**Forestry Department**
**Food and Agriculture Organization of the United Nations**

# PROCEEDINGS

# REGIONAL WORKSHOP ON DEVELOPMENT OF EFFECTIVE TOOLS FOR MANAGEMENT OF FOREST INFORMATION FOR SUSTAINABLE FOREST MANAGEMENT

PATHUM THANI, THAILAND, SEPTEMBER 2010

NOVEMBER 2010, BANGKOK

**MAR Working Paper 39 / 2010**

# Strengthening Monitoring, Assessment and Reporting (MAR) on Sustainable Forest Management (SFM) in Asia (GCP/INT/988/JPN)

FAO initiated the project "Strengthening Monitoring, Assessment and Reporting (MAR) on Sustainable Forest Management (SFM) in Asia" (GCP/INT/988/JPN) (abbreviated as the "MAR-SFM Project") in January 2006. This five-year project is funded by the Government of Japan and will be implemented until December 2010.

The main objective of the MAR-SFM Project is to develop a globally harmonised forest-related national MAR system to contribute directly to the improvement of SFM regimes in the Asia-Pacific region. Allied objectives of the project are to enhance the use of the MAR information in national decision-making, formulation of effective forest policies, and sustainable forest management and planning.

The MAR-SFM Project aims to accomplish its objectives in two phases: Development Phase for two years and Implementation Phase for three years. During the development phase the project focused on: (i) strengthening of linkages with forest-related processes; (ii) development of globally harmonised frameworks and guidelines; (iii) use of MAR information in national policy development and planning on forests; (iv) establishment of networks of national focal points to various forest-related processes; and (v) national activities to facilitate harmonisation of forest MAR. The implementation phase spreads over the remaining three years of the project period and focuses on the implementation of the harmonised MAR at the national level in selected project countries through studies, expert consultations, training, and pilot testing.

All countries in the Asia-Pacific region are welcome to participate in the MAR-SFM Project, although the actual level and intensity of their participation may vary. Up to now, forestry departments in 26 countries have nominated their national focal points for the project.

FAO, in collaboration with the Forest Agency of Japan, the International Tropical Timber Organization (ITTO), the International Network for Bamboo and Rattan (INBAR), and the FAO - Norway project organised an inception workshop on the MAR-SFM Project in Sapporo, Japan, 24-28 July 2006. The workshop reviewed the current status of MAR in project countries, briefed participating national focal points on the project, and deliberated on a work plan of project activities. The project organized a planning workshop in Chiang Mai, Thailand, 31 October - 2 November 2006, a training workshop on the remote sensing-based land cover classification system in Dehradun, India, 4-8 December 2006, a workshop on harmonisation of national forest inventories (NFIs) in Beijing, China, 26-31 March 2007, and a training workshop on MAR in Nadi, Fiji, 10-12 October 2007. The tripartite mid-term review meeting was held at the FAO Regional Office for Asia and the Pacific (FAO-RAP) in Bangkok, 16-19 September 2008, to review overall achievements of the MAR Project to date. FAO, the donor (Japan) and participants from 18 project countries discussed a plan of project activities up to December 2010. The participants proposed core international and national activities for the remaining period.

FAO-RAP manages the MAR-SFM Project in close coordination with the Forest Resources Development Division (FOMR) and other divisions at FAO Headquarters in Rome and other collaborating organizations. Contact persons are:


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# EXECUTIVE SUMMARY

The Regional Workshop on Development of Effective Tools for Management of Forest Information for Sustainable Forest Management was held in collaboration with the Asian Institute of Technology (AIT) in Pathum Thani, Thailand, 14 – 17 September 2010. Eighteen participants attended the workshop from 16 countries, facilitated by FAO officers from RAP and HQs. The workshop aimed to provide participants with updated knowledge and skills on overall forest information systems. The workshop consisted of lectures and exercises for each session, covering topics of: overall forest information systems and results of recent project work on database management systems in Asian countries; open-source software for geospatial data management; GIS and remote sensing data with MODIS for near-real time forest fire monitoring; web map services, geo-portals and spatial data infrastructures; and data storage, processing and analysis for sample-based forest field surveys under the National Forest Monitoring and Assessment (NFMA). The staff of AIT presented and demonstrated training activities of Geoinformatics Center, including database development on disaster management and the MODIS Fire Information System.

