

A5 Technical Assisatance Plan

A5. Technical Assistance Plan

1. Background of the Technical Assistance

1.1 Programme Background

The Government of Lao People's Democratic Republic (hereinafter referred to as "Laos") has formulated a plan to recover its forest percentage to 70% by 2020, and it has developed legal systems concerned with the enactments and the revisions of its forestry law and rural forest controls. In addition, the Government of Laos defines the Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (hereinafter referred to as "REDD") as extremely useful measures to increase rural livelihoods which rely on forest conservation and forestry. For these reasons, it urges the preparations for REDD implementation by actively participating in related workshops.

In order to accelerate forest conservation toward REDD, it is vital to develop highly-accurate forest resource information by methods such as satellite imagery analyses. In Laos, the Forest Inventory and Planning Division (hereinafter referred to as "FIPD") of the Department of Forestry (hereinafter referred to as "DoF") of the Ministry of Agriculture and Forestry (hereinafter referred to as "MAF") works for controlling forest resources information, but the existing FIPD facility is decrepit and it is necessary to rebuild it. Furthermore, the processing capacities, volumes, functions and quantities of necessary equipment for satellite imagery analyses and field surveys cannot adequately handle the analyzing and controlling works of data concerned with forest resources at present. Besides, Laos needs funds to accelerate its forest conservation by procuring satellite imagery and forest resources information with the funds. However, it is difficult for Laos to take these actions. For these reasons, it is necessary to examine possibilities to use funding systems established by other donors.

Under such circumstances, this grant aid cooperation shall be implemented with the Lao local specifications and designs on the premise of the application of Grant Aid for Environment and Climate Change (hereinafter referred to as "GAEC"), aiming to arrange facilities and equipment for grasping forest resources conditions and accelerating forest conservation, and also aiming to establish the systems of personnel resources development. (Refer to Figure 1)

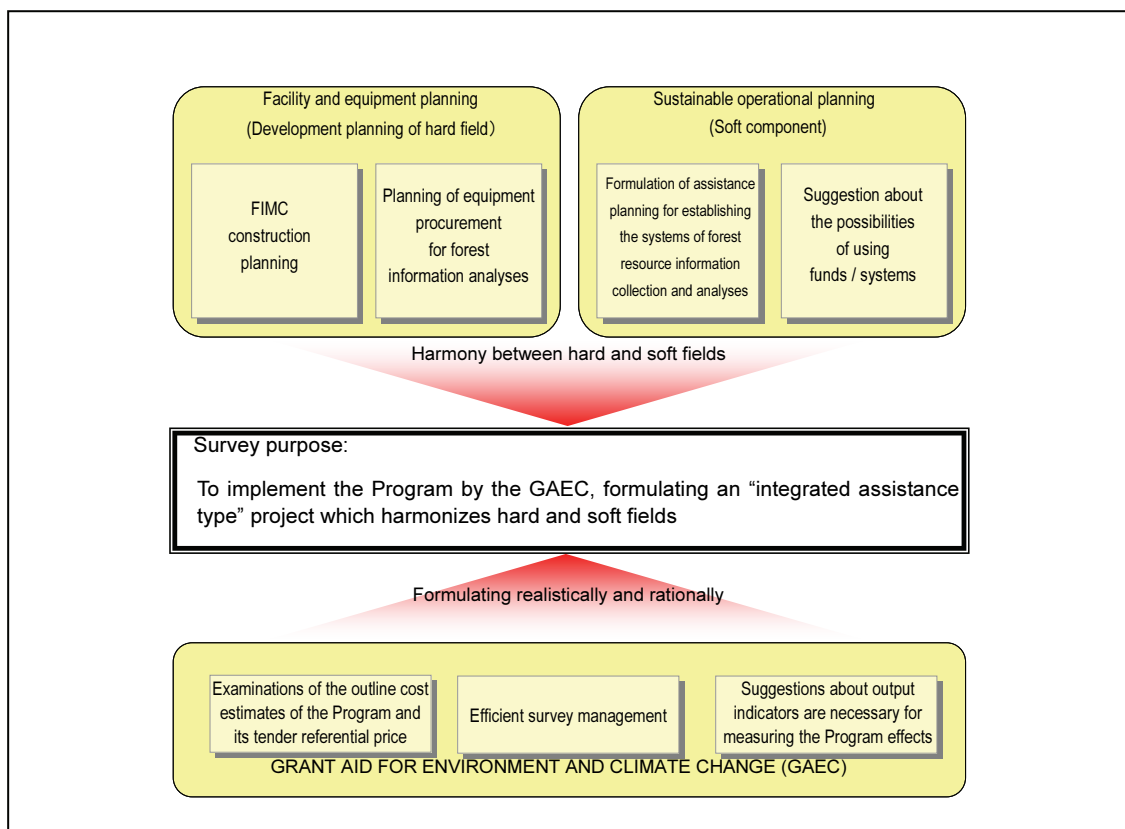


Figure 1 Overall Image of the Programme (GAEC)

1.2 Scope of Works

In Laos, there are a number of aims to be achieved and issues to be solved for forest conservation/controls and REDD implementation. The following three describe particularly important points as the results of the outline design study of the Programme in September and October 2009 and their present situation.

1. Establishment of REDD implementation systems (definitions and methodologies)
 - Present situation: Stage of pilot project commencement to standardize the methodologies
2. Production of benchmark maps at the national level of Laos
 - Present situation: No implementation since nation-wide inventory surveys in 1992 and 2002
3. Capacity to solve operational issues and data quality controls
 - Present situation: Operations are possible, but there are a number of issues about basic theories and data controls

Preceding pilot projects have already implemented 1 above. This also depends on the tendencies of international arguments. Accordingly, the Programme shall focus particularly on the arrangement of basic systems with the purposes of realizing 2 and 3 above and the improvement of basic knowledge. (Refer to Figure 2)

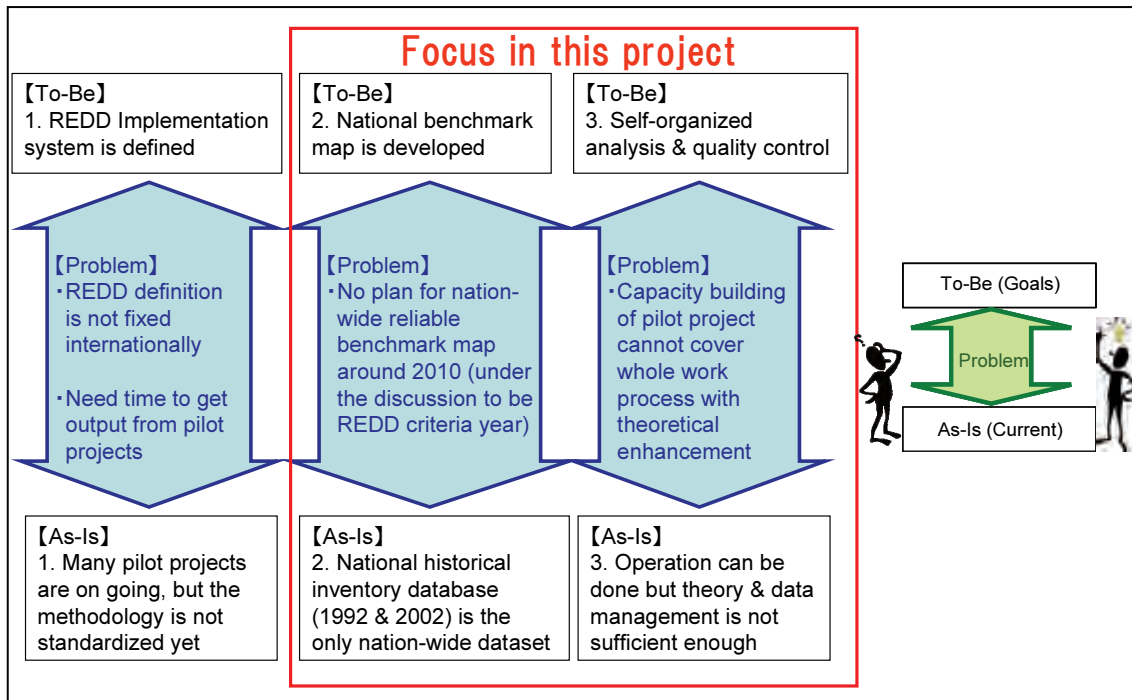


Figure 2 Basic Concept of Technical Assistance by the Programme and the Scope of Works

1.3 Programme Purposes and Relationships with Other Donors

As for the forest sector of Laos (especially concerning REDD), there are projects in the implementation and planning stages, such as Sustainable Forestry and Rural Development Project (hereinafter referred to as “SUFORD”) by the World Bank, and others by Kreditanstalt für Wiederaufbau (hereinafter referred to as “KfW”) and Deutsche Gesellschaft für Technische Zusammenarbeit (hereinafter referred to as “GTZ”) of Germany, the Forestry Agency of Japan (Forestry and Forest Products Research Institute (hereinafter referred to as “FFPRI”) and Asia Air Survey Co., Ltd.). All of them are pilot projects at limited sites to formulate REDD methodological theories, and they are not for data development at the national level of Laos.

SUFORD has been formulating the designs of forest resources survey at the national level and the plans of technical assistance, but it does not plan to implement them at the national level. It plans to use the results of nation-wide forest inventory surveys, and therefore, it cannot plan detailed implementation for data development by newly procuring and analyzing satellite imagery. Besides, its contents focus on the model productions of biomass volume estimations rather than data development.

From the situations above, DoF of the Lao side greatly looked toward the Japanese side for data development at the national level, the implementation of field surveys and technical assistance concerned with them during the field work of the outline design study of the Programme. Therefore, the Programme shall aim to enhance the systems and the capacities to develop forest basic data at the national level necessary for the forest conservation / controls and the implementation of REDD in Laos.

Table 1 and Figure 3 summarize the relationships among the Programme, Japanese and other donors’ assistance. Japan’s Forestry Agency assists demonstrational activities toward REDD methodologies. JICA-PAREDD covers community participation approaches; GTZ assists carbon stock evaluations at limited sites. Thus, their activities do not overlap with the Programme’s, and their systems can generate positively synergistic effects. SUFORD’s assistance targets the whole of Laos. However, it is placed as a master plan, and the purpose of the Programme mainly aiming to implementation is different from that of SUFORD. The Programme already agrees with SUFORD to coordinate participants into the technical

assistance. The implementing systems of JICA-FSIP then assist to controls overall activities and to establish their strategies for the Lao side.

Table 1 Position of the Programme Towards REDD Implementation

No	Challenges	Data	Implemented by (JICA-FICP Idea)
1	Nation-wide historical database	Existing Inventory Data	SUFORD
2	Nation-wide forest basemap 1990	LANDSAT TM	SUFORD (JICA-FICP Training)
3	Nation-wide forest basemap 2000(2002)	SPOT/LANDSAT ETM+	SUFORD (JICA-FICP Training)
4	Nation-wide forest basemap 2005	SPOT4	JICA-FICP
5	Nation-wide forest basemap 2010 Nation-wide field survey in 2010	ALOS/AVNIR-2 & PRISM SPOT5 & RapidEye	JICA-FICP
6	REDD Method, Biometric Modeling, Biomass & Carbon Data	Output from Pilot Projects	SUFORD
7	REDD Method Pilot Project	QuickBird, Kompsat, etc. Airborn Laser Scanner	Kfw/GTZ, SUFORD, JICA-PAREDD, ASA
8	REDD Policy/Implementation System	Whole Outputs	
9	REDD Projects Overall Coordination	Whole Outputs	FSIP or following project

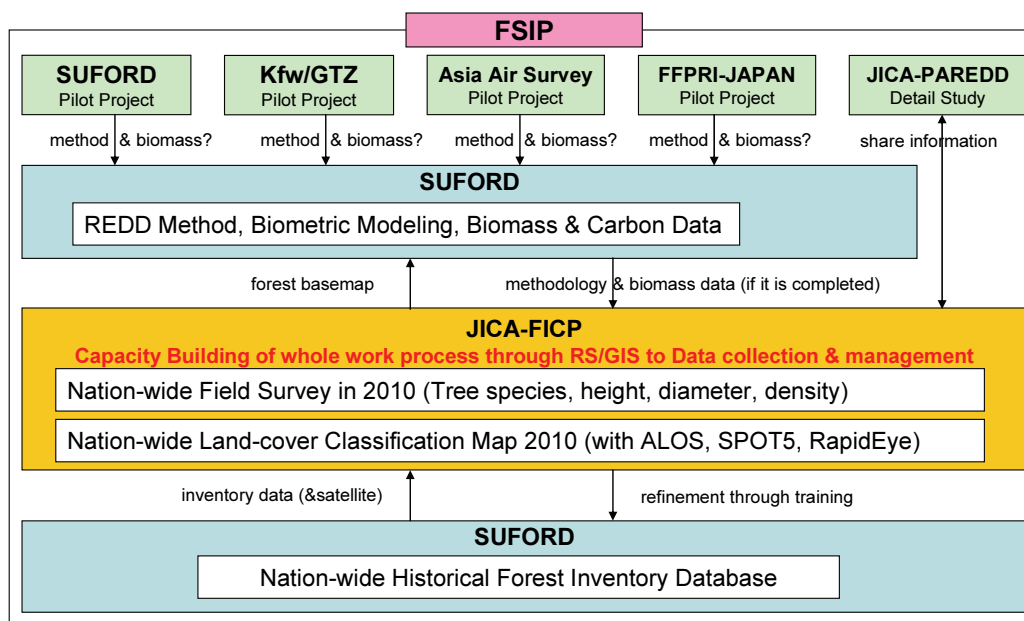


Figure 3 Relationships with Other Donors

1. 4 Reasons and Necessities to Implement Technical Assistance

It is still undetermined whether or not REDD is to be institutionalized and by what methodologies it is to be. If it is credited, it is necessary to develop reliable and objective data during its basic years. However, the fact is that FIPD has not been able to implement forest inventory surveys at the national level since its surveys carried out with the assistance of SIDA in 2002. Besides, it cannot also ensure the quality of the developed data to meet the present tendencies of REDD arguments. It cannot also control the whereabouts and the detailed information of the developed data.

The Programme shall be a grant aid cooperation with necessary facility constructions and equipment procurements for REDD implementation. From the situations above, however, because FIPD does not have sufficient experience of field surveys and data development at the national level, it is anticipated that it shall be difficult for FIPD to work for nation-wide data development to handle REDD implementing and monitoring works. Thus, the Lao side shall not be able to develop reliable data at the national level, meaning it will not gain REDD credit. And eventually, it may lose out on investment from foreign countries.

Even if REDD is not institutionalized, the development of forest basic data at the national level is useful to grasp forest reduction areas and to formulate afforestation plans, and it greatly contributes to the forest conservation and controls of Laos. Without regard to whether or not REDD is implemented, FIPD should continuously implement the development by itself after the completion of the Programme implementation.

From the circumstances above, the technical assistance of the Programme is necessary for the implementation of REDD and forest conservation/controls of Laos with facilities and equipment materials to be provided by the grant aid.

