking measures to meet the new situation (if necessary, amend the plan) in comparison with the plan, it is expected that the quality of the project will be improved.

Prior to launching the Project, the JICA Expert Team has analysed the Project Design Matrix (PDM<sub>0</sub>) and the Plan of Operation (PO<sub>(1)</sub>), originally attached document in ANNEX I of M/M on 7<sup>th</sup> September, 2006, and prepared for tentative plans as PDM<sub>1</sub> and PO<sub>(2)</sub> respectively in Table 2-1 and Figure 2-4, along with a proposal of the Achievement Grid (Draft) in Table 2-2.

In the 1<sup>st</sup> Fiscal Year of the Project, the Myanmar C/P and JICA Expert Team shall discuss and collect relevant information about the Project and submit the revised PDM and PO to JICA, taking particular consideration of the actual number of wells, conditions of the equipment and machinery and the current capacity of the DDA.

In the 2<sup>nd</sup> and following fiscal years of the Project, the JICA Expert Team and Myanmar C/P shall implement the Project based on the revised PDM, monitor the progress, and evaluate the activities of the Project.

As to the indicators of the project outputs of each fiscal year in the PDM, the JICA Myanmar office shall review and report their effectiveness to the JICA headquarter at the end of each year. Furthermore, the Mid-Term Evaluation and Final Evaluation Study on the Project shall each be carried out by JICA as follows.

- ① **Mid-Term Evaluation Study:** The JICA Expert Team and Myanmar C/P submit the actual data regarding the outcomes of implemented technology transfer, degree of achievement based on the targets, outputs of the activities to JICA as basic information for the evaluation mission tentatively planned in May 2008.

The expected outputs until the Mid-Term Evaluation are “Complete construction of nine (9) new wells, nine (9) electric borehole logging, groundwater geographic exploration survey in 11 villages, rehabilitation of 20 existent wells, operation and maintenance activities in 12 villages, and a total of 71 staff of DDA and more than 24 members of water management committees receive the training programmes.”

The Mid-Term Evaluation is a study to be conducted by JICA, using PCM methods, and the JICA Expert Team and Myanmar C/P shall cooperate with JICA for the execution of these project evaluation missions.

- ② **Final Evaluation Study:** The JICA Expert Team and Myanmar C/P submit the actual data regarding outcomes of implemented technology transfer, degree of

achievement based on the targets, outputs of the activities to JICA as basic information for the evaluation mission tentatively planned in May 2009.

The expected outputs for the Final Evaluation are “Complete construction of twenty (20) new wells, twenty (20) electric borehole logging, groundwater geographic exploration survey in twenty (20) villages, rehabilitation of forty (40) existent wells, operation and maintenance activities in sixty (60) villages, and a total of 71 staff of DDA and more than 120 members of water management committees receive the training programmes.”

The Final Evaluation is a study to be conducted by JICA, using PCM methods, and the JICA Expert Team and Myanmar C/P shall cooperate with JICA for the execution of these project evaluation missions.

Table 2-1: PDM<sub>1</sub> (Draft)

Project Period: November, 2006-October, 2009 Target site: Central Dry Zone Target Group: DDA staff October 17, 2005

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p><b>Overall Goal</b> The number of villages in the Central Dry Zone with access to safe drinking water is increased.</p> <p><b>Project Purpose</b> Capacity for construction, repair and maintenance of water supply facilities in the Central Dry Zone is strengthened.</p>	<p>The number of the villages in the Central Dry Zone which does have not access to safe drinking water is reduced by half (by 2015, the targeted year of MDGs).</p> <p>The report on Lessons Learned and Good Practices is prepared.</p>	<p>Quarterly report and annual report of DDA</p> <p>The report on Lessons Learned and Good Practices</p>	<p>DDA carries out its rural water supply project as planned.</p>
<p><b>Outputs</b></p> <ol style="list-style-type: none"> <li>1. Advanced technology for construction of rural water supply facilities is transferred.</li> <li>2. Advanced technology for rehabilitation of deep tube wells is transferred.</li> <li>3. Advanced techniques for maintenance / monitoring of water supply are transferred.</li> </ol>	<ol style="list-style-type: none"> <li>1-1 More than 20 deep tube wells are drilled and over 20 thousand people can access safe drinking water from these wells.</li> <li>1-2 More than thirty four (34) staff receive technical training.</li> <li>2-1 More than 40 deep tube wells are rehabilitated and over 40 thousand people can access safe drinking water from these wells.</li> <li>2-2 More than thirty seven (37) DDA staff receive technical training.</li> <li>3-1 Manuals for villagers and DDA staff on maintenance/monitoring.</li> <li>3-2 More than thirty seven (37) DDA staff are trained through activities.</li> <li>3-3 More than one hundred and twenty (120) villagers of Water Management Committee receive technical training.</li> </ol>	<ol style="list-style-type: none"> <li>1-1 Progress report of the project and quarterly report of DDA.</li> <li>1-2 Progress report of the project and quarterly report of DDA.</li> <li>2-1 Progress report of the project and quarterly report of DDA.</li> <li>2-2 Progress report of the project and quarterly report of DDA.</li> <li>3-1 Progress report of the project and quarterly report of DDA.</li> <li>3-2 Progress report of the project and quarterly report of DDA.</li> </ol>	
<p><b>Activities</b></p> <ol style="list-style-type: none"> <li>1-1 To conduct training on the groundwater exploration geographic survey.</li> <li>1-2 To conduct training on the advanced technologies in drilling deep tube wells.</li> <li>1-3 To prepare equipment/materials necessary for the field training on the drilling of deep tube wells.</li> <li>1-4 To repair boring related equipment for the training on the drilling practice of deep tube wells.</li> <li>1-5 To compile lessons learned and good practices on drilling deep tube wells.</li> <li>1-6 To compile good practice/cases on the design of reservoir tanks.</li> <li>1-7 To prepare a manual for the training on the planning of water supply facility construction.</li> <li>1-8 To conduct training on the planning of water supply facility construction.</li> <li>2-1 To collect basic information for rehabilitation of existing deep tube wells.</li> <li>2-2 To conduct training on the rehabilitation of tube wells.</li> <li>2-3 To prepare equipment/materials necessary for the training practice to rehabilitate the existing deep tube wells.</li> <li>2-4 To compile lessons learned and good practices on the rehabilitation of deep tube wells.</li> <li>3-1 To select the pilot township.</li> <li>3-2 To conduct a survey on the condition of the management/maintenance of water supply facilities by the villagers in the selected township.</li> <li>3-3 To prepare a manual for the villagers on the management/maintenance of water supply facilities.</li> <li>3-4 To prepare manual for DDA staff on management and maintenance of water supply facilities.</li> <li>3-5 To conduct training for DDA staff on the management/maintenance of water supply facilities.</li> <li>3-6 To conduct training for the leader and member of water committee in the pilot township on maintenance of water supply facilities.</li> <li>3-7 To compile a case on the management/maintenance of the water supply facilities.</li> </ol>	<p><b>Input</b></p> <p><b>Japan</b></p> <ol style="list-style-type: none"> <li>1. Experts Chief Advisor Chief Advisor (2) Geophysical Survey Hydrogeology Well Drilling Machine Well Drilling Mechanical Equipment Water Supply Planning Social Mobilization Social Mobilization(2) 2. Local Consultant 3. Training of C/P in Japan 4. Machinery and Equipment 5. Local Cost</li> </ol>	<p><b>Myanmar</b></p> <ol style="list-style-type: none"> <li>1. Counterpart Personnel 2. Facilities (1) Office space for Japanese experts at central / local level (2) Repair workshop and training facility and equipment necessary for the Project activities (3) Others 3. Budget (1) Salary for DDA C/P, Travel Expense (2) Administrative Cost</li> </ol>	<p><b>Preconditions</b></p> <p>DDA arranges equipment/materials DDA assigns counterpart personnel</p>

Notes: Because most of the total village populations in the targeted townships are less than 1,000, in order to achieve the above indicator, for example, water access for over 20 thousand people, number of well drilling can be largely beyond 20. Besides, because these indicators might change according to the progress of the Project, they will be discussed and determined with JICA and DDA, considering mastered degree of technical trainings by DDA staff and the Project objective.

Table 2-2: Achievement Grid (Draft)

<b>Narrative Summary / Planned Activities</b>	<b>Means of Verification</b>	<b>Baseline of Activities and Envisaged Targets as of Today</b>
1-1 To conduct training on the groundwater exploration geographic survey.	Training Activity Report (Geophysical Survey)	DDA staff lack analysis skills and interpretation skills of analyzed results. By improving their analysis skills, DDA staff will be able to respond to trouble and interpret the analysis as engineers.
1-2 To conduct training on the advanced technologies in drilling deep tube wells.	Training Activity Report (Well Drilling)	DDA staff lack skills for treatment of muddy water and lost circulation, as well as drilling experiences of deep tube wells. Through the training programme, DDA staff will be able to respond to these issues practically.
1-3 To prepare equipment/materials necessary for the field training on the drilling of deep tube wells.	Equipment and Material Quantity Report	DDA staff lack equipment for drilling 300 meter deep tube wells and equipment for preventing lost circulation. DDA staff will be able to search for shortages of equipment, check and prepare it.
1-4 To repair boring related equipment for the training on the drilling practice of deep tube wells.	Rehabilitation Equipment Quantity Report	DDA staff has high a capacity to repair boring machines, but the capacity to repair machines for deep well drilling is unknown. Through the training, DDA staff will be able to repair the machines for deep well drilling.
1-5 To compile lessons learned and good practices on drilling deep tube wells.	Case Study Report (Drilling of Deep Tube Well)	DDA staff can drill up to a depth of 200 meter, but lessons from failed drilling cases have not been recorded. By conducting deep tube well drilling and compiling the lessons and cases, good practices/cases will be utilized in other areas.
1-6 To compile good practice/cases on the design of reservoir tanks.	Case Study Report (Reservoir Tank Design)	There are good practices for constructed water reservoir tanks as well as damage accidents. Among the DDA staff, some staff lack knowledge of designing reservoir tanks. DDA staff will be able to design reservoir tanks and compile good practice/cases for other areas.
1-7 To prepare a manual for the training on the planning of water supply facility construction.	Training manual	Any training programmes or manuals for the planning of water supply facility construction are made among DDA staff. The manuals for the training will be prepared and used in a sustainable way.
1-8 To conduct training on the planning of water supply facility construction.	Training Activity Report (Water Supply Planning)	DDA staff lack the knowledge about planning water supply facility construction. Through the training program, DDA staff will be able to plan the water supply facility construction.
2-1 To collect basic information for rehabilitation of existing deep tube wells.	Well Inventory	DDA lack management and usage of a database for well inventory. DDA staff will be able to collect well inventory and manage/use the database.
2-2 To conduct training on the rehabilitation of tube wells.	Training Activity Report (Well Rehabilitation)	DDA staff lack rehabilitation knowledge and field experience. Through the training, DDA staff will be able to independently rehabilitate wells.
2-3 To prepare equipment/materials necessary for the training practice to rehabilitate the existing deep tube wells.	Check List for Rehabilitation Equipments	Due to insufficient knowledge about rehabilitation, the equipment necessary for rehabilitation is not confirmed. DDA staff will be able to research the insufficient equipment and prepare it.
2-4 To compile lessons learned and good practices on the rehabilitation of deep tube wells.	Case Study Report (Rehabilitation of Deep Tube Wells)	Due to the lack of practice on rehabilitation by DDA staff, there are no lessons or good practices compiled. By compiling good practices, rehabilitation skills will be disseminated and rehabilitation will be smoothly conducted in other areas.
3-1 To select the pilot villages.	Village Selection Report	Selection of the pilot villages has not yet been done. Clarifying the selection criteria, DDA staff and the JICA Expert Team will collectively make a report to select the pilot villages.

<b>Narrative Summary / Planned Activities</b>	<b>Means of Verification</b>	<b>Baseline of Activities and Envisaged Targets as of Today</b>
3-2 To conduct a survey on the condition of the management/maintenance of water supply facilities by the villagers in the selected villages.	Baseline Survey Report	A baseline survey of pilot township has not been conducted. After the baseline survey is conducted based on the selection of the pilot villages, the outputs of the Project will be clearly understood by comparing them to the outputs after the Project.
3-3 To prepare a manual for the villagers on the management/maintenance of water supply facilities.	Manual for O&M of Water Supply Facilities (Villagers)	There are no manuals for management/maintenance of water supply facilities in both hard and soft aspects. By DDA and the JICA Expert Team collectively preparing the manuals, the manuals will be used for raising awareness of villagers by DDA staff.
3-4 To prepare a manual for DDA staff on management and maintenance of water supply facilities.	Manual for O&M of Water Supply Facilities (DDA staff)	A manual for DDA staff on management/maintenance of water supply facilities has not been made. The manual will be made by the JICA Expert Team, considering opinions from DDA staff, and will be used for operating the facilities.
3-5 To conduct training for DDA staff on the management/maintenance of water supply facilities.	Training Activity Report (Water Supply Facilities for DDA staff)	Management/maintenance of water supply facilities by DDA is insufficient. Through receiving the training, DDA staff will be able to conduct awareness programmes towards villagers for systematic management/maintenance.
3-6 To conduct training for the leader and member of water committee in the pilot villages on maintenance of water supply facilities.	Training Activity Report (Water Supply Facilities for Villagers)	Management/maintenance of water supply facilities is not executed by villagers at the newly constructed water supply facilities. Training for villagers will be conducted by DDA staff in consideration of the status before, during, and after the construction.
3-7 To compile a case on the management/maintenance of the water supply facilities.	Case Study Report (Management/Maintenance of Water Supply Facilities)	Cases on management/maintenance of water supply facilities have not been compiled. Implementing practical management/maintenance activities, the cases will be compiled and printed as materials. Lessons and good practices will be disseminated by using the materials.





**Approach 2: Conducting Effective Training Programmes for Strengthening Self-reliability and Sustainability of the DDA**

The JICA Expert Team shall conduct effective technology transfer training programmes in order to enable the DDA to construct, rehabilitate, operate and maintain the water supply facilities in a self-reliable and sustainable way. To achieve the overall goal of the Project, “The number of villages in the Central Dry Zone with access to safe drinking water is increased” as a result of the implementation of the Project, the capacity of Myanmar side is to be strengthened.

For the training programme on the construction of new wells, the pilot villages where the construction is put into practice shall be targeted on the villages which lack deep tube wells and water resources as the first priority. However, geological characteristics and attitude of excavation are also taken into consideration in the selection. The villages for rehabilitation of the wells are selected from the villages which enable various cases of rehabilitation. In the case that several villages require the same rehabilitation activities, appropriate numbers of villages are selected from the high prioritized villages in terms of scarcity of water.

The realm of training programmes consist of the groundwater geophysical survey (including hydrogeology); construction of new well and rehabilitation; repairing of equipment of the existent wells; and maintenance/management of water supply facilities. As for the maintenance/management of water supply facilities, two courses targeting DDA staff and villagers shall be established. In addition to the above training, DDA staff needs to receive the training programme on planning of water supply facilities. General approaches and remarks for conducting training programmes are as follows;

- 1) As for implementation of the training programme, the needs of DDA shall be carefully taken into consideration.
- 2) In order to implement the training programme effectively, lectures must be provided prior to the OJT in the field. In addition, especially the training on groundwater geographic exploration technique must combine OJT and feed-back analysis after the OJT in the field.
- 3) Issues and improvement points must be compiled after the training programmes, and given as feedback to the following training programmes. DDA shall learn how to revise the programme by revising the training manuals by themselves. The training manuals must be written not only in English but also in Burmese. Prior to implementation of the training programmes, existing training manuals must be collected in the field.
- 4) Manuals for maintenance/management of water supply facilities shall be made in cooperation with the JICA Expert Team and staff of DDA as a part of training programme.
- 5) The contents of training programme shall be designed, considering the large number of participants. Depending on the contents of the programmes, the learners shall be divided into individual group training programmes such as a working session.
- 6) The learners shall become lecturers in the training programmes in order to raise

self-reliability. The last training sessions regarding geophysical survey techniques and rehabilitation shall be executed as practical training only by the staff of DDA. In the training for the management/maintenance of water supply facilities in the community, trained staffs of DDA become instructors, supported by the JICA Expert Team.

- 7) The training programme on drilling deep tube wells shall utilize the bad examples in the past as material in order to promote self-reliability of DDA's techniques.

To implement the training programmes effectively and enable the DDA staff to be self-reliable, the major approaches and remarks are as follows;

◆ Geophysical Survey

It is crucial to include the hydrogeology into the lecture. Failures and successes of the past geophysical survey need to be reviewed as training material. Especially for analysis of the electric sounding, both manual based analysis (standard analysis method) and computer based analysis (inverse modeling method) must be trained, since the accuracy of analysis will be improved by applying the results of the standard analysis method into the first model of the inverse modeling method. The measured data must be plotted in the field and its quality must also be checked. If the data is regarded as not good, then the data must be measured thoroughly. The data must be compared with the drilling results of new wells and the quality must be compared.

◆ Drilling New Wells and Rehabilitation of Existing Wells

In the lecture, issues and problems regarding drilling practices and deep wells need to be reviewed and lectured intensively. For example, one of the reasons for failing to prevent lost circulation might be influenced by the quality of bentonite, so these problems need to be analyzed not generally but more specifically. As for the rehabilitation of wells, technology transfer from multiple aspects is crucial due to the variety of rehabilitations.

◆ Repair of Equipment and Machinery/Maintenance of Water Supply Facilities (Hard)

All of the equipment and machinery, except drilling machines, needs to be targeted in the training programme. As for the rehabilitation of wells, the trainees work together with well drilling and groundwater sections and receive training programmes on repairing the peripherals and generators. Although the equipment and facilities can be repaired after the breakdown, maintenance is crucial to prevent these issues. Therefore, training of its know-how needs to be provided.

◆ Management and Maintenance of Water Supply Facilities (Soft)

Training programmes for management and maintenance for villagers need not only hard aspects such as the maintenance of water supply facilities, but also the soft components such as raising awareness of water management committees, and the method and setting of water fee collection. Actually the training will be trainer's training of DDA which needs to implement the training to villagers.

**Approach 3: Providing Maximum Support on Capacity Development**

The JICA Expert Team shall provide maximum support on Capacity Development in the Project. To strengthen the capacity of DDA, three layers of capacity (individual, organizational, societal) shall be analyzed in the Project.

Actually the DDA has the capacity to carry out well drilling, utilizing their own previous experience and existing machinery and equipment. However, in regard to the rehabilitation and maintenance of facilities, DDA are facing a number of issues and challenges. Furthermore, even if positive goals are set up at an organizational level, a sense of responsibility and will to contribute to water supply services at an individual level may remain weak for many reasons. Thus, in order to understand the issues and challenges of the capacity in each level, and design effective training programmes to overcome them, the capacity within the Project should be analyzed from the individual, organizational and societal aspects in each field related to the Project. A tentative checklist of the capacity assessment was made by the JICA Expert Team in Table 2-3. Using the (tentative) checklist as a basis and taking the (tentative) achievement grid into consideration, the JICA Expert Team and Myanmar C/P shall check and revise (if necessary) the verification points according to each stage of work, and examine the contents of training programmes as evaluating each capacity.

Table 2-3 A Checklist of Capacity Assessment (Draft)

	<b>Individual</b>	<b>Organization</b>	<b>Institution/Social System</b> (Capacity Owner : Country, Village)
<b>Details of Capacity</b>	Willingness/Ability to achieve the goal by using knowledge and skills of rural water supply (construction, rehabilitation, maintenance of water supply facilities)	Decision making process, management system, and organizational culture & system to achieve the goal of rural water supply (construction, rehabilitation, maintenance of water supply facilities)	Environment and conditions enabling the exhibit of individual and organizational capacity; decision making process, systems and framework to implement policies and strategic planning
<b>Geophysical Survey</b>	<ul style="list-style-type: none"> <li>• knowledge of hydrogeology</li> <li>• knowledge of exploration theory</li> <li>• skills of field work</li> <li>• willingness/attitude for implementing geographic exploration survey</li> <li>• awareness/responsibility of the issues involved rural water supply</li> </ul>	<ul style="list-style-type: none"> <li>• number of staff in the organization, existence of proper staff arrangement</li> <li>• proper arrangement, number, condition of surveying machines</li> <li>• a chain of command to the survey team</li> <li>• existence of survey manuals</li> <li>• awareness/responsibility of the issues involved rural water supply</li> </ul>	<ul style="list-style-type: none"> <li>• Effectiveness of water laws and regulations</li> <li>• National Water Supply Policy, awareness of needs</li> </ul>

		<b>Individual</b>	<b>Organization</b>	<b>Institution/Social System</b> (Capacity Owner : Country, Village)
<b>Issues and checkpoints on Capacity Development</b>	<b>Drilling New Wells and Rehabilitation of Existing Wells</b>	<ul style="list-style-type: none"> <li>• knowledge of hydrogeology</li> <li>• knowledge of drilling theory</li> <li>• drilling technique</li> <li>• knowledge of well rehabilitation</li> <li>• skills for well rehabilitation</li> <li>• willingness/ability to implement drilling</li> <li>• awareness/responsibility of the issues involved rural water supply</li> </ul>	<ul style="list-style-type: none"> <li>• number of staff in the organization, existence of proper staff arrangement</li> <li>• proper arrangement, number, condition of drilling machines</li> <li>• a chain of command to the drilling teams</li> <li>• treatment in case of trouble</li> <li>• awareness/responsibility of the issues involved with rural water supply</li> </ul>	
	<b>Repair of Equipment and Machinery and Maintenance of Water Supply Facilities</b>	<ul style="list-style-type: none"> <li>• knowledge of general machinery</li> <li>• repairing techniques of machinery / materials</li> <li>• awareness/responsibility of the issues involved rural water supply</li> <li>• willingness to provide technical training with villagers</li> </ul>	<ul style="list-style-type: none"> <li>• number of staff in the organization, existence of proper staff arrangement</li> <li>• maintenance and management of workshop as an organization</li> <li>• a chain of command to the rehabilitation section and maintenance &amp; monitoring section</li> <li>• practical measurement to rehabilitation as an organization (eg. securing the budget)</li> <li>• awareness/responsibility of the rehabilitation section and maintenance &amp; monitoring section for the issues involved with rural water supply, as responsible organizations</li> </ul>	
	<b>Management and Maintenance of Water Supply Facilities</b>	<ul style="list-style-type: none"> <li>• knowledge about water supply facilities of the villagers</li> <li>• villagers' techniques to rehabilitate and manage the facilities</li> <li>• villagers' willingness/attitude to manage and maintain the facilities</li> <li>• villagers' willingness/responsibility involved in water supply</li> </ul>	<ul style="list-style-type: none"> <li>• existence and activities of water management committee, existence and number of other committees</li> <li>• existence of water collection system</li> <li>• existence of a clear chain of command</li> <li>• leadership of water management committee towards water users</li> </ul>	<ul style="list-style-type: none"> <li>• existence of clear sense of role sharing, awareness and responsibility involved in water supply as a village</li> <li>• existence of legal status of water management committee</li> <li>• utilization of village water management committee</li> </ul>

**Approach 4: Providing Technical Support to Establish a Sustainable Maintenance and Management System of Water Supply Facilities**

For maintaining and managing water supply facilities, hard components such as rehabilitation of wells and pumps, and soft components such as water fee collection for water use are significant. In order to take care of both aspects effectively, the relationships among DDA, the water management committee and villagers need to be clarified as well as each one's share of responsibility for management and maintenance. The relationships among the above three parties in the field, analyzed by BAJ's field experience are shown in Figure 2-5. The training programmes on the maintenance and management of water supply facilities aim at enabling these relationships and roles work effectively as a system.