Participants learned and practiced database management systems and applied tools during the workshop. They also made presentations on forest database management in countries, building on forest inventories and remote sensing. Countries required harmonization of database formats for common use and sharing of forest-related data.

The participants evaluated the workshop and suggested follow-up activities. Although the workshop provided overall knowledge on spatial and non-spatial forest information systems as introductory sessions, they requested follow-up training and pilot activities to build up national capacities for forest information systems in thematic areas at various levels, based on countries' specific needs. They requested continuous and intensive training for technical sessions with detailed lectures and exercises. Many of the participants pointed out that countries still lacked financial and technical capacities as well as decision makers' political will to develop forest information systems. They requested technical assistance from FAO and AIT in their programs to further support countries in developing national and regional forest information systems. Participants suggested various types of technical assistance such as mini-projects, case studies, regional training, distance learning, and free software distribution.

Countries are expected to collaborate with each other to share experience and expertise on forest information management by developing a regional network of experts with countries' initiatives. At the same time, the countries will have to develop effective national mechanisms to better influence decision makers on development of national forest information systems. It would be useful to establish a list of e-mail addresses of national experts to facilitate distribution of software.

# Regional Workshop on Development of Effective Tools for Management of Forest Information for Sustainable Forest Management
# Asian Institute of Technology (AIT)
# Pathum Thani, Thailand, 14 – 17 September 2010

## 1. Background of the Workshop

A questionnaire regarding the status of forest information systems (FISs) was distributed to all member countries of the project: Strengthening Monitoring, Assessment and Reporting on Sustainable Forest Management in Asia (GCP/INT/988/JPN) earlier this year. The countries were among others asked about main constraints on filling the gap between the current and ideal situations regarding use of information systems. The results show that almost all countries need more opportunities for training on database management for government officers.

This workshop therefore was organized as a tentative short course that could be a model for similar courses in participants' countries. Participants took training material back home to organize similar courses in their countries.

## 2. Objectives of and justification for the workshop

The overall objective of this workshop was to improve national capacities for management of forest-related data in the Asia-Pacific region. The workshop was expected to contribute to countries' effective management of forest-related data through capacity building.

## 3. Organization of the workshop

FAO organized the workshop at the Asian Institute of Technology (AIT), Pathum Thani, Thailand, 14 – 17 September 2010 in close collaboration with the AIT as the co-organizer. The workshop consisted of lectures and hands-on exercises for technical sessions, facilitated by FAO and AIT.

## 4. Content/Structure of the Workshop

The workshop will be organized in plenary sessions mixed with short lectures and sessions with practical exercises. Several aspects of database management will be dealt with, including:

- Definitions of data structures and its harmonization
- Recent techniques for forests database management
- Open source software for desktop and web-GIS
- Spatial data infrastructures regarding forest information
- Environment-related databases within FAO and other international organizations
- Relevant Internet-based data portals
- Case studies regarding GIS and mapping applications from Asia-Pacific countries

At the end of the workshop evaluation and discussions were made on the course agenda and content. The agenda of the workshop is presented in **Appendix 1**.

# 5. Participants of the Workshop

Eighteen participants attended the workshop from 16 countries, facilitated by FAO and AIT (28 persons in total). The complete list of participants is provided in **Appendix 2.**

# 6. Workshop Sessions

Overall descriptions of training course modules are described in **Appendix 3**.

(1) Lectures and exercises

The following is the summary of presentations and discussions during the workshop:

After welcome and opening addresses by the FAO (Mr. Masahiro Otsuka) and the AIT (Prof. Nitin Afzulpurkar) and self-introduction by participants, the lecturer (Dr. Anders Wellving) introduced the overall structure of the workshop and the AIT (Dr. Pradeep Kumar Dash) explained logistic arrangements. Then the lecturer presented overall FISs and results of database surveys. Presentations clarified areas of application, technical descriptions, and current systems at national, regional and international levels. The questionnaire survey showed limited capacities of countries except some advanced countries for management and use of forest information despite some progress in database systems. Then AIT (Dr. Lal Samarakoon) made a presentation on overall capacity building activities of AIT-Geoinformatics Centre, containing GIS training on natural resources management and disaster management as well as support for FISs in Lao PDR in collaboration with various organizations.