2. Purpose of Technical Assistance

Based on the contents of the Programme, the Programme shall set its achievement purpose as follows;

Enhancement of capacity to develop forest base maps
at the national level for the production of the 2010 benchmark map
to be based on REDD implementation

In addition, the Programme shall set the following activity purposes to achieve the purpose above;

On-the-job training (OJT) through training for basic knowledge
(by a third-country educational institute) and the implementation
of the whole work

- ※ REDD frameworks are under discussion. Although its base year is still undetermined, it is conceivable that it will be 2010, because a discussion about this year is in progress according to the Programme survey results.

3. Outputs of Technical Assistance

There are six outputs to be achieved by the results of the technical assistance of the Programme as follows;

(Output 1) Strength of basic knowledge for satellite imagery analyses / GIS database
(Output 2) Strength of basic capacities for the arrangement of forest basic data at the national level
(Output 3) Strength of capacities for forest inventory survey at the national level
(Output 4) Strength of capacities for forest basic data arrangement at the national level
(Output 5) Strength of capacities for the implementation of forest inventory surveys / forest basic data development
(Output 6) Strength of the integration of the REDD pilot projects / monitoring systems

4. Means of Output Verification

Table 2 presents the objectively verifiable indicators of the outputs defined in Chapter 3 above and their means of verification.

Table 2 Means of Output Verification

Output	Objectively verifiable indicator	Means of verification
Output 1: Enhancement of basic knowledge for RS/GIS/DB	<ol style="list-style-type: none"> 1) Implementation of training for satellite imagery analyses / GIS and database 2) Understanding of the basic processes of satellite imagery analyses / GIS and database 3) Understanding of methods utilizing satellite imagery analyses 	<ul style="list-style-type: none"> - Results of training programs and evaluation questionnaires - Results of the 1990 forest cover classification map and its quality confirmation - Results of the 2000 forest cover map and change extracting methods
Output 2: Understanding of nation-wide forest base map development	<ol style="list-style-type: none"> 1) Development of using methods by integrating plural satellites 2) Understanding of the developing processes of nation-wide forest basic data 3) Training in Japan for leading technicians 	<ul style="list-style-type: none"> - Pilot survey reports (including methodological suggestions) - 2005 forest base map and the results of its quality controls - Training in Japan and their reports
Output 3: Understanding of nation-wide forest inventory survey	<ol style="list-style-type: none"> 1) Understanding of the selecting methods of field survey points 2) Understanding of the collecting methods of survey data 3) Trial operations of database for field surveys 	<ul style="list-style-type: none"> - Field survey planning reports (relevance to selected survey points) - Data ledgers of field survey results (blank data, error values) - Database for field surveys (prototype)
Output 4: Understanding of nation-wide forest base map Development	<ol style="list-style-type: none"> 1) Understanding of the quality controlling methods of database 2) Understanding of the developing methods of forest basic data by satellite imagery analyses 3) Trial operations of database developed with the results of forest imagery analyses 	<ul style="list-style-type: none"> - Conceptual references for data qualities and security backups - Results of the 2010 forest basic data and quality confirmations, developing systems - Nation-wide forest basic database (prototype)
Output 5: Implementation of nation-wide inventory survey and database development	<ol style="list-style-type: none"> 1) Implementation of forest inventory surveys by C/Ps 2) Developing of forest basic data by C/Ps 3) Full operation of developed forest basic database 	<ul style="list-style-type: none"> - Field survey planning reports and survey data sheets (led by C/Ps) - Accurate qualities, examination results and developing systems of the 2010 forest basic data - Nation-wide forest basic database (operational version)
Output 6: Understanding of integrating REDD pilot projects and monitoring system	<ol style="list-style-type: none"> 1) Determination of the concepts of REDD implementation methods of Laos 2) Examination of integrating methods with pilot projects 3) Understanding of change extracting methods with the developed forest basic data 	<ul style="list-style-type: none"> - Holding of task force meetings concerned with REDD methodologies - Holding of meetings concerned with pilot projects at the national level - Manuals concerned with forest change extracting methods

In terms of Outputs from 2 to 5 above, the Programme shall work for forest basic data development and inventory surveys at the national level, but it shall plan to develop their working capacities by repeating their activities on a step-by-step basis. Initially, for the activities of Output 2, the Programme shall formulate working methods before nation-wide development by consultants and leading technicians. For Outputs 3 and 4, the Programme shall attempt methods to be formulated by the Lao side, while receiving these instructions from the consultants. Then, the Programme shall implement the works by the leadership of the Lao side toward Output 5.

5. Activities of Technical Assistance (Input Plans)

5.1 Satellite Imagery to be Used

It can be summarized that the needs of the Lao side for REDD implementation found by the outline design study of the Programme in September and October 2009 are summarized as follows;

- The Lao side has strong needs for data development within the same year, even though it is uncertain whether a base year will be set.
 - It is unrealistic to set multi-year data as benchmarks in terms of developing countries, which tend to change rapidly.
- It is necessary to accurately categorize forestry in the view of growth amounts for the estimates of carbon amounts.
 - It is necessary to develop data in the same season for categorizing them under universal standards.
- It is desirable to take satellite imagery regularly at affordably low prices in order to monitor changes.
 - It is desirable to develop data obtained in the same season as those obtained in the past to efficiently extract changes.

Table 3 summaries the advantages, disadvantages and uses of major satellites (except past satellites and satellites with a low-resolution of less than 30 m from the viewpoint of REDD benchmark map development).

Table 3 Summary of the Advantages, Disadvantages and Uses of Major Satellites

Kind	Satellite / sensor	Advantage	Disadvantage	Use
Medium resolution	LANDSAT	Free, a number of past data, wide-area imagery	Not high resolutions, limitations of categorizations and distinctions	Analyses of the past data
High resolution	ALOS/ PRISM&AVNIR2	Affordably low price, high resolutions of Pan* ¹ , possible to be used by multiple users of value-added products	Pan* ¹ and MS* ² are different sensors, no coverage of simultaneous shootings	Nation-wide development, regular updates
	SPOT5	Comparisons with past archives, coverage of accuracies and qualities, medium-infrared band	High price (compared with ALOS), no blue bands	Nation-wide development, partly updates
	RapidEye	Imagery shootings available for a short period (5 satellites), high-resolution of MS* ² , RedEdge band* ⁴	No Pan* ¹ available, a small number of archives, a small number of use experiences, inadequate authorized shop	Emergency and short period development (new shootings)

Kind	Satellite / sensor	Advantage	Disadvantage	Use
			networks	
Very high resolution	QuickBird GeoEye, etc.	Possible to interpret up to tree species and rural roads	High price, difficult to analyze in the same year and season	Field survey supplements and examinations, examinations of carbon estimated models
Air survey	LiDAR	Possible to accurately interpret surface and ground elevations	Usable for sloping lands and high density areas	Contributions to produce volume tables
Radar SAR	ALOS/ PALSAR	Regular and certain observations, strong in changes* ⁵ extraction	Because of SAR's characteristics, difficult to analyze mountainous areas (sloping lands)	Regular change monitoring

*1: Panchromatic, black and white sensor (usually higher resolution than color).

*2: Multispectral, color sensor (usually lower resolution than black and white).

*3: Band which can work for moorland vegetation discriminations, SPOT covers it but normal optical satellites do not cover it.

*4: Band which can work for vegetation stress analyses, RapidEye covers it but normal optical satellites do not cover it.

*5: Radar receives little influence from weather conditions and solar altitudes compared with optics, and radar can easily catch physical changes of terrestrial features.

The following table summarizes the information of existing major satellite imagery (kinds, operation terms, owning organizations, using conditions, etc.) in Laos (except for partial imagery shootings and web sites such as Google). These satellites have issues of uses for producing nation-wide benchmark maps towards REDD implementation.

Table 4 Information of the Existing Satellite Imagery in Laos

Kind of satellite/sensor	Operation term	Owning organization	Using condition, etc.
LANDSAT 5 & 7 /TM & ETM+	1990/2000 /2005	-	Officially not used yet (freely released in 2009, so anticipated to be used widely)
SPOT4	2001	FIPD/SIDA	FIPD owns and controls its hardcopies only, impossible to use for imagery analyses.
ALOS /PRISM & AVNIR-2	2007-2008	NLMA ^{*1} /ADB	PRISM and AVNIR have not shot simultaneously, and their imagery is simply and geometrically corrected. So, there are issues of high quality uses.

*1: National Land Management Authority (hereinafter referred to as NLMA)

The Programme shall target the development of the 2010 forest base map at the national level. High resolution satellites (ALOS, SPOT, RapidEye) have possibilities to realize the target. However, because there are the failure risks of taking imagery with cloudy influences to cover the whole of Laos only in the dry season of 2010 (from November 2010—after the commencement of the project—until the end of February 2011), it is difficult to realize the data with only a single satellite. Accordingly, it is necessary to combine the uses of plural satellites for the target achievement.

While considering the characteristics of the needs and satellites as explained above, the selection concepts of satellite imagery to be used for the Programme and its technical assistance are set as follows;

- Satellite data in the dry season of 2010 (as the same as the season of field surveys) shall be based on ALOS/AVNIR-2+PRISM (OB2). SPOT5 and RapidEye shall complement their cloudy and orbit

problems (planned to carry out pre-examination surveys for integration uses).

- With SPOT 4 in 2005, the existing forest base map shall be produced to compare with that to be produced in 2010 (propriety of satellite sensor unifications rather than timing in 2010)
- LANDSAT (TM and ETM) in 1990 and 2000 shall be used as data for basic technical training
- Training for ALOS / PALSAR shall be carried out for part of leading technicians (desirable to observe FBD in 2010 and 2011)
- Very high resolution satellites (QuickBird, etc.) and air surveys shall be committed to pilot projects.

As a result of coordination with satellite providers, Table 5 lists the kinds of satellite imagery to be procured and input by the Programme and their quantities as follows (except for imagery such as LANDSAT available to be procured freely) .

Table 5 Satellite Imagery and Quantities to be Procured

	Kind of satellite	Quantity	Specification
A-6-1	ALOS AVNIR-2 (2010)	106 scenes	Level 1B1 (PRISM simultaneous shooting)
A-6-2	ALOS AVNIR-2 (2011)	106 scenes	Level 1B1
A-7	ALOS PRISM (2010)	193 scenes	Level1B1 with RPC (AVNIR simultaneous shooting)
A-8-1	ALOS PALSAR (2010)	111 scenes	Level1.1
A-8-2	ALOS PALSAR (2011)	111 scenes	Level1.1
A-9	SPOT4 (2005)	114 scenes	Level1A
A-10-1	SPOT5 (2008)	2 sets	Level1A
A-10-2	SPOT5 (2010)	14 sets	Level1A
A-11-1	RapidEye (2008)	1 set	Level1B/3A
A-11-2	RapidEye (2010)	1 set	Level1B/3A

5. 2 Target persons

The target persons of the Programme shall be the FIPD staff members. The personnel resources of FIPD can be categorized into three professional levels and working contents as follows. These contents are referred to SUFORD's Capacity Building Plan. Table 6 and Appendix 1 explain its details concerned with personnel numbers and the scope of works.

<Professional level>

1. Manager
2. Senior technician / researcher
3. Local researcher / imagery interpreting technician

<Scope of Works>

- a. National forest inventory monitoring
- b. GIS and RS / database
- c. Forest control planning

Table 6 Personnel Resources of FIPD

Post	Number of persons	Job description	Current Educational background
Manager (1)			
Forest Inventory (1a)	2	Organizing Operational; Administration and general management; Design and planning for forest inventory; development and upgrade the inventory	MSc/BSc
GIS/RS/Database (1b)	3	Organising operational and planning of mapping missions; Network management and coordinating to other sections	MSc/BSc
Forest Planning Management (1c)	3	Organising operational and planning for FIPD activities Contribute calculation result of forest inventory; contribute for development and upgrade	MSc/BSc
Advanced operator/ Researcher (2)			
Forest Inventory (2a)	9	Survey Team leader, design and plan the survey and quality data collection control	BSc
GIS/RS/Database (2b)	7	Maintenance of the digital map database, and image interpretation (quality control, data validation, map data changes and input). GIS analysis, thematic	BSc
Forest Planning Management (2c)	1	Calculation data from inventory fields survey; maintenance the database system; coordinate with provincial level in	BSc
Field worker/ Interpreter/assistance (3)			
Forest Inventory (3a)	43	Operational Field work	BSc/Diploma/undergraduate
GIS/RS/Database (3b)	6	Image interpretation; Integrity checking of map and attribute data, attribute data input; digital cartography	BSc/Diploma/undergraduate
Forest Planning Management (3c)	4	Field survey data entry	Diploma/undergraduate

5.3 Implementation systems

Technical assistance to be carried out by the Programme shall be implemented under a Japanese consultant firm for the Programme by placing local consultants and a third-country's research institute for the Programme, while consulting with FIPD. The third-country's institute shall be in charge of initial basic training, and the local and Japanese consultants shall be in charge of the technical assistance. As for activities which shall need a deal of manpower such as massive data arranging works and field surveys, the Programme shall contribute to the future personnel exchanges by offering practical opportunities to the academic fellows and students of National Agriculture and Forestry Research Institute (hereinafter referred to as "NAFRI") and National University of Laos (hereinafter referred to as "NUoL"), while cooperating these academic bodies. Besides, by grasping the tendencies about the policies of MAF and DoF, the Programme shall implement its works while considering coordination with other activities and their relevance. Figure 4 presents the implementation system of the technical assistance.

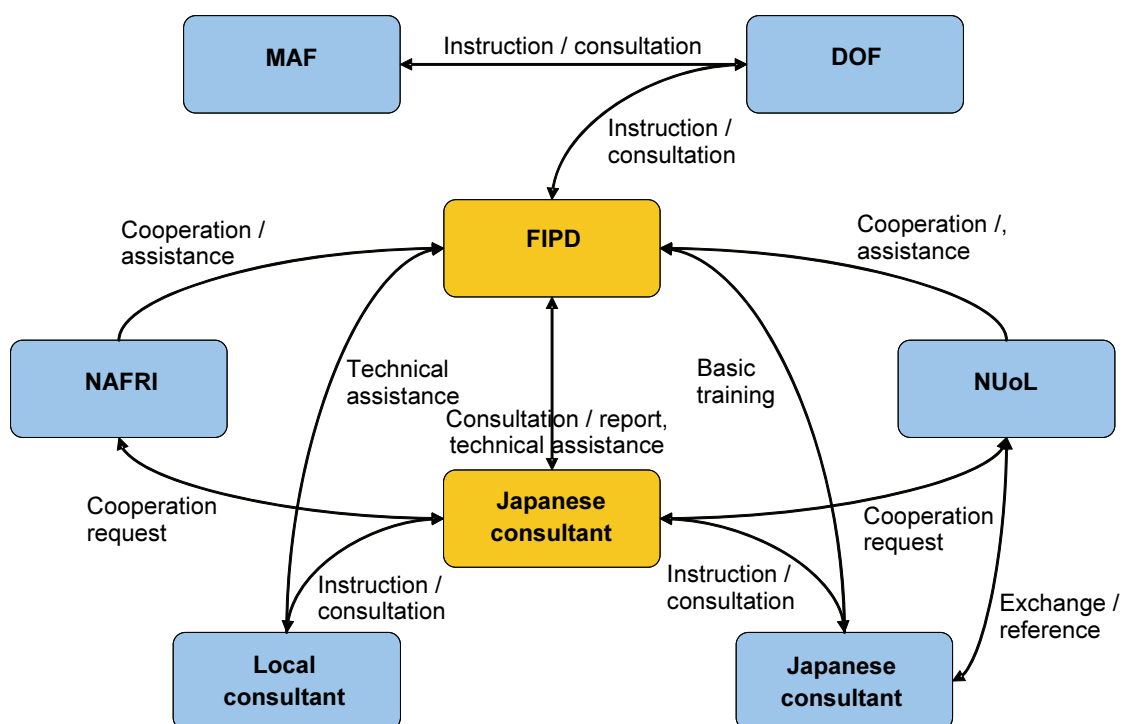


Figure 4 Implementation Systems of Technical Assistance

5. 4 Contents of Activities

The technical assistance of the Programme shall aim at “Enhancement of a capacity to develop forest base maps at the national level for the production of the 2010 benchmark map to be as the base of REDD implementation”. In terms of technical standards, the purpose of the technical assistance shall be “Acquirement of technical skills to produce forest base maps and their controls by using imagery information taken by plural satellites”. To achieve these technical standards, the Programme shall increase the capacity of the Lao side while taking the following six steps.