As indicated in the basic policies for the Project in **2.1**, as for maintenance and management of water supply facilities, effectiveness of the project is to be secured by making the best use of the experiences of preceding activities by BAJ. In the case of the construction of new wells and maintenance in the JICA grassroots technical cooperation, BAJ proceeded various activities based on community participation according to the situation of the target village, such as before well drilling, during construction and afterwards. For the rehabilitation of wells, BAJ also provided training programmes for caretakers in the village, and conducted community meetings for information sharing, in which a majority of the villagers including the water management committee participated. As a matter of fact, inability to share village information is a big issue in the maintenance and management of water supply facilities; therefore, it is important to arrange for all information to be centralized to the DDA. For example, there is a Township Peace & Development Council (TPDC) in Nyaung\_U Township, once a month at township level. It is necessary to have a plan for collecting information by using such an opportunity. If the DDA staff can facilitate the water management committee and keep friendly and close communication with the community, it is expected that the arrangement for maintenance and management, including information sharing, will be made gradually. The JICA Expert Team provides technical support to enable DDA staff to monitor the water supply facilities and facilitate the water maintenance and management committee. It will be necessary to request the DDA headquarter to secure the establishment of a monitoring team in the DDA as well as the budget (e.g. transportation, fuel, etc.) for enabling the team to visit the villages. Concrete measurement for the arrangement for sustainable activities based on (currently un-functional) cooperation between the administration and the community is also to be examined by consulting the preceding activities by BAJ.

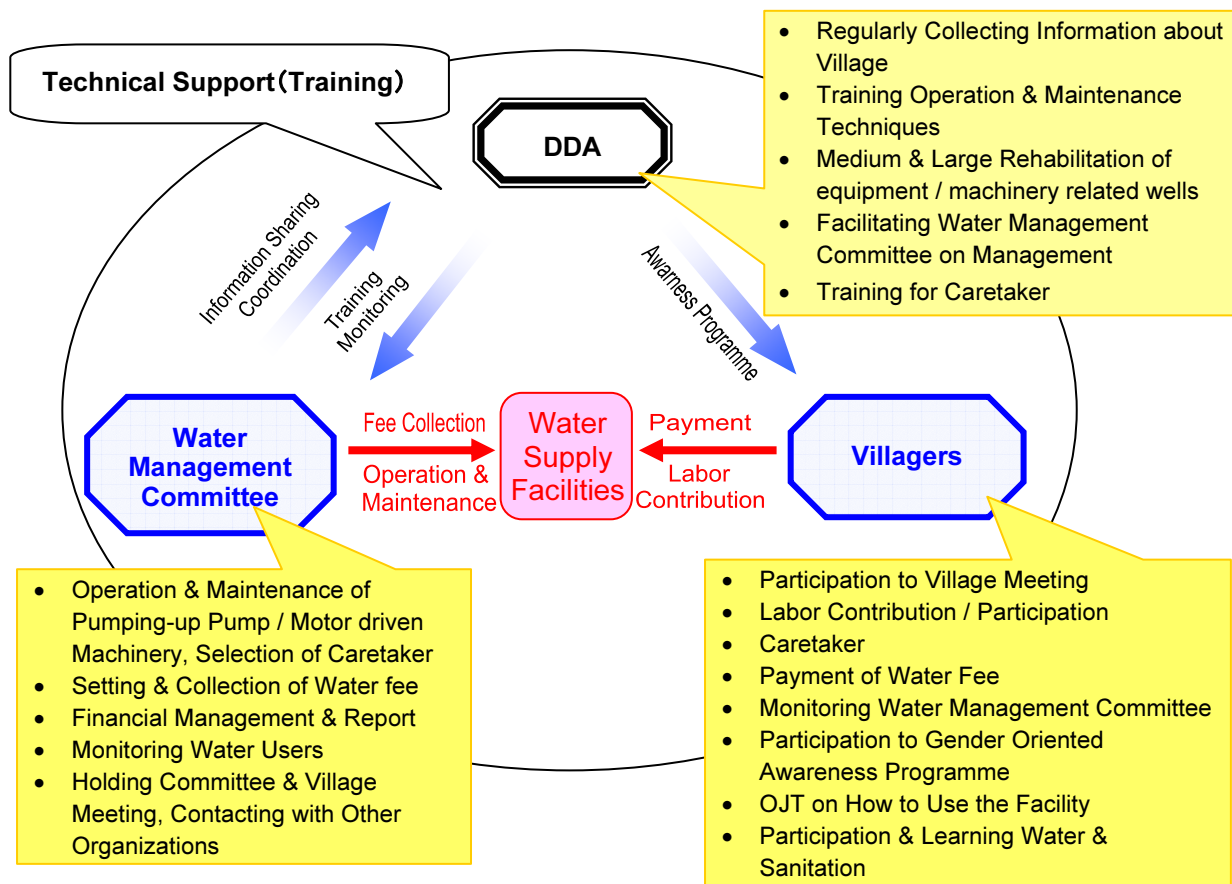


Figure 2-5 Relationships for Management and Maintenance System of Water Supply Facilities in the Community

**Approach 5: Share the Contents of the Project and Work in Close Cooperation with Other Donor Agencies**

To exchange experiences and opinions regarding technology transfer and collect information useful to the Project, the objectives, expected outcomes, the contents of activities and practical ways of technology transfer of the Project shall be explained and widely known by other donor agencies within Myanmar, from the beginning of the Project.

Since the United Nation International Children’s Emergency Fund (UNICEF) has implemented well construction projects including deep tube wells, working with DDA as a C/P agency, and the United Nation of Development Programme (UNDP) has constructed water supply facilities along with a school and road construction, it is necessary to examine the on-going projects in order to avoid overlapping activities.

Both UNICEF and UNDP target community support and participation. Especially UNICEF has planned well construction projects covering 45 townships for five years in 2005-2010. By exchanging useful techniques and information related to community based approaches of UNICEF and UNDP and working in close cooperation with other donor agencies, effort will be made to raise the quality of technical support of the Project.

**Approach 6: Utilize the Opportunities of C/P Training Programmes in Japan for Increasing the Effect of the Project**

One of the objectives of C/P training programmes in Japan is not only studying the advanced cases of well drilling, rehabilitation of machinery or mechanical facilities in Japan, but also learning how the administrative agents engage in operation and maintenance of water supply facilities and how operation and maintenance is carried out on the basis of community participation. There are a number of cases that governments in partnership with civilians tackle the groundwater management and water usage policy in small and medium cities of Japan, not only cases like the water supply facilities of large areas in big cities. The opportunity of C/P training programmes in Japan shall be provided for the personnel who have a great ability to reinforce the effect of the Project and sustainability after participation in the training programme.

According to the experiences of JICA grassroots technical cooperation and currently on-going activities, the regional office of DDA needs to support maintenance and management towards the villagers in future. Therefore, it is necessary for the maintenance and management staff in the DDA to participate in the C/P training program in Japan in order to observe un-teachable cases by themselves and gain experience. Especially, as for the selection of participants for the training programme of maintenance and management of water supply facilities, it is expected that those who can facilitate maintenance and management in the community will be selected from the target participants.

After the C/P training programme implemented by the JICA grassroots technical cooperation, a trained DDA staff played an important role in establishing a relationship between BAJ and DDA, and it proved the importance of the training programme. As for planning of the training programs, the JICA Expert Team coordinates necessary administration such as getting request sheets or A2/A3 forms prior to official acceptance, as well as verifying ideas from JICA and discussing the selection of candidates and contents of the training programme with the DDA. Major fields of the C/P training programmes and the themes are shown in Table 2-4.

Table 2-4: Training Schedule and Topics (Draft)

Training Period	Leading Fields	Major Training Topics	Participants
The 2 <sup>nd</sup> Year The 3 <sup>rd</sup> Year	Rehabilitation of Wells	How to distinguish issues with wells, and appropriate methods for rehabilitation	1 persons /year (Total 2 persons)
	Repair of Equipment & Machinery of Existing Wells	Appropriate repair techniques for pumping-up pumps, peripherals, generators, etc.	1 persons /year (Total 2 persons)
	Operation & Maintenance of Water Supply Facilities	Case studies for water supply administration and community in Japan, etc.	1 persons /year (Total 2 persons)

**Approach 7:** Implement safe and smooth field activities, considering other important remarks

The JICA Expert Team needs to implement the work, considering coping strategies towards the following remarks.

**a. Implement the work effectively**

**a.1 Repair of Drilling Machines**

As indicated in R/D, out of the existing drilling machines which the Myanmar side prepared, it is concluded that two machines will change the models from TONE-TRD300 to TONE-TOP300. Procurement of the machines and a technician for maintenance will be dispatched separately by JICA. Although it is planned that the rehabilitation of other machines will be July 2007 (the 2<sup>nd</sup> Fiscal Year), the JICA Expert Team will monitor whether the model changed drilling machines will work without problems or not. In the event that any problems occur, the JICA Expert Team will report to JICA as soon as possible. The JICA Expert Team will make a plan of the availability of using all the drilling machines prior to designing the training plan for well drilling techniques, as well as considering the progress of changing the models of existing machines. In any event, because the number of available drilling machines is the key to effective implementation, the latter half of the 2<sup>nd</sup> Fiscal Year of the Project will be the period to start full-scale drilling of new wells.

**a.2 Travel Expenses for C/P**

When C/P make official trips as part of the Project activities, travel expenses within the jurisdiction of each DDA office and non-targeted townships, as well as travel expenses for participating in various workshops and training programmes from townships shall be paid by the Myanmar side.

**a.3 Project Meetings**

The JICA Expert Team will attend the meetings related to the Project in Japan and Myanmar, prepare and submit the proceedings and materials of the meetings, according to the instruction from JICA. The contents of reports and topics for discussions shall be clearly and briefly explained, utilizing visual materials in the meetings. Objectives and other details of major meetings are as follows.

Table 2-5: Contents of Meetings to be held in Myanmar

Title	Objectives	Contents	Participants	Frequency
Joint Coordinating Committee (JCC)	<ul style="list-style-type: none"> <li>• Discussing and decision making for policies, implementation, issues of the Project</li> <li>• Promoting cooperation between relevant organizations, discussing the progress of the Project</li> </ul>	<ul style="list-style-type: none"> <li>• Decisions related to basic policies, action plan, implementation of the project</li> <li>• Evaluation of the work plan and methods for technical support</li> <li>• Discussion and approval in case the relevant matters submitted by other organizations</li> </ul>	<ul style="list-style-type: none"> <li>• DDA HQ, Head of Township (incl. C/P)</li> <li>• Other Head of relevant organizations</li> <li>• JICA Expert Team members</li> <li>• JICA Myanmar office</li> <li>• Embassy of Japan in Myanmar</li> </ul>	<ul style="list-style-type: none"> <li>• Once during the 2<sup>nd</sup> Fiscal Year</li> <li>• 2 or 3 times during the 3<sup>rd</sup> and 4<sup>th</sup> Fiscal Year</li> <li>• Necessary time</li> </ul>



Title	Objectives	Contents	Participants	Frequency
Inception Report Seminar	<ul style="list-style-type: none"> <li>Explanation of the Project based on the Inception Report</li> </ul>	<ul style="list-style-type: none"> <li>Explanation by the JICA Expert Team</li> <li>Exchanging ideas</li> </ul>	<ul style="list-style-type: none"> <li>Donors</li> <li>DDA</li> </ul>	Beginning of the 1 <sup>st</sup> Fiscal Year

#### **a.4 Export Administration of the Equipment and Machinery used for the Work**

Out of the equipment and machinery to be used in the field, the JICA Expert Team will carry out export administration for the equipment and machinery which will not be carried back (to Japan) by the JICA Expert Team and need export bills. On the other hand, because the DDA need to get permission regarding import of the equipment from the Ministry of Progress of Border Areas and National Races and Development Affairs and Trade Council, the JICA Expert Team submits an invoice for delivering equipments and machinery 1-2 months prior to the delivery, and delivers them after the permit bill is confirmed.

#### **b. Sharing Information and Utilizing the Outputs with the *Development Study on Sustainable Agricultural and Rural Development for Poverty Reduction Programme in the Central Dry Zone of the Union of Myanmar***

The Development Study on Sustainable Agricultural and Rural Development for Poverty Reduction Programme in the Central Dry Zone of the Union of Myanmar (hereinafter referred to the Study) aims to formulate action plans for livelihood improvement of the people in the area, and develop the capacity of local communities including extension officers and others, throughout the process of the study and implementation of pilot projects. The Study is scheduled from December 2005 to October 2009 and the responsible organizations include the Department of Agricultural Planning, the Ministry of Agriculture and Irrigation as well as the Myanmar Agriculture Service. As the Study has already conducted the baseline survey and understood the current conditions of the villages, the JICA Expert Team avoids duplication of the baseline survey and utilizes useful outputs as reference materials.

#### **c. Security Management**

Security control during the field activities, especially traffic accidents, must be paid attention to. As for the security situation in Myanmar, sufficient information collection will be conducted from JICA Myanmar office and the Embassy of Japan in Myanmar. In order to ensure security during field activities, requests will be made for cooperation and coordination from the relevant government organizations. Communication will be maintained with the JICA Myanmar office. The communication structure for security management is shown in the figure after-mentioned.

### **2.3 Proposal for Project Activities**

Out of the operational remarks, the remarks which will be newly proposed as activities with DDA are as follows.

#### **a. Extension of maintenance/management activities in the pilot villages to other areas**

In the Project, the regional offices of DDA will monitor the villages after the facilities are completed, by facilitating water management committees in the villages. Dissemination of these Project outcomes to other townships will be considered, and the JICA Expert Team will

propose the following activities to put it into practice. The basis of those activities is that the outcomes of the pilot villages are passed onto other townships as experience.

- ◆ To make and distribute visual materials for a series of operation and maintenance activities, not only by video but also by DVD and VCD.
- ◆ To distribute a good practice collection book of operation and maintenance, which will enable other townships to implement them
- ◆ To construct a mobile workshop equipped with a chain saw and machinery/material by using a DDA vehicle, and the maintenance/monitoring section of DDA will demonstrate the work by gathering village leaders from three townships other than the pilot villages.

**b. Public relation activities**

In due course in implementing the Project activities, the JICA Expert Team will advertise the significance of the cooperation, contents of the activities and the outputs to all strata of the nation appropriately. Public relations of the Project output to villagers will also be considered. Furthermore, a project webpage (Japanese, English) will be launched on the JICA technical cooperation website, and the progress and outputs of the Project activities will be publicized. Other ideas for public relations will be considered as follows.

- ◆ In the technical transfer seminar and final seminar, mentioned earlier, the Project will invite mass media including newspaper and television broadcasters, and appeal the outcome of water supply and improved situation of villagers by the Project to all citizens in Myanmar. The planned seminars for publicity are shown in Table 2-6. In case of difficulty to establish a website for the Project in Myanmar due to the regulations of communication and correspondence, relevant materials will be distributed as CDs.

Table 2-6: Planned Seminar for Publicity

Name	Objectives	Contents	Participants	Frequency
Technology Transfer Seminar	<ul style="list-style-type: none"> <li>• Localization of technology to trainees and villagers of the pilot villages</li> <li>• Dissemination of the project to surrounding areas of DDA and villagers</li> </ul>	<ul style="list-style-type: none"> <li>• Explanation of the Project</li> <li>• Presentation on the outcomes by the technology transferred trainees</li> <li>• (to be considered) sub-committees for each field</li> <li>• questions and answers</li> </ul>	<ul style="list-style-type: none"> <li>• Representative of DDA HQ</li> <li>• Targeted DDA staff</li> <li>• Villagers of the pilot villages</li> <li>• DDA staff and villagers of surrounding areas</li> <li>• JICA Expert Team</li> <li>• Invited mass media such as newspaper and TV broadcasters</li> </ul>	Once a year from the 2 <sup>nd</sup> to the 4 <sup>th</sup> year
Final Seminar	<ul style="list-style-type: none"> <li>• Sharing the outputs of the Project with other organizations</li> <li>• Summarization of the results of technology transfer</li> </ul>	<ul style="list-style-type: none"> <li>• Brief explanation of the results of activities</li> <li>• Presentation on technological outputs/issues and</li> </ul>	<ul style="list-style-type: none"> <li>• Ministry of Agriculture and Irrigation</li> <li>• Donor agencies (mainly UNICEF, UNDP)</li> </ul>	Once in the 4 <sup>th</sup> year

Name	Objectives	Contents	Participants	Frequency
	<ul style="list-style-type: none"> <li>• Dissemination of the results of the Project and dissemination of achievements to other organizations</li> </ul>	<ul style="list-style-type: none"> <li>good practice collections by the trainees</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Other stakeholders</li> <li>• Representative of DDA HQ</li> <li>• Targeted DDA staff</li> <li>• JICA Expert Team</li> </ul>	

- ◆ A newsletter for villagers will be published twice a year in English and Burmese, and not only the progress of the Project, but also information related to water, will be provided. Although the newsletter will be distributed to not only the villagers but also other DDA townships, the subscribers will be determined through discussions with DDA.
- ◆ Using the good practice collection, publication of a booklet about wells and professional information related water will be considered. This is because journals are not circulated in Myanmar, but the subscription of the booklet will be also considered through discussion with DDA.
- ◆ Effective materials for public relations such as calendar will be determined.

### 3 Methods of Activities

#### 3.1 Methods of Activities

##### The 1<sup>st</sup> Fiscal Year: Beginning of November 2006 to End of March 2007

##### a. The 1<sup>st</sup> Preparatory work in Japan

##### a.1 Preparation of Inception Report

Reviewing the available materials and information in Japan, and considering the basic policy, methods (including methodology of technology transfer) and contents of activities, implementing system as well as the schedule, the JICA Expert Team will prepare the Inception Report (Draft). For preparation of the Inception Report, collected materials such as the completed master plans of the JICA development study, “A Ten Year Project for Rural Water Supply by Development Committees of Sagaing, Magway and Mandalay Divisions”, and preliminary evaluation study reports will be utilized for reference.

##### b. The 1<sup>st</sup> Field Activities

##### b.1 Explanation, Discussion and Seminar on Inception Report (draft)

The Inception Report (draft) will be explained to the Government of Myanmar and Joint Coordination Committee (JCC), and the Plan of Operation (PO) will be discussed for consensus. Furthermore, a seminar, shown in Table 3-1 will be held targeting DDA and Donor agencies. The JICA Expert Team will prepare the Inception Report (Final) as a result of discussions in the seminar.

Table 3-1: Seminar on the Inception Report

Items	Seminar on the Inception Report
Objectives	• Announcement of the Project
Targets	• DDA staff • Donor agencies (UNICEF, UNDP, NGO, etc.) • Representatives from Ministry of Agriculture and Irrigation, Ministry of Construction, Ministry of Energy, and other ministries related to water
Venue & Time	• Yangon or Nyaung_U (to be decided by discussion with Myanmar side) • Once in January 2007
No. of Participants	• 50 participants
Presenter	• JICA Expert Team, DDA
Contents	• Objectives, outputs, and activities of the Project • Methods of technology transfer in the Project

##### b.2 Revision of Project Design Matrix (PDM) and Plan of Operation (PO)

Based on the above examination of outputs and activities of the Project during discussion of the Inception Report, the feasibility of PDM and PO will be examined by reconfirming the information related to the former achievements and the action plan. In the case that necessity for revisions of the PDM and PO is recognized, a revised draft will be submitted to JICA. In the case that JICA confirms the necessity of revision; the JICA Expert Team shall discuss with DDA and revise them based upon the agreement. At this stage, the contents which the JICA Expert Team considers to be revised are as shown in Approach 1 of the basic policy.

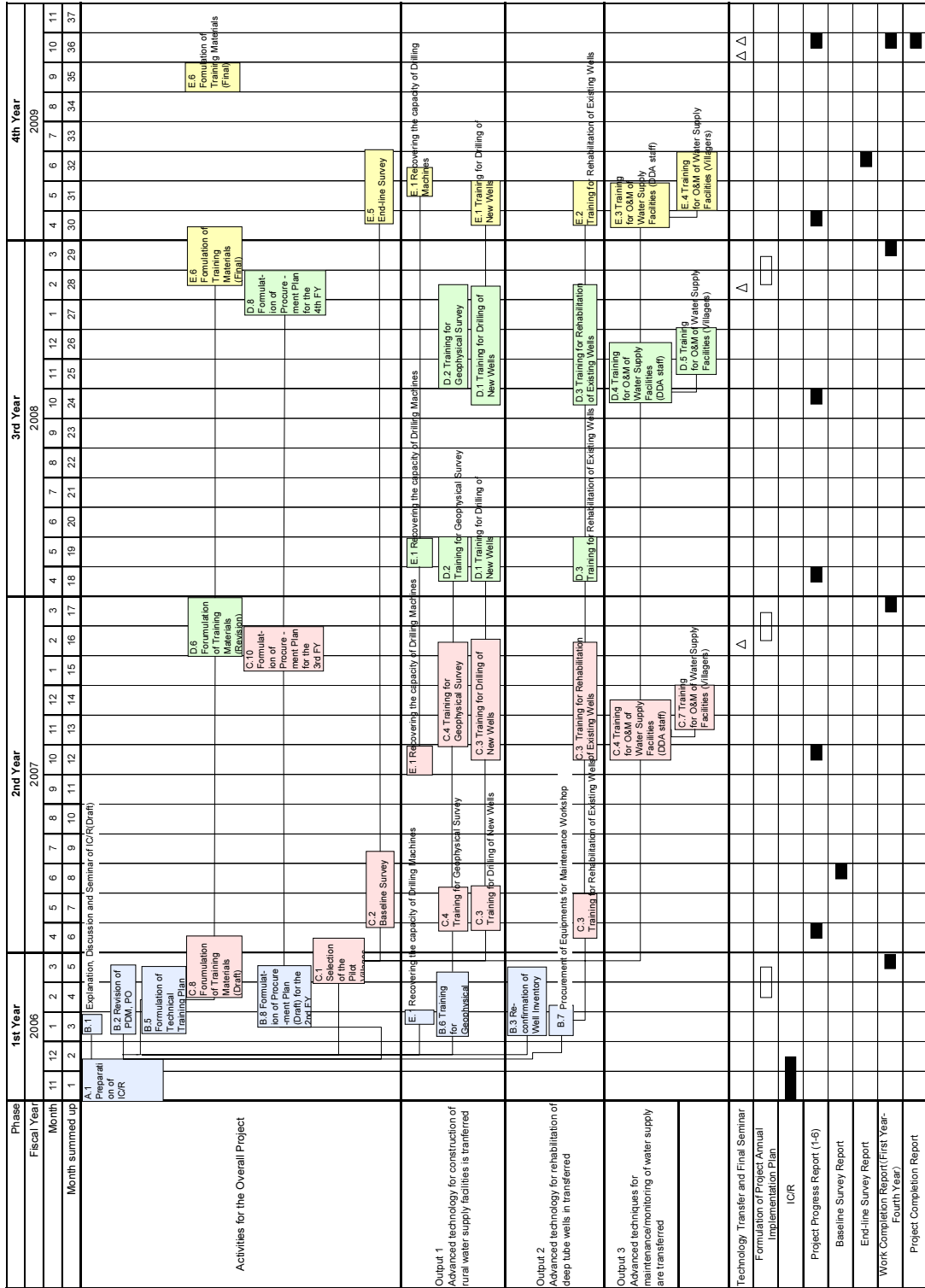


Figure 3-1: Flowchart for the Project on Rural Water Supply in the Central Dry Zone in Myanmar

### b.3 Reconfirmation of the Current Status of Well Inventory necessary for Well Rehabilitation (Monitoring)

DDA has established a database of existing wells, collaborating with a Japanese expert during the JICA development study (2002-2003), and furthermore it has developed it as a nation-wide well inventory database. However, the following issues were reported at the preliminary evaluation study mission.