At Lecture 1, the lecturer made a presentation on data structures and tools for management of data in GIS-based FISs covering spatial data structures with vector- and rastor-based GIS, tools for management of data including spatial modelling for calculations on the REDD process, and mobile information systems with the case of Sweden, followed by demonstration and exercise.

Country presentations were made on:
- Online Forestry Information Database System (FID) with computer-based information management systems in Bhutan
- Development of forestry information systems in Indonesia using spatial and non-spatial database and national policies for improved data management and coordination in Indonesia
- FISs and software packages (e.g., MS SQL Server 2005, etc.) in Nepal

Nepal faces a problem of political conflicts which makes it difficult to carry out forestry activities in many areas. Four participants marked this session as the most interesting session and three as the second.

Lecture 2 treated open source alternatives for FISs with examples of spatial open-source projects (e.g. quantum GIS, GRASS, gvSIG, MapGuide, MapServer, OpenLayers, GeoTools, GEOS, PostgreSQL/PostGIS, GeoNetwork, etc.) and reference systems (e.g. Spheroid, etc.). Country presentations were made on:

- Overall forest cover assessment and a pilot project in Cambodia
- Data management systems associated with national forest inventory (NFI), utilization of NFI data and needs for multi-resolution data and information extraction models in China
- Forest cover map in 2010 and classification systems in collaboration with FAO in Lao PDR

Lao PDR has recently received substantial support from foreign donors to modernize their RS/ GIS centre, and there were several questions on it from participants. Three participants regarded this session as the most interesting, another three as the second and one as the third.

Lecture 3 dealt with application of MODIS data to near-real time forest fire monitoring with demonstration about the MODIS Fire Information System, presented by AIT-Geoinformatics Center (Dr. Vivarad Phonekeo).

Country presentations were made on:
- Current status of GIS and other types of database management on forest information, national forest and tree resources assessment in collaboration with the National Forest Monitoring and Assessment (NFMA) in 2007 in Bangladesh;
- Current status of database management, forest cover map, and software (e.g. ArcGIS, Erdas, etc.) in Pakistan
- Current status of forest database management in Thailand though clarification of database structure with MS Access

Five participants considered this session as the most interesting, three as the second and two as the third.
Bangladesh applied the NFMA methodology for the sample-based forest inventory, and some participants asked questions about this approach. In Bangladesh there is a particular problem in sustaining supported activities, because most of the officers with higher education tend to shift to different positions. Officers who have learnt to use FISs may be transferred to less relevant positions in which they cannot keep their knowledge. In Pakistan, lectures and exercises in this course will probably be distributed to all offices where there is a possibility to replicate training at a local level.

Lecture 4 treated open-source software for geospatial data management using Internet, such as PostgreSQL/PostGIS and MapServer, Mushup, Keyhole Markup Language, GeoNetwork, and Global forest Information Service. Country presentations were made on:

- Forest cover assessment, national forest-type mapping, near-real time detection of forest fires using MODIS data, NFI and training in India
- Updated forest cover assessment in Sri Lanka using the IRS-LISS3-P6 and Environmental Information Management System in Sri Lanka

Seeing that the Forest Survey of India (FSI) monitors wild fires with MODIS system described, as discussed in Session 5, participants were attracted at potential benefits of applying the system in India. The location of fire cells is distributed to the state forest administrations as soon as relevant data are collected, and this can be used locally to monitor the situation effectively and make decision on adequate measures. Six participants had marked this session as the most interesting and one each as the second and third.

Lecture 5 introduced sample-based Forest Field Surveys (FFS) with its data storage, processing, analysis and presentation of survey information, presenting the case of NFMA database systems.