- (1) Technical assistance of satellite imagery analyses by means of LANDSAT imagery taken in 1990 and 2000 / GIS (basic level: including conceptual lectures)
- (2) Technical assistance of satellite imagery analyses by means of SPOT 4 taken in 2005 / GIS (intermediate level)
- (3) Technical assistance of satellite imagery analyses by means of plural satellites such as ALOS, SPOT5 and RapidEye to be taken in 2010 / GIS
- (4) Technical assistance concerned with field surveys necessary for satellite imagery analyses to be taken in 2010 / GIS and database constructions
- (5) Technical assistance concerned with the development / controls of forest basic database through the whole works of the technical assistance of the Program
- (6) Technical assistance concerned with finding areas of change by means of forest base maps to be produced in 2010 and ALOS imagery to be taken in 2011

The components above shall be implemented through the six outputs described in Article 3 “Outputs of Technical Assistance” The contents of activities for each of the outputs are mentioned as follows.

(Output 1) Enhancement of basic knowledge for RS/GIS/DB

<Recognition of current situation and action policy>

In terms of the current levels of FIPD staff members' imagery analyses and GIS technical skills, there are senior staff members with over 10 year experience, but other staff members are beginners with less than two year experience. Moreover, although the senior staff members have participated in training for imagery analyses and GIS, this training has been held sporadically. Accordingly, their understanding is not sufficient for a series of works consistently from the theories of imagery analyses and GIS to imagery analyses and database construction. Therefore, if troubles are encountered, both their trouble-solving skills and their data-controlling skills are insufficient. Under such as circumstances, the Programme shall need to hold theoretical training for imagery analyses and GIS in the initial step of the technical assistance.

It is rational and economical to use an educational research institute's programs in terms of the theoretical training of imagery analyses and GIS. However, in the case of these institutes in Laos, such programs are still in preparation, or they have just started. For these reasons, the technical assistance shall use programs by educational research institutes in a third country. The Programme assistance shall also consider contributing program formulations to the institutes in Laos.

<Contents of Activities>

Table 7 summarizes the whole concept of training to achieve Output 1. Table 8 presents the outlines of the training contents.

Table 7 Whole Concept of Basic Training to Achieve Output1

Title	Basic training of satellite imagery analyses / GIS and database
Term	July and August, 2010 (2 months)
Place	FIPD (existing facility)
Target persons	FIPD staff members (participation of other organizational staff members available)
Purpose	Learning of basic theories of satellite imagery analyses / GIS and database through the production of the nation-wide forest cover classification maps, and laying a foundation to acquire the following capacities <ul style="list-style-type: none"> • Ability to formulate self-measures against issues occurred by operations • Ability to develop and control data produced by operations efficiently • Ability to standardize operational methods and control data qualities
Indicator	<ul style="list-style-type: none"> • Production of the 1990 nation-wide forest cover classification map • Production of the 2000 nation-wide cover forest classification maps • Improvement of nation-wide inventory data produced in the past
Data to be used	<ul style="list-style-type: none"> • LANDSAT TM imagery around 1990: 18 scenes • LANDSAT ETM+ around 2000: 18 scenes • 1992 – 2002 nation-wide forest inventory data
Remark	<ul style="list-style-type: none"> • Implementation with the existing facility and equipment, because of no deliveries of PCs and analyzing software to be procured by the Programme at the time of the Programme commencement • In terms of participants from other organizations, based on training materials prepared under the responsibilities of the participants

Table 8 Outlines of Contents of Basic Training to Achieve Output 1

Step	Activity	Implementation term (plan)
1: Conceptual lectures on satellite imagery analyses	<ul style="list-style-type: none"> • Selection and procurement of satellite imagery / data structures (band layer) • Geometrical corrections of satellite imagery / radiometric calibration/ mosaicing • Forest cover classifications (auto classifications / semi-auto classification (with samples)) • Sampling of forest secular changes (radiation amounts, vegetation indicators, etc.) 	5 days (1 day x 4 for each lecture, 1day for summary)

Step	Activity	Implementation term (plan)
2: Conceptual lectures on GIS	<ul style="list-style-type: none"> • Understanding of GIS data type (Vector Raster) • Understanding of data structures 1 (completeness, location accuracy, theoretical consistency) • Understanding of data structures 2 (timing accuracy, thematic accuracy) • Spatial analyzing methods by GIS (geographies, accesses, land uses, etc.) 	5 days (1 day x 4 for each lecture, 1 day for summary)
3: Conceptual lectures on field surveys and database	<ul style="list-style-type: none"> • Understanding of field survey planning in forest sector and data collecting concepts • Understanding of GPS theories, field surveys by GPS • Requests, operations / functional analyses of database • Designs of database (table designs, normalizations and relations) 	5 days (field survey: 2 days, database: 2 days, summary: 1 day)
4: Practical training for the productions of the 1990 nation-wide forest cover classification map	<ul style="list-style-type: none"> • With LADSAT TM imagery (18 scenes) around 1990, production of nation-wide forest cover classification maps as of the benchmark year of the Kyoto Protocol • Understanding of efficient controlling methods in terms of the results of data and analyses used for the productions (database concepts) 	5 days (approx. 1 week)
5: Practical training for the productions of the 2000 nation-wide forest cover classification map and change extraction	<ul style="list-style-type: none"> • Production of nation-wide forest cover classification maps by the end of the next decade from its benchmark year with LANDSAT ETM+ imagery (18 scenes) taken around in 2000 • Sampling of areas changed by forest reductions, etc., compared with the 1990 data. 	10 days (approx. 2 weeks)
6: Practical training for the improvement of nation-wide forest inventory data taken in the past	<ul style="list-style-type: none"> • Inclusion of nation-wide forest inventory data produced in 2002 into GIS (geo database) • Refinement of data by comparing forest cover maps produced through training with the past forest cover maps 	20 days (approx. 4 weeks)

(Output 2) Understanding of nation-wide forest base map development

<Recognition of current situation and action policy>

Although the technical assistance of the Programme shall aim at “Enhancement of a capacity to develop forest base maps at the national level for the production of the 2010 benchmark map to be the base of REDD implementation”, there are currently three major issues for the achievement of the aim.

- (Issue 1) Methodologies for producing forest base maps and controlling their qualities using plural satellite imagery information have not been established yet.
- (Issue 2) There is no reliable data on a national level for planning and implementing nation-wide forest inventory surveys in the dry season of 2010.
- (Issue 3) There are limitations in terms of the present personnel resources and capacities of the FIPD staff members. Accordingly, it is difficult to increase the whole capacities of them by the implementation in 2010.

Consequently, the technical assistance shall work for the achievement of Output 2 by implementing the following Activities 1 to 3 to solve Issues 1 to 3 above. However, it is difficult to implement Activities 1 to 3 by the present FIPD resources within a limited period. Therefore, the Programme shall implement the activities in the form of the hiring of local consultants and training in Japan (FIPD’s leading technicians to be invited).

- | | |
|--------------|---|
| (Activity 1) | Preliminary survey: Surveys to establish methodologies for the production of forest base maps by means of plural satellites such as ALOS / SPOT5 / RapidEye and their field verification (local consultants) |
| (Activity 2) | Training in Japan 1: OJT for the production of the 2005 nation-wide forest base map by means of SPOT4 (Japanese consultant and FIPD's leading technicians) |
| (Activity 3) | Training in Japan 2: Introduction of Japanese systems of forest inventory surveys and monitoring by means of satellites with high frequency imagery and radar satellites (Japanese consultant and FIPD's leading technicians) |

○ Reasons for implementing the training in Japan

In Activity 2, the forest base maps to be developed shall consist of the past trends in 2005, and the assistance shall use the map data for planning and implementing field surveys to be started in November, 2010. Therefore, the Programme shall not be able to accept any delays of the completion of the FIMC construction (end of September 2011), and the Programme shall also not be able to complete the Activity with the FIPD resources at the time of the Activity implementation. For these reasons, the Programme shall implement works to be led by the Japanese consultant toward the FIPD leading technicians with training in Japan, and then, the Programme shall be able to meet the requirements of the construction deadline and personnel training. In Activity 3, toward the activities in the second and third years, the Programme shall construct the basic knowledge of forest base maps to lead other FIPD staff members in these annual activities by introducing case studies in Japan and these implementation structures to the FIPD leading technicians who shall participate in the "Training in Japan 1".

<Contents of Activities>

The following Tables 9 to 11 outline Activities 1 to 3.

Table 9 Outline of Preliminary Survey (Activity 1) to achieve Output 2

Title	Pilot survey concerning the integration uses of plural satellites
Term	August and September, 2010 (2 months)
Place	Local consultant office(s)
Target person	FIPD's leading technician : 1 person
Purpose	Thematic arrangements and methodological establishment of forest base maps to be produced with plural satellites in 2010
Content	<ul style="list-style-type: none"> • Performance comparisons and arrangement of the location accuracies, qualities, etc. of ALOS/SPOT5/RapidEye • Thematic arrangement of mosaicing and overlapping of ALOS/SPOT5/RapidEye • Trial productions of forest base maps by means of ALOS/SPOT5/RapidEye and their accurate evaluations • Methodological establishment of the integration uses while considering the band differences of ALOS/SPOT5/RapidEye
Indicator	<ul style="list-style-type: none"> • Pilot survey reports (including methodological proposals) • Prototypes of forest base maps (some areas) and accurate evaluation results
Data to be used	<ul style="list-style-type: none"> • ALOS imagery 2008 – 2009 : existing data • SPOT imagery 2008 – 2009 : 2 scenes • RapidEye imagery 2008 – 2009 : 2 scenes
Remark	None

Table 10 Outline of Training in Japan 1 (Activity 2) to achieve Output 2

Title	Training in Japan concerning nation-wide forest base map production
Term	August and September, 2010 (2 months)
Place	Japanese consultant office(s)

Target person	FIPD's leading technicians : 3 persons
Purpose	Enhancement of capacities to develop nation-wide forest database by means of medium-resolution satellite imagery in 2005
Content	<ul style="list-style-type: none"> • Forest cover classification classes and classification methods (ref. GOFD-GOLD) by means of SPOT4 (SPOT5 in part) • Ortho corrections, radiometric correction, connections of SPOT4 (SPOT5 in part) • Trial productions of forest base maps by means of SPOT4 (SPOT5 in part) and their accurate evaluations • Accurate evaluations of the existing data based on the analyzing results of SPOT4 (SPOT5 in part)
Indicator	<ul style="list-style-type: none"> • Pilot survey reports (including methodological proposals) • Prototypes of forest base maps (some areas) and accurate evaluation results
Data to be used	<ul style="list-style-type: none"> • SPOT 4 (SPOT5 in part) imagery taken around 2005: 114 scenes • Forest inventory survey database in Laos implemented in 2002
Remark	None

Table 11 Outline of Training in Japan 2 (Activity 3) to achieve Output 2

Title	Training in Japan concerning forest inventory arrangements and monitoring
Term	August and September, 2010 (2 months)
Place	Japanese consultant office(s), related organization office(s)
Target person	FIPD's leading technicians : 3 persons
Purpose	Training of leading technicians for forest inventory arrangements and monitoring systems
Content	<ul style="list-style-type: none"> • Introduction to aerial imagery and domestic ARD inventory arrangement methods • Introduction to monitoring systems by means of the receiving systems of satellites with high frequent imagery (MODIS) • Introduction to the monitoring methods of forest reductions by means of Synthetic Aperture Radar (PALSAR) • Introduction to Japanese practical cases by other related organizations to be visited by the training participants
Indicator	<ul style="list-style-type: none"> • Training programs in Japan • Training reports in Japan
Data to be used	<ul style="list-style-type: none"> • No data to be procured particularly • Planning to use the existing operational data (planned to obtain their permission)
Remark	None

(Output 3) Understanding of nation-wide forest inventory survey

<Recognition of current situation and action policy>

FIPD does not implement surveys at the national level at present. Each donor of FIPD supports field surveys necessary for pilot projects. SUFORD has already formulated the designs of forest resource surveys and the plans of technical assistance at the national level, but there are not the corroborations of budgets to implement at the national level in terms of the designs and plans, and their implementation is planned in part of provinces in Laos. Moreover, there are also many surveys to produce the estimated models of biomass volumes. In terms of data, SUFORD plans to use the past results of the nation-wide forest inventory.

The Programme shall carry out forest resource surveys and technical assistance to produce forest base maps at the national level, taking into consideration time (commencement, completion and necessary time), resources (personnel, materials and budget) and scope/quality, while drawing upon SUFORD's designs. The survey items shall be based on tree species, heights, diameters and densities, and the items shall not include biomass. In terms of data, the Programme shall use satellite imagery taken in 2005.