- (1) Currently DDA has only two engineers; therefore, additional data input and update for 2005, supposed to be done annually, has not been implemented. The number of staff needs to be increased.
- (2) DDA has been unable to update necessary software for the database after the completion of the JICA development study. Furthermore, it is difficult to get the latest computers, although the capacity of the computer needs twice as much data updating as current computers.
- (3) Due to poor coordination with another database owned by WRUD, DDA has been unable to obtain the data of the wells constructed by WRUD other than 11 townships targeted by the JICA development study. Administrative transfer on the rural water supply services is not carried out smoothly in the field.

With the hydrogeologist of the JICA Expert Team taking a leading role, in regard to the Nyaung\_U Township targeted for well rehabilitation, (1) reconfirmation of the current situation regarding well inventory management will be conducted, and (2) proposals for improving management, and discussions for selecting the pilot villages for well rehabilitations after the 2<sup>nd</sup> fiscal year of the Project, will be made with the DDA side. For selection of the pilot villages, monitoring records and results of diagnosing survey of the existing wells, which were conducted by BAJ, shall be fully utilized (refer to Table 3-2 and Box 1 on the next page). Furthermore, the candidate villages for groundwater development and drilling of new wells to be conducted in the Project will be listed and added to the information of existing wells, after other water resource information and hydrological information is considered and comprehensively analyzed.

Table 3-2 Examples of the Well Inventory

Sr. No.	Location Village	Household	Population	Borehole (ft.)	Pipe (feet)	Casing (feet)	Screen (feet)	SWL (feet)	DWI (ft)	Yield (gph)	Duration Time	Rig	Discharge pipe (gph)	Pump	Engine	Installation Date	Tank Cap. (gals)	P. House Duration
1	Nyaung To (1)	324	1741	3.0	240 6"ø	160	60 40-60 160-220	44	104	750	7.1- 8.3.00	DR-001	200 900 2"ø	Submersible Shakti India F7 + 12 stages 2HP		10.2.02	3000	1.5- 13.5.00
2	Taung Zin Hospital (3)	2870	12921	630	598 6"ø	548	40 548-588	273	331	3000	3.3- 18.06.00	DRF-006	320 1900 2"ø	Submersible CORA 7/25 20 KW Gen	2C Diesel	30.12.00		
3	Kone Tan Gyi (4)	196	954	450	380 6"ø	320	40 320-360	32	75	900	14.03- 14.05.00	DR-001	190 1800 2"ø	Submersible CORA 7/15	C.C. 25HP	24.5.01	5500	4.1- 2.2.01
4	Kone Shay (7)	134	738	690	650 6"ø	580	60 580-640	455	470	2000	31.08- 30.11.00	DR-006	503 2400 2"ø	Submersible UQD 152/20	Taro 18 HP 20 KW Gen	19.2.02	7500	19.11- 23.03.01
5	Khet Lan Kan (8)	206	1376	520	502 6"ø	450	40 450-490	280	326	2000	15.10- 15.11.00	DRF-006	340 1800 2"ø	Submersible CORA 7/25	C.C. 25HP 20 KW Gen	23.2.01	5000	26.3- 25.04.01
6	Ta Ma Kha (9)	209	1134	380	574 6"ø	505	59 505-564	320		2000	8.12.00 15.1.01	DRF-006	430 1650 2"ø	Submersible CORA 7/25	C.C. 25HP 20 KW Gen	25.2.01	3000	21.3- 07.04.01
7	Gon Taw (12)	43	280	715	704 6"ø	634	60 634-694	535		2000	1.5- 1.6.01	DR-006	580 1800 2"ø	Submersible CORA 7/35	Taro 19 HP	12.11.01	3000	19.11- 12.12.01
8	Nyaung Bin Kan (14)	287	1467	695	680 6"ø	610	60 610-670	358	450	10000	6.6- 1.7.01	DR-006	420 1800 2"ø	Submersible CORA 7/25	J D 25 HP	25.7.01	5000	10.8- 26.8.01
9	Nai Kyo Aung (16)	137	700	245	220 4"ø	170	40 170-210	110	120	720	19.7- 19.9.01	DRM-001	150 1800 2"ø	Submersible Shakti India F7 + 17 stages 3HP	J M 18 HP	14.10.01	5000	23.11- 15.12.01
10	Thant Shin Kan (17)	37	170	360	550 6"ø	480	60 480-540	340	365	5000	6.7- 8.8.01	DR-006	410 1800 2"ø	Submersible CORA 7/25	J D 25 HP	31.8.01	3000	30.8- 30.9.01
11	Kan Zauht (18)	250	1300	600	570 6"ø	500	60 500-560	330	390	2500	11.8- 17.9.01	DR-006	423 1500 2"ø	Submersible CORA 7/25	J D 25 HP	7.10.01	5000	11.10- 5.11.01
12	Ka Kyai (19)	155	1200	740	735 6"ø	670	60 670-730	535		2000	23.9- 19.10.01	DR-006	603 1700 2"ø	Submersible CORA 7C/35	TARO (TW) 19 HP	29.12.01	5000	28.1- 18.2.02
13	Kyo Pin Thar (West) (22)	98	554	735	720 6"ø	650	60 650-710	605	613	2000	23.10- 30.11.01	DR-006	630 1600 2"ø	Submersible CORA 7C/35	J D 25 HP	17.3.02	5000	20.3- 12.4.02
14	Kan Taw (24)	105	371	320	280 4"ø	210	60 GI 210-270	40	70	1000	25.11- 7.2.02	DRM-001	170 1800 2"ø	Submersible Shakti India F7 + 16 stages 3HP	J D 20-22HP	12.3.02	5000	17.3- 2.4.02
15	Da Hat Kan (25)	75	400	860	850 6"ø	800	40 800-840	480	530	4000	3.12- 4.2.02	DR-006	590 1800 2"ø	Submersible	TARO (TW) 19 HP		5000	14.3- 2.4.02
16	Kone Ywa (26)	137	877	680	640 4"ø	550	80 550-630	232		5000	22.3- 20.4.01	DR-006	260 2000 2"ø	Submersible CORA12A/14	25 HP CC	27.4.01 21.5.01	5000	14.6- 5.7.01

In the case that it is recognized that the database used by DDA can not be further developed owing to the software or the hardware (equipment), a database expert might be considered as a project input from the 2<sup>nd</sup> fiscal year.

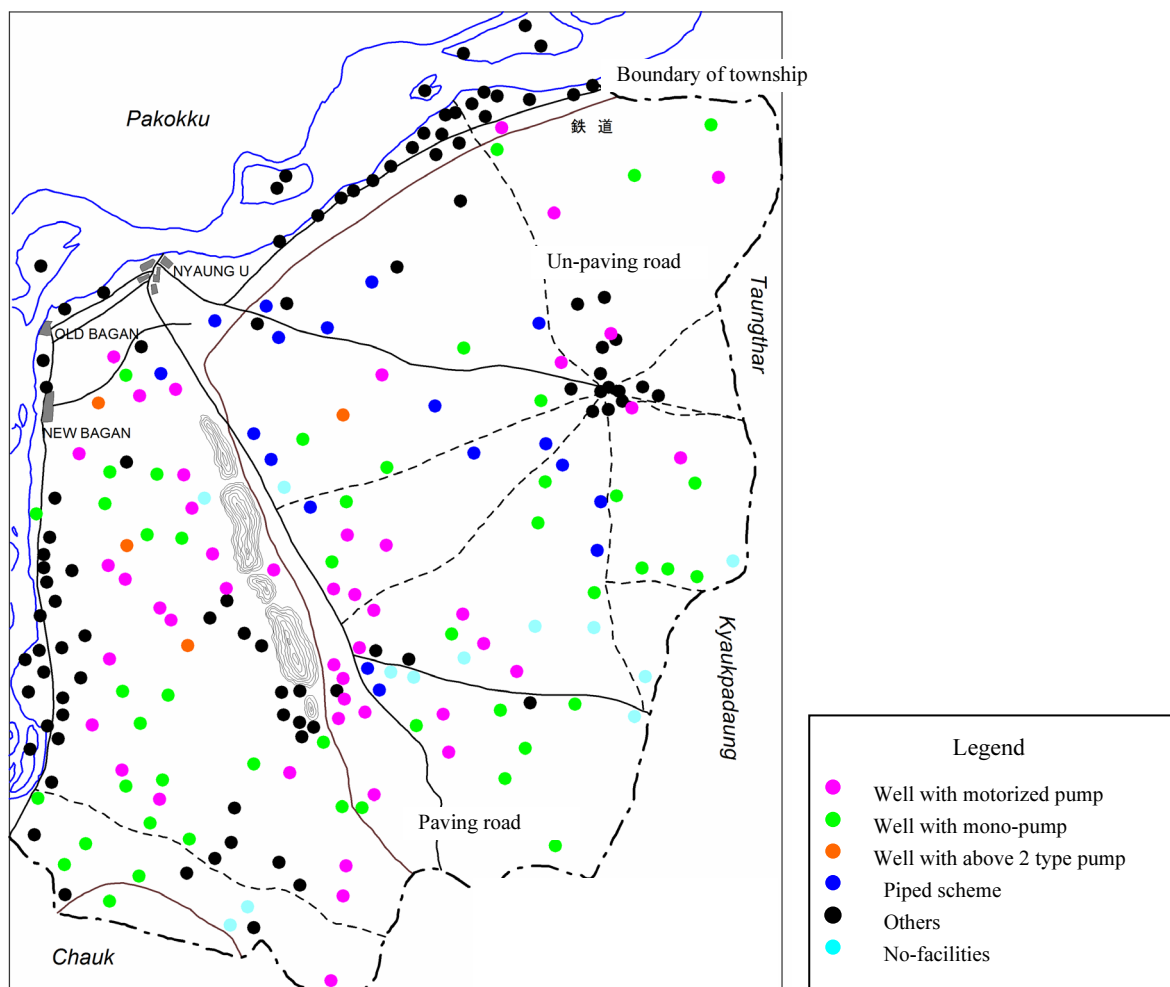


Figure 3-2: Water Resource Conditions of the Villages in the Nyaung\_U Township

**Box 1**

BAJ, one of the JICA Expert Team members, has completed a well diagnosis survey of the 55 surrounding villages of the Nyaung\_U Township including 33 villages within the Township in the fiscal year of 2005. The results of well diagnosis are as follows. ( ) is numbers of villages

**A: currently non-functional wells**

- 1: generator engines are non-functional due to being irreparable (2)
- 2: pumps are non-functional due to sand swallow (1)
- 3: pumping water lines have fallen into the wells (1)
- 4: non-functional due to trouble with pumping-up pumps (2)

**B: functional wells with some trouble**

- 1: unstable wells due to the low capacity of the engines for pumping-up pumps (5)
- 2: rapid water decreasing due to trouble with pumping-up pumps (6)
- 3: moderate water decreasing due to stacked scale inside pumping-up pumps or screen part (7)
- 4: insufficient volume of water due to insufficient pumping-up capacity (1)

<p>C: irreparable trouble occurred                      -1: deep tube wells are necessary (5)                      -2: low concerns by villagers in spite of the trouble (1)                      -3: poor water quality and no possibility of using the water even after rehabilitation (1)                      -4: private or semi-private wells, which are not managed as public wells in spite of the trouble (2)</p> <p>D: maintained and basically functioning wells                      -1: stable wells without trouble (9)                      -2: rehabilitated wells by BAJ (10)                      -3: rehabilitated wells by villagers (2)</p>
--

#### **b.4 Recovery of the Capacity of Drilling Machines necessary for Deep Tube Well Drilling**

Out of the existing drilling machines which JICA has granted in the past, it is planned that two rotary type machines will be changed to the top type models and used in the Project. Procurement of the machines and a technician for foundation will be dispatched separately by JICA. The JICA Expert Team will monitor whether the changed drilling machines models will work without problems or not. In the event that any problems occur, the JICA Expert Team will report them to JICA as soon as possible.

The schedule of changing drilling machine models is shown in Table 3-3. Although substantial activities relating to the drilling machines start from the 2<sup>nd</sup> fiscal year, in regard to the other unchanged existing drilling machines (e.g. TONE TOP-500), the JICA Expert Team shall diagnose them during the 1<sup>st</sup> fiscal year, and report to JICA about the quantity of necessary spare parts and accessories for those machines.

Table 3-3: Action Plan for Changing Drilling Machine Model by JICA

Model Changing Activities	Schedule (tentative)
Procurement of machinery and material	Until March 2007
Shipment (Yokohama-Yangon)	Until September 2007
Rehabilitation	Until October 2007

#### **b.5 Preparing for Technical Training Plan (Draft)**

There are many training programmes and seminars planned in the Project. The JICA Expert Team shall design and submit a technical training plan (draft). Then, the plan shall be discussed and agreed with DDA. For implementation of the technical training programmes, it is considered that the training programmes shall be systemically linked to the C/P training programme in Japan. A flow of the training programme is based on the flowchart shown in .

In particular, when the issues based on good practices and lessons in the past experiences are analyzed, any causes for the issues shall be categorized as below, and it will be clarified whether the necessary future technical support involves “human” or “material” matters. If machinery and materials are particularly the issues, the JICA Expert Team will consult with JICA as well as the Myanmar side.



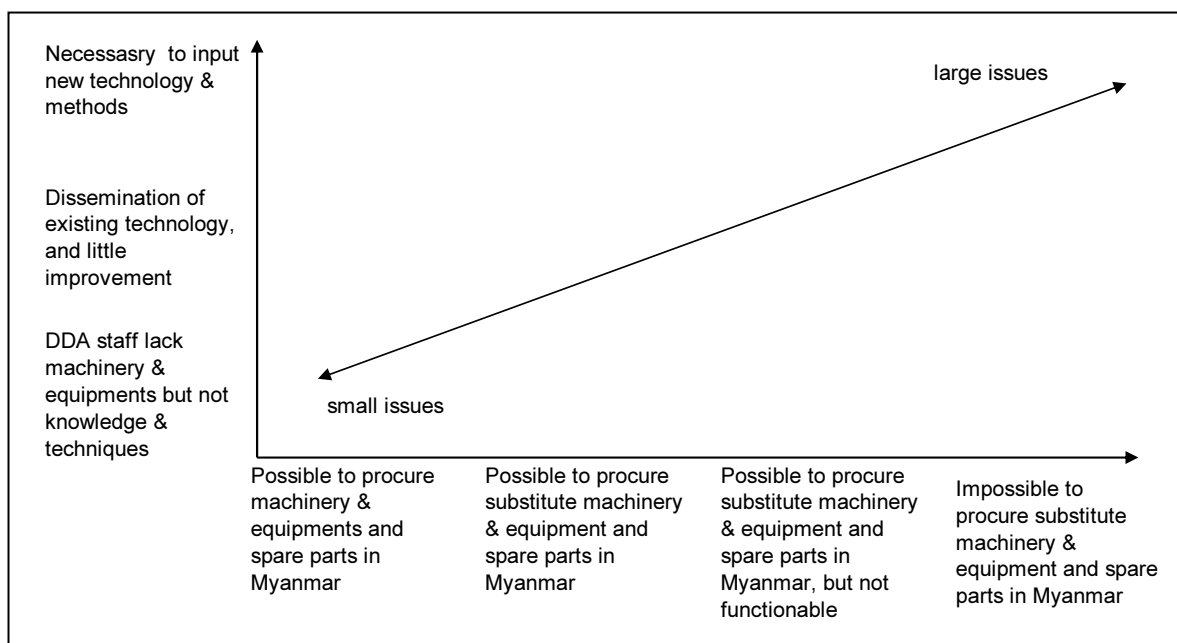


Figure 3-3: Matrix of Issues

Table 3-4: Technical Training Plan (Draft)

Training		1 <sup>st</sup> FY	2 <sup>nd</sup> FY	3 <sup>rd</sup> FY	4 <sup>th</sup> FY
<b>Drilling of New Wells</b>	Target		Understanding the general theory of wells, and causes of faulty wells in the past	Reducing accidents during drilling, and standardization of water supply facilities	Establishing sustainable rural water supply administration structure
	Contents of Lecture	-	<ul style="list-style-type: none"> <li>case study of faulty wells in the past</li> <li>well drilling techniques</li> <li>structure of well drilling techniques and maintenance</li> <li>planning water supply facilities, and designing wells</li> </ul>	<ul style="list-style-type: none"> <li>constructive accidents during 2<sup>nd</sup> year's drilling work and the measures for dealing with them</li> <li>mechanic accidents during 2<sup>nd</sup> year's drilling work and the measures for dealing with them</li> <li>planning of water supply facilities, and formulating rules for planning</li> </ul>	Presentation by DDA staffs <ul style="list-style-type: none"> <li>constructive accidents during drilling work in the past and the measures for dealing with them</li> <li>mechanic accidents during drilling work in the past and the measures for dealing with them</li> <li>Reviews of water supply planning cases in the past (incl. practices)</li> </ul>
	Contents of OJT		<ul style="list-style-type: none"> <li>well drilling techniques, how to avoid accidents during drilling, and how to respond the accidents (esp. lost circulation)</li> <li>structure of TOP-300</li> <li>daily maintenance periodical maintenance, how to</li> </ul>	<ul style="list-style-type: none"> <li>well drilling techniques, how to avoid accidents during drilling, and how to respond the accidents</li> <li>daily maintenance, periodical maintenance, how to respond to trouble</li> <li>preliminary field</li> </ul>	Presentation only by DDA staff <ul style="list-style-type: none"> <li>well drilling techniques, how to avoid accidents during drilling, and how to respond the accidents</li> <li>daily maintenance, periodical maintenance, how to respond to trouble</li> </ul>

Training		1 <sup>st</sup> FY	2 <sup>nd</sup> FY	3 <sup>rd</sup> FY	4 <sup>th</sup> FY
			cope with trouble • preliminary field reconnaissance, planning water supply facilities, designing wells • (drilling of new wells: 9 villages)	reconnaissance, water supply facilities planning, designing wells • (drilling of new wells: 11 villages)	• preliminary field reconnaissance, planning of water supply facilities, designing wells • (pilot villages for OJT are selected according to the results until 3 <sup>rd</sup> year)
<b>Geophysical Survey</b> (Electrical Sounding, Electro-magnetic Survey, Borehole Logging Test)	Target	Understanding the hydrogeological structure for wide area and issues with geophysical survey, and selection of candidate geophysical survey points	Advancing analysis methods of geophysical survey	Self-reliable field exploration and analysis skills, and sustainable groundwater development	To be determined according to the results until 3 <sup>rd</sup> year
	Contents of Lecture	• basics of hydrogeology • hydrogeological structure analysis necessary before geophysical survey • machinery and material check & repair • presentation by DDA staff about failure and succeeded samples from the past geophysical survey	• Explanation of analysis methods • Exercise for analysis using previously measured data • comparison of the results of the analysis exercise and results of test well drilling	• examination of issues clarified in the 2 <sup>nd</sup> year, by DDA staff • basics of management for sustainable groundwater use	
	Contents of OJT	• verification of the hydrogeological structure analysis learned by lecture • selection of candidate geophysical survey points	• measuring exercise • analysis exercise • comparing with results of test well drilling • hydrogeological structure analysis for each village • (electrical sounding /electro- magnetic survey: 11 villages; borehole logging test: 9 villages)	• measuring exercise • analysis exercise • comparing with results of test well drilling • hydrogeological structure analysis for each village • hydrogeological structure analysis for wide area • (electrical sounding /electro- magnetic survey: 11 villages; borehole logging test: 9 villages)	
<b>Rehabilitation of Existing Wells</b>	Target	-	Understanding major causes of trouble related to wells and understanding rehabilitation methods	Making a rehabilitation plan for existing wells and rehabilitation	Establishment of sustainable rural water supply administration
	Contents of Lecture		• case study of well rehabilitation in the past • understanding the mechanisms of trouble occurring with existing wells and outlines of rehabilitation methods	• case study of rehabilitation in the 2 <sup>nd</sup> year • decision of rehabilitation plan for existing water supply facilities	• formulation of the rehabilitation plan for existing water supply facilities only by DDA staff

Training		1 <sup>st</sup> FY	2 <sup>nd</sup> FY	3 <sup>rd</sup> FY	4 <sup>th</sup> FY
			<ul style="list-style-type: none"> <li>understanding mechanism mechanic trouble occurring and outlines of repair methods</li> <li>outline of monitoring conditions of existing water supply facilities</li> </ul>		
	Contents of OJT		<ul style="list-style-type: none"> <li>investigating methods for trouble with existing wells, and countermeasures</li> <li>investigating methods for trouble with well equipment, and countermeasures</li> <li>investigating methods for conditions of existing water supply facilities and rehabilitation plan</li> <li>(rehabilitation of existing wells: 20 villages)</li> </ul>	<ul style="list-style-type: none"> <li>repair methods for trouble with constructed equipments</li> <li>rehabilitation methods of existing wells</li> <li>(rehabilitation of existing wells: 20 villages<sup>9</sup>)</li> </ul>	<ul style="list-style-type: none"> <li>repair work according to a repair work plan formulated by DDA staff</li> <li>(to be considered by the results until the 3<sup>rd</sup> year)</li> </ul>
<b>Operation &amp; Maintenance of Water Supply Facilities (DDA Staff)</b>	Target		Formulation of operation & maintenance manuals, Provision of technical support to water management committee by DDA staff	Revision of operation & maintenance manuals, better technical support to water management committee by DDA staff, and improvement of self-reliability through cooperation among DDA staff	Revision of operation & maintenance manuals, better technical support to water management committee by DDA staff, and improvement of self-reliability through cooperation among DDA staff
	Contents of Lecture	-	<ul style="list-style-type: none"> <li>establishment of, structure and roles of water management committee</li> <li>knowledge of water fee and status of water management</li> <li>important points during geophysical survey and well drilling</li> <li>how to use pumping-up pumps, and motor driven equipments</li> <li>how to promote community participation for operation and maintenance and reservoir facility</li> </ul>	<ul style="list-style-type: none"> <li>establishment of, structure and roles of water management committee</li> <li>knowledge of water fee and status of water management</li> <li>important points during geophysical survey and well drilling</li> <li>how to use pumping-up pumps, and motor driven equipments</li> <li>how to promote community participation for operation and maintenance and reservoir facility</li> <li>(other experiences in the 2<sup>nd</sup> year)</li> </ul>	<ul style="list-style-type: none"> <li>establishment of, structure and roles of water management committee</li> <li>knowledge of water fee and status of water management</li> <li>important points during geophysical survey and well drilling</li> <li>how to use pumping-up pumps, and motor driven equipments</li> <li>how to promote community participation for operation and maintenance and reservoir facility</li> <li>(other experiences in the 3<sup>rd</sup> year)</li> </ul>
	Contents of OJT		<ul style="list-style-type: none"> <li>monitoring activities by water management committee</li> <li>contents of rehabilitation and</li> </ul>	<ul style="list-style-type: none"> <li>monitoring activities by water management committee</li> <li>contents of rehabilitation and</li> </ul>	<ul style="list-style-type: none"> <li>monitoring activities by water management committee</li> <li>contents of rehabilitation and</li> </ul>

Training		1 <sup>st</sup> FY	2 <sup>nd</sup> FY	3 <sup>rd</sup> FY	4 <sup>th</sup> FY
			implementation <ul style="list-style-type: none"> <li>operation &amp; maintenance after repair</li> <li>establishment of repair system</li> </ul>	implementation <ul style="list-style-type: none"> <li>operation &amp; maintenance after repair</li> <li>establishment of repair system</li> <li>(other experiences in the 2<sup>nd</sup> year)</li> </ul>	implementation <ul style="list-style-type: none"> <li>operation &amp; maintenance after repair</li> <li>establishment of repair system</li> <li>(other experiences in the 3<sup>rd</sup> year)</li> </ul>
<b>Operation &amp; Maintenance of Water Supply Facilities (Villagers)</b>	Target	-	Establishment of water management committee in the village through training program, if it exists, the functions become active	Establishment of water management committee in the village through training program, if it exists, the functions become active	Establishment of water management committee in the village through training program, if it exists, the functions become active
	Contents of Lecture		<ul style="list-style-type: none"> <li>establishment of, structure and roles of water management committee</li> <li>knowledge of water fee and status of water management</li> <li>important points during geophysical survey and well drilling</li> <li>how to use pumping-up pumps, and motor driven equipments</li> <li>operation and maintenance</li> <li>reservoir facility</li> <li>use of water management committee</li> <li>selection of caretaker</li> <li>etc.</li> </ul>	<ul style="list-style-type: none"> <li>establishment of, structure and roles of water management committee</li> <li>knowledge of water fee and status of water management</li> <li>important points during geophysical survey and well drilling</li> <li>how to use pumping-up pumps, and motor driven equipments</li> <li>operation and maintenance</li> <li>reservoir facility</li> <li>use of water management committee</li> <li>selection of caretaker</li> <li>etc.</li> </ul>	<ul style="list-style-type: none"> <li>establishment of, structure and roles of water management committee</li> <li>knowledge of water fee and status of water management</li> <li>important points during geophysical survey and well drilling</li> <li>how to use pumping-up pumps, and motor driven equipments</li> <li>operation and maintenance</li> <li>reservoir facility</li> <li>use of water management committee</li> <li>selection of caretaker</li> <li>etc.</li> </ul>
	Contents of OJT		<ul style="list-style-type: none"> <li>Report of activities of water management committee</li> <li>contents of rehabilitation and implementation</li> <li>operation &amp; maintenance after repair</li> <li>establishment of repair system</li> </ul>	<ul style="list-style-type: none"> <li>Report of activities of water management committee</li> <li>contents of rehabilitation and implementation</li> <li>operation &amp; maintenance after repair</li> <li>establishment of repair system</li> </ul>	<ul style="list-style-type: none"> <li>Report of activities of water management committee</li> <li>contents of rehabilitation and implementation</li> <li>operation &amp; maintenance after repair</li> <li>establishment of repair system</li> </ul>

Hydrogeology and groundwater development/management, related to the selection of groundwater development points, shall be included in the “Training Programme for Geophysical Survey”. The “Training programme for Drilling of New Wells”, shall include the foundation of water supply facilities.