County presentations were made on:
- Forest database and FISs with GIS and forest inventory in Mongolia
- Forest information and database systems with spatial and tabular database elements in Myanmar
- The current situation of GIS surveys and imminent needs to create the GIS Unit with staff training in Timor Leste

Thailand has applied a sample-based inventory through collaboration with an international organization (e.g., International Tropical Timber Organization) as well as a consulting company in Japan. A few questions were related to the system. Two participants regarded this as the most interesting session, two as the second and six as the third.

Participants learned and practiced database management systems and applied tools during the workshop. They also made presentations on forest database management in countries, building on forest inventories and remote sensing. Countries required harmonization of database formats for common use and sharing of forest-related data. They also pointed out that common problems were lack of human resources and technical or financial capacities for continuous database management.

Materials that were used during this training workshop can be downloaded from websites of the AIT-Geoinformatics Center or the MAR Project and reused at other workshops as an everlasting asset (textbook).

(2) Evaluation

After these sessions, participants evaluated the workshop and discussed follow-up activities, divided into three groups. Then group leaders presented results of their group discussions and their suggestions for priority issues at plenary discussions.

Although the workshop provided overall knowledge on spatial and non-spatial FISs as introductory sessions, they requested follow-up training and pilot activities to build up national capacities for FISs in thematic areas at various levels, based on countries' specific needs. They requested continuous and intensive training for technical sessions with detailed lectures and exercises. Many of the participants pointed out that countries still lacked financial and technical capacities as well as decision makers' political will to develop FISs. They requested technical assistance from FAO and AIT in their programs to further support countries in developing national and regional FISs. Participants suggested various types of technical assistance such as mini-projects, case studies, regional training, distance learning, and free software distribution.

Regarding development of FISs all groups pointed out the following constraints:

- Lack of awareness and commitments from their leaders: they face problems in needing more extensive information for lobbying on the importance of information management tools.
- high costs of hardware and software
- lack of qualified staff for FISs, requiring more training and education opportunities

Many of the participants (12 persons out of 18) solicited a longer workshop for at least the whole week, considering that the period for exercises and case studies appeared to be too short. They also manifested such a request during their other discussions.

Countries are expected to collaborate with each other to share experience and expertise on forest information management by developing a regional network of experts with countries' initiatives. At the same time, the countries will have to develop effective national mechanisms to better influence decision makers on development of national FISs. It would be useful to establish a list of e-mail addresses of national experts to facilitate distribution of software.

**Appendix 4** shows participants' overall evaluation of the workshop.

# 7. Conclusions and Recommendations

The workshop gained positive responses from participants as the initial stage of training and information exchange on FISs, covering GIS and non-spatial database systems associated with forest inventories and satellite monitoring. FAO is expected to develop follow-up activities with potential partner organizations to strengthen national FISs through its related programs in the forms of capacity building and pilot programs. Countries should also develop a network of experts to share and exchange recent knowledge on FISs and gain more political support from decision makers.

It will be significant to consider possible follow-up training activities and other programs on FISs and potential partners with related divisions of FAO, after the MAR Project is closed. The AIT would also be one of the promising partner organizations to provide training facilities and related knowledge to participants on information management for forestry and environment.

# Acknowledgements

FAO would like to express sincere gratitude to the Asian Institute of Technology (AIT) and its Geoinformatics Center for their technical and administrative support during the workshop in Kuala Lumpur.

# *Appendix 1 - Agenda of the workshop*

## Tuesday 14th of Sep

08:00 - 09:00 Registration

**Session 1 Opening ceremony (AIT Conference Center, Room No. B108)**

09:00 – 10:00 Welcome address by FAO representative (Mr. Masahiro Otsuka)
Opening address by the Dean of School of Engineering & Technology (Associate Professor Nitin Afzulpurkar)
Introduction of participants and workshop organizers
Briefing on workshop programme and logistic arrangements

10:00 - 10:10 Group Photo

10:10 - 10:30 *Refreshments (coffee/tea break)*

**Session 2 Introduction (AIT Conference Center, Room No. B108)**

10:30 – 11:30 **A review of Forest Information Systems and results of a questionnaire**
Dr. *Anders Wellving*, FAO Consultant
- Overall forest information systems
- Results of database surveys