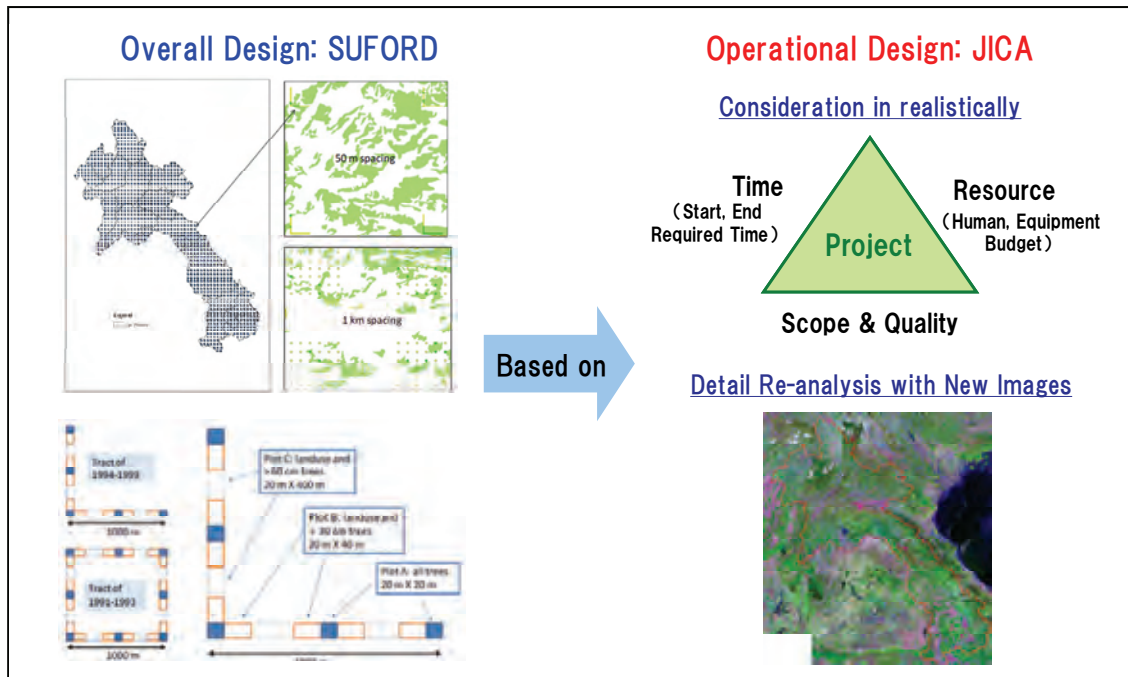


Figure 5 Compartmentalization of SUFORD and the Programme Concerning Field Surveys

<Outline Designs>

- ① Pre-conditions (based on hearing surveys)
 - There are 17 provinces and approximately 180 districts in Laos
 - 6 core persons (1 person working for approximately 3 provinces), 3 field researches per core person
 - A total of 6 persons including drivers and local employees (mowing, etc.) per team, 6 teams
 - A total of 18 GPS devices to be provided to and used by: 3 field researchers × 6 teams
 - Survey targets to be based on tree species, heights, diameters and densities
- ② Survey point simulations
 - 1 team can obtain 4 – 7 samples per day (1 point per hour, including moving)
 - 4 months a dry season (beginning of November – end of February), actual working days are 20 days / month × 4 months = 80 days
 - Team structure, number of provinces and districts are as described in Pre-conditions 1

Table 12 Survey Point Simulations

No. of samples / 1 day · 1 team	No. of total samples	No. of samples / province	No. of samples / district
4	1920 points (4×80×6)	Approx. 110(1920÷17)	Approx.11 (140÷10)
5	2400 points (5×80×6)	Approx. 140(2400÷17)	Approx.14 (140÷10)
6	2880 points (6×80×6)	Approx. 170(2880÷17)	Approx.17 (170÷10)
7	3360 points (7×80×6)	Approx. 200(3360÷17)	Approx.20 (200÷10)

- ③ Simulation evaluations
 - (Ref.) Approximately 2,700 sample survey points are in the whole of Indonesia.
 - It is roughly reasonable as sample number, given the land area size of Laos.
 - (Ref.) According to SUFORD’s outline design survey, approximately 1,600 sample points are necessary in forest areas.
 - Approximately 30 % of samples are necessary for land use excluding forestry for forest base map production.

④ Sample point locations

- Based on the outline designs, they shall be located by analyzing the existing forest cover classification maps, topographies (slopes), road accesses, etc.
- By referring to the forest base maps based on SPOT4 in 2005 before the survey commencement in 2010, their locations shall finally be adjusted

According to the outline survey above, it is desirable to target on the securing of approximately 2,400 points by obtaining approximately 5 points per day.

<Contents of Activities>

To achieve Output 3, the following Table 13 describes the whole contents of field surveys. Table 14 presents individual activities concerned with the field surveys. Table 6 of “5.2 Target persons” explains the codes of target persons.

Table 13 Whole Contents of Field Survey (2010) to Achieve Output 3

Title	Nation-wide forest inventory survey (2010)
Implementation term	Beginning of September, 2010 – end of March, 2011 (survey to be carried out from beginning of November, 2010 until end of February, 2011)
Target area	Whole of Laos
Implementing organization	FIPD (assisted by Lao National University and NAFRI)
Purpose	<ul style="list-style-type: none"> • Enhancement of the capacities of nation-wide forest inventory surveys not to be implemented since 2002 • Development of basic systems to collect tree species, heights, diameters and densities necessary to produce the nation-wide forest base map (2010)
Indicator	<ul style="list-style-type: none"> • Field survey report (2010) • Field survey result data ledgers (2010) • Database for field surveys (prototype)
Data to be used	<ul style="list-style-type: none"> • Nation-wide forest base map (2005) (based on SPOT4) • Nation-wide forest inventory database (2002)
Remark	None

Table 14 Individual Contents of Activities Concerned with Field Survey (2010) to Achieve Output 3

Step	Activity	Target person	Lecturer	Implementation term (plan)
1 : Design of database and data collection systems	Examination and determination of design development of database storing field survey data without redundancy and data collection by what systems and organizations.	1a ; 1b 2a ; 2b (approx. 18 persons)	Japanese and local consultants	10th September, 2010 (2 months)
2 : Determination of field survey analyses and survey sample points	Understanding of selection methodologies for analyzing topographical, access and land use and social conditions to formulate the samples of field surveys	1b ; 2b ; 3b (approx. 13 persons)	Japanese and local consultants	October, 2010 (1 month)
3: Lectures on data collection systems (including preparations)	Further understanding of database systems developed by already examined and determined designs and data collection systems through these related lectures to persons concerned with field surveys	1a ; 1b ; 1c 2a ; 2b ; 2c 3a ; 3b ; 3c (approx. 78 persons)	Japanese and local consultants	October, 2010 (15 days)

Step	Activity	Target person	Lecturer	Implementation term (plan)
4: GPS training (settings, in/outputs), collaborations with GIS	Understanding how to use newly procured GPS devices (initial settings and in/outputs, etc.) and data uploading and arrangement through their practical operation	3a (approx. 43 persons)	Japanese and local consultants	October, 2010 (15 days)
5: Implementation of inventory surveys (tree species, heights, diameters, densities)	Implementation of nation-wide inventory surveys based on database and data collection systems to be developed	3a (approx. 43 persons)	Japanese and local consultants	November, 2010 – February, 2011 (4 months)
6: Data collection and data arrangement	Data arrangement to use to collect data from each field survey team and analyze them	2a ; 2b 3a ; 3b (approx. 65 persons)	Japanese and local consultants	December, 2010 - March, 2011 (4 months)

(Output 4) Understanding of nation-wide forest base map development

<Recognition of current situation and action policy>

FIPD has not developed nation-wide forest base maps since 2002, and it still does not have any detailed plans of the map data productions. On the other hand, SUFORD is now designing a database including a series of works from data collection at provincial level to data controls at central level, and it is currently moving forward with these concrete steps. SUFORD plans to complete the database design by July, 2010. However, there is still no corroboration of budgets for the database construction, and there has been insufficient consideration given to handle a great deal of satellite imagery at central level. Besides, there are also the plans of technical assistance concerned with these matters, and SUFORD's plan includes advanced technical skills for using open source databases, database languages, airplane lasers and so forth.

The Programme shall carry out forest database construction inside FIPD and technical assistance to be relevant with the whole design of SUFORD. The Programme shall also forward these works, while continuously coordinating with SUFORD particularly for the efficient controls of satellite imagery, data transfers with the whole database and technical assistance with these activities.

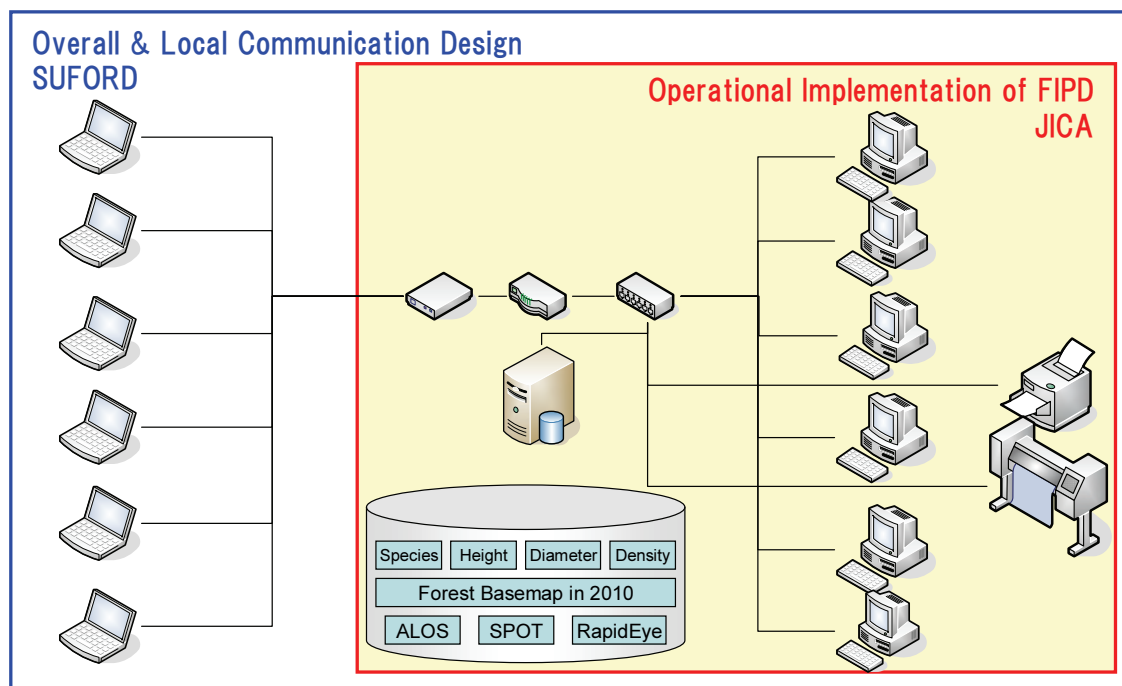


Figure 6 Scope of the SUFORD Database Design and the Programme Database Design

MAF has also a plan to develop database at the national level for issuing a nation-wide census by the assistance of FAO. As of December, 2009, it is still in the outline design stage, and FAO proposes ideas for its detailed implementation. However, it is a large plan aiming at cooperation among ministries and departments. Accordingly, efforts shall be made to maintain its consistency while keeping track of future trends.

<Contents of Activities>

Table 15 lists the whole contents of field surveys to achieve Output 4 as follows. The following table 17 shows individual activities concerned with the field surveys. Table 6 of “5.2 Target person” describes the codes of target persons.

Table 15 Whole contents of forest basic data development (2010) to achieve Output 4

Title	Nation-wide forest base map development (2010)
Implementation term	Beginning of May, 2011 – end of September, 2011 (approx. 5 months)
Target area	Whole of Laos
Implementing organization	FIPD (assisted by National University of Laos and NAFRI)
Purpose	<ul style="list-style-type: none"> • Enhancement of capacities to develop nation-wide forest base maps undeveloped since 2002 • Enhancement of systems for the quality controls and security backups of forest base maps
Indicator	<ul style="list-style-type: none"> • Conceptual references of data qualities and security backups • Development systems of nation-wide forest base maps • Nation-wide basic database (prototype)
Data to be used	<ul style="list-style-type: none"> • ALOS/SPOT5/RapidEye in 2010 • Nation-wide inventory database in 2002
Remark	None

Table 16 Contents of activities concerned with the nation-wide forest basic data development (2010) to achieve Output 4

Step	Activity	Target person	Lecturer	Implementation term (plan)
1: Development of the quality controlling methods and the systems of database	Development of quality control systems, securities and back-ups to ensure the quality and safeness of nation-wide forest base maps	1a ; 1b 2a ; 2b (approx. 18 persons)	Japanese and local consultants	May, 2001 (1 month)
2: Development of forest basic data by satellite imagery analyses	Authorization of attribute data divided into each area by forest cover classifications using newly taken satellite imagery and field survey data	1b ; 2b ; 3b (approx. 13persons)	Japanese and local consultants	Beginning of June, 2011 – end of September, 2011 (4 months)
3: Construction of nation-wide basic database (prototype)	Construction of spatial database for the efficient controls of satellite imagery / forest base maps and related GIS data	1b ; 2b ; 3b (approx. 13persons)	Japanese and local consultants	Beginning of June, 2011 – End of September, 2011 (4 months)

(Output 5) Implementation of nation-wide inventory survey and database development

<Recognition of current situation and action policy>

The Programme shall carry out nation-wide forest inventory surveys from the beginning of November, 2010 until the end of February, 2011, and it shall then implement nation-wide forest base map development from June 2011 until the end of September. For the practical use of these data, it shall be necessary to handle the following two points at least.

- (1) Local confirmation and examination of the accuracy of forest base maps to be developed, and their modifications if necessary.
- (2) Obtainment of samples at forest reduction areas for monitoring these areas by satellite imagery

The Programme shall handle the above not only in 2010 but also in 2011 by implementing nation-wide forest inventory surveys and database development. The Programme and its technical assistance implement the surveys twice in 2010 and 2011 respectively, and the surveys shall contribute continuous capacity development, which FIPD staff members cannot implement at present, to the Laos side. In terms of the survey implementation in 2011, the aim of the implementation shall be to carry out from its plan until implementation to be led by the FIPD staff members.

<Contents of Activities>

The following Table 17 lists the whole contents of inventory surveys and database development to achieve Output 5. Table 18 then presents individual activities concerned with the inventory surveys and database development. Table 6 of “5.2 Target person” explains the codes of target persons.

Table 17 Whole contents of inventory surveys and database development (2011)

Title	Nation-wide forest inventory survey and database development (2011)
Implementation term	Beginning of October, 2011 – End of March, 2012 (field survey: beginning of November, 2011 – End of February, 2012)
Target area	Whole of Laos

Implementing organization	FIPD (assisted by National University of Laos and NAFRI)
Purpose	<ul style="list-style-type: none"> Development of local confirmation / examination of forest base maps to be developed in 2010 and these correction capacities. Completion of preparations for implementing forest changes extractions by obtaining regional samples from areas where forest reduction is occurring from 2010 to 2011. Establishment of capacities for planning and implementing forest inventory surveys and database development by C/Ps themselves
Indicator	<ul style="list-style-type: none"> Field survey planning reports led by C/Ps (2011) Field survey result data ledges led by C/Ps (2011) Database for field surveys (operational version)
Data to be used	<ul style="list-style-type: none"> Nation-wide forest base map in 2010 (based on ALOS/SPOT5/RapidEye) Nation-wide forest inventory database in 2005
Remark	None

Table 18 Contents of Activities concerned with Inventory Surveys and Database Development (2011)

Step	Activity	Target person	Lecturer	Implementation term (plan)
1: Design (improvement) of database and data collection systems	Redesign of structures and contents by clarifying the improving points of database to be developed in 2010 and data collection systems (led by C/Ps as much as possible)	1a ; 1b 2a ; 2b (approx. 18persons)	Japanese and local consultants	October, 2011 (1 month)
2: Determination of field survey analyses and survey sampling points	Enhancement of capacities for survey plans especially by analyzing areas necessary for new samples and areas necessary for confirming data on-site based on survey points in 2010 (led by C/Ps as much as possible)	1b ; 2b ; 3b (approx. 13 persons)	Japanese and local consultants	October, 2011 (1 month)
3: Inventory survey implementation (tree species, heights, diameter, densities)	Implementation of nation-wide inventory surveys based on database to be developed and data collection systems	3a (approx. 43 persons)	Japanese and local consultants	November, 2011 – end of February, 2012 (4 months)
4: Data collection and data arrangement	Data arrangement to use for analyzing data collected from each field survey team	2a ; 2b 3a ; 3b (approx. 65 persons)	Japanese and local consultants	December, 2011 – end of March, 2012 (4 months)

(Output 6) Understanding of integrating REDD pilot projects and monitoring system

<Recognition of current situation and action policy>

At present, various pilot projects are implemented towards REDD implementation (refer to Table 1 and Figure 3). It is still uncertain whether or not REDD is to be institutionalized and what kind of methodologies are to be adopted for REDD. However, the outputs of each pilot project may appear by May, 2012, when REDD starts, and also the last year of the validity of the Kyoto Protocol. As a result, it is supposed that their rough tendencies and directional movements will be clear by then.