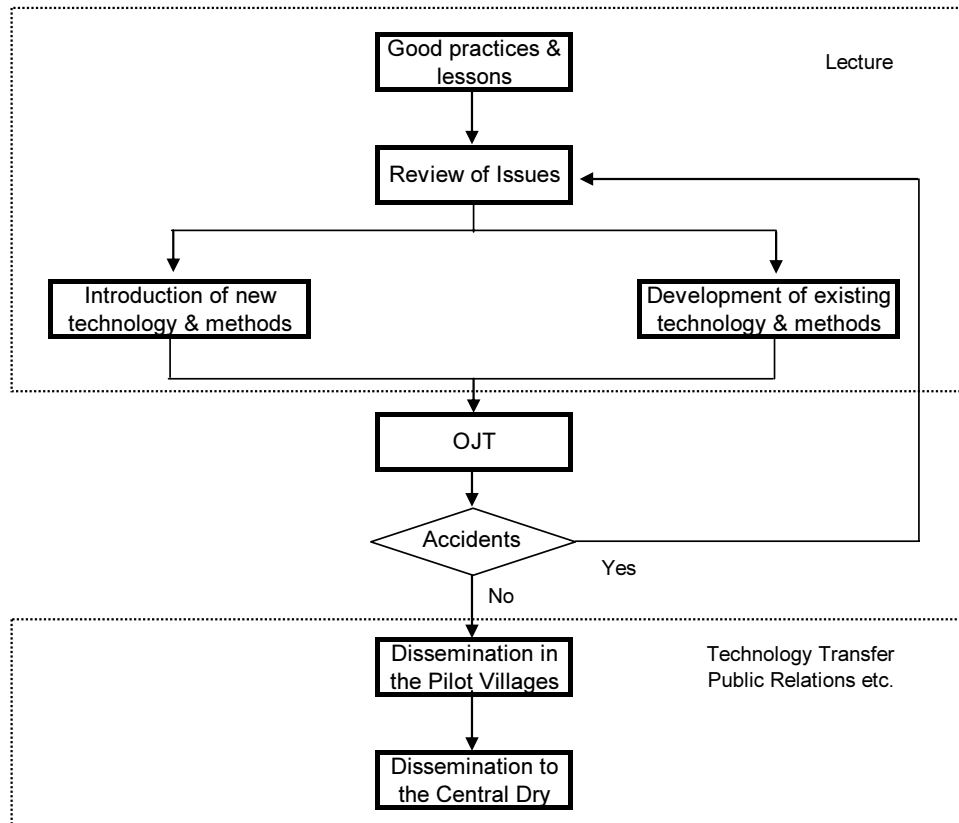


Figure 3-4: Flow of Technical Training Programme

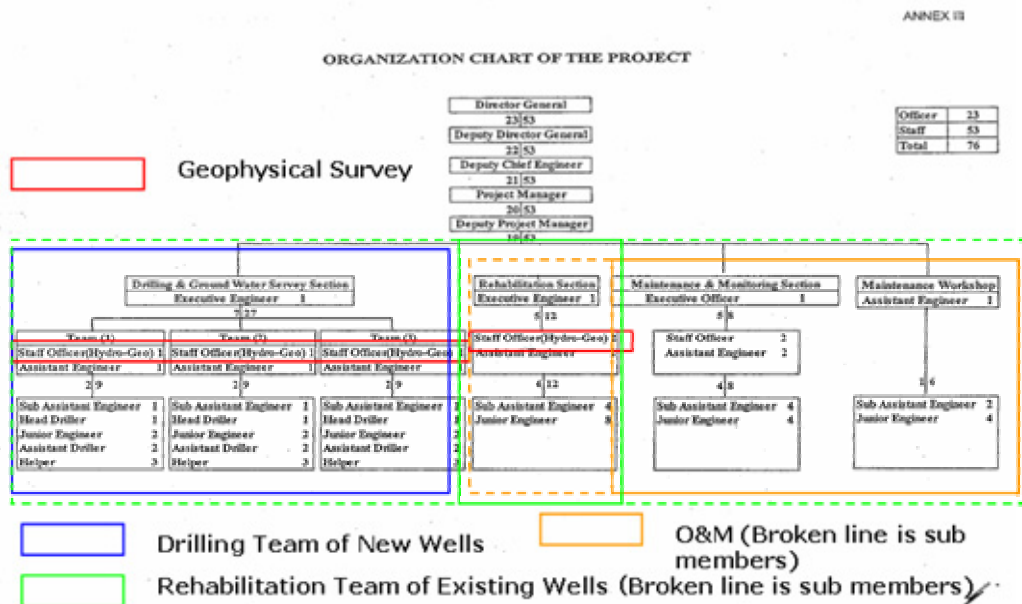


Figure 3-5: Major Target Trainees (DDA staff)

## b.6 Training for Geophysical Survey

As planned in section b.5, a training programme for geophysical survey (electric sounding, electromagnetic survey and borehole logging test) will be carried out, mainly targeting the hydrogeological engineers of DDA (referred to Figure 3-5). A tentative training plan is shown in Table 3-5. The training programme shall be conducted, using two methods such as lectures for learning theory and OJT for practice.

The main target of the training in the 1<sup>st</sup> year is “to understand the hydrogeological structure for wide area and issues with geophysical survey, and selection of candidate geophysical survey points”.

The following points shall be paid attention to during implementation of the programme.

- ①. In order to implement the training programme effectively, lectures must be provided prior to the OJT in the field.
- ②. As for implementation of the training programme, the needs of DDA shall be carefully taken into consideration.
- ③. Issues and improvement points must be compiled after the training programmes, and given as feedback to the following training programmes in the 2<sup>nd</sup> and 3<sup>rd</sup> year, as training materials.

During the preliminary evaluation missions, it is recognized that a shortage of spare parts of machines for survey is one of the issues. As mentioned later (b.8), the JICA Expert Team will reconfirm the existing conditions of machinery and materials relevant to geophysical survey, owned by DDA, and propose the equipment, which will be necessary to the future training programmes, to JICA.

Table 3-5: A Draft Training Plan for Geophysical Survey (1<sup>st</sup> year)

Items	Training for Geophysical Survey (1 <sup>st</sup> year)
Target for the 1 <sup>st</sup> year	Understanding the hydrogeological structure for wide area and issues with geophysical survey (electrical sounding, electro-magnetic), and selection of candidate geophysical survey points
<b>Indoor Lecture &amp; Exercise</b>	
Aim	<ul style="list-style-type: none"> <li>• To understand analysis methods</li> <li>• To apply results of analysis</li> </ul>
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung_U, Kyaukpadaung, Chauk Township</li> <li>• Once in January, 2007</li> </ul>
Planned No. of Trainees	• Approx. 5-8
Lecturer	• JICA Expert Team (Geophysical Survey, Hydrologist), DDA staff
Contents	<ul style="list-style-type: none"> <li>• Basics of hydrogeology (Hydrologist)</li> <li>• Hydrogeological structure analysis necessary before geophysical survey (Hydrologist)</li> <li>• Machinery and material check &amp; repair (DDA staff, Geophysical Survey)</li> <li>• Presentation by DDA staff about failure and succeeded samples from the past geophysical survey (DDA staff, Geophysical Survey)</li> </ul>
Necessary machinery & materials	• Text, PC, Software for data analysis
OJT	

Items	Training for Geophysical Survey (1 <sup>st</sup> year)
Aim	• To practice learned techniques by the indoor lecture and exercise in the survey filed
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	• Pilot villages for drilling of new wells (20 villages) • Jan-Mar 2007
Planned No. of Trainees	• Approx. 5-8
Lecturer	• JICA Expert Team (Geophysical Survey, Hydrologist), DDA staff
Contents	• Verification of the hydrogeological structure analysis learned by lecture (Hydrogeologist) • Selection of candidate geophysical survey points (Geophysical Survey, Hydrologist)
Necessary machinery & materials	• Results of data analysis in the lecture and exercise

### b.7 Procurement of necessary equipments and machinery necessary for a maintenance workshop

As shown in Table 3-6, a list for procurement of the equipment and machinery will be made between the Myanmar side and JICA. The JICA Expert Team will procure the equipment and machinery for the maintenance workshop. The details of the list are as shown in section 3.7.

Table 3-6: List of Machine Tools to be procured for Maintenance Workshop

Items	Purpose	To be prepared by DDA	To be prepared by JICA
1. Lathe machine	Fabrication of metal: Shaping and thread -cutting		○
2. AC Arc welding machine	Welding metal		○
3. Gas welding machine	Welding and cutting metal		○
4. Drilling machine	Drilling metal		○
5. High speed disk cutter	Cutting metal		○
6. Double head pedestal grinder	Grinding metal		○
7. Air compressor	Air wash	○	
8. Bench vise	Holding objects	○	
9. Work bench	Metal working table	○	
10. Electric tools	Drilling, grinder, etc.		○
11. Pump fishing tools	Fishing pump		○
12. Hand tools	File, wrench, screw drier, etc.	○	
13. Measuring instruments	Vanier, caliper, micro meter, circuit tester, etc.		○
14. Automotive lubrication tools	Hand grease gun, oil syringe, etc.	○	
15. Automotive service tools	Diesel nozzle tester, compression gage, etc.	○	
16. Movable engine/pump crane			○
17. High pressure cleaner	Cleaning workshop		○
18. Diesel engine generator	Power supply in emergency		○
19. Pipe threading/cutting machine	Treading pipe		○
20. Hydraulic garage jack	Jacking up heavy equipment		○

### **b.8 Formulation of Facility Procurement Plan (Draft) for the 2<sup>nd</sup> Fiscal Year**

The JICA Expert Team will reconfirm the existing conditions of machinery, materials and equipment relevant to the geophysical survey, owned by DDA, and will propose the equipment, which will be necessary to the future training programmes, to JICA.

The responsibilities for procurement, shared between JICA and the JICA Expert Team, are as shown in Table 3-7.

Table 3-7: Responsibilities for Facility Procurement

<b>Items</b>	<b>JICA Expert</b>	<b>JICA</b>
Rehabilitation for overhaul of two (2) drilling rigs	-	Procurement
Vehicles (2)	-	Procurement (1 <sup>st</sup> : Mar., 2007; 2 <sup>nd</sup> : Oct.,2007)
Machine tools for maintenance workshop	Procurement in Myanmar	-
Spare parts & accessories for drilling rigs	Diagnose the existing drilling rigs, and report necessary quantities in the 1 <sup>st</sup> year to JICA	With consideration of the budget, procurement necessary quantities for each year
Spare parts for electrical sounding	Check the existing machinery and materials, and report necessary quantities in the 1 <sup>st</sup> year to JICA	With consideration of the budget, procurement necessary quantities ( principally procurement in the 2 <sup>nd</sup> year)
Machinery & materials for well construction (pump, screen, casing )	Check the existing machinery and materials, and report necessary quantities in the 1 <sup>st</sup> year to JICA	With consideration of the budget, procurement necessary quantities

Notes: Although the Project will utilize the existing machinery and equipment owned by DDA (drilling rigs, electrical sounding machines, and other equipments), it is agreed that JICA will grant the spare parts and accessories for drilling wells, spare parts for electric sounding machines, and equipments and materials for water supply facilities (pump, screen ,casing), as mentioned in the above list. Until the spare parts are procured, it is confirmed in the preliminary evaluation missions that the machinery and materials owned by DDA will be borrowed.

### **The 2<sup>nd</sup> Fiscal Year: Beginning of April 2007 to End of March 2008**

#### **c. The 2<sup>nd</sup> Field Activities**

##### **c.1 Selection of the Pilot Villages for Operation and Maintenance of Water Supply Facilities**

The pilot villages will be selected through discussions with DDA. Since the pilot villages are both for drilling of new wells and rehabilitation of existing wells, operation and maintenance activities of water supply facilities will be conducted within the above pilot villages in the Project.

##### **c.2 Baseline Survey (partially by local sub-contractor)**

After the formulation and approval of the new well drilling plan and rehabilitation plan of



existing wells, the baseline survey will be implemented by a local sub-contractor in order to (1) understand the village conditions before the activities, and (2) measure the envisaged effect of the activities in the future. As for implementing the baseline survey, the following remarks shall be paid attention to.

- (1) The survey shall be conducted after the candidate villages are divided into the villages where wells are already constructed, and the villages where wells are to be constructed, and the villages with wells and the villages without wells will be compared and analyzed.
- (2) In the former villages (villages with wells), the operation and maintenance activities managed by the villagers are to be studied.
- (3) In the latter villages (villagers without wells), the baseline survey and end-line survey shall be conducted in order to utilize the results of the surveys for evaluating the Project impact on the villages.
- (4) By sharing information with “The Development Study on Sustainable Agricultural and Rural Development for Poverty Reduction Programme in the Central Dry Zone of the Union of Myanmar”, the survey shall avoid repetition of the above study and consider utilizing the outputs.

Table 3-8: Contents of Baseline Survey (draft)

<b>Village Information</b>		
1. General Information	Population	Total, male, female
	Families	No. of family, female headed families
2. Economic Information	Types of Occupations	Job types, working rates (male/female), etc.
	Income	Average annual income (male/female), etc.
3. Education/Health Information	Education	Existence of school within/near the village, school attendance rates (male/female), etc.
	Health	Health issues, hospitals/clinics within/near the village, water-prone diseases, medical treatment cost, etc.
4. Existing Water Resources	Water resources	Main water resources (dry, monsoon), etc.
	Water supply facilities	Existence and types of water supply facilities, water supply capacity of existing facilities, water demand, etc.
5. Operation & Maintenance	Organization	Existence and members of water management committee, activities of water management committee, existence and activities of water related organizations other than water management committee, issues on operation & maintenance, etc.
	Management	Water fee, reserve fund, methods of water fee collection, accounting balance of water management committee, etc.
	Repair/Rehabilitation	Means for purchasing spare parts & cost, experience of rehabilitation, training experience of rehabilitation
6. Others		Issues on the present livelihoods
<b>Household Information</b>		
1. General Information		Family structure, job of the head of a family, total income/outcome of the family, school attendance of children, etc.
2. Health/Sanitation		Disease within the family, medical treatment cost, frequency of going to hospital,

		conditions of toilet/bath, water use (hand washing, water boiling, etc.), etc.
3. Water Use		Water use for various purposes and water quality (dry/monsoon), time and frequency of water fetching (dry/monsoon), water carrier, water consumption, water fee, demands for water supply facilities, etc.
4. Others		Issues on water, etc.

### c.3 Training for Drilling New Wells

The issues with drilling deep tube wells, with a depth of 300 meter or beyond, confirmed by the preliminary evaluation missions are as follows;

- (1) In the areas of the Central Dry Zone, where deep wells have not been developed yet and where wells over 300 meter in depth are necessary, hard bedrocks need to be drilled. DDA has only one machine capable for the above drilling (TONE TOP-500). Although DDA needs to prepare spare parts for emergency repairing and exchange of equipment, there are severe difficulties procuring components for repair and spare parts in the Township.
- (2) TONE TOP300 is generally capable of drilling relatively soft bedrocks in the Central Dry Zone area, however, again there are severe difficulties procuring components for repair and spare parts in the Township.
- (3) Since it turns out that there are many cases of lost circulation during well drilling according to the past well drilling cases in the Central Dry Zone area, it is necessary to master the deep well drilling techniques such as how to respond to lost circulation.
- (4) Currently DDA has only two hydrogeological engineers in the Drilling and Groundwater Survey section. Although the number of personnel is planned to increase to five, it is necessary to organize the Geophysical Survey section in the DDA and make sure that the staff master geophysical survey techniques.

Out of the above remarks, (4) indicates that hydrogeological engineers will be allocated as shown in Figure 3-5, and will receive the training programme for geophysical survey as described in **b.6**. In order to overcome issues (1)~(3), the training programme for drilling of new wells will be carried out in the 2<sup>nd</sup> year, mainly targeting staff from the Drilling and Groundwater Survey section in DDA (a tentative training plan is referred to in Table 3-9). The training programme shall be conducted, using two methods such as lectures for learning theory and OJT for practice. The main target of the training in the 1<sup>st</sup> year is “to understand the general theory of wells, and causes of faulty wells in the past”.

The following points shall be paid attention during implementation of the programme.

- (1) In order to implement the training programme effectively, lectures must be provided prior to the OJT in the field.
- (2) As for implementation of the training programme, the needs of DDA shall be carefully taken into consideration.
- (3) Issues and improvement points must be compiled after the training programmes, and

given as feedback to the following training programmes in the 2<sup>nd</sup> and 3<sup>rd</sup> year, as training materials.

New wells for drilling by OJT will be constructed according to the specification shown in Table 3-9. Groundwater samples from newly constructed wells are delivered to National Health Laboratory in Mandalay, and the following 14 items of chemical test and 3 items of bacteria test will be conducted. Although a summary of water analysis will be understood by measuring pH, electric conductivity (EC) and temperature in the field of sampling, in the case that water-related faults of water supply facilities turn out to be outstanding, inputs related to water quality analysis in the 2<sup>nd</sup> year will be considered.

Chemical Test: Appearance, Colour, Turbidity, pH value, Total Solids, Total Hardness, Total Alkalinity, Calcium (Ca), Magnesium (Mg), Chloride (Cl), Sulfate (SO<sub>4</sub>), Total Iron (Fe), Arsenic, Chlorine

Bacteria Test: Colonies on Agar at 37C after 24 hours, Coliform organisms in M.P.N., E.coliin M.P.N.

Table 3-9: A Draft Training Plan for Drilling New Wells ( 2<sup>nd</sup> year)

Items	Training for Drilling New Wells ( 2 <sup>nd</sup> year)
Target for the 2 <sup>nd</sup> year	Understanding the general theory of wells, and causes of faulty wells in the past
<b>Indoor Lecture &amp; Exercise</b>	
Aim	• To understand the general theory related to wells
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	• Nyaung U, Kyaukpadaung, Chauk Township • Twice in May and October, 2007
Planned No. of Trainees	• Approx. 34 (if drilling sections are changed, participants will be considered.)
Lecturer	• JICA Expert Team (Well Drilling, Drilling Machine, Water Supply Planning), DDA staff
Contents	• Case study of faulty wells in the past (DDA staff) • Well drilling techniques (Well Drilling) • Structure of well drilling techniques and maintenance (Drilling Machine) • Planning water supply facilities, and designing wells (Water Supply Planning)
Necessary machinery & materials	• Text
<b>OJT</b>	
Aim	• To practice learned techniques by the indoors lecture and exercise in the survey field
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	• Once in August, 2007 at the storage place for drilling rigs • From October, 2007 to January, 2008, Pilot villages for newly constructed wells (9 villages)
Planned No. of Trainees	• Approx. 34 (if drilling sections are changed, participants will be considered.)
Lecturer	• JICA Expert Team (Well Drilling, Drilling Machine, Water Supply Planning), DDA staff
Contents	• Well drilling techniques, how to avoid accidents during drilling, and how to respond to the accidents (Well Drilling) • Structure of TOP-300, daily maintenance and periodical maintenance, how to cope with trouble (Drilling Machine)

Items	Training for Drilling New Wells ( 2 <sup>nd</sup> year)
	<ul style="list-style-type: none"> <li>• Preliminary field reconnaissance, planning water supply facilities, designing wells (Water Supply Planning)</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>• Equipments/materials for well drilling and maintenance, Drilling rigs with TOP-300</li> </ul>

Table 3-10: Specification for New Drilling Wells

Items	New Drilling Well
Drilling points	• 20 villages (20 wells) in Nyaung U, Kyaukpadaung, Chauk Township
Drilling depth	• 200 meter – 350 meter
Drilling specification	<ul style="list-style-type: none"> <li>• Drilling Methods: Rotary Method,</li> <li>• Drilling Diameter: 8-12 inches</li> <li>• Casing/Screen Pipe Diameter: 6 inches</li> <li>• Screen Open Air Ratio: 5% or more</li> <li>• Bottom Plug: Installed at bottom of well</li> <li>• Sealing: Cement Sealing</li> </ul>
Drilling methods and Completion	<ol style="list-style-type: none"> <li>① Collection of slime samples every 1m in depth</li> <li>② Geophysical logging (resistivity, self-potential)</li> <li>③ Insertion of screen/casing pipe</li> <li>④ Gravel filling, sealing works</li> <li>⑤ Completion of well</li> <li>⑥ Pumping Test</li> <li>⑦ Construction of Water Supply Facilities</li> </ol>

#### c.4 Training for Geophysical Survey (2<sup>nd</sup> year)

Following the 1<sup>st</sup> year, the training programme for geophysical survey will be conducted, mainly targeting on hydrogeological engineers of DDA (refer to Figure 3-5). Although the contents of the training programme will be determined based on the result of training in the 1<sup>st</sup> year, the main target of the 2<sup>nd</sup> year is to “advance analysis methods of geophysical survey”. A tentative training plan is referred to in Table 3-11. Issues and improvement points must be compiled after the training programmes, and given as feedback to the following training programmes in the 3<sup>rd</sup> year, as training material.