11:30 - 12:30 **Capacity building activities of Geoinformatics Center at AIT**
Dr. *Lal Samarakoon*, Director of Geoinformatics Center

12:30 - 13:30 *Lunch*

**Session 3 Forest-related information management (GIC building)**

13:30 - 14:10 **Lecture 1**. Design of information system with emphasis on management of geospatial data with a GIS. Common data structures and their typical file formats. Dr. *Anders* Dr. Dr. *Anders Wellving*, FAO Consultant.

14.15 – 15:00 Country reports

15:00 - 15:30 *Refreshments (coffee/tea)*

15:30 - 17:00 **Exercise 1**. The exercise aims to demonstrate the common structures for data in forest geographic information systems which are vector and raster. There are two subtypes of raster data: image and grid. Example of databases with forest related content from different parts of the world are given.

19.00- 21.00 *Reception and conference dinner at AIT Conference Center*

## Wednesday 15th of Sep

**Session 4 Open source software for geospatial data management (GIC building)**

08:30 – 09.10 **Lecture 2**. Introduction to open source software. Software suitable for design of forest information systems. Available sources for download of relevant datasets. Dr. *Anders Wellving*, FAO Consultant.

09.15 – 10.00 Country report

10:00 - 10:30 *Refreshments (coffee/tea)*

10:30 – 12:00 **Exercise 2**. Introduction to a open source GIS called QGIS Use of base maps from Internet in forest information systems. Import of data from an Excel.

12:15 - 13:30 *Lunch*

**Session 5 GIS and remote sensing data (GIC building)**

13:30 - 14:10 **Lecture 3**. Brief introduction to MODIS. Application of MODIS data to near-real time forest fire monitoring. Demonstration about MODIS Fire Information System. Dr. *Vivarad Phonekeo*, Geoinformatics Center.

14.15 – 15:00 Country reports

15:00 - 15:30 *Refreshments (coffee/tea)*

15:30 - 17:00 **Exercise 3**. Access to daily fire information from MODIS website. Visualization of fire distribution. Making fire distribution maps. Generation of active fire pixels.

## Thursday 16th of Sep

**Session 6 Data portals and harmonization of forest data (GIC building)**

08:30 – 09:10 **Lecture 4.** Web Map Services, geoportals and spatial data infrastructures as well as basic concepts related to storage of geospatial information are explained. The potential benefit of Google Earth in forest information systems. Dr. *Anders* Dr. *Anders Wellving*, FAO Consultant

09.15 – 10.00 Country reports

10:00 – 10:30 *Refreshments (coffee/tea)*

10:30 – 12.00 **Exercise 4**. The exercises give an introduction to relevant geoportals where data can be downloaded. It is also demonstrated how to use Google Earth to capture data in order to update your database.

12:15 - 13:30 *Lunch*

**Session 7 Using data from sample based forest inventories (GIC building)**

13:30 - 14:10 **Lecture 5**. Introduction to sample-based Forest Field Surveys (FFS). Introduction to FFS data storage, processing and analysis. Presentation of survey information. Mr. *Marco Piazza*, FAO

14.15 – 15:00 Country reports

15:00 - 15:30 *Refreshments (coffee/tea)*

15:30 - 17:00 **Exercise 5.** Working with survey data in a relational database management system. Geo-preparation of survey data and features. Integration of information in a GIS environment. GIS visualization of primary and preprocessed survey data.

## Friday 17th of Sep

### Session 8 Evaluation and future activities (GIC building)

08:30 – 10:00 Evaluation of the course lectures and exercises. Group discussions regarding a curriculum for national short courses on database management and GIS.

- Synthesis of the workshop programme
- Work plan: suggestions for next steps with FAO and AIT

10:00 - 10:15 *Refreshments (coffee/tea)*

10:15 – 11:30 Discussions in plenum regarding a work plan to support introduction of forest information systems in Asia-Pacific. Wrap up of the main experiences and