Toward the conceptual determination of REDD implementation methodologies in Laos, therefore, the Programme shall assist activities to determine REDD methodologies in Laos by studying the character of the outputs of each pilot project. Besides, the Programme shall also work for structuring the systems of the integration methods of the pilot project outputs and monitoring implementation.

<Contents of Activities>

Table 19 describes the whole outlines to integrate pilot projects and enhance monitoring systems as follows. Table 20 presents individual activities concerned with pilot project integration and monitoring system enhancement. Table 6 of “5.2 Target person” explains the codes of target persons.

Table 19 Whole outlines of pilot project intergration and monitoring system enhancement

Title	Pilot project integration and monitoring system enhancement
Implementation term	Beginning of May, 2012 – end of February, 2012
Target area	Whole of Laos
Implementing organization	FIPD(assisted by National University of Laos, NAFRI)
Purpose	<ul style="list-style-type: none"> • Assistance of activities toward the formulation of REDD methodologies in Laos • Assistance of the determination and adoption of methodologies to expand the outputs of pilot projects at the national level • Enhancement of capacities to extract orest reduction areas from 2010 until 2011
Indicator	<ul style="list-style-type: none"> • Holding of task force meetings concerned with REDD methodologies • Holding of meetings concerned with the nation-wide expansions of pilot project outputs • Manuals about the methodologies of forest change extractions
Data to be used	<ul style="list-style-type: none"> • Nation-wide forest base map in 2010 (based on ALOS/SPOT5/RapidEye) • ALOS imagery to be taken in 2011 (AVNIR-2/PALSAR)
Remark	None

Table 20 Contents of activities concerned with pilot project integration and monitoring system enhancement

Step	Activity	Target person	Lecturer	Implementation term (plan)
1: Characteristic evaluation and selection of REDD methodologies	Assistance of the methodological formulation of REDD implementation at the Lao task force by studying the characteristics of pilot project outputs	1a ; 1b ; 1c 2a ; 2b ; 2c (approx. 25 persons)	Japanese and local consultants	May, 2012 (1 month)
2: Nation-wide expansion by pilot project outputs and nation-wide base map integration	Assistance of benchmark map production for the nation-wide REDD implementation by examining these methodologies to integrate pilot project outputs with the nation-wide forest base maps	2a ; 2b ; 2c (approx. 16 persons)	Japanese and local consultants	September, 2012 (1 month)
3: Enhancement of capacities to analyze forest changes at the national level by means of optical satellite imagery	Assistance to enhance the analyzing functions of forest changes with optical imagery by means of AVNIR2's imagery to be developed in 2010 and its imagery to be taken in 2011	2a ; 2b ; 2c (approx. 16 persons)	Japanese and local consultants	May, 2012 – end of August, 2012 (4 months)
4: Enhancement of capacity to analyze forest changes at the national level by means of radar satellite imagery	Assistance to enhance the analyzing functions of forest changes with radar imagery by means of PALSAR's imagery to be taken in 2010 and 2011	2a ; 2b ; 2c (approx. 16 persons)	Japanese and local consultants	September, 2012 – end of February, 2013 (4 months)

5.5 Software to be Used

<GIS software>

The Programme shall adopt a GIS software program (ArcGIS) being popularly used in Laos, and it is becoming a global standard at present. The Programme shall procure software: with professional functions to produce and edit the data of forest base maps (ArcInfo); with basic functions to load field survey data, confirm their results and simply analyze them (ArcView); for the extension of spatial analyzing functions (Spatial Analyst); and for the extension of 3-Dimension visualization functions (3-D Analyst). Moreover, the Programme shall also procure equipment for servers (ArcGIS Server) with functions to control a great deal of data efficiently.

The Programme shall introduce two (2) sets of ArcInfo + Spatial Analyst + 3D Analyst onto two (2) of the desk-top computers (high performance) to be installed at FIMC. The Programme shall then introduce six (6) sets of ArcView + Spatial Analyst + 3D Analyst onto the other six (6) desk-top computers (standard performance), and it shall also introduce 18 sets of ArcView onto the 18 notebook computers respectively. The Programme shall introduce one (1) set of ArcGIS server. In terms of their licenses, the Programme shall design floating types which can flexibly handle the increasing and decreasing of user numbers.

<Imagery analyzing software 1>

The Programme shall adopt an imagery analyzing software, which the Lao C/Ps have experience in using, which other projects also have used and which can easily use interfaces. The Programme shall also plan to procure the software: with functions to enable high-resolution satellite imagery analyses for professionals (ERDAS IMAGINE Professional); with functions for ortho-rectification of high-resolution satellite imagery analyses (LPS Core); with correction function modules of influences from clouds and hazes between plural scenes (ATCOR for ERDAS IMAGINE); with image matching function modules to be important for change extraction between scenes (IMAGINE Auto Sync); with inter-imagery mosaicing function modules (ERDAS Mosaic Pro); and with radar analysis function module (IMAGINE Radar Mapping Suites).

The Programme shall install two (2) sets of ERDAS IMAGINE Professional and two (2) sets of LPS Core on four (4) of the desk-top computers (high performance) to be installed at FIMC. As optional modules, it shall also plan to install one (1) set of ATCOR for ERDAS IMAGINE, one (1) set of IMAGINE Auto Sync, one (1) set of ERDAS Mosaic Pro and one (1) set of IMAGINE Radar Mapping Suites. The Programme shall design floating types which can flexibly handle the increasing and decreasing of user numbers.

<Imagery analyzing software 2>

In addition to the Imagery analyzing software 1, the Programme shall use software (eCognition) specialized in image segmentation Modules to be extremely important in terms of forest cover classifications. The function of this called object-based classification is not categorized into the units of imagery pixel, but it can be categorized into an object-by-object basis at nearly the same level as human interpretability. Accordingly, in terms of this function, it is difficult to alternate Imagery analyzing software 1 and other software.

Because this software is specialized in one function and this function as a module to complement the satellite imagery analyzing software 1, the Programme shall introduce two (2) set of eCognition.

Table 21 Software to be Procured and Quantities

DESCRIPTION	QTY	UNIT
ArcGIS Desktop	1	Set
ArcInfo Concurrent Floating V 9.3	2	Unit
ArcView ArcGIS 9.3 Concurrent Floating	24	Unit

DESCRIPTION	QTY	UNIT
ArcGIS 3D Analyst 9.3	8	Unit
ArcGIS Spatial Analyst 9.3	8	Unit
ArcGIS Server Basic Enterprise 9.3.1	1	Unit
ERDAS IMAGINE	1	Set
ERDAS IMAGINE Professional 9.3	2	Unit
3 years upgrade software (no technical support)	2	Unit
LPS Core 9.3	2	Unit
3 years upgrade software (no technical support)	2	Unit
ATCOR for ERDAS IMAGINE	1	Unit
IMAGINE Auto Sync	1	Unit
ERDAS Mosaic Pro	1	Unit
IMAGINE Radar Mapping Suite	1	Unit
Diffiniense	1	Set
eCognition Server & Developer	2	Unit
3 years software maintenance	2	Unit

6. Procuring Methods of Implementation Resources of Technical Assistance

The technical assistance of the Programme shall be implemented by a Japanese consultant firm under recommendation from JICA upon its contract concerning the technical assistance with the authorized agent of the Programme. The procuring methods of individual implementation resources are as follows.

6.1 Japanese Consultant

The authorized agent shall make a contract concerning the technical assistance of the Programme with a Japanese consultant firm with recommendation from JICA. Besides, the Japanese consultant firm shall dispatch Japanese experts as follows. In terms of the “2005 forest base map development”, the Programme shall implement it in Japan and the Japanese consultant firm shall undertake it as training in Japan.

Table 22 Personnel Plan of Japanese Consultant (Japanese Expert)

Specialized field	Necessary working experience
Project manager	<ul style="list-style-type: none"> Experienced in project management for grant aid projects in Southeast Asia Experienced in projects in Laos concerned with forest sector
Coordinator / field survey control	<ul style="list-style-type: none"> Experienced in grant aid projects or works in Laos (desirably both)
Forest base map development 2005 (training in Japan)	<ul style="list-style-type: none"> Experienced in forest inventory development by means of satellite imagery Experienced in vegetation classification using object-based classification Experienced in accepting of trainees from foreign countries
Satellite imagery analysis / forest base map development	<ul style="list-style-type: none"> Experienced in forest inventory development by means of satellite imagery Experienced in vegetation classification using object-based classification Experienced in analyzing and monitoring of Synthetic Aperture Radar (SAR)
Database / database collection design	<ul style="list-style-type: none"> Experienced in designs and development of spatial database Experienced in database construction for overseas projects Certified expert concerned with RDMS (desirably holder)
Field survey plan	<ul style="list-style-type: none"> Experienced in field surveys in forest sector in Southeast Asia Practically experienced in group training for overseas projects Experienced in the analyses of topography and land use and so on by GIS
REDD implementation / policy formulation	<ul style="list-style-type: none"> Experienced in projects concerned with REDD in Japan Ability to grasp working situations toward REDD in Japan and cases in Southeast Asian region, and ability to comment on them

6.2 Local Consultant

The Japanese consultant firm for the Programme shall use local resources as much as possible by considering the sustainability of the Lao side after the completion of the Programme. There are several local consultant (third-country consultant) firms having offices in Laos depending on field works, and their technical skills are excellent. Furthermore, NAFRI and the National University of Laos have researchers dispatched from European countries, and they have also researchers who have studied at the Asian Institute of Technology (hereinafter referred to as “AIT”) in Bangkok, Thailand.

Therefore, the Japanese consultant firm shall plan to employ the local consultants above as the Programme personnel. In terms of “Imagery analysis /GIS • DB basic training” below, however, the Japanese consultant

firm shall plan to make a consigning contract with a local consultant firm for the Programme.

Table 23 Personnel Plan of Local Consultant

Specialized field	Necessary working experience	Country
Imagery analysis / GIS·DB basic training lecturer	<ul style="list-style-type: none"> Practically experienced in projects in Laos Experienced in work for imagery analyses / GIS·DB basic training 	Third country
Imagery analysis / GIS·DB basic training assistant	<ul style="list-style-type: none"> Ability to communicate in Lao or Thai language with the knowledge of imagery analyses / GIS·DB 	Laos / Thailand
Pilot survey concerned with the integrated use of plural satellites	<ul style="list-style-type: none"> Experienced in treatment / analyses of a wide variety of satellite imagery Experienced in vegetation classification using object-based classification Practically experienced in projects by developed-country donors 	Third country
Trainee in Japan (FIPD leading technician: 3 persons)	<ul style="list-style-type: none"> Basic capability for satellite imagery analyses / GIS·database Capability for communication in English Relatively young age, ability to be candidates for future leaders 	Laos
Database / data collection designing assistant	<ul style="list-style-type: none"> Experienced in design and development of spatial database Experienced in database construction for projects by developed-country donors Certified expert concerned with RDMS (desirably holder) 	Laos
Field survey planning assistant	<ul style="list-style-type: none"> Experienced in field surveys in forest sector in Laos Experienced in the assistance of group training for projects by developed-country donors Experienced in analyses of topography and land use and so on by GIS 	Laos
Data quality control	<ul style="list-style-type: none"> Experienced in the quality controls of satellite imagery analyses / GIS database Practically experienced in field surveys for projects by developed-country donors 	Third country

6.3 Counterparts of implementing organization

FIPD is the counterpart organization of the technical assistance by the Programme. Figures 7 and 8 describe the organization charts of MAF and DoF. Appendix 1 presents these further details.

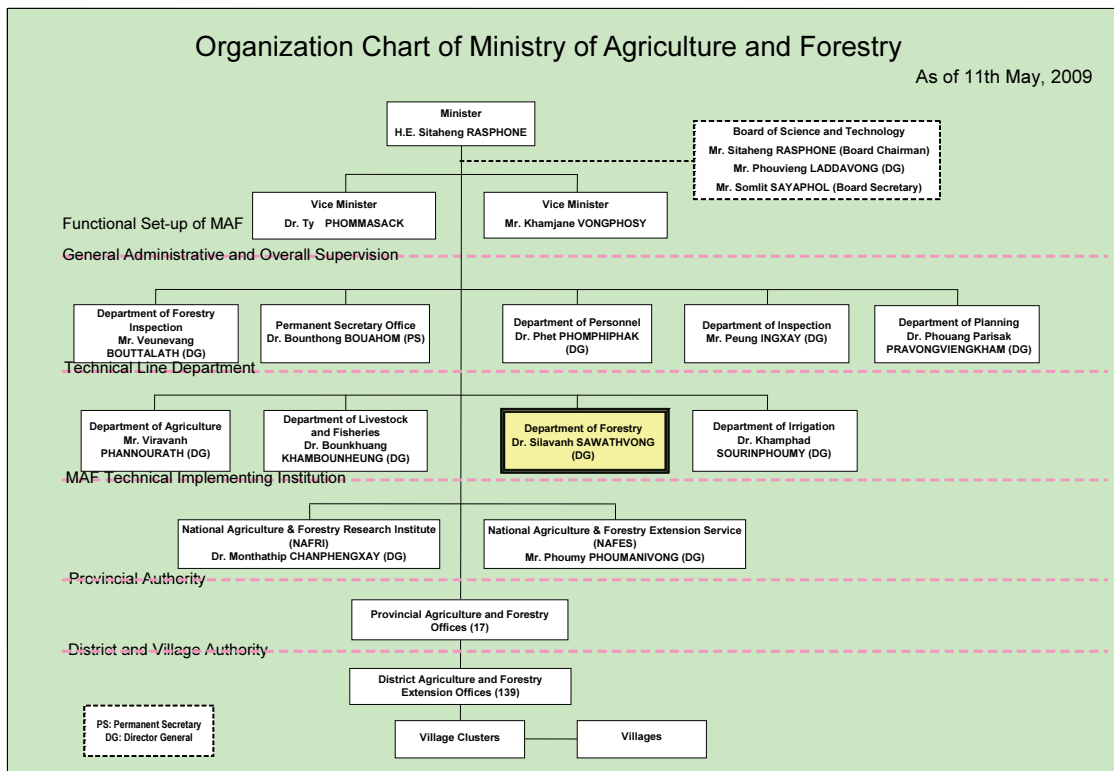


Figure 7 Organization Chart of Ministry of Agriculture and Forestry (MAF)