Table 3-11: A Draft Training Plan for Geophysical Survey (2<sup>nd</sup> year)

Items	Training for Geophysical Survey (2 <sup>nd</sup> year)
Target for the 2 <sup>nd</sup> year	Advancing analysis methods of geophysical survey
<b>Indoor Lecture &amp; Exercise</b>	
Aim	<ul style="list-style-type: none"> <li>• To master the basic techniques on Hydrology</li> <li>• To verify geophysical survey skills of DDA staff</li> </ul>
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung_U, Kyaukpadaung, Chauk Township</li> <li>• Once in April, 2007</li> </ul>
Planned No. of Trainees	• Approx. 5
Lecturer	• JICA Expert Team (Geophysical Survey, Hydrogeologist), DDA staff
Contents	<ul style="list-style-type: none"> <li>• Explanation of analysis methods (Geophysical Survey)</li> <li>• Exercise for analysis using previously measured data (Geophysical Survey)</li> <li>• Comparison of the results of the analysis exercise and results of test</li> </ul>

Items	Training for Geophysical Survey (2 <sup>nd</sup> year)
	well drilling (Geophysical Survey, Hydrogeologist)
Necessary machinery & materials	• Text, materials for standard analysis method, software for data analysis
OJT	
Aim	• To practice learned techniques by the indoor lecture and exercise in the survey field
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	• Electric sounding & Electro- magnetic survey: Pilot villages for drilling of new wells (11 villages), April-May 2007 & November-January 2008 • Borehole Logging Test: Pilot villages for drilling of new wells (9 villages), November-February 2008:
Planned No. of Trainees	• Approx. 5
Lecturer	• JICA Expert Team (Geophysical Survey, Hydrogeologist), DDA staff
Contents	• Measuring exercise (Geophysical Survey) • Analysis exercise (Geophysical Survey) • Comparing with results of test well drilling (Geophysical Survey, Hydrologist) • Hydrogeological structure analysis for each village (Hydrogeologist)
Necessary machinery & materials	• Geophysical Survey (Electrical Sounding, Electro-magnetic Survey, Borehole Logging Test)

### c.5 Training for Rehabilitation of Existing Wells

Training for the rehabilitation of existing wells as planned in **b.5** will be conducted, mainly targeting the staff from the “Rehabilitation section” of DDA, and “Maintenance & Monitoring Section” and the “Maintenance Workshop” of the DDA are sub-staff. The training programme shall be conducted, using two methods such as lectures for learning theory and OJT for practice. (A tentative training plan is referred to in Table 3-12.)

Problems with water supply facilities can be divided into trouble with wells *per se*, and trouble with equipment such as pumps. Therefore, technicians responding to the problems also differ. In other words, it is very important to diagnose the problem and cause of each well appropriately at first. The contents of the training programme, therefore, need to aim at developing the capacity for diagnosing. From this point of view, the main target of the 2<sup>nd</sup> year is to “understand major causes of trouble related to wells and understand rehabilitation methods”.

Table 3-12: A Draft Training Plan for Rehabilitation of Existing Wells (2<sup>nd</sup> year)

Items	Training for Rehabilitation of Existing Wells (2 <sup>nd</sup> year)
Target for the 2 <sup>nd</sup> year	Understanding major causes of trouble related to wells and understanding rehabilitation methods
<b>Indoor Lecture &amp; Exercise</b>	
Aim	• To understand mechanisms of trouble occurring with existing wells and rehabilitation methods
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	• Nyaung_U, Kyaukpadaung, Chauk • Twice in May and October, 2007
Planned No. of Trainees	• Approx. 37 + 10-20 (Drilling Team)
Lecturer	• JICA Expert Team (Well Drilling, Mechanical Equipment, Water Supply Planning), DDA staff

Items	Training for Rehabilitation of Existing Wells (2 <sup>nd</sup> year)
Contents	<ul style="list-style-type: none"> <li>• Case study of well rehabilitation in the past (DDA staff)</li> <li>• Understanding mechanism of trouble occurring with existing wells and outlines of rehabilitation methods (Well Drilling)</li> <li>• Understanding mechanism mechanic trouble occurring and outlines of repair methods (Mechanical Equipment)</li> <li>• Outline of monitoring conditions of existing water supply facilities (Water Supply Facilities)</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>• Training text</li> </ul>
OJT	
Aim	<ul style="list-style-type: none"> <li>• To practice learned techniques by the indoor lecture and exercise in the survey field</li> </ul>
Target	<ul style="list-style-type: none"> <li>• DDA staff (shown in Figure 3-5 &amp; applicants from other sections)</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>• Pilot villages for rehabilitation of existing wells (20 villages)</li> <li>• October, 2007-February, 2008</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>• Approx. 50 (DDA staff according to the responsible fields)</li> </ul>
Lecturer	<ul style="list-style-type: none"> <li>• JICA Expert Team (Well Drilling, Mechanical Equipment, Water Supply Planning), DDA staff</li> </ul>
Contents	<ul style="list-style-type: none"> <li>• Investigating methods for trouble with existing wells, and countermeasures (Well Drilling)</li> <li>• Investigating methods for trouble with well equipments, and countermeasure (Mechanical Equipment)</li> <li>• Investigating method for conditions of existing water supply facilities and rehabilitation plan (Water Supply Planning)</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>• Machinery and Equipment for rehabilitation of wells and water supply facilities (machinery and equipments owned by the Drilling Section)</li> </ul>

#### c.6 Training for Operation & Maintenance of Water Supply Facilities for DDA staff

Training for operation and maintenance of water supply facilities as planned in **b.5** will be conducted, mainly targeting the staff from “Maintenance& Monitoring Section “ and “Maintenance Workshop” of the DDA with the “Rehabilitation Section” (A tentative training plan is referred to in Table 3-13). The main target of the 2<sup>nd</sup> year is "to enable DDA staff to formulate operation & maintenance manuals together with the JICA Expert Team and to provide technical support with water management committee and villagers”.

The following points shall be paid attention to during implementation of the programme.

- (1) Each party’s share of responsibility for operation and maintenance of water supply facilities between DDA staff and villagers (water management committee) shall be clarified.
- (2) Methods for coping with emergent trouble shall be arranged.
- (3) The training plan by the JICA Expert Team shall be designed in consideration of improving leadership of DDA staff, since it is expected that DDA staff will provide training programmes with villagers and transfer various techniques.
- (4) In the pilot villages for rehabilitation of existing wells, operation and maintenance activities from the hard aspect will be mainly conducted after understanding the actual activity of the water management committee.

Table 3-13: A Draft Training Plan for Operation and Maintenance of Water Supply Facilities (for DDA staff) (2<sup>nd</sup> year)

Items	Training for Operation & Maintenance of Water Supply Facilities (for DDA staff) (2 <sup>nd</sup> year)
Target for the 2 <sup>nd</sup> year	<ul style="list-style-type: none"> <li>• Formulation of operation &amp; maintenance manuals</li> <li>• Provision of technical support to water management committee by DDA staff</li> </ul>
<b>Indoor Lecture, Exercise and OJT</b>	
Aim	<ul style="list-style-type: none"> <li>• To clarify each party's share of responsibilities for O&amp;M of water supply facilities among DDA, water management committee, and villagers</li> <li>• To provide technical support to the water management committee by DDA staff, based on formulated O&amp;M manuals</li> <li>• To master the differences of O&amp;M in the villages for new well drilling and the villages for rehabilitation of existing wells.</li> </ul>
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung_U, Kyaukpadaung, Chauk Township or the pilot villages (for well drilling and rehabilitation)</li> <li>• Twice from April to May, 2007</li> <li>• Once or twice in October, 2007</li> </ul>
Planned No. of Trainees	• Approx. 37
Lecturer	• JICA Expert Team (Mechanical Equipment, Social Mobilization), DDA staff
Contents	<p><u>The pilot villages for new wells drilling:</u></p> <ul style="list-style-type: none"> <li>• Establishment of, structure and roles of water management committee</li> <li>• Knowledge of water fee and status of water management</li> <li>• Important points during geophysical survey and well drilling</li> <li>• How to use pumping-up pumps, and motor driven equipments</li> <li>• How to promote community participation (village meeting, water management committee, selection of caretaker, etc.)</li> </ul> <p><u>The pilot villages for rehabilitation of existing wells:</u></p> <ul style="list-style-type: none"> <li>• Understanding of the activities of water management committee</li> <li>• Identification and implementation of rehabilitation</li> <li>• O&amp;M after rehabilitation</li> <li>• Establishment of a repair system</li> </ul>
Necessary machinery & materials	• PC (with software such as power point )

### c.7 Training for Operation & Maintenance of Water Supply Facilities for Villagers

The training programme for operation and maintenance of water supply facilities for villager will be conducted by the leadership of trained DDA staff as planned in c.6,. A tentative training plan is referred to in Table 3-14. The JICA Expert will follow up a series of activities such as planning of training programme, arrangement, implementation, analysis and feedback to the next training by working together with DDA staff.

The main target of the 2<sup>nd</sup> year is “to establish a water management committee in the village through training program, and if it already exists, the functions will become active”.

The following points shall be paid attention to during implementation of the programme.

- (1) At first, each party's share of responsibility for operation and maintenance of water supply facilities between DDA staff and villagers (water management committee) shall be clarified and reported to villagers.

- (2) Then, methods for coping with emergent trouble shall be taught to villagers, and various comments shall be made in order to link the DDA and villagers in a systematic way.
- (3) Then, roles and techniques for when trouble occurs shall be transferred to villagers.

Furthermore, the following remarks shall be particularly paid attention to.

- (1) Formulation of visualized manuals (text shall be minimum)
- (2) The issues with the training programme shall be identified by giving questionnaires to trainees after the training and by reviewing the results.
- (3) Any improvement for the next programme shall be discussed with DDA.

Table 3-14: A Draft Training Plan for Operation and Maintenance of Water Supply Facilities (for Villagers) (2<sup>nd</sup> year)

Items	Training for Operation & Maintenance of Water Supply Facilities (for Villagers) (2 <sup>nd</sup> year)
Target for the 2 <sup>nd</sup> year	<ul style="list-style-type: none"> <li>• Establishment of a water management committee in the village through training program, if it exists, the functions become active</li> </ul>
<b>Indoor Lecture &amp; Exercise and OJT</b>	
Aim	<ul style="list-style-type: none"> <li>• To strengthen the functions of water management committee</li> <li>• To establish the O&amp;M system in a hard aspect and enable to operate and maintain the facilities</li> </ul>
Target	<ul style="list-style-type: none"> <li>• Villagers</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung_U, Kyaukpadaung, Chauk Township or the pilot villages (for new well drilling &amp; rehabilitation)</li> <li>• Three times of General Community Meeting from November to December 2007 (several members from the villages)</li> <li>• Field Visit</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>• General Community Meeting (Nyaung_U): Approx. 20-30</li> <li>• Village Meeting: Approx. 30-50</li> </ul>
Lecturer	<ul style="list-style-type: none"> <li>• DDA staff, JICA Expert Team (Well Drilling, Mechanical Equipment, Social Mobilization)</li> </ul>
Contents	<p><u>The pilot villages for new wells drilling:</u></p> <ul style="list-style-type: none"> <li>• Establishment of, structure and roles of water management committee</li> <li>• Knowledge of water fee and status of water management</li> <li>• Important points during geophysical survey and well drilling</li> <li>• How to use pumping-up pumps, and motor driven equipments</li> <li>• How to promote community participation (village meeting, water management committee, selection of caretaker, etc.)</li> </ul> <p><u>The pilot villages for rehabilitation of existing wells:</u></p> <ul style="list-style-type: none"> <li>• Understanding of the activities of water management committee</li> <li>• Identification and implementation of rehabilitation</li> <li>• O&amp;M after rehabilitation</li> <li>• Establishment of a repair system</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>• Stationary</li> </ul>

#### c.8 Formulation of Teaching Materials for Each Training Programme (Draft)

Teaching materials for each training programme (draft) will be formulated after the materials used for training programmes in the 2<sup>nd</sup> year are reviewed. The materials will be revised in



the 3<sup>rd</sup> year and be formulated as final versions in the 4<sup>th</sup> year. They will be not only distributed to DDA staff and villagers in the target areas, but also utilized to extend the Project outcome to DDA staff and villagers in other surrounding areas. Therefore, it is necessary to set an image of the final output, and revise it for a more useful one. The JICA Expert Team will describe an image of the final output by figure, and submit an operational plan (draft) towards its completion.

#### **c.9 The 1<sup>st</sup> Technology Transfer Seminar**

The 1<sup>st</sup> technology transfer seminar will be held in the Nyaung\_U Township, in order to localize the techniques amongst DDA staff and villagers and extend the Project outcome to DDA staff and villagers in other surrounding areas. A tentative seminar plan is referred to Table 3-15. The seminar will widely invite DDA staff members who did not participate in the training in the Central Dry Zone, and villagers (members of water management committee) from the villages other than the pilot villages. By drawing the maximum cooperation from the DDA side, improved coordination capacity of DDA staff and ensured self-reliability after the completion of the project is planned.

Table 3-15: A Draft Plan for the 1<sup>st</sup> Technology Transfer Seminar

<b>Items</b>	<b>The 1<sup>st</sup> Technology Transfer Seminar</b>
Aim	<ul style="list-style-type: none"> <li>• To localize the technology to DDA staff and villagers</li> <li>• To expand the Project output to DDA staff, not participating in the training programme in the Central Dry Zone and villagers outside the pilot villages</li> </ul>
Target	<ul style="list-style-type: none"> <li>• DDA staff</li> <li>• Villagers</li> <li>• Donor agency (UNICEF, UNDP, NGO, etc.)</li> <li>• Representatives from Ministry of Agriculture and Irrigation, Ministry of Construction, Ministry of Energy</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung_U Township</li> <li>• Once in February, 2008</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>• Approx. 50</li> </ul>
Presenter	<ul style="list-style-type: none"> <li>• DDA staff, JICA Expert Team</li> </ul>
Contents	<ul style="list-style-type: none"> <li>• The Project output of the 2<sup>nd</sup> field activities</li> <li>• The contents of technology transfer in the 2<sup>nd</sup> field activities</li> <li>• Report from the trainers of C/P training in Japan</li> </ul>

#### **c.10 Formulation of Facility Procurement Plan (Draft) for the 3<sup>rd</sup> Fiscal Year**

The JICA Expert Team will submit a procurement plan for equipment necessary for the Project activities in the 3<sup>rd</sup> year to JICA.

#### **The 3<sup>rd</sup> Fiscal Year: Beginning of April 2008 to End of March 2009**

##### **d. The 3<sup>rd</sup> Field Activities**

##### **d.1 Training for Drilling New Wells (Continuing)**

Following the 2<sup>nd</sup> year (c.3), the training programme for drilling new wells will be conducted, mainly targeting DDA staff of the “Drilling & Ground Water Survey Section” of the DDA.

Although the contents of the training programme will be determined based on the result of training in the 2<sup>nd</sup> year, the envisaged main target of the 3<sup>rd</sup> year at this stage is to “reduce accidents during well drilling and standardize water supply facilities.” Particularly by focusing on the cases of constructive accidents and mechanic accidents occurring during well drilling in the 2<sup>nd</sup> year, the causes and countermeasures will be reviewed in the indoor lecture. A tentative training plan is referred to in Table 3-16.

In the case that new techniques, which are not included in the 2<sup>nd</sup> year, are transferred, the lecture must be received prior to the OJT in order to implement the effective training programme. Issues and improvement points must be compiled after the training programmes, and given as feedback to the following training programmes in the 4<sup>th</sup> year, as training materials.

Table 3-16: A Draft Training Plan for Drilling New Wells (3<sup>rd</sup> year)

Items	Training for Drilling New Wells ( 3 <sup>rd</sup> year)
Target for the 3 <sup>rd</sup> year	Reducing accidents during well drilling, and standardization of water supply facilities
<b>Indoor Lecture &amp; Exercise</b>	
Aim	<ul style="list-style-type: none"> <li>To review the accidents during well construction and control the accidents</li> <li>To make a rule for water supply facility design</li> </ul>
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	Nyaung U, Kyaukpadaung, Chauk Township Three times in April, May and October, 2007
Planned No. of Trainees	• Approx. 34
Lecturer	• JICA Expert Team (Well Drilling, Drilling Machine, Water Supply Planning), DDA staff
Contents	<ul style="list-style-type: none"> <li>Constructive accidents during 2<sup>nd</sup> year’s drilling work and the measures (DDA staff, Well Drilling)</li> <li>Mechanic accidents during 2<sup>nd</sup> year’s drilling work and the measures (DDA staff, Drilling Machine)</li> <li>Planning of water supply facilities, and formulating rules for planning (Water Supply Planning)</li> </ul>
Necessary machinery & materials	• Drilling records of the 1 <sup>st</sup> year, training materials
<b>OJT</b>	
Aim	• To practice learned techniques by the indoor lecture and exercise in the survey field
Target	• DDA staff (shown in Figure3-5 & applicants from other sections)
Location & Time	<ul style="list-style-type: none"> <li>From April to May,2008 for the pilot villages for newly constructed wells (11villages)</li> <li>Once in May, 2008 at the storage place for drilling rigs</li> </ul>
Planned No. of Trainees	• Approx. 34 (if drilling sections are changed, participants will be considered.)
Lecturer	• JICA Expert Team (Well Drilling, Drilling Machine, Water Supply Planning), DDA staff
Contents	<ul style="list-style-type: none"> <li>Well drilling techniques, how to avoid accidents during drilling, and how to respond to accidents (Well Drilling)</li> <li>Daily maintenance, periodical maintenance, how to respond to trouble (Drilling Machine)</li> <li>Preliminary field reconnaissance, planning of well construction designing wells (Water Supply Planning)</li> </ul>
Necessary machinery & materials	• Equipments/materials for well drilling and maintenance

## d.2 Training for Geophysical Survey (Continuing)

Following the 2<sup>nd</sup> year (c.4), the training programme for geophysical survey will be conducted, mainly targeting on the hydrogeological engineers from DDA (refer to Figure 3-5). Although the contents of the training programme will be determined based on the result of training in the 2<sup>nd</sup> year, the envisaged main target of the 3<sup>rd</sup> year at this stage is “self-reliable field exploration and analysis skills, and sustainable groundwater development.” The lecture in the 3<sup>rd</sup> year shall include methods for groundwater development and management and emphasize on sustainable usage of groundwater. A tentative training plan is referred to in Table 3-17.

In the case that new techniques, which are not included in the 3<sup>rd</sup> year, are transferred, the lecture must be received prior to the OJT in order to implement the effective training programme. Since the training for geophysical survey is not planned after the 3<sup>rd</sup> year, if training is considered necessary in the 4<sup>th</sup> year, the JICA Expert Team will explain the reasons and propose a training programme for the 4<sup>th</sup> year to JICA.

Table 3-17: A Draft Training Plan for Geophysical Survey (3<sup>rd</sup> year)

Items	Training for Geophysical Survey (3 <sup>rd</sup> year)
Target for the 3 <sup>rd</sup> year	Self-reliable field exploration and analysis skills, and sustainable groundwater development
<b>Indoor Lecture &amp; Exercise</b>	
Aim	<ul style="list-style-type: none"> <li>To review and analyze the issues until the 2<sup>nd</sup> year</li> <li>To ensure sustainable usage of groundwater</li> </ul>
Target	• DDA staff (shown in Figure 3-5& applicants from other sections)
Location & Time	<ul style="list-style-type: none"> <li>Nyaung_U, Kyaukpadaung, Chauk Township</li> <li>Twice in April and November, 2008</li> </ul>
Planned No. of Trainees	• Approx. 5
Lecturer	• Mainly DDA staff, JICA Expert Team (Geophysical Survey, Hydrogeologist), (Groundwater Development for methods of groundwater development and management)
Contents	<ul style="list-style-type: none"> <li>Examination of issues clarified in the 2<sup>nd</sup> year, by DDA staff (DDA staff)</li> <li>Basics of management for sustainable groundwater use (Groundwater Development)</li> </ul>
Necessary machinery & materials	• Geophysical survey and drilling records until the 2 <sup>nd</sup> year, training materials
<b>OJT</b>	
Aim	• To practice learned techniques by the indoor lecture and exercise in the survey field
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	<ul style="list-style-type: none"> <li>Electrical sounding / Electro-magnetic survey: Pilot villages for drilling of new wells (9 villages) from April, 2008to May, 2008 and from November, 2008 to February, 2009</li> <li>Borehole logging test: Pilot villages for drilling of new wells (9 villages) from April, 2008to May, 2008 and from November, 2008 to February, 2009</li> </ul>
Planned No. of Trainees	• Approx. 5
Lecturer	• JICA Expert Team (Geophysical Survey, Hydrogeologist), DDA staff
Contents	<ul style="list-style-type: none"> <li>Measuring exercise by DDA staff</li> <li>Analysis exercise by DDA staff</li> <li>Comparing with results of test well drilling by DDA staff</li> <li>Hydrogeological structure analysis for each village by DDA staff</li> </ul>

Items	Training for Geophysical Survey (3 <sup>rd</sup> year)
	<ul style="list-style-type: none"> <li>Hydrogeological structure analysis for wide area (DDA staff, Hydrogeologist)</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>Geophysical Survey (Electrical Sounding, Electro-magnetic Survey, Borehole Logging Test), Machinery/Materials for field exploration</li> </ul>

### d.3 Training for Rehabilitation of Existing Wells (Continuing)

Following the 2<sup>nd</sup> year (c.5), the training programme for rehabilitation of existing wells will be conducted, mainly targeting the DDA staff from the “Rehabilitation Section”, and “Maintenance & Monitoring Section “ and the “Maintenance Workshop” are sub-staff. Although the contents of the training programme will be determined based on the result of training in the 2<sup>nd</sup> year, the focus of the training programme shall be the rehabilitation of actual trouble with existing wells, based on the rehabilitation plan formulated in the 2<sup>nd</sup> year. A tentative training plan is referred to in Table 3-18. Therefore, the envisaged main target of the 3<sup>rd</sup> year is “self-reliable field exploration and analysis skills, and sustainable groundwater development.” Before rehabilitating the issues with existing wells, the problems with the wells and causes and rehabilitation methods (rehabilitation plan) shall be reviewed and the rehabilitation will be put into practice by the OJT. As mentioned earlier (c.5), the lecture must be received prior to the OJT in order to implement the effective training programme. Issues and improvement points must be compiled after the training programmes and given as feedback to the following training programmes in the 4<sup>th</sup> year, as training materials.

Table 3-18: A Draft Training Plan for Rehabilitation of Existing Wells (3<sup>rd</sup> year)

Items	Training for Rehabilitation of Existing Wells (3 <sup>rd</sup> year)
Target for the 3 <sup>rd</sup> year	Making a rehabilitation plan for existing wells and rehabilitation
<b>Indoor Lecture &amp; Exercise</b>	
Aim	<ul style="list-style-type: none"> <li>To conclude a rehabilitation plan of existing wells</li> </ul>
Target	<ul style="list-style-type: none"> <li>DDA staff (shown in Figure 3-5 &amp; applicants from other sections)</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>Nyaung_U, Kyaukpadaung, Chauk Township</li> <li>Twice in April and October, 2008</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>Approx. 37 + 10-20 (Drilling Team)</li> </ul>
Lecturer	<ul style="list-style-type: none"> <li>JICA Expert Team (Well Drilling, Mechanical Equipment, Water Supply Planning), DDA staff</li> </ul>
Contents	<ul style="list-style-type: none"> <li>Case study of rehabilitation in the 2<sup>nd</sup> year (DDA staff)</li> <li>Settlement of rehabilitation plan for existing water supply facilities (Well Drilling, Mechanical Equipment, Water Supply Planning)</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>Drilling record, Training materials</li> </ul>
<b>OJT</b>	
Aim	<ul style="list-style-type: none"> <li>To practice learned techniques by the indoor lecture and exercise in the survey field</li> </ul>
Target	<ul style="list-style-type: none"> <li>DDA staff (shown in Figure 3-5 &amp; applicants from other sections)</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>Pilot villages for rehabilitation of existing wells (20 villages)</li> <li>April to May, 2008 and October, 2008 to May, 2009</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>Approx. 50 (DDA staff according to the responsible fields)</li> </ul>
Lecturer	<ul style="list-style-type: none"> <li>JICA Expert Team (Well Drilling, Mechanical Equipment, Water Supply Planning), DDA staff</li> </ul>
Contents	<ul style="list-style-type: none"> <li>Repair methods for trouble with equipment (Mechanical Equipment)</li> <li>Rehabilitation methods of existing wells (Well Drilling)</li> </ul>
Necessary machinery &	<ul style="list-style-type: none"> <li>Machinery and Equipment for rehabilitation of wells and water supply</li> </ul>

Items	Training for Rehabilitation of Existing Wells (3 <sup>rd</sup> year)
materials	facilities (machinery and equipments owned by the Drilling Section)

#### d.4 Training for Operation & Maintenance of Water Supply Facilities for DDA staff (Continuing)

Following the 2<sup>nd</sup> year (c.6), the training programme for operation and maintenance of water supply facilities for DDA staff will be conducted, mainly targeting the DDA staff from the “Maintenance & Monitoring Section” and the “Maintenance Workshop” with the “Rehabilitation Section”. Although the contents of the training programme will be determined based on the result of training in the 2<sup>nd</sup> year, the envisaged main target of the 3<sup>rd</sup> year is to “revise operation & maintenance manuals, and provide better technical support to water management committee by DDA staff, and improve sustainability through cooperation among DDA staff.” A tentative training plan is referred to in Table 3-19.