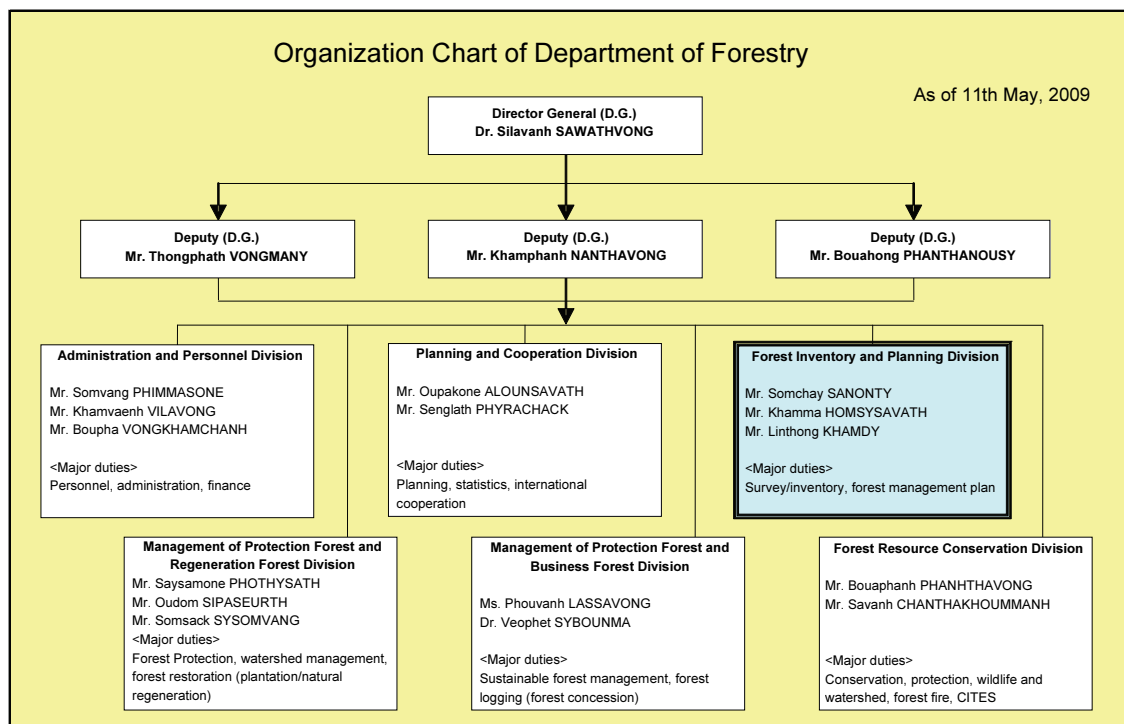


Figure 8 Organization Chart of Department of Forestry

6. 4 Educational research institute of third countries

There are educational research institutes in neighboring countries such as Vietnam, Thailand and India (SUFORD’s Capacity Building Plan also suggests the use of educational research institutes’ programs as

presented in the following Table 24). However, in view of well-arranged training resources, communications and past training performances (training for satellite imagery analyses and GIS concerned with watershed management were held in Laos in 2005), it can be supposed that the most efficient way is the dispatching of lecturers from AIT.

Table 24 Educational research institute of neighboring countries of Laos

Educational research institute	Country	Fund / scholarship
AIT – Geoinformatics Center (http://www.geoinfo.ait.ac.th/)	Thailand	JAXA, JICA
Indian Institute of Remote sensing (http://www.iirs-nrsc.gov.in/)	India	Indian government, UNESCAP
International Institute for Geo-Information Science and Earth Observation (http://www.itc.nl/education/)	Netherland	NUFFIC
Joensuu: Forest information center: GIS, RS, Biometric modeling, Forest Inventory	Finland	

7. Implementation Schedule of Technical Assistance

Table 25 outlines the implementation schedule of the technical assistance. Appendix 2 presents this detailed version including personnel resources and equipment for reference.

Table 25 Implementation Schedule of Technical Assistance

No	Purpose and Activity of Capacity Building	2010			2011			2012												
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1	I Enhancement of Basic Knowledge for RS/GIS/DB (Third Country Institute Program)																			
8	RS lecture by AIT																			
11	Database lecture by AIT																			
2	Creating nation-wide forest cover map with LANDSAT (1990)																			
3	Analyzing nation-wide forest cover map change with LANDSAT (1990-2000)																			
9	Developing/Refinement of national historical inventory database into GIS																			
11	II Understanding of Nation-wide Forest Basemap Development (Preliminary Study)																			
4	Feasibility study for multiple satellites integration (ALOS/SPOT/RapidEye)																			
5	Developing nation-wide forest basemap 2005 with SPOT 4																			
7	Training for inventory database and monitoring system in Japan																			
11	III Understanding of Nation-wide Forest Inventory Survey (2010)																			
12	Database/Data-collection design																			
10	Analyzing field survey area and selecting sample points																			
15	Data collection system lecture																			
16	GPS training (setup, trial, import/export), Data entry with field computer																			
17	Field survey (tree species, height, density, diameter)																			
18	Data collection & arrangement																			
11	IV Understanding of Nation-wide Forest Basemap Development (2010)																			
13	Database management (quality/security policy and backup system)																			
6	Developing nation-wide forest basemap 2010 with field survey data																			
14	Database development																			
11	V Implementation of Nation-wide Inventory Survey & Database Development (2011)																			
12	Database/Data-collection design (refinement)																			
10	Analyzing field survey area and selecting sample points																			
17	Field survey (tree species, height, density, diameter)																			
15	Data collection & arrangement																			
11	VI Understanding of Integrating REDD Pilot Projects and Monitoring System																			
19	REDD method evaluation																			
20	Integration with pilot project outputs in national level																			
21	Analyzing forest change in national level (optical)																			
22	Analyzing forest change in national level (radar)																			
14	Database development																			
11	VII Summary/Reporting																			
	Finalizing database																			
	Final Reporting																			

8. Output Materials of Technical Assistance

The following Table 26 lists the output materials (verifiable indicators of training). They shall be such as referential materials to verify their implementation activities, manuals to be developed by the technical assistance and the results of questionnaires from the Lao side.

Table 26 Output Materials (Verifiable Indicators of Training)

Item	Submission to / obtainment from	When
Training programs and results of evaluation questionnaires	Third-country educational research institute	End of August, 2010
Nationwide forest cover classification map (1990)	Third-country educational research institute	End of August, 2010
Nationwide forest cover classification map (2000)	Third-country educational research institute	End of August, 2010
Pilot survey reports for plural satellite integration	Local consultant	End of September, 2010
Nationwide forest base map (2005)	Japanese consultant	End of September, 2010
Completion reports of training in Japan	Japanese consultant	End of September, 2010
Nationwide forest base map (2010)	Japanese consultant	End of March, 2012
Forest resource information database (including satellite imagery)	Japanese consultant	End of February, 2013
Completion reports to the Lao side	Lao side	End of February, 2013
Completion reports to the Japanese side	JICA	End of February, 2013

9. Responsibilities of the Implementing Organization of the Lao side

In order to achieve the purpose of the technical assistance, it is necessary to implement activities such as operating and maintaining works by the implementing organization of the Lao side continuously in addition to the outputs resulting from the technical assistance. In particular, the Lao side shall need to assign the FIPD staff members to the training by the technical assistance. However, the personnel resources of the FIPD staff members are limited, and the SUFORD project is also in progress. In terms of this implementation, therefore, it is necessary to coordinate with persons concerned with the Project to confirm when and how many persons the technical assistance shall need for what activities to DoF and FIPD.

10. Appendices of Technical Assistance Plan

10.1 Appendix 1 (FIPD staff list)

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
1.	Somchai	Sanontry	1	21	Master	Administration section	Director of FIPD	Administration, Financial planning, Strategy of the organization, Organizational management	B.Sc in Hungary/ M.Sc in The Netherland/short course in Sweden
2.	Linthong	Khamdy	1c	29	Master	Administration section	Deputy director of FIPD	Administration, Design of system, Development of system	Russia
3.	Khamma	Homsisawath	1b	25	Forestry Diploma/ RS and GIS	Administration section	Deputy director of FIPD	Administration, Design of system, Development of system	
4.	Thongphoune	Onbouda		30	Bsc. Of forestry / RS & NFI	Administration section	Chief of Office?	Office management	
5.	Amphai	Vongmanivanh		28	Forestry Diploma/ accountant	Administration section	Chief of Administration section / Accountant	Accounting, procurement	
6.	Bounphieng	Saiyasensouk		41	Forestry Diploma	Administration section	Officer	Assistance accountant	
7.	Vilalak	Laddavong		22	Forestry Diploma	Administration section	Deputy chief of office administration	Accounting, receipts/bills related work, procurement	
8.	Keo	Manivong		18	Technical	Administration section	Secretary	Office assistance	

	First_name	Family_name	Type of Job	Work experience (year)	Qualification	Section	Position	Main_duty	Abroad Training in the past
9.	Bounmong	Souvannasone		40	Forestry Diploma	Administration section		Office assistance	
10.	Khamlao	Khongsaluy		34	Forestry Diploma	Administration section		Office assistance	
11.	Souvanna	Chitavong		2	Technical	Administration section		Office assistance	
12.	Vilaphanh	Chanthavisouk		20	Under Graduate	Botany section	Botanical expert/officer	Botanical identification. Methodology to improve plant surveys. Surveys related to rare existing species and NIFP	
13.	Bounlouan	Kettavong		18	Forestry Diploma	Botany section	Botanical expert/officer	Botanical identification. Methodology to improve plant surveys. Surveys related to rare existing species and NIFP	
14.	KhamKhone	Phimsavanh		22	Forestry Diploma	Botany section	Officer	Botanical identification. Methodology to improve plant surveys. Surveys related to rare existing species and NIFP	
15.	Thongkham	Volabouth		4	Under Graduate	Botany section	Officer	Botanical identification. Surveys related to rare existing species and NIFP	
16.	Khone	Chanthilath		1	Under Graduate	Botany section	Officer	Botanical identification. Surveys related to rare existing species and NIFP	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
17.	Phouangphethi	Simouthady	1a	24	Forestry Diploma/	Forest inventory and planning section	Head of the forest inventory section	Field survey, Field data processing/control, upgrade the inventory manual	
18.	Somphon	Thammavongsa	1a	24	Forestry Diploma	Forest inventory and planning section	Deputy chief of the inventory section	Organising operation, inventory planning, budget plan, Field data processing/control result of the NFI and PFA; upgrade the inventory manual	
19.	Cholachak	Phouthachak	3a	41	Under Graduate in forestry	Forest inventory and planning section	Forest officer	Plan of Budget for Operational field work : knowledge about tree species	
20.	Khampheng	Vongsenphanh	2a	20	Forestry Diploma	Forest inventory and planning section	Forest officer	Inventory team leader: design the survey (tract and plot) Operational field work related to NFI and PFA	
21.	Phaivanh	Sihalath	3a	21	Forestry Diploma	Forest inventory and planning section	Forest officer	Inventory team leader: design the survey (tract and plot) Operational field work related to NFI and PFA	
22.	Phouvong	Saiyasan	3a	17	Forestry Diploma	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
23.	Somvong	Sihalath	2a	24	Under Graduate	Forest inventory and planning section	Forest officer	Inventory team leader, design the survey (tract and plot) Operational field work related to NFI and PFA	
24.	Phanousith	Homsombath	2a	6	Under Graduate	Forest inventory and planning section	Forest officer	Inventory team leader, design the survey (tract and plot) Operational field work related to NFI and PFA	
25.	Chantha	Phaethommy	2a	19	Forestry Diploma	Forest inventory and planning section	Forest officer	Inventory team leader, design the survey (tract and plot) Operational field work related to NFI and PFA	
26.	Boukham	Chasongtoua	2a	45	Technical	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
27.	Sousakanh	Opasith	2a	5	Under Graduate	Forest inventory and planning section	Forest officer	Inventory team leader, design the survey (tract and plot) Operational field work related to NFI and PFA	
28.	Kedsamone	Kanhysome	2a	7	Forestry Diploma	Forest inventory and planning section	Forest officer	Inventory team leader, design the survey (tract and plot) Operational field work related to NFI and PFA	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
29.	Duangchai	Saipanya	2a	6	Under Graduate	Forest inventory and planning section	Forest officer	Inventory team leader, design the survey (tract and plot) Operational field work related to NFI and PFA	
30.	Khamdy	Chasongtota	2a	5	Forestry Diploma	Forest inventory and planning section	Forest officer	Inventory team leader, design the survey (tract and plot) Operational field work related to NFI and PFA	
31.	Khamsonk	Khodimonty	3a	5	Forestry Diploma	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
32.	Amphaiavanh	Meuanghan	3a	5	Bsc. Of forest	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
33.	Phuangthong	Thammavong	3a	5	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
34.	Onkeo	Ladvieng	3a	5	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
35.	Bounnam	SoukOubone	3a	5	Forestry Diploma	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
36.	Sivone	Somethipaanya	3a	5	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
37.	Sithong	Chanthalada	3a	5	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
38.	Chanthavy	Manivanh	3a	5	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
39.	Phuangphanh	Vongsai	3a	4	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
40.	Phouthione	Khoudthavong	3a	4	Forestry Diploma	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
41.	Bounkham	Hongkham	3a	4	Forestry Diploma	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
42.	Anousone	Luanglath	3a	4	Forestry Diploma	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
43.	Onkeo	Phengvongsa	3a	4	Forestry Diploma	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
44.	Phouthone	Komkieng	3a	4	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
45.	Khamdy	Volavouth	3a	4	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
46.	Keovilai	Chanthalaphone	3a	4	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
47.	Khampone	Inthanone	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
48.	Sathid	Senthamayong	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
49.	Choulamany	Saryalath	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
50.	Phoudthasone	Vongsat	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
51.	Thongponn	Sengmupeng	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
52.	Kedsana	Sisouphanthong	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
53.	Madsalong	Keovongsa	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
54.	Tiengthong	Phengsisomboune	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
55.	Anousone	Lovankham	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
56.	Phedsamone	Saiyamongkhotune	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
57.	Somphone	Phommachanh	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
58.	Souvanthong	Chandala	3a	3	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
59.	Chanbandid	Saiyavong	3a	2	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
60.	Kongkeo	Pongbounma	3a	2	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
61.	Thongvanh	Phengchampa	3a	2	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
62.	Soutsakhone	Phakonekham	3a	2	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
63.	Khamsung	Boudtalad	3a	2	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
64.	Eb	Phiasai	3a	1	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
65.	Saiyasith	SaiOutdom	3a	1	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
66.	Khamphao	Siphachanh	3a	1	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
67.	Chitavong	Chanthavong	3a	1	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
68.	Somesai	Phaophongsavathi	3a	1	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA.	
69.	Phouyong	Boualavong	3a	1	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
70.	Daosadeth	Keophilavanh	3a	0	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
71.	Bouanni	Viengvisai	3a	0	Under Graduate	Forest inventory and planning section	Forest officer	Operational field work related to NFI and PFA	
72.	Bounpheng	Vichith	1c	25. Excel, Access, Dbase, Foxpro	Under Graduate/ forestry	Planning and data base section	Chief of Database section./ Planning, analysis and Manager	Organizing Operational Database analysis for forest inventory and related activities, Budgeting and planning for FIPD operation (in Production forest) Delivery report on forest inventory and production forest management plan	Short course/ - Germany (Database and GIS) - SUFORD training: FOMIS
73.	Bounhieuang	Sengvilai	2b	25. Excel	Technical/ Forestry	Planning and data base section	Database operator officer/ data entry	Plan of Budget for office equipment. Field survey data entry to computer with excel format Ability for simple calculation : Volume	SUFORD/ Knowledge tree