The training programme shall be conducted, considering the sustainability after the completion of the Project, for example, making DDA staff, an experienced lecturer of the training programme for villagers in the 2<sup>nd</sup> year, conducted the lecture towards other DDA.

Table 3-19: A Draft Training Plan for Operation and Maintenance of Water Supply Facilities (for DDA staff) (3<sup>rd</sup> year)

Items	Training for Operation & Maintenance of Water Supply Facilities (for DDA staff) (3 <sup>rd</sup> year)
Target for the 3 <sup>rd</sup> year	<ul style="list-style-type: none"> <li>• Revision of operation &amp; maintenance manuals</li> <li>• Better technical support to water management committee by DDA staff,</li> <li>• Improvement of self-reliability through cooperation among DDA staff</li> </ul>
<b>Indoor Lecture, Exercise and OJT</b>	
Aim	<ul style="list-style-type: none"> <li>• To clarify each party’s share of responsibilities for O&amp;M of water supply facilities among DDA, water management committee, and villagers</li> <li>• To enable more DDA staff to provide technical support for water management committee, based on revised O&amp;M manuals</li> <li>• To master the differences of O&amp;M in the villages for new well drilling and the villages for rehabilitation of existing wells.</li> </ul>
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung_U, Kyaukpadaung, Chauk Township or the pilot villages (for well drilling and rehabilitation )</li> <li>• Twice from April to May, 2008</li> <li>• Once or twice in October, 2008</li> </ul>
Planned No. of Trainees	• From April to May Approx. 37, In October Approx. 37
Lecturer	• DDA staff, JICA Expert Team (Mechanical Equipment, Social Mobilization),
Contents	<p><u>The pilot villages for new wells drilling:</u></p> <ul style="list-style-type: none"> <li>• Establishment of, structure and roles of water management committee</li> <li>• Knowledge of water fee and status of water management</li> <li>• Important points during geophysical survey and well drilling</li> <li>• How to use pumping-up pumps, and motor driven equipments</li> <li>• How to promote community participation (village meeting, water management committee, selection of caretaker, etc.)</li> </ul> <p><u>The pilot villages for rehabilitation of existing wells:</u></p> <ul style="list-style-type: none"> <li>• understanding of the activities of water management committee</li> </ul>

Items	Training for Operation & Maintenance of Water Supply Facilities (for DDA staff) (3 <sup>rd</sup> year)
	<ul style="list-style-type: none"> <li>• Identification and implementation of rehabilitation</li> <li>• O&amp;M after rehabilitation</li> <li>• Establishment of a repair system</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>• PC (with software such as power point )</li> </ul>

#### d.5 Training for Operation & Maintenance of Water Supply Facilities for Villagers (Continuing)

Following the 2<sup>nd</sup> year (c.7), the training programme for operation and maintenance of water supply facilities for villagers will be conducted, mainly targeting the DDA staff from the “Rehabilitation Section”, “Maintenance& Monitoring Section”, and the “Maintenance Workshop”. Although the contents of the training programme will be determined based on the result of training in the 2<sup>nd</sup> year, the envisaged main target of the 3<sup>rd</sup> year is the “establishment of water management committee in the village through training program, if it exists, the functions will become active.” A tentative training plan is referred to in Table 3-20. Training programmes for villagers shall be conducted mainly by DDA staff, who received the training programme conducted in d.4. The JICA Expert follow up a series of activities such as planning of the training programme, arrangement, implementation, analysis and feedback to the next training by working together with DDA staff. The issues with the training programme shall be identified by giving questionnaires to trainees after the training and by reviewing the results. The improvement will be discussed with DDA.

Table 3-20: A Draft Training Plan for Operation and Maintenance of Water Supply Facilities (for Villagers) (3<sup>rd</sup> year)

Items	Training for Operation & Maintenance of Water Supply Facilities (for Villagers) (3 <sup>rd</sup> year)
Target for the 3 <sup>rd</sup> year	<ul style="list-style-type: none"> <li>• Establishment of water management committee in the village through training program, if it exists, the functions will become active</li> </ul>
<b>Indoor Lecture &amp; Exercise and OJT</b>	
Aim	<ul style="list-style-type: none"> <li>• To strengthen the functions of water management committee</li> <li>• To establish the O&amp;M system in a hard aspect and enable to operate and maintain the facilities</li> </ul>
Target	<ul style="list-style-type: none"> <li>• Villagers</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung_U, Kyaukpadaung, Chauk Township or the pilot villages (for new well drilling &amp; rehabilitation)</li> <li>• Three times of General Community Meeting from November to December 2008 (several members from the villages)</li> <li>• Field Visit</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>• General Community Meeting (Nyaung_U): Approx. 20-30</li> <li>• Village Meeting: Approx. 30-50</li> </ul>
Lecturer	<ul style="list-style-type: none"> <li>• DDA staff, JICA Expert Team (Mechanical Equipment, Social Mobilization)</li> </ul>
Contents	<p><u>The pilot villages for new wells drilling:</u></p> <ul style="list-style-type: none"> <li>• Establishment of, structure and roles of water management committee</li> <li>• Knowledge of water fee and status of water management</li> <li>• Important points during geophysical survey and well drilling</li> <li>• How to use pumping-up pumps, and motor driven equipments</li> <li>• How to promote community participation (village meeting, water management committee, selection of caretaker, etc.)</li> </ul> <p><u>The pilot villages for rehabilitation of existing wells:</u></p>

Items	Training for Operation & Maintenance of Water Supply Facilities (for Villagers) (3 <sup>rd</sup> year)
	<ul style="list-style-type: none"> <li>• Understanding of the activities of water management committee</li> <li>• identification and implementation of rehabilitation</li> <li>• O&amp;M after rehabilitation</li> <li>• Establishment of a repair system</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>• Stationary</li> </ul>

#### d.6 Formulation of Teaching Materials for Each Training Programme (Revision)

Teaching materials (revision) will be formulated by compiling the teaching materials (draft) formulated in c.8 and materials used for the training programmes in the 3<sup>rd</sup> year.

In order to formulate a final version in the 4<sup>th</sup> year, the quality of the materials shall be improved, for example, by conducting questionnaires. The results of the questionnaires and proposals for improvement shall be reported to JICA.

#### d.7 The 2<sup>nd</sup> Technology Transfer

The 2<sup>nd</sup> technology transfer seminar will be held in the Nyaung\_U Township, in order to localize the techniques amongst DDA staff and villagers and extend the Project outcomes to DDA staff and villagers in other surrounding areas. A tentative seminar plan is referred to in Table 3-21. The seminar will invite DDA staff who did not participate in the training in the Central Dry Zone, and villagers (members of water management committee) from the villages other than the pilot villages. By drawing maximum cooperation from the DDA side, improving the coordination capacity of DDA staff and ensuring the self-reliability after the completion of the project is planned.

Table 3-21: A Draft Plan for the 2<sup>nd</sup> Technology Transfer Seminar

Items	The 2 <sup>nd</sup> Technology Transfer Seminar
Aim	<ul style="list-style-type: none"> <li>• To localize the technology to DDA staff and villagers</li> <li>• To expand the Project output to DDA staff, not participating to the training programme in the Central Dry Zone and villagers outside the pilot villages</li> </ul>
Target	<ul style="list-style-type: none"> <li>• DDA staff</li> <li>• Villagers</li> <li>• Donor agency (UNICEF, UNDP, NGO, etc.)</li> <li>• Representatives from Ministry of Agriculture and Irrigation, Ministry of Construction, Ministry of Energy</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung_U Township</li> <li>• Once in February, 2009</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>• Approx. 50</li> </ul>
Presenter	<ul style="list-style-type: none"> <li>• DDA staff, JICA Expert Team</li> </ul>
Contents	<ul style="list-style-type: none"> <li>• The Project output of the 2<sup>nd</sup> field activities</li> <li>• The contents of technology transfer in the 2<sup>nd</sup> field activities</li> <li>• Report from the trainers of C/P training in Japan</li> </ul>

#### d.8 Formulation of Facility Procurement Plan for the 4<sup>th</sup> Year (Draft)

The JICA Expert Team will submit a procurement plan for equipment necessary for the Project activities in the 3<sup>rd</sup> year to JICA.

#### The 4<sup>th</sup> Fiscal Year: Beginning of April 2008 to End of March 2009

##### e. The 4<sup>th</sup> Field Activities

##### e.1 Training for Drilling of New Wells (Continuing)

Following the 3<sup>rd</sup> year (d.1), the training programme for geophysical survey will be conducted, mainly targeting the DDA staff of the “Drilling & Ground Water Survey Section”. Although the contents of the training programme will be determined based on the result of training in the 3<sup>rd</sup> year, the envisaged main target of the 4<sup>th</sup> year at this stage is to “establish sustainable rural water supply system.” A tentative training plan is referred to in Table 3-22.

As the 4<sup>th</sup> year is the final year of the Project, the contents of the training programme need to take consideration of the sustainability of the Project. Particularly considering the demand for the contents from DDA staff, the JICA Expert Team will operate and manage training programmes based on the self-reliability of DDA staff. In the case that new techniques, which are not included in the 3<sup>rd</sup> year, are transferred, the lecture must be received prior to the OJT in order to implement the effective training programme.

Table 3-22: A Draft Training Plan for Drilling of New Wells (4<sup>th</sup> year)

Items	Training for Drilling of New Wells ( 4 <sup>th</sup> year)
Target for the 4 <sup>th</sup> year	Establishing sustainable rural water supply administration structure
<b>Indoor Lecture &amp; Exercise</b>	
Aim	• To master the necessary knowledge and know-how
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	• Nyaung_U, Kyaukpadaung, Chauk Township • Twice in April and June, 2009
Planned No. of Trainees	• Approx. 34
Lecturer	• DDA staff, JICA Expert Team (Well Drilling, Drilling Machine, Water Supply Planning)
Contents	Presentation by DDA staffs • Constructive accidents during drilling work in the past and the measures (DDA staff, Well Drilling) • Mechanic accidents during drilling work in the past and the measures (DDA staff, Drilling Machine) • Reviews of water supply planning cases in the past (incl. practices) DDA staff, Water Supply Planning)
Necessary machinery & materials	• Good Practice Collection , training materials
<b>OJT</b>	
Aim	• To practice learned techniques by the indoors lecture and exercise in the survey field
Target	• DDA staff (shown in Figure 3-5 & applicants from other sections)
Location & Time	• From April to May, 2009 at the sites selected in the 3 <sup>rd</sup> year • Once in June, 2009 at the storage place for drilling rigs
Planned No. of Trainees	• Approx. 34
Lecturer	• JICA Expert Team (Well Drilling, Drilling Machine, Water Supply Planning), DDA staff
Contents	Presentation only by DDA staffs



Items	Training for Drilling of New Wells ( 4 <sup>th</sup> year)
	<ul style="list-style-type: none"> <li>Well drilling techniques, how to avoid accidents during drilling, and how to respond the accidents (Well Drilling)</li> <li>Daily maintenance, periodical maintenance, how to respond to trouble (Drilling Machine)</li> <li>Preliminary field reconnaissance, planning of water supply facilities, designing wells (Water Supply Planning)</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>Equipments/materials for well drilling and maintenance</li> </ul>

### e.2 Training for Rehabilitation of Existing Wells (Continuing)

Following the 3<sup>rd</sup> year (d.3), the training programme for rehabilitation of existing wells will be conducted, mainly targeting the DDA staff from the “Rehabilitation Section”, and “Maintenance& Monitoring Section “ and “Maintenance Workshop” are sub-staff. Although the contents of the training programme will be determined based on the result of training in the 3<sup>rd</sup> year, the envisaged main target of the 4<sup>th</sup> year at this stage is to “establish sustainable rural water supply system.” A tentative training plan is referred to in Table 3-23.

As the 4<sup>th</sup> year is the final year of the Project, the contents of the training programme need to take consideration of the sustainability of the Project. Particularly considering the demand for the contents from DDA staff, the JICA Expert Team will operate and manage training programmes based on the self-reliability of DDA staff. In the case that new techniques, which are not included in the 3<sup>rd</sup> year, are transferred, the lecture must be received prior to the OJT in order to implement the effective training programme.

Table 3-23: A Draft Training Plan for Rehabilitation of Existing Wells (4<sup>th</sup> year)

Items	Training for Rehabilitation of Existing Wells ( 4 <sup>th</sup> year)
Target for the 4 <sup>th</sup> year	Establishing sustainable rural water supply administration structure
<b>Indoor Lecture &amp; Exercise</b>	
Aim	<ul style="list-style-type: none"> <li>To master the necessary knowledge and know-how</li> </ul>
Target	<ul style="list-style-type: none"> <li>DDA staff (shown in Figure 3-5 &amp; applicants from other sections)</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>Nyaung_U, Kyaukpadaung, Chauk Township</li> <li>Once in April, 2009</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>Approx. 34 + 10-20 (Drilling Team)</li> </ul>
Lecturer	<ul style="list-style-type: none"> <li>DDA staff, JICA Expert Team (Well Drilling, Drilling Machine, Water Supply Planning)</li> </ul>
Contents	<ul style="list-style-type: none"> <li>Formulating the rehabilitation plan of existing water supply facilities only by DDA staff</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>Training materials</li> </ul>
<b>OJT</b>	
Aim	<ul style="list-style-type: none"> <li>To practice learned techniques by the indoors lecture and exercise in the survey field</li> </ul>
Target	<ul style="list-style-type: none"> <li>DDA staff (shown in Figure 3-5 &amp; applicants from other sections)</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>From April to May, 2009 at the sites selected in the 3<sup>rd</sup> year</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>Approx. 50</li> </ul>
Lecturer	<ul style="list-style-type: none"> <li>DDA staff, JICA Expert Team (Well Drilling, Drilling Machine, Water Supply Planning)</li> </ul>
Contents	<ul style="list-style-type: none"> <li>Repair work according to a repair work plan formulated by DDA staff</li> </ul>
Necessary machinery & materials	<ul style="list-style-type: none"> <li>Equipments/materials for well drilling and maintenance (machinery and equipments owned by the Drilling Section)</li> </ul>

### e.3 Training for Operation & Maintenance of Water Supply Facilities for DDA staff (Continuing)

Following the 3<sup>rd</sup> year (d.4), the training programme for operation and maintenance of water supply facilities for DDA staff will be conducted, mainly targeting the DDA staff from “Maintenance & Monitoring Section” and the “Maintenance Workshop” with the “Rehabilitation Section”. Although the contents of the training programme will be determined based on the result of training in the 3<sup>rd</sup> year, the envisaged main target of the 4<sup>th</sup> year is to “revise operation & maintenance manuals based on the activities in the 3<sup>rd</sup> year, and provide better technical support to water management committee by DDA staff, and improve sustainability through cooperation among DDA staff.” A tentative training plan is referred to Table 3-24.

The training programme shall be conducted, considering the sustainability after the completion of the Project, for example, making DDA staff, an experienced lecturer of the training programme for villagers in the 2<sup>nd</sup> year, conducted the lecture towards other DDA.

Table 3-24: A Draft Training Plan for Operation and Maintenance of Water Supply Facilities (for DDA staff) (4<sup>th</sup> year)

Items	Training for Operation & Maintenance of Water Supply Facilities (for DDA staff) (4 <sup>th</sup> year)
Target for the 4 <sup>th</sup> year	<ul style="list-style-type: none"> <li>• Revision of operation &amp; maintenance manuals</li> <li>• Better technical support to water management committee by DDA staff,</li> <li>• Improvement of self-reliability through cooperation among DDA staff</li> </ul>
<b>Indoor Lecture, Exercise and OJT</b>	
Aim	<ul style="list-style-type: none"> <li>• To clarify each one’s share of responsibilities for O&amp;M of water supply facilities among DDA, water management committee, and villagers</li> <li>• To enable more DDA staff to provide technical support for water management committee, based on revised O&amp;M manuals</li> <li>• To master the differences of O&amp;M in the villages for new well drilling and the villages for rehabilitation of existing wells.</li> </ul>
Target	• DDA staff (shown in Figure 1.6-5 & applicants from other sections)
Location & Time	<ul style="list-style-type: none"> <li>• Nyaung U, Kyaukpadaung, Chauk Township or the pilot villages (for well drilling and rehabilitation )</li> <li>• Once from April to May, 2009</li> </ul>
Planned No. of Trainees	• From April to May Approx. 37
Lecturer	• DDA staff, JICA Expert Team (Mechanical Equipment, Social Mobilization),
Contents	<p><u>The pilot villages for new wells drilling:</u></p> <ul style="list-style-type: none"> <li>• Establishment of, structure and roles of water management committee</li> <li>• Knowledge of water fee and status of water management</li> <li>• Important points during geophysical survey and well drilling</li> <li>• How to use pumping-up pumps, and motor driven equipments</li> <li>• How to promote community participation (village meeting, water management committee, selection of caretaker, etc.)</li> </ul> <p><u>The pilot villages for rehabilitation of existing wells:</u></p> <ul style="list-style-type: none"> <li>• Understanding of the activities of water management committee</li> <li>• Identification and implementation of rehabilitation</li> <li>• O&amp;M after rehabilitation</li> <li>• Establishment of a repair system</li> </ul>
Necessary machinery &	• PC (with software such as power point )

Items	Training for Operation & Maintenance of Water Supply Facilities (for DDA staff) (4 <sup>th</sup> year)
materials	

**e.4 Training for Operation & Maintenance of Water Supply Facilities for Villagers (Continuing)**

Following the 3<sup>rd</sup> year (c.5), the training programme for operation and maintenance of water supply facilities for villagers will be conducted, mainly targeting the DDA staff from the “Rehabilitation Section”, “Maintenance & Monitoring Section”, and the “Maintenance Workshop”. Although the contents of the training programme will be determined based on the result of training in the 3<sup>rd</sup> year, the envisaged main target of the 4<sup>th</sup> year is the “establishment of water management committee in the village through training program, if it exists, the functions become active.” A tentative training plan is referred to in Table 3-25.

Training programmes for villagers shall be conducted mainly by DDA staff, who received the training programme conducted in d.5. The JICA Expert will follow up a series of activities such as planning of training programme, arrangement, implementation, analysis and feedback to the next training by working together with DDA staff. The issues with the training programme shall be identified by giving questionnaires to trainees after the training and by reviewing the results. The improvement will be discussed with DDA.

Table 3-25: A Draft Training Plan for Operation and Maintenance of Water Supply Facilities (for Villagers) (4<sup>th</sup> year)

Items	Training for Operation & Maintenance of Water Supply Facilities (for Villager) (4 <sup>th</sup> year)
Target for the 4 <sup>th</sup> year	<ul style="list-style-type: none"> <li>Establishment of water management committee in the village through training program, if it exists, the functions become active</li> </ul>
<b>Indoor Lecture, Exercise and OJT</b>	
Aim	<ul style="list-style-type: none"> <li>To strengthen the functions of water management committee</li> <li>To establish the O&amp;M system in a hard aspect and enable to operate and maintain the facilities</li> </ul>
Target	<ul style="list-style-type: none"> <li>Villagers</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>Nyaung_U, Kyaukpadaung, Chauk Township or the pilot villages (for new well drilling &amp; rehabilitation)</li> <li>General Community Meeting: Once in April, 2009 (several members from the villages)</li> <li>Field Visit</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>General Community Meeting (Nyaung_U): Approx. 20-30</li> <li>Village Meeting: Approx. 30-50</li> </ul>
Lecturer	<ul style="list-style-type: none"> <li>DDA staff, JICA Expert Team (Mechanical Equipment, Social Mobilization)</li> </ul>
Contents	<p><u>The pilot villages for new wells drilling:</u></p> <ul style="list-style-type: none"> <li>Establishment of, structure and roles of water management committee</li> <li>Knowledge of water fee and status of water management</li> <li>Important points during geophysical survey and well drilling</li> <li>How to use pumping-up pumps, and motor driven equipments</li> <li>How to promote community participation (village meeting, water management committee, selection of caretaker, etc.)</li> </ul> <p><u>The pilot villages for rehabilitation of existing wells:</u></p> <ul style="list-style-type: none"> <li>Understanding of the activities of water management committee</li> <li>Identification and implementation of rehabilitation</li> <li>O&amp;M after rehabilitation</li> <li>Establishment of a repair system</li> </ul>
Necessary machinery &	<ul style="list-style-type: none"> <li>Stationary</li> </ul>

Items	<b>Training for Operation &amp; Maintenance of Water Supply Facilities (for Villager) (4<sup>th</sup> year)</b>
materials	

**e.5 End-line Survey (partially by local sub-contractor)**

The end-line survey in the target villages where the Project activities are carried out will be implemented by a local sub-contractor in order to (1) understand the village conditions after drilling of new wells, rehabilitation of existing wells, and training programmes, and (2) measure the effects of the activities. The end-line survey will be conducted in the following methodology.

- (1) The detailed items of the survey shall consider the contents of the baseline survey. In this report, the same items of the baseline survey are assumed (refer to Table 3-8).
- (2) Issues with operation and maintenance of water supply facilities at the time of end-line survey shall also be identified through a hearing with DDA staff and villagers.
- (3) In the Project, various impacts are assumed on villagers (especially women and children) by rural water supply of the Project activities. The impact of water supply project (including negative impact) will be surveyed, by confirming the usage of time, which is what was used for fetching water.

**e.6 Formulation of Training Materials for Each Training Programme (Final)**

Teaching materials (final) will be formulated by compiling the teaching materials (draft) revised in d.6 and materials used for the training programmes in the 4<sup>th</sup> year.

The final version of training materials will be distributed to DDA and villagers in the pilot area, and DDA Headquarter and DDA Township office, and will be fully utilized. Three hundred sets of materials will be made for villagers, and approximately 100 sets of other materials will be made.

**e.7 The 3<sup>rd</sup> Technology Transfer**

The 3<sup>rd</sup> technology transfer seminar will be held in the Nyaung\_U Township, in order to localize the techniques amongst DDA staff and villagers and extend the Project outcomes to DDA staff and villagers in other surrounding areas. A tentative seminar plan is referred to in Table 3-26. The seminar will invite DDA staff who did not participate in the training in the Central Dry Zone, and villagers (members of water management committee) from the villages other than the pilot villages. By drawing the maximum cooperation from the DDA side, improving coordination capacity of DDA staff and ensuring the self-reliability after the completion of the project is planned.