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
74.	Pheddavong	Nammachanh	3c	4, Excel	Under Graduate/ certificate in Forestry	Planning and data base section	Database operator officer/ data entry	Field survey data entry to computer with excel format.Ability for simple calculation : Volume Daily management of computer system (maintenance of hardware, software and hardware upgrading). Ability in network management/ IT	SUFORD/ Knowledge tree
75.	Saodavanh	Sayasensouk	3c	3, Excel	Under Graduate/ Certificate in Forestry	Planning and data base section	Database operator officer/ data entry	Field survey data entry to computer with excel format.Ability for simple calculation : eg.Volume	SUFORD/ Knowledge tree
76.	Petter	Thavone	3c	3, Excel	Under Graduate/ Certificate in Forestry	Planning and data base section	Database operator officer/ data entry	Field survey data entry to computer with excel format	SUFORD/ Knowledge tree
77.	Say	Keobounthanh	3c	1, Excel	Under Graduate/ Certificate in Forestry	Planning and data base section	Database operator officer/ data entry	Field survey data entry to computer with excel format	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
78.	Soukanh	Bounthabandid	1b	24, ArcMap, Erdas	Master of GIS & RS in forestry	Remote sensing	Chief of RS&GIS section Coordinator with SUFORD project and REDD task force.	General management, Organizing Operational GIS and RS work for forest mapping and land use planning in production forest Progress reporting Data management for SUFORD Budgeting, procure and order digital data for FIPD.	BSc. In India MSc in Indonesia. Short course in Japan
79	Sombath	Panyasak	2b	24, Erdas, ArcGIS, PCI	Under Graduate/ RS	Remote sensing	Deputy chief of RS&GIS section	Data preparation and management RS visual interpretation Planning for field check Forest cover monitoring Maintenance of the digital map database (quality control, data validation, map data changes and input). Daily management of computer system.	Short course/ Thailand
80.	Khannouy	Chaulhhalangsy	2b	24, ArcMap, PCI	Forestry Diploma/ GIS	Remote sensing	Deputy chief of RS&GIS section	Maintenance of the digital map database (quality control, data validation, map data changes and input). Thematic map, digital cartography. Field check	Short course RS / Thailand

	First_name	Family_name	Type of Job	Work experience (year)/software	Qualification	Section	Position	Main_duty	Abroad Training in the past
81.	Kom	Maly	3b	28, ArcMap	Forestry Diploma/RS	Remote sensing	Remote sensing Operator	Visual image interpretation, digitizing, Integrity checking of map and attribute data, attribute data input. Incharge of hard copy document in the office	
82.	Bounthanom	Luangpaseuth	3b	24, ArcMap	Forestry Diploma/RS	Remote sensing	Remote sensing Operator	Good skill with visual image interpretation, digitizing, Integrity checking of map and attribute data, attribute data input. Field check	Short course RS /Thailand
83.	Chansanoud	Vongsanuth	2b	24, ArcGIS, Erdas	Forestry Diploma/ GIS	Remote sensing	GIS operator	Landuse planning, Identify land zoning in the PFA, Digitizing, thematic map, Integrity checking of map and attribute data, attribute data input, GIS analysis, Field check	SUFORD training
84.	Si-CE,Amphone	Siboune	2b	24, ArcGIS, Erdas	Forestry Diploma/ GIS	Remote sensing	GIS operator	Landuse planning, Digitizing, thematic map, Integrity checking of map and attribute data, attribute data input, GIS analysis.	

	First_name	Family_name	Type of Job	Work experience (year)/ software	Qualification	Section	Position	Main_duty	Abroad Training in the past
85.	Khankeo	Sengthong	3b	18, Arcmap	Forestry Diploma/	Remote sensing	Remote sensing Operator	Visual image interpretation, digitizing, Integrity checking of map and attribute data, attribute data input	
86.	Khammoun	Chaleunsouk	3b	1, Arcmap	Under Graduate	Remote sensing	RS operator	Visual image interpretation, digitizing, Integrity checking of map and attribute data, attribute data input	
87.	Kongsi	Siliphong	2b	1, Arcmap	Under Graduate	Remote sensing	RS operator	Visual image interpretation, digitizing, Integrity checking of map and attribute data, attribute data input	Short course RS /Thailand
88.	Khamkhong	Inthavong	3b	7, Arcmap	Forestry Diploma/ GIS	Remote sensing	GIS operator	Digitizing, thematic map, Integrity checking of map and attribute data, attribute data input, GIS analysis.	
89.	Khamla	Santhavong	2b	3, Arcmap	Under Graduate	Remote sensing	RS/GIS operator	Digitizing, thematic map, Integrity checking of map and attribute data, attribute data input, field check	
90.	Souvanna	Chanthalisy	2b	5, Arcmap	Under Graduate	Remote sensing/ GIS	RS/GIS operator	Digitizing, thematic map, Integrity checking of map and attribute data, attribute data input, field check	

	First_name	Family_name	Type of Job	Work experience (year)/software	Qualification	Section	Position	Main_duty	Abroad Training in the past
91.	Sonesai	Senekham	3b	5, Arcmap	Forestry Diploma	Remote sensing/ GIS	RS/GIS operator	Digitizing, thematic map, Integrity checking of map and attribute data, attribute data input, field check	

10.2 Appendix 2 (Schedule of Technical Assistance)

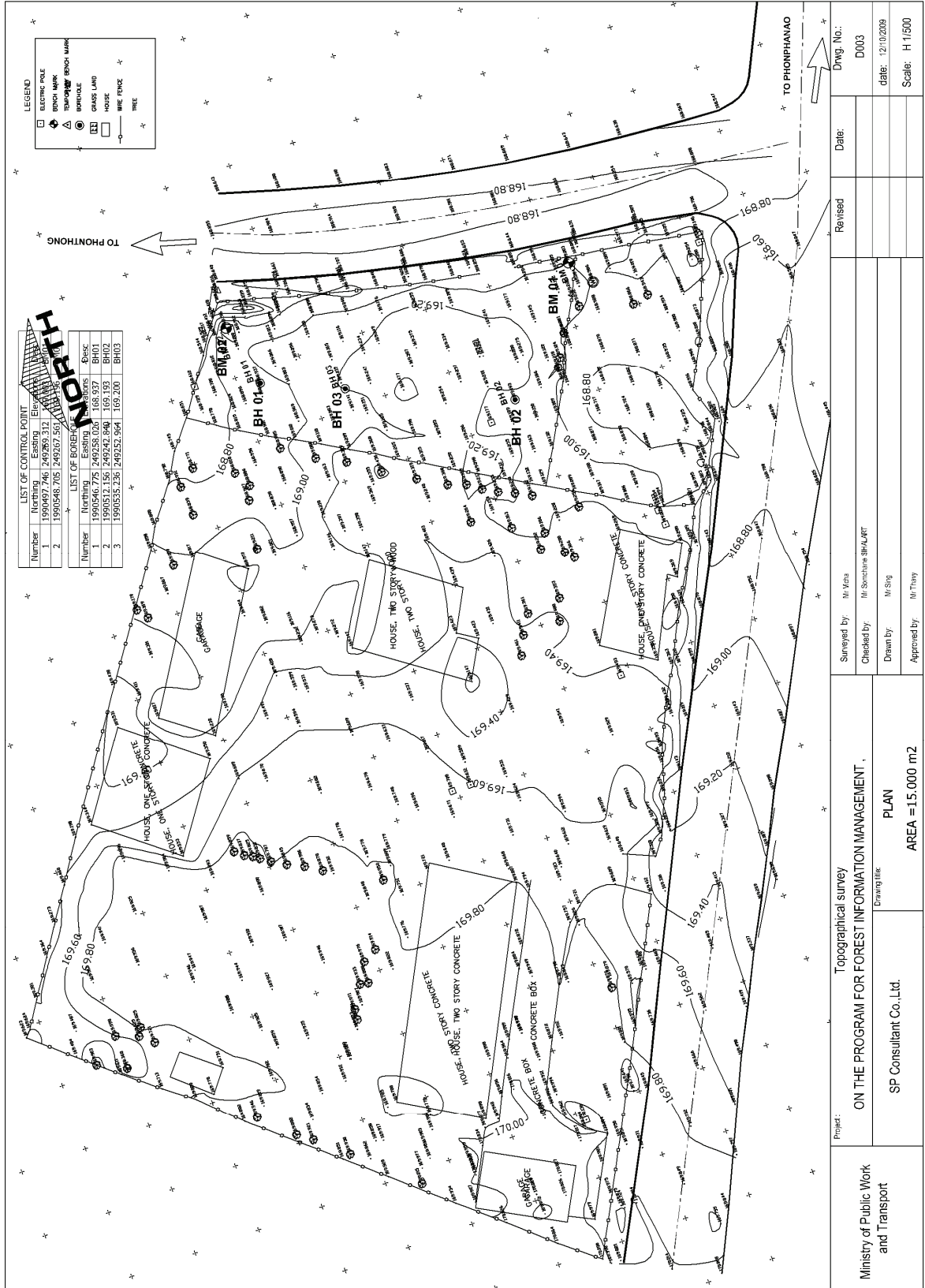
The schedule of the Technical Assistance is shown in the next page.

No	Target Goals and Activities of Capacity Building	2010			2011			2012			2013												
		Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
I Enhancement of Basic Knowledge for RS/GIS/DB (Third Country Institute Program)																							
1	RS lecture by AIT																						
2	Database lecture by AIT																						
3	Creating nation-wide forest cover map with LANDSAT (1990-2000)																						
4	Analyzing nation-wide forest cover change with LANDSAT (1990-2000)																						
5	Developing/refinement of national historical inventory database into GIS																						
II Understanding of Nation-wide Forest Basemap Development (Preliminary Study)																							
6	Feasibility study for multiple satellites integration (ALOS/SPOT/RapidEye)																						
7	Developing nation-wide forest basemap 2005 with SPOT 4																						
8	Training for inventory database and monitoring system in Japan																						
III Understanding of Nation-wide Forest Inventory Surveys (2010)																							
9	Database/Data-collection design																						
10	Analyzing field survey area and selecting sample points																						
11	GPS training (setup, trial, import/export), Data entry with field computer																						
12	Field survey (tree species, height, density, diameter)																						
13	Data collection & arrangement																						
IV Understanding of Nation-wide Forest Basemap Development (2010)																							
14	Database management (quality/security policy and backup system)																						
15	Developing nation-wide forest basemap 2010 with field survey data																						
16	Database development																						
V Implementation of Nation-wide Inventory Surveys & Database Development (2011)																							
17	Database/Data-collection design (refinement)																						
18	Analyzing field survey area and selecting sample points																						
19	Field survey (tree species, height, density, diameter)																						
20	Data collection & arrangement																						
VI Understanding of Integrating REDD Pilot Projects and Monitoring System																							
21	REDD method evaluation																						
22	Integration with pilot project outputs in national level																						
23	Analyzing forest change in national level (optical)																						
24	Analyzing forest change in national level (radar)																						
25	Database development																						
VII Summary/Reporting																							
26	Finalizing database																						
27	Final Reporting																						
A Human Resources Inputs																							
Japanese Consultant																							
	Project manager (Expert from Japan)																						
	Project coordinator/field survey management (Expert from Japan)																						
	Forest basemap 2005 development (Japanese consultant)																						
	RS analysis/forest basemap development (Expert from Japan)																						
	Database/Data-collection design (Expert from Japan)																						
	Field survey planning (Expert from Japan)																						
	REDD analysis/implementation (Expert from Japan)																						
Local/International Consultant																							
	Basic training trainer (Institute of the third country: AIT)																						
	Basic training assistant (Local consultant with Thai/Lao language)																						
	Pre-study for RS methodology (International consultant)																						
	LAO trainees in Japan (3 Counterparts with leading ability)																						
	Database/Data-collection design assistant (Local consultant)																						
	Field survey/Database development assistant (Local institute)																						
	Data quality control/management (International consultant)																						
	Local Translator1																						
	Local Translator2																						
B Satellite Imagery																							
	LANDSAT (1990&2000)																						
	SPOT4 (2005)																						
	SPOT5 (2007-2008)																						
	RapidEye (2008)																						
	ALOS/AVNIR-2 (2010)																						
	ALOS/PRISM-OB2 (2010)																						
	ALOS/PALSAR-FBD (2010)																						
	ALOS/AVNIR-2 (2011)																						
	ALOS/PALSAR-FBD (2011)																						
	SPOT5 (2010)																						
	RapidEye (2010)																						
C Equipments (only related to activities)																							
	RS software (high-end) : ERDAS IMAGINE Professional/LPS																						
	GIS software (high-end): ArcInfo + Spatial Analyst + 3D Analyst																						
	GIS software (standard): ArcView + Spatial Analyst + 3D Analyst																						
	GIS software (for fields): ArcView (without extension)																						
	Handy GPS: Garmin Map 60 CSX																						
	Desktop PC (high-end)																						
	Laptop PC (standard)																						
	Storage Server (tower type)																						
	Storage Server (rack type) (10TB)																						
D Indicators																							
	Nation-wide Forest Governance (1990)																						
	Nation-wide Forest Governance & Change Detection (2000)																						
	Nation-wide Forest Basemap Map (2005)																						
	Nation-wide Forest Basemap & Inventory (2010)																						
	Forest Resource Information Database with Satellite Imagery																						

A6 Other Relevant Data

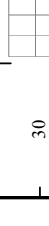

A6. Other Relevant Data

1) Topographic Map

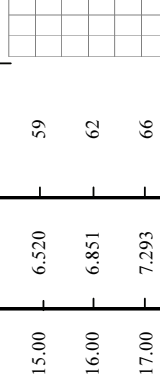
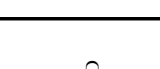