Table 3-26: A Draft Plan for the 3<sup>rd</sup> Technology Transfer Seminar

Items	<b>The 3<sup>rd</sup> Technology Transfer Seminar</b>
Aim	<ul style="list-style-type: none"> <li>• To localize the technology to DDA staff and villagers</li> <li>• To expand the Project output to DDA staff, not participated to the training programme in the Central Dry Zone and villagers outside the pilot villages</li> </ul>
Target	<ul style="list-style-type: none"> <li>• DDA staff</li> <li>• Villagers</li> <li>• Donor agency (UNICEF, UNDP, NGO, etc.)</li> </ul>

Items	The 3 <sup>rd</sup> Technology Transfer Seminar
	<ul style="list-style-type: none"> <li>Representatives from Ministry of Agriculture and Irrigation, Ministry of Construction, Ministry of Energy</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>Nyaung_U Township</li> <li>Once in October, 2009</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>Approx. 50</li> </ul>
Presenter	<ul style="list-style-type: none"> <li>DDA staff, JICA Expert Team</li> </ul>
Contents	<ul style="list-style-type: none"> <li>The Project output of the 4<sup>th</sup> field activities</li> <li>The contents of technology transfer in the 4<sup>th</sup> field activities</li> </ul>

### e.8 Final Seminar

The final seminar of the Project will be held in order to confirm the Project outputs and share lessons and suggestions for the Project with relevant organizations. In the seminar, the results of technology transfer will be summarized and consensus will be obtained by presenting the achievement of the Project activities and dissemination to the relevant organization of the Myanmar side, the Ministry of Agriculture and Irrigation, donor agencies and other wide areas of stakeholders.

Since many parts of the operation and maintenance of water supply facilities are involved with villagers, the participants from the villages (water management committee) are also considered.

Table 3-27: A Draft Plan for the Final Seminar

Items	Final Seminar
Aim	<ul style="list-style-type: none"> <li>To confirm the Project output and share lessons and suggestions of the Project with relevant organizations</li> </ul>
Target	<ul style="list-style-type: none"> <li>Representatives from Ministry of Agriculture and Irrigation, Ministry of Construction, Ministry of Energy</li> <li>Donor agency (UNICEF, UNDP, NGO, etc.)</li> <li>DDA staff</li> <li>Villagers</li> </ul>
Location & Time	<ul style="list-style-type: none"> <li>Nyaung_U Township, Yangon or Nay Pyi Taw (to be discussed with the Myanmar side)</li> <li>Once in October, 2009</li> </ul>
Planned No. of Trainees	<ul style="list-style-type: none"> <li>Approx. 50</li> </ul>
Presenter	<ul style="list-style-type: none"> <li>JICA Expert Team, DDA staff,</li> </ul>
Contents	<ul style="list-style-type: none"> <li>The Project output</li> <li>The contents of technology transfer in the Project</li> </ul>

## 3.2 Formulation of the Plan

### a. Formulation of Annual Activity Plan of the Project

Annual activity plans for the 2<sup>nd</sup> and following year will be formulated in accordance with the guideline instructed before each fiscal year, and will be approved by JICA. In formulation of the plan, close contact with JICA headquarter and JICA Myanmar office will be made.

As for the equipments considered necessary for the Project activities in the 2<sup>nd</sup> and following year, the details including name, quantity, specification, brand, availability of procurement in Myanmar, estimated price, reasons for necessity, and purpose are required in the proposal. In the case that the required equipments are approved, the JICA Expert Team shall procure the

equipment, based on the instructions from JICA. Means and procedures of the procurement will follow another guideline formulated by JICA.

Furthermore, the JICA Expert Team will suggest to the relevant organization (DDA) that the Myanmar side ensure sufficient budget for the following each fiscal year.

**b. Procurement for Grant Equipments / Procurement for Carrying Equipments**

The details are described in the section 3.7 Machinery and Materials Necessary for the Field Activities.

**c. Proposal for the Next Fiscal Year Plan**

**c.1 Administration of Dispatching JICA experts**

Leading field, schedule, period of the JICA experts to be dispatched will be proposed.

**c.2 Administration of C/P Training in Japan**

Contents, training schedule, period, number of trainees, and recipient organizations of the C/P training in Japan will be proposed.

**c.3 Administration of Grant Equipments**

Items, quantity, purchasing schedule, purchasing ways will be proposed.

**c.4 Administration for Local Contract**

When the re-commission of the work is proposed in the Project, objectives, activity plan, contents and quantity of the local contract will be proposed.

**3.3 Activity Reports**

The achievement of the Project outputs will be evaluated based on the submitted reports mentioned below, and the results of the Project completion assessment study. The copyrights of the outputs will belong to JICA, and they cannot be cited or used without permission from the JICA Expert Team or JICA. The items mentioned in the outputs and the submission dates are listed below.

Table 3-28: Reports submitted in the project schedule

Year	Report	Submission Date	Type	Submitted Copies			Contents
				JICA	Myanmar	Total	
1 <sup>st</sup> Year	Inception Report <IC/R>	One month after commencement of work (Mid December 2006)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	Work implementation plans incl. the basic policy for the Project, methods, work schedule, personnel plan, etc.
	Work	End of March 2007	Japanese	5	0	5	

Year	Report	Submission Date	Type	Submitted Copies			Contents
				JICA	Myanmar	Total	
	Completion Report (First Year)		CD-ROM			3 sets	
2 <sup>nd</sup> Year	Project Progress Report (1)	6 months after commencement of work ( End of April 2007)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	
	Baseline Study Report	9 months after commencement of work (End of June 2007)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	
	Project Progress Report (2)	13 months after commencement of work (End of October 2007)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	
	Work Completion Report (2 <sup>nd</sup> Year)	End of March 2008	Japanese CD-ROM	5	0	5 3 sets	
3 <sup>rd</sup> Year	Project Progress Report (3)	18 months after commencement of work (End of April 2008)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	
	Project Progress Report (4)	24 months after commencement of work (End of October 2008)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	
	Work Completion Report (3 <sup>rd</sup> Year)	End of March 2009	Japanese CD-ROM	5	0	5 3 sets	
4 <sup>th</sup> Year	Project Progress Report (5)	30 months after commencement of work (End of April 2009)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	
	End-line Survey Report	32 months after commencement of work (End of June 2009)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	
	Project Progress Report (6)	36 months after commencement of work (End of October 2009)	English Japanese CD-ROM	5 5	10 0	15 5 3 sets	
	Work Completion Report (4 <sup>th</sup> Year)	End of October 2009	Japanese CD-ROM	5	0	5 3 sets	
	Project Completion Report	Upon termination of 4 <sup>th</sup> year contract (End of October 2009)	English Japanese CD-ROM	10 10	20 0	30 10 3 sets	

### 3.4 Safety Management System

No matter how the Project is succeeded, safety management is the major premise, and serious attention must be paid to it. Especially, a liaison system will be constructed between our headquarters and Japan Cooperation Corporation to gather information from the JICA Myanmar Office, Myanmar Embassy, private safety information providers that Kokusai Kogyo Co., Ltd. has contracted, counterparts and local commission traders.

Besides, the JICA Expert Team will report local emergency contact system to JICA headquarters and the JICA Myanmar Office. In events of emergency, the BAJ Yangon Office and the Yangon Office, established by Kokusai Kogyo for Grant Aid work in the “Project for a forest in the Dry Zone”, will provide special support. The safety management system of the Project is shown in Figure 3-6.

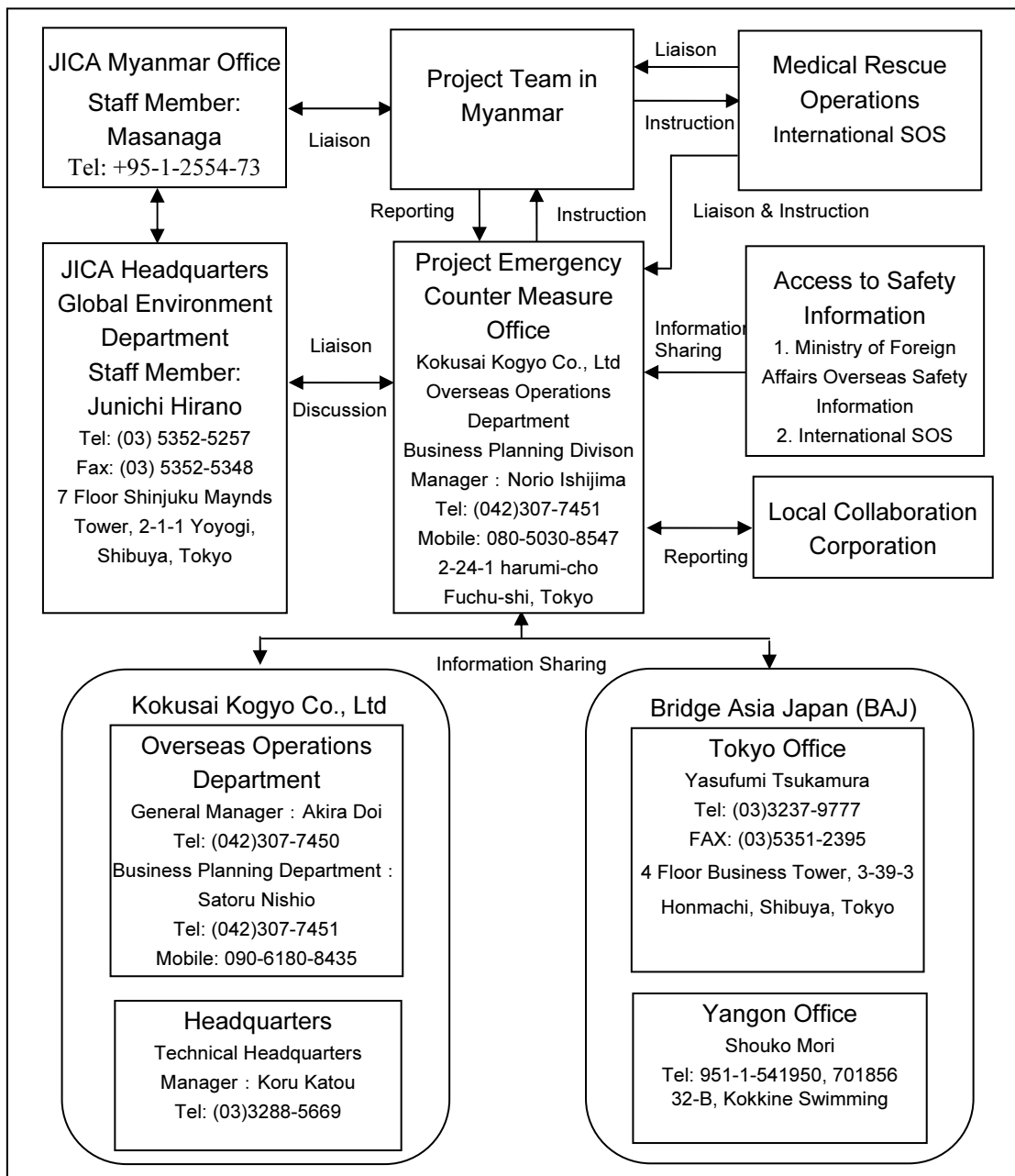


Figure 3-6: Safety Management System







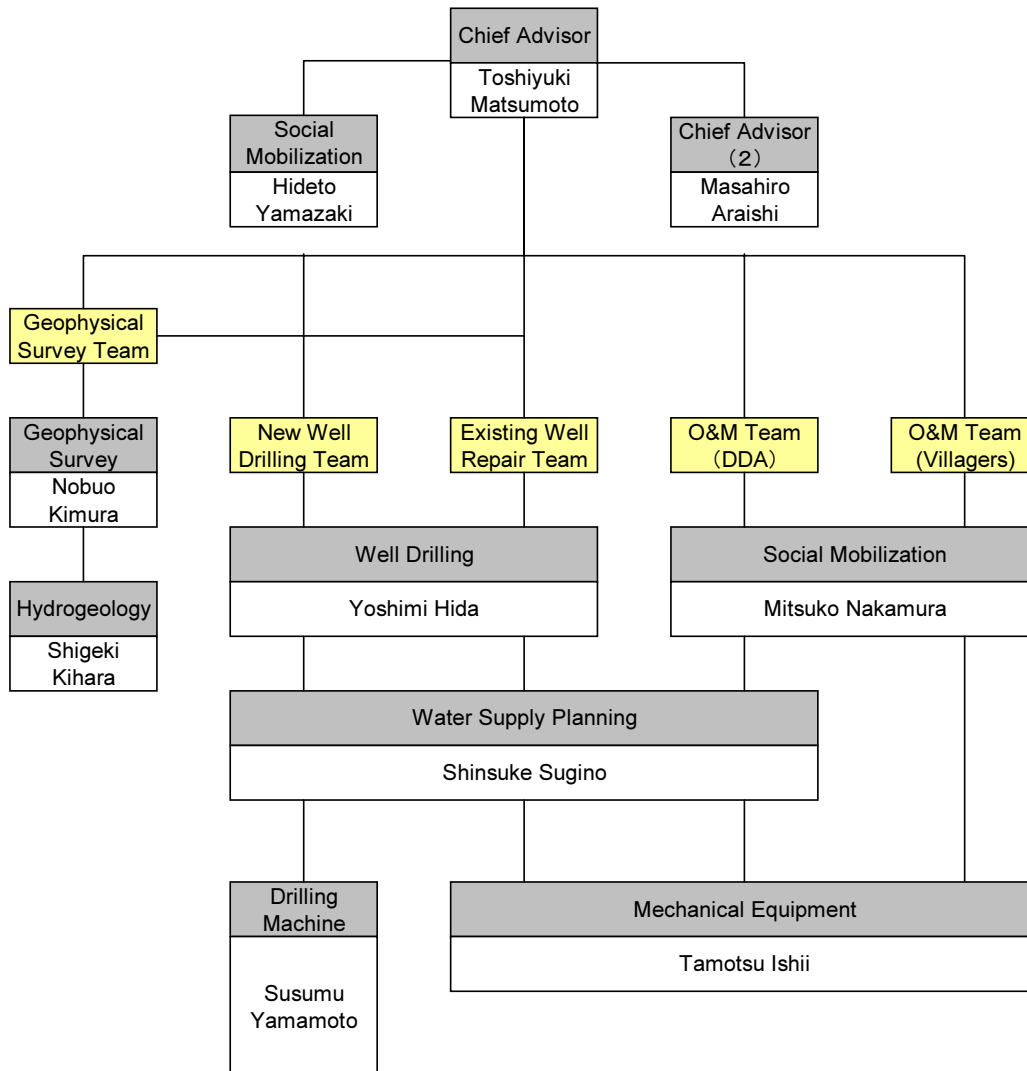
### 3.6 Personnel Plan

The JICA Expert Team is composed of the following ten (10) experts, with Mr. Toshiyuki Matsumoto, senior chief engineer of Kokusai Kogyo Co., Ltd., as team leader and coordinator of undertakings relevant to the project involving the Government of Myanmar, JICA and other agencies concerned. The personnel and assignment plan is as shown in Table 3-30.

Table 3-30: The JICA Expert Team

Responsibility	Name	Origin of Country
ChiefAdvisor/Groundwater Development	Mr. Toshiyuki Matsumoto	Japan
Chief Advisor (2)	Mr. Masahiro Araishi	Japan
Groundwater Survey	Mr. Nobuo Kimura	Japan
Hydrogeology	Mr. Shigeki Kihara	Japan
Drilling Machine	Mr. Susumu Yamamoto	Japan
Well Drilling	Mr. Yoshimi Hida	Japan
Mechanical Equipment	Mr. Tamotsu Ishi	Japan
Water Supply Planning	Mr. Shinsuke Sugino	Japan
Social Mobilization	Ms. Mitsuko Nakamura	Japan
Social Mobilization (2)	Mr. Hideto Yamazaki	Japan
Project Coordination	Ms. Mitsuko Nakamura	Japan

Each member will maintain mutual close contact with the focus on generalization, and carry out the operation through bilateral cooperation while attempting to achieve coordination (see the personnel organization chart).



Note 1) : The hierarchy between each expert is not shown.

Note 2): The geophysical survey team will assist and advise the new well digging team and the existing well repair team.



### 3.7 Machinery/Materials Necessary for Field Work

The machinery/materials need to be provided particularly for maintenance and workshop in the first year are listed in the table below.

Table 3-31 Machinery/Materials Necessary for Maintenance Workshop in the 1<sup>st</sup> Year

Name		Unit	Specification
Lathe Machine		1	Type: High speed precision lath 6feet model, complete set Distance between centers 800mm Swing over bed:350mm Spindle speed range:20 to 1800 rpm Rated voltage:380V,50Hz,3phase Accessories : a complete set 4Q'ty
Arc Welding Machine		4	Rated output capacity:200A Range of output: 50 to 200A Operating ratio:20 to 40% Rated voltage: 230V,50Hz,1phase
		4	Accessories : a complete set
		1	Diesel Engine AC Arc Welder Rated output capacity:180A Range of output: 30 to 180A Operating ratio:50% Rated voltage: 230V, 50Hz, 1 phase Accessories : a complete set
Gas Welding Machine		4	Type: Oxygen and acetylene welding
Drilling Machine		1	Type: Floor stand type Capacity: 16mm for steel Revolution range: 800 to 2500rpm Rated voltage: 230V, 50Hz, 1 phase Accessories: Drill chuck, 1ps
		5	Straight shank twist drill set 1 to 16mm, 0.5 mm up, 31pcs/set
High-Speed Disk Cutter		1	Type: Floor type Cutting wheel: max dia.350mm Cutting capacity max.: pipe:100mm, steel bar:60mm Rated voltage: 230V,50Hz,1phase
		50	Accessories: Cutting wheel 350mm dia
Double Head Pedestal Grinder		4	Grinding wheel: max dia. 200mm Rated voltage: 230V, 50Hz, 1 phase
		50	Accessories: Grinding wheel 200mm
Air Compressor		Procurement by DDA	
Bench Vise		Procurement by DDA	
Work Bench		Procurement by DDA	
Electric Equipments	Electric Drill	4	Capacity: 13mm(steel),230V.50Hz, 1phase
	Grinder	4	Disk dia:100mm,230V,50Hz,1phase
	Others	Complete Set	Elec. soldering ir.:100w,230V,50Hz Shank :1 to 13mm, 0.5mm up 25pcs Disk grinder cutting wh.:dia. 100mm Disk grinder grinding wh.:dia.100m

Name		Unit	Specification
Pump Fishing Tools		4	Chain block: Capacity:2 tons Three-legged hanger head with legs Leg length:4m,Capacity: 3 tons Fishing nylon sling: Leg length:3m,Capacity: 2 tons
Hand Tools		Procurement by DDA	
Measuring Instruments	Vernier	4	Range: 0 to 200mm
	Micro Meter	4	Outside & Internal depth, Range: 0 to 25mm
	Tester	4	[Circuit tester]: Digital type DC voltage: 0 to 40V AC voltage: 0 to 500V Resistance: 0 to 30 M ohm [Insulation tester] Measuring AC voltage: 0 to 500V Measuring resistance: 0 to 100 ohm
	Others	4	[Thickness gauge]: No. of blade:25,0.05 to 1mm,L75mm [Convex rule]:Range: 0 to 5m [Tape measure]:Range: 0 to 30m [Iron bench level]:Overall leg:500mm
Lubricant Equipments	Grease Gun	Procurement by DDA	
	Lubricant Syringe	Procurement by DDA	
Automotive Service Tools	Nozzle Tester	Procurement by DDA	
	Pressure Gauge	Procurement by DDA	
Movable Engine Pump Crane		2	Hoisting capacity: 2tons Arm length:1500mm Arm height: 400 to 1500mm
High Pressure Cleaner		2	Movable type Discharge volume: 1000 l/hr Discharge pressure: 100kgf/cm <sup>2</sup> Rated voltage: 380V,50Hz,3 phase
Diesel Engine Generator		2	Rated output: 380V,50Hz,3 phase Output capacity: 10kVA/50Hz Engine cooling system: water cooling Sound proof Accessories: standard
Pipe threading/cutting machine		2	Capacity: dia. 15 to 100mm Rated voltage: 230V, 50Hz, 1 phase Revolution: 7 to 22 r.p.m Accessories: pipe stand, H:350-450
Hydraulic Garage Jack		2	Capacity:10 tons Saddle height: 150 to 550 mm Lift: 400mm

### 3.7.1 Other Materials required for Project Activities

The materials required for the project activities in the first year are shown in the table below.

Table 3-32 Other Materials required for Project Activities

Material Name		Unit	Specification	Brand	Need and Use
Photocopier		1	A3, A4 size with sorter	Canon iR-2016	Required for everyday work and necessary as a large amount of literature is expected to be distributed for training. Usable for creating reports on-site.
Telephone with Fax machine (incl. phone line installation fee)		1	A4 size Fax machine	—	A necessity for safety management and local communication. Applications have to be made for 2 lines for the Phone and Fax machine and Fax is necessary as there are many occasions where email conditions are not suitable.
LAN. Internet connection fee		1 time	—	—	<ul style="list-style-type: none"> <li>• Required for indoor work (creating reports) and creating an effective communication network.</li> <li>•</li> </ul>
Printer	Indoor	1	LaserJet printer, capable of A3 colour	HP8150dn	<ul style="list-style-type: none"> <li>• Necessary for everyday work and for creating materials for training.</li> <li>• Usable for creating reports on-site.</li> </ul>
	Outdoor	1	A4 Handheld model	—	<ul style="list-style-type: none"> <li>• Usable for electric detection and for taking to the site for analysis.</li> </ul>
Office Fitting	Desks and chairs	10 desks 20 chairs	—	—	Usable for indoor work, have to prepare enough desks for most of the necessary people, including local employees. More chairs are required than desks for visiting clients.
	PC (incl. UPS)	1	Desktop PC, 1 GB memory, 40GB HD	—	Necessary for data analysis. Usable for geophysical survey and the well ledger database.
	Various kinds of software	1 time	MS-Window XP Pro Virus protection MS-office	—	Necessary basic software for PCs. Minimum software for data analysis and creating reports.
	Air-conditioner	1	Air-conditioner	—	Necessary in the summer season.
	Generator	1	—	—	Necessary for emergency use during the many power failures.
	Stationary	1times	Including paper	—	Usable indoor and for field work.
Analytical Software		1	Surfer & Grapher	—	Usable for geologic analysis.
Electric Detection		1	IX1D V2	Interpex	New software will be introduced



Material Name	Unit	Specification	Brand	Need and Use
Software				as the DDA software is the old DOS edition.
Electromagnetic Sounding Software	1	IX1D V3	Interpex	Usable for electromagnetic sounding analysis. Required for frequency and time domain (TEM). Expensive license. 2 licenses are required (on-site and indoor).
GPS	5	—	—	Usable by each Team. Identifies the location of wells.
pH Indicator	2	—	—	Usable for analysis of site water quality. Necessary for examining new wells.
EC Indicator	2	—	—	Usable for analysis of site water quality. Necessary for examining new wells.
ORP Indicator	2	—	—	Usable for analysis of site water quality. Necessary for examining new wells.
Roped Water Gauge	2	—	—	Necessary for measuring the groundwater level of wells.

### 3.8 Others

#### 3.8.1 Provision by the Myanmar Side

The provisions from the Myanmar side are described in the R/D “Attached Document III” attached at the end of the report.

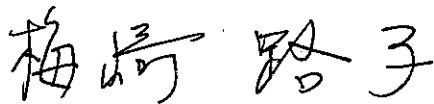
# ANNEX

**RECORD OF DISCUSSIONS  
BETWEEN  
JAPAN INTERNATIONAL COOPERATION AGENCY  
AND  
DEPARTMENT OF DEVELOPMENT AFFAIRS, MINISTRY OF  
PROGRESS OF BORDER AREAS AND NATIONAL RACES AND  
DEVELOPMENT AFFAIRS, THE UNION OF MYANMAR  
ON  
THE PROJECT ON RURAL WATER SUPPLY TECHNOLOGY  
IN THE CENTRAL DRY ZONE**

With regard to the Minutes of Meeting between the 1<sup>st</sup> and 2<sup>nd</sup> Preparatory study teams and Department of Development Affairs (hereinafter referred to as "Myanmar side") dated 14 December 2005 and 20 March 2006, Japan International Cooperation Agency (hereinafter referred to as "JICA") had a series of discussions, through the Resident Representative of JICA Myanmar Office, with the Myanmar side with respect to the desirable measures to be taken by JICA and the Myanmar side for the successful implementation of the Project on rural water supply technology in the Central Dry zone.