2) Boring Survey Result

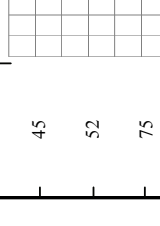

SOIL INVESTIGATION FOR THE PROGRAM FORESTRY INFORMATION MANAGEMENT				LAO PEOPLE'S DEMOCRATIC REPUBLIC PEACE INDEPENDENCE UNITY DEMOCRACY PROSPERITY				SHEET NUMBER.				
LOCATION OF SUB PROJCT Chanthabouli District, Vientiane Capital				A.S.T.M METHOD, MODEL D-1586 FOR STANDARD PENETRATION TEST (SPT)				BOREHOLE No. : 1				
ELEVATION (m) : 168.937				SOIL DESCRIPTION & TYPE OF SAMPLING				N : 1990546.7751				
DEPTH (m) : 0.00				OBSERVATION AND ANALYSIS RECORD				E : 249258.0257				
LAYER THICKNESS (m) : 2.00				COLOR OF SOIL				LOCATION :				
SYMBOL				DEPTH (m)				STATION :				
GRAVEL-SAND-SILT MIXTURES				QU (Kg/Cm2)				DATED : 2009/10/8				
GRAVEL-SAND-CLAY MIXTURES				NUMBER OF BLOW PER 30 Cm				ELEVATION :				
SILTY CLAYS				CONSISTENCY				168.937				
1	2	3	4	5	6	7	8	9	10	11	12	13
1.00	168.937	0.00	2.00		GRAVEL-SAND-SILT MIXTURES		1.00	0.111	1			VERY SOFT
2.00	166.937	2.00	4.00		GRAVEL-SAND-CLAY MIXTURES	RED	2.00	0.332	3			VERY SOFT
3.00					SILTY CLAYS	RED	3.00	0.995	9			MEDIUM
4.00					SILTY CLAYS	RED	4.00	1.879	17			STIFF
5.00					SILTY CLAYS	RED	5.00	1.989	18			STIFF
6.00	162.937	6.00			SILTY CLAYS	RED	6.00	2.100	19			STIFF
7.00					SILTY CLAYS	RED	7.00	2.321	21			VERY STIFF
8.00					SILTY CLAYS	RED	8.00	1.547	14			STIFF
9.00					SILTY CLAYS	RED	9.00	1.658	15			STIFF
10.00					SILTY CLAYS	RED	10.00	1.768	16			STIFF
11.00					SILTY CLAYS	RED	11.00	1.768	16			STIFF
12.00					SILTY CLAYS	RED	12.00	2.210	20			STIFF
13.00					SILTY CLAYS	RED	13.00	2.431	22			VERY STIFF
14.00	154.937	14.00			SILTY CLAYS	RED	14.00	2.652	24			VERY STIFF
A : AUGURING				N : NUMBER OF BLOW				REMARKS.				
W.O : WASH OUT				PER FT or PER 30 Cm				THE END OF BORING AT : 18.00 m				
S.T : SHELL BY TUBE				QU : UNCONFINED COMPRESSIVE				GROUND WATER LEVEL AFTER 24 HOURS : 0.70 m				
S.S : SPLIT SPOON				STRENGTH (Kg/Cm ²)				GROUND WATER LEVEL : 7.50 m				
D.B : DIAMOND BIT				DS : DISTURBED SAMPLE								
C : CORE SAMPLING				UDS : UNDISTURBED SAMPLE								

SOIL INVESTIGATION FOR THE PROGRAM FORESTRY INFORMATION MANAGEMENT		LAO PEOPLE'S DEMOCRATIC REPUBLIC PEACE INDEPENDENCE UNITY DEMOCRACY PROSPERITY				SHEET NUMBER. 2							
LOCATION OF SUB PROJECT Chanhaboul District, Vientiane Capital		A.S.T.M METHOD, MODEL D-1586 FOR STANDARD PENETRATION TEST (SPT)				BOREHOLE No. SPT. No: 1							
		BORING LOG				LOCATION:							
		OBSERVATION AND ANALYSIS RECORD				STATION:							
SCALE (m)	ELEVATION (m)	DEPTH (m)	LAYER THICKNESS (m)	SYMBOL	SOIL DESCRIPTION & TYPE OF SAMPLING	COLOR OF SOIL	DEPTH (m)	QU (Kg/Cm ²)	NUMBER OF BLOW PER 30 Cm	VALUES OF NUMBER OF BLOWS	ELEVATION	CONSISTENCY	
1	2	3	4	5	6	7	8	9	11	10 20 30 40 50 60 70 80	12	13	
15.00	154.937	14.00	3.00		SILTY CLAYS	RED	15.00	3.315	30			VERY STIFF	
16.00							16.00	3.868	35			VERY STIFF	
17.00	151.937	17.00			SANDSTONE		17.00	4.089	37			VERY STIFF	
18.00							18.00	8.177	74			HARD	
19.00													
20.00													
21.00													
22.00													
23.00													
24.00													
25.00													
26.00													
27.00													
28.00													
A:	AUGURING												
W.O:	WASH OUT												
S.T:	SHELL BY TUBE												
S.S:	SPLIT SPOON												
D.B:	DIAMOND BIT												
C:	CORE SAMPLING												
		N : NUMBER OF BLOW PER FT or PER 30 Cm		STANDARD PENETRATION TEST SS.		REMARKS.							
		QU : UNCONFINED COMPRESSIVE STRENGTH (Kg/Cm ²)		SIZE 2" O.D. SPLIT SPOON 140 LBS HAMMER		THE END OF BORING AT : 18.00 m							
		DS : DISTURBED SAMPLE		30" DROP		GROUND WATER LEVEL AFTER 24 HOURS: 0.70 m							
		UDS : UNDISTURBED SAMPLE				GROUND WATER LEVEL : 7.50 m							

SOIL INVESTIGATION FOR THE PROGRAM		LAO PEOPLE'S DEMOCRATIC REPUBLIC						SHEET NUMBER.			
FORESTRY INFORMATION MANAGEMENT		PEACE INDEPENDENCE UNITY DEMOCRACY PROSPERITY						BOREHOLE No.			
LOCATION OF SUB PROJECET		BORING LOG						SPT. No: 2			
Charthabouli District ,vientiane Capital		A.S.T.M METHOD, MODEL D-1586 FOR STANDARD PENETRATION TEST (S P T)						LOCATION :			
		OBSERVATION AND ANALYSIS RECORD						STATION:			
SCALE (m)	ELEVATION (m)	DEPTH (m)	LAYER THICKNESS (m)	SYMBOL	SOIL DESCRIPTION & TYPE OF SAMPLING	COLOR OF SOIL	DEPTH (m)	QU (Kg/Cm ²)	NUMBER OF BLOW PER 30 Cm	ELEVATION:	
										10	20
1	2	3	4	5	6	7	8	9	11	12	13
1.00	169.231	0.00	2.00		GRAVEL-SAND-SILT MIXTURES		1.00	0.553	5		SOFT
2.00	167.231	2.00			GRAVEL-SAND-CLAY MIXTURES	RED	2.00	0.663	6		SOFT
3.00					SILTY CLAYS		3.00	1.547	14		MEDIUM
4.00			4.00				4.00	2.321	21		STIFF
5.00							5.00	2.100	19		STIFF
6.00	163.231	6.00					6.00	1.879	17		STIFF
7.00							7.00	1.658	15		VERY STIFF
8.00							8.00	1.437	13		STIFF
9.00							9.00	1.326	12		STIFF
10.00			8.00			RED	10.00	1.547	14		STIFF
11.00							11.00	1.658	15		STIFF
12.00							12.00	1.768	16		STIFF
13.00							13.00	1.989	18		VERY STIFF
14.00	155.231	14.00					14.00	2.210	20		VERY STIFF
A:	AUGURING			N : NUMBER OF BLOW							
W.O:	WASH OUT			PER FT or PER 30 Cm							
S.T :	SHELL BY TUBE			QU : UNCONFINED COMPRESSIVE		STANDARD PENETRATION TEST SS.					REMARKS.
S.S :	SPLIT SPOON			STRENGTH (Kg/Cm ²)		SIZE 2" O.D. SPLIT SPOON 140 LBS HAMMER					THE END OF BORING AT : 19.00 m
D.B:	DIAMOND BIT			DS : DISTURBED SAMPLE		30" DROP					GROUND WATER LEVEL AFTER 24 HOURS: 0.75 m
C :	CORE SAMPLING			UDS : UNDISTURBED SAMPLE							GROUND WATER LEVEL : 2.80 m

SOIL INVESTIGATION FOR THE PROGRAM FORESTRY INFORMATION MANAGEMENT		LAO PEOPLE'S DEMOCRATIC REPUBLIC PEACE INDEPENDENCE UNITY DEMOCRACY PROSPERITY				SHEET NUMBER: 2	
LOCATION OF SUB PROJECT Chanthabouly District, Vientiane Capital		A.S.T.M METHOD, MODEL D-1586 FOR STANDARD PENETRATION TEST (SPT)				BOREHOLE No. N: 1990512.1561 E: 249242.8396	
ELEVATION (m)		SOIL DESCRIPTION & TYPE OF SAMPLING		OBSERVATION AND ANALYSIS RECORD		STATION:	
1	2	3	4	5	6	7	8
15.00	155.231	14.00	4.00		SILTY CLAYS	RED	15.00
16.00					SANDSTONE		16.00
17.00							17.00
18.00	151.231	18.00					18.00
19.00							19.00
20.00							
21.00							
22.00							
23.00							
24.00							
25.00							
26.00							
27.00							
28.00							
A:	AUGURING	NUMBER OF BLOW PER FT or PER 30 Cm		STANDARD PENETRATION TEST SS.		REMARKS.	
W.O:	WASH OUT	QU: UNCONFINED COMPRESSIVE STRENGTH (Kg/Cm ²)		SIZE 2" O.D. SPLIT SPOON 140 LBS HAMMER		THE END OF BORING AT : 18.00 m	
S.T:	SHELL BY TUBE	DS: DISTURBED SAMPLE		30" DROP		GROUND WATER LEVEL AFTER 24 HOURS: 0.75 m	
S.S:	SPLIT SPOON	UDS: UNDISTURBED SAMPLE				GROUND WATER LEVEL : 2.80 m	
D.B:	DIAMOND BIT						
C:	CORE SAMPLING						

SOIL INVESTIGATION FOR THE PROGRAM FORESTRY INFORMATION MANAGEMENT		LAO PEOPLE'S DEMOCRATIC REPUBLIC PEACE INDEPENDENCE UNITY DEMOCRACY PROSPERITY				SHEET NUMBER.		1			
LOCATION OF SUB PROJCT Charthabouli District, Vientiane Capital		BORING LOG A.S.T.M METHOD, MODEL D-1586 FOR STANDARD PENETRATION TEST (SPT)				BOREHOLE No.		SPT No: 3			
						N: 1990546.7751		LOCATION:			
						E: 249258.0257					
		OBSERVATION AND ANALYSIS RECORD				STATION:					
						DATED: 2009/10/13		ELEVATION: 168.937			
						VALUES OF NUMBER OF BLOWS		CONSISTENCY			
						10 20 30 40 50 60 70 80					
						12		13			
SCALE (m)	ELEVATION (m)	DEPTH (m)	LAYER THICKNESS (m)	SYMBOL	SOIL DESCRIPTION & TYPE OF SAMPLING	COLOR OF SOIL	DEPTH (m)	QU (Kg/Cm ²)	NUMBER OF BLOW PER 30 Cm		
1	2	3	4	5	6	7	8	9	11		
1.00	168.937	0.00	1.00		SANDY CLAYS		1.00	0.553	5		SOFT
2.00	167.937	1.00			GRAVEL-SAND-CLAY MIXTURES	YELLOW	2.00	0.663	6		SOFT
3.00			5.00		SILT CLAYS		3.00	1.105	10		MEDIUM
4.00							4.00	1.105	10		MEDIUM
5.00							5.00	2.984	27		VERY STIFF
6.00	162.937	6.00					6.00	2.763	25		VERY STIFF
7.00							7.00	2.542	23		VERY STIFF
8.00							8.00	1.879	17		STIFF
9.00							9.00	1.547	14		STIFF
10.00			8.00			RED	10.00	2.100	19		STIFF
11.00							11.00	2.763	25		VERY STIFF
12.00							12.00	2.652	24		VERY STIFF
13.00							13.00	2.873	26		VERY STIFF
14.00	154.937	14.00					14.00	4.531	41		VERY STIFF
A:	AUGURING										
W.O:	WASH OUT										
S.T:	SHELL BY TUBE										
S.S:	SPLIT SPOON										
D.B:	DIAMOND BIT										
C:	CORE SAMPLING										
		N : NUMBER OF BLOW PER FT or PER 30 Cm		STANDARD PENETRATION TEST SS.						REMARKS.	
		QU : UNCONFINED COMPRESSIVE STRENGTH (Kg/Cm ²)		SIZE 2" O.D. SPLIT SPOON 140 LBS HAMMER						THE END OF BORING AT : 17.00 m	
		DS : DISTURBED SAMPLE		30" DROP						GROUND WATER LEVEL AFTER 24 HOURS: 0.80 m	
		UDS : UNDISTURBED SAMPLE								GROUND WATER LEVEL : 3.00 m	

SOIL INVESTIGATION FOR THE PROGRAM FORESTRY INFORMATION MANAGEMENT				LAO PEOPLE'S DEMOCRATIC REPUBLIC PEACE INDEPENDENCE UNITY DEMOCRACY PROSPERITY				SHEET NUMBER: 2			
LOCATION OF SUB PROJECT Charitaboul District, Vientiane Capital				A.S.T.M METHOD, MODEL D-1586 FOR STANDARD PENETRATION TEST (SPT)				BOREHOLE No. SPT. No: 3			
CHARITABOUL DISTRICT, VIENTIANE CAPITAL				OBSERVATION AND ANALYSIS RECORD				STATION: ELEVATION: 168.937			
SCALE (m)	ELEVATION (m)	DEPTH (m)	LAYER THICKNESS (m)	SYMBOL	SOIL DESCRIPTION & TYPE OF SAMPLING	COLOR OF SOIL	DEPTH (m)	QU (Kg/Cm ²)	NUMBER OF BLOW PER 30 Cm	VALUES OF NUMBER OF BLOWS	CONSISTENCY
1	2	3	4	5	6	7	8	9	11	10 20 30 40 50 60 70 80	13
15.00	154.937	14.00	3.00		SILTY CLAYS	RED	15.00	4.973	45		VERY STIFF
16.00							16.00	5.746	52		VERY STIFF
17.00	151.937	17.00			SANDSTONE		17.00	8.288	75		VERY STIFF
18.00							18.00				HARD
19.00											
20.00											
21.00											
22.00											
23.00											
24.00											
25.00											
26.00											
27.00											
28.00											
A:	AUGURING										
W.O:	WASH OUT										
S.T:	SHELL BY TUBE										
S.S:	SPLIT SPOON										
D.B:	DIAMOND BIT										
C:	CORE SAMPLING										
REMARKS:				STANDARD PENETRATION TEST SS.				THE END OF BORING AT : 17.00 m			
				SIZE 2" O.D. SPLIT SPOON 140 LBS HAMMER				GROUND WATER LEVEL AFTER 24 HOURS: 0.80 m			
				30" DROP				GROUND WATER LEVEL : 3.00 m			