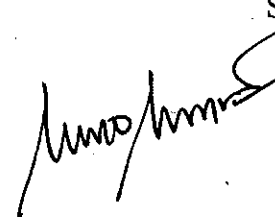
As a result of the discussions, JICA and the Myanmar side agreed to recommend to their respective Governments the matters referred to in the document attached hereto.

September 7, 2006



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Ms. Michiko UMEZAKI  
Resident Representative  
Myanmar Office  
Japan International Cooperation Agency



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U Myo Myint  
Director General  
Department of Development Affairs  
Ministry for Progress of Border Areas and  
National Races and Development Affairs  
The Union of Myanmar

## THE ATTACHED DOCUMENT

### I. COOPERATION BETWEEN JICA AND THE MYANMAR SIDE

1. The Myanmar side will implement the Project on rural water supply technology in the Central Dry zone (hereinafter referred to as "the Project") in cooperation with the Japan International Cooperation Agency (hereinafter referred to as "JICA").
2. The Project will be implemented in accordance with the Master Plan which is given in Annex I.

### II. MEASURES TO BE TAKEN BY JICA

In accordance with the laws and regulations in force in Japan, JICA will take, at its own expense, the following measures according to the normal procedures under the Colombo Plan Technical Cooperation Scheme.

#### 1. DISPATCH OF JAPANESE EXPERTS

JICA will provide the services of the Japanese experts as listed in Annex II.

#### 2. PROVISION OF MACHINERY AND EQUIPMENT

JICA will provide such machinery, equipment and other materials (hereinafter referred to as "the Equipment") necessary for the implementation of the Project as listed in Annex III. The Equipment will become the property of the Myanmar side upon being delivered C.I.F. (cost, insurance, and freight) to the Myanmar authorities concerned at the ports and/or airports of disembarkation.

#### 3. TRAINING OF MYANMAR COUNTERPART PERSONNEL IN JAPAN

JICA will receive the Myanmar personnel connected with the Project for technical training in Japan.

### III. MEASURES TO BE TAKEN BY THE MYANMAR SIDE

1. The Myanmar side will take necessary measures to ensure that the self-reliant operation of the Project will be sustained during and after the period of Japanese technical cooperation, through the full and active involvement in the Project of all related authorities, beneficiary groups and institutions.
2. The Myanmar side will ensure that the technologies and knowledge acquired by the Myanmar nationals as a result of Japanese technical cooperation will contribute to the economic and social development of Myanmar.
3. The Myanmar side will grant in Myanmar priviléges, exemptions and benefits to the Japanese experts referred to in II-1 above and their families, which are no less favorable than those accorded to experts of third countries working in Myanmar under the Colombo Plan Technical Cooperation Scheme.
4. The Myanmar side will ensure that the Equipment referred to in II-2 above will be utilized effectively for the implementation of the Project in consultation with the Japanese experts referred to in Annex II.
5. The Myanmar side will take necessary measures to ensure that the knowledge and experience acquired by the Myanmar personnel through technical training in Japan will be utilized effectively in the implementation of the Project.
6. In accordance with the laws and regulations in force in Myanmar, the Myanmar side will take necessary measures to provide at its own expense:
  - (1) Services of the Myanmar counterpart personnel and administrative personnel as listed in Annex IV;
  - (2) Office buildings and facilities as listed in Annex V;
  - (3) Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary as mutually agreed

for the implementation of the Project other than the Equipment provided by JICA under II-2 above;

7. In accordance with the laws and regulations in force in Myanmar, the Myanmar side will take necessary measures to meet:
- (1) Expenses necessary for transportation within Myanmar of the Equipment referred to in II-2 above as well as for the installation, operation and maintenance thereof;
  - (2) Customs duties, internal taxes and any other charges, imposed in Myanmar on the Equipment referred to in II-2 above; and
  - (3) Running local expenses necessary for the implementation of the Project.

#### IV. ADMINISTRATION OF THE PROJECT

1. Director General of the Department of Development Affairs, Ministry for Progress of Border Areas and National Races and Development Affairs of the Union of Myanmar (hereinafter referred to as "DDA"), as the Project Director, and Deputy Director General of DDA and Deputy Chief Engineer of DDA as the Deputy Project Director, will bear overall responsibility for the administration and implementation of the Project.
2. Director of Water Supply Division, DDA as the Project Manager, will be responsible for the managerial and technical matters of the Project.
3. The Japanese Chief Advisor will provide necessary recommendations and advice to the Project Director and the Project Manager on any matters pertaining to the implementation of the Project.
4. The Japanese Experts will give necessary technical guidance and advice to the Myanmar counterpart personnel on technical matters pertaining to the

implementation of the Project.

5. For the effective and successful implementation of technical cooperation for the Project, a Joint Coordinating Committee will be established whose functions and composition are described in Annex VI.

## V. JOINT EVALUATION

Evaluation of the Project will be conducted jointly by JICA and the Myanmar side at the middle and during the last six (6) months of the cooperation term in order to examine the level of achievement.

## VI. CLAIMS AGAINST JAPANESE EXPERTS

The Myanmar side undertakes to bear claims, if any arises, against the Japanese experts engaged in technical cooperation for the Project resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in Myanmar except for those arising from the willful misconduct or gross negligence of the Japanese experts.

## VII. MUTUAL CONSULTATION

There will be mutual consultation between JICA and the Myanmar side on any major issues arising from, or in connection with this Attached Document.

## VIII. MEASURES TO PROMOTE UNDERSTANDING OF AND SUPPORT FOR THE PROJECT

For the purpose of promoting support for the Project among the people of Myanmar, the Myanmar side will take appropriate measures to make the Project widely known to the people of Myanmar.

## IX. TERM OF COOPERATION

The duration of the technical cooperation for the Project under this Attached Document will be three (3) years from the date of arrival of the first expert.

### List of Annexes

- ANNEX I MASTER PLAN
- ANNEX II LIST OF JAPANESE EXPERTS
- ANNEX III LIST OF MACHINERY AND EQUIPMENT
- ANNEX IV LIST OF MYANMAR COUNTERPART AND ADMINISTRATIVE PERSONNEL
- ANNEX V LIST OF OFFICE BUILDINGS AND FACILITIES
- ANNEX VI JOINT COORDINATING COMMITTEE



## ANNEX I: MASTER PLAN

Project title: Rural Water Supply Technology in the Central Dry Zone

### 1. Overall goal

The number of villages in the Central Dry Zone which have access to safe drinking water is increased.

### 2. Project purpose

Capacity in construction, repair and maintenance of water supply facilities in the Central Dry Zone is strengthened.

### 3. Project outputs

- 1) The advanced technology on construction of rural water supply facilities is transferred.
- 2) The advanced technology on rehabilitation of deep tube well is transferred.
- 3) The advanced techniques on maintenance/monitoring of water supply is transferred.

### 4. Project activities

#### 4.1 Activities under outputs 1)

- 1-1 To conduct the training on the groundwater exploration geographic survey.
- 1-2 To conduct the training on the advanced technologies in drilling deep tube well.
- 1-3 To prepare the equipment/materials necessary for the field training on the drilling of deep tube wells.
- 1-4 To repair the boring related equipment for the training on the drilling practice of deep tube well.
- 1-5 To compile the lessons learned and good practices on drilling deep tube well.
- 1-6 To compile the good practice/cases on the design of reservoir tank.
- 1-7 To prepare the manual for the training on the planning of water supply facility construction.
- 1-8 To conduct the training on the planning of water supply facility construction.

#### 4.2 Activities under outputs 2)

- 2-1 To collect the basic information for rehabilitation of existing deep tube wells.
- 2-2 To conduct the training on the rehabilitation of tube wells.
- 2-3 To prepare the equipment/materials necessary for the training practice to rehabilitate the existing deep tube wells.

- 2-4 To compile lessons learned and good practices on the rehabilitation of deep tube wells.
- 4.3 Activities under output 3)
- 3-1 To select the pilot township.
  - 3-2 To conduct the survey on the condition of the management/maintenance of water supply facilities by the villagers in the selected township.
  - 3-3 To prepare the manual for the villagers on the management/maintenance of water supply facilities.
  - 3-4 To prepare the manual for DDA staff on management and maintenance of water supply facilities.
  - 3-5 To conduct the training for DDA staff on the management/maintenance of water supply facilities.
  - 3-6 To conduct the training for the leader and member of water committee in the pilot township on maintenance of water supply facilities.
  - 3-7 To compile the cases on the management/maintenance of the water supply facilities.

## ANNEX II: LIST OF JAPANESE EXPERTS

1. The Project experts, who will be in charge of the following fields, will be dispatched:

- (1) Chief Advisor
- (2) Ground Water survey
- / (3) Hydrogeology
- / (4) Drilling Machine
- / (5) Well Drilling
- (6) Mechanical Equipment
- / (7) Water Supply Planning
- / (8) Social Mobilization

2. Other experts in specific fields would be dispatched if necessary upon mutual agreement.

**ANNEX III: LIST OF MACHINERY AND EQUIPMENT**

1. The following equipment, necessary for the Project activities, will be provided:
  - (1) Equipment and spare parts for construction and rehabilitation of deep tube wells.
  - (2) Equipment and spare parts for ground water survey.
  - (3) Vehicles
  
2. Other equipment would be provided if necessary upon mutual agreement.

## **ANNEX IV: LIST OF COUNTERPART AND ADMINISTRATIVE PERSONNEL**

1. Project Director: Director General, DDA
2. Deputy Project Director1: Deputy Director General, DDA
3. Deputy Project Director2: Deputy Chief Engineer, DDA
4. Project Manager: Director, Water Supply Division, DDA
5. Counterpart Personnel
  - (1) Deputy Director, Water Supply Division (H.Q)
  - (2) Deputy Director, Water Supply Division (H.Q)
  - (3) Assistant Chief Engineer (Sagaing Division)
  - (4) Assistant Chief Engineer (Magway Division)
  - (5) Assistant Chief Engineer (Mandalay Division)
  - (6) Assistant Director, Water Supply Division (H.Q)
  - (7) Executive Engineer (Sagaing Division)
  - (8) Executive Engineer (Magway Division)
  - (9) Executive Engineer (Mandalay Division)
  - (10) Assistant Engineer, Water Supply Division (H.Q)
  - (11) Assistant Engineer (Sagaing Division)
  - (12) Assistant Engineer (Magway Division)
  - (13) Assistant Engineer (Mandalay Division)
6. Administrative Personnel
  - (1) Staff Officer
  - (2) Deputy Staff Officer
  - (3) Senior Clerk
  - (4) Junior Clerk
7. Other personnel mutually agreed upon as necessary

## **ANNEX V: LIST OF OFFICE BUILDINGS AND FACILITIES**

1. Office buildings and facilities necessary for the implementation of the Project
2. Rooms and space necessary for installation and storage of the Equipment
3. Office space and necessary facilities for the Japanese experts and related staff members
4. Other facilities mutually agreed upon as necessary

## ANNEX VI: JOINT COORDINATING COMMITTEE

### 1. Function

In order to support the Project in various ways and to direct the implementation of the Project in proper way reflecting opinions of key organizations concerned the Joint Coordinating Committee will be established.

The Joint Coordinating Committee (hereinafter referred to as "JCC"), will perform the following:

- To approve the annual work plan of the Project based on the Tentative Schedule of Implementation within the framework of the Record of Discussions
- To evaluate the result of the plan of operation and the progress of the technical cooperation.
- To review and exchange opinions on major issues that arises during the implementation of the Project

The JCC will be called by the Chairperson periodically.

### 2. Composition

The members of the JCC will be provisionally as follows;

Chair person: Director General, DDA

Vice Chairperson1: Deputy Director General, DDA

Vice Chairperson2: Deputy Chief Engineer, DDA

Myanmar side: Director of Water Supply Division, DDA

Director of Sagaing Division, DDA

Director of Magway Division, DDA

Director of Mandalay Division, DDA

Deputy Director of Water Supply Division, DDA

Assistant Chief Engineer of Sagaing Division, DDA

Assistant Chief Engineer of Magway Division, DDA

Assistant Chief Engineer of Mandalay Division, DDA

Staff Officer, DDA

Japanese side:

JICA experts

Representative of the JICA Myanmar Office

Personnel concerned to be decided by Japanese side

The JCC will be held at least once a year. The Chairperson will be the Director General of DDA and will bear overall responsibility for the administration and implementation of the Project.

Notes:

- 1) Officials of the Embassy of Japan may attend JCC meetings as observers.
- 2) Chairperson can request the attendance of Myanmar officials to JCC meetings if necessary.



**MINUTES OF MEETING  
BETWEEN  
JAPAN INTERNATIONAL COOPERATION AGENCY  
AND  
THE AUTHORITIES CONCERNED OF  
THE GOVERNMENT OF THE UNION OF MYANMAR  
ON  
THE JAPANESE TECHNICAL COOPERATION  
FOR  
THE PROJECT ON RURAL WATER SUPPLY TECHNOLOGY  
IN THE CENTRAL DRY ZONE**

With regard to the Minutes of Meetings between the 1<sup>st</sup> and 2<sup>nd</sup> Preparatory study teams and the authorities concerned of the Government of the Union of Myanmar dated 14 December 2005 and 20 March 2006, Japan International Cooperation Agency (hereinafter referred to as "JICA"), had a series of discussions with the Myanmar authorities concerned (hereinafter referred to as "Myanmar side") with respect to desirable measures to be taken by both sides for the successful implementation of the Project on Rural Water Supply Technology in the Central Dry Zone (hereinafter referred to as "the Project").

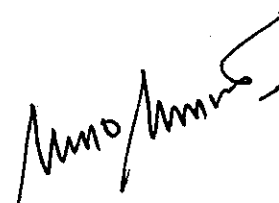
As a result of the discussions with respect to the desirable measures to be taken by both sides for the successful implementation of the Project, JICA and Myanmar side agreed to implement the Project based on the above-mentioned Minutes. Both sides also agreed to make this complementary Minutes of Meetings in order to confirm the mutual understanding reached through the discussions hereto.

September 7, 2006



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Ms. Michiko UMEZAKI  
Resident Representative  
Myanmar Office  
Japan International Cooperation Agency



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U Myo Myint  
Director General  
Department of Development Affairs  
Ministry for Progress of Border Areas and  
National Races and Development Affairs  
The Union of Myanmar

## THE ATTACHED DOCUMENT

### I. PROJECT DESIGN MATRIX

The Project Design Matrix (hereinafter referred to as "PDM") is commonly used in Japanese technical cooperation in order to manage and implement Projects efficiently and effectively. It will also be used as a reference for monitoring and evaluating the Project.

As a result of discussions, both sides agreed to apply the PDM as shown in ANNEX I to the Project with the following understanding.

The PDM is to be reviewed according to the progress and achievements of the Project, upon agreement on the Joint Coordinating Committee.

### II. PLAN OF OPERATION

The Tentative Plan of Operation (PO<sub>1</sub>) is shown in ANNEX II. Both sides will set the Plan of Operation (PO<sub>2</sub>) within four (4) months from the commencement of the Project.

### III. FACILITIES TO BE PREPARED BY THE MYANMAR SIDE

- (1) Office space for the Japanese experts in Yangon and Nyaung Oo
- (2) Maintenance Workshop

The Myanmar side will complete the maintenance workshop construction before the Project starts. The Project activities in this maintenance workshop will be focused on rehabilitation of tube wells.

- (3) Drilling Rig

The Myanmar side will provide two (2) Drilling Rigs (TONE-TRD300) and one (1) Drilling Rig (TONE-TOP500) exclusively for the Project. Among them, two (2) Drilling Rig (TONE-TRD300) will be change into to two (2) Drilling Rig (TONE-TOP300) by the Japanese side's expenses.

### IV. STRUCTURE OF PROJECT IMPLEMENTATION

The organization chart of project implementation is given ANNEX III. Especially as for construction of deep tube well, the Myanmar side will organize three teams – one (1) team for drilling rig (TONE-TOP500) and two (2) teams for drilling rig (TOME-TRD300).

ANNEX I  
ANNEX II  
ANNEX III

PROJECT DESIGN MATRIX  
TENTATIVE PLAN OF OPERATION  
ORGANIZATION CHART OF PROJECT IMPLEMENTATION

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Project on Rural Water Supply Technology in the Central Dry Zone (PDM 0)

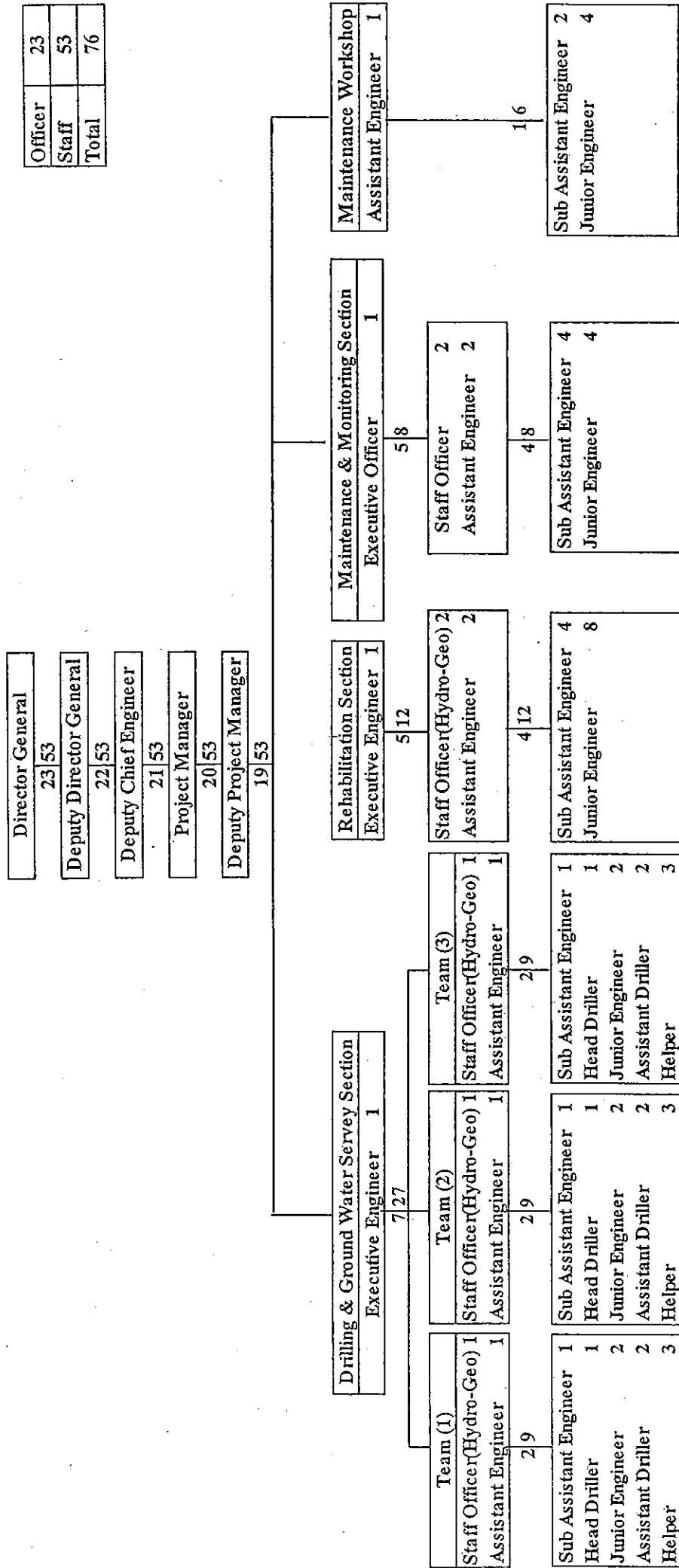
Project Period : August, 2006 - July, 2009  
 Target site : Central Dry Zone  
 Target Group : DDA staff  
 December 14 2005

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p><b>OVERALL GOAL</b>                      The number of villages in the Central Dry Zone which have access to safe drinking water is increased.</p>	<p>The number of the villages in the Central Dry Zone which have not access to safe drinking water is reduced by half (by 2015, the targeted year of MDG9).</p>	<p>Quarterly report and annual report of DDA</p>	
<p><b>PROJECT PURPOSE</b>                      Capacity in construction, repair and maintenance of water supply facilities in the Central Dry Zone is strengthened.</p>	<p>The Report on Lessons Learned and Good Practices is prepared</p>	<p>The report on Lessons Learned and Good Practices</p>	<p>DDA carries out its rural water supply project as planned.</p>
<p><b>OUTPUTS</b></p> <ol style="list-style-type: none"> <li>The advanced technology on construction of rural water supply facilities is transferred.</li> <li>The advanced technology on rehabilitation of deep tube well is transferred.</li> <li>The advanced techniques on maintenance/monitoring of water supply facilities is transferred.</li> </ol>	<p>1-1 More than 20 deep tube wells are drilled and more than 20 thousand people can have access to the safe drinking water by these wells.                      1-2 More than thirty four (34) staff receive technical training.                      2-1 More than 40 deep tube wells are rehabilitated and more than 40 thousand people can have access to the safe drinking water by these wells.                      2-2 More than thirty seven (37) DDA staff receive technical training                      3-1 Manual for villages and DDA staff on maintenance/monitoring                      3-2 More than thirty seven (37) DDA staff are trained through workshops                      3-3 More than one hundred and twenty (120) villages of Water Management Committee receive technical training</p>	<p>1-1 Progress report of the project and quarterly report of DDA                      1-2 Progress report of the project and quarterly report of DDA                      2-1 Progress report of the project and quarterly report of DDA                      2-2 Progress report of the project and quarterly report of DDA                      3-1 Progress report of the project and quarterly report of DDA                      3-2 Progress report of the project and quarterly report of DDA</p>	
<p><b>ACTIVITIES</b></p> <ol style="list-style-type: none"> <li>To conduct the training on the groundwater exploration geographic survey.</li> <li>To conduct the training on the advanced technologies in drilling deep tube well.</li> <li>To prepare the equipment/materials necessary for the field training on the drilling of deep tube wells.</li> <li>To repair the boring related equipment for the training on the drilling practice of deep tube well.</li> <li>To compile the lessons learned and good practices on drilling deep tube well.</li> <li>To compile the good practices on the design of reservoir tank.</li> <li>To prepare the manual for the training on the planning of water supply facility construction.</li> <li>To conduct the training on the planning of water supply facility construction.</li> <li>To collect the basic information for rehabilitation of existing deep tube wells.</li> <li>To conduct the survey on the condition of the management/maintenance of water supply facilities by the villagers in the selected township.</li> <li>To prepare the manual for the villagers on the management/maintenance of water supply facilities.</li> <li>To prepare the manual for DDA staff on management and maintenance of water supply facilities.</li> <li>To conduct the training for DDA staff on the management/maintenance of water supply facilities.</li> <li>To conduct the training for the leader and member of water committee in the pilot township on maintenance of water supply facilities.</li> <li>To compile the cases on the management/maintenance of the water supply facilities.</li> </ol>	<p><b>JAPAN</b></p> <p>Personnel</p> <p>Experts</p> <p>Chief Advisor                      Ground Water survey                      Hydrogeology                      Drilling Machine                      Well Drilling                      Mechanical Equipment                      Water Supply Planning                      Social Mobilization</p> <p>Local consultant</p> <p>Training of C/P in Japan</p> <p>Machinery and Equipment</p> <p>Local Cost</p>	<p><b>MYANMAR</b></p> <p>Personnel</p> <p>Counterpart Personnel</p> <p>Facilities</p> <p>Office space for Japanese experts at central level and local level                      Repair Work-shop and training facility in central dry zone area</p> <p>Local Cost</p>	<p><b>PRE-CONDITIONS</b></p> <p>DDA arranges equipment/materials                      DDA assigns counterpart personnel</p>

2



ORGANIZATION CHART OF THE PROJECT



Officer	23
Staff	53
Total	76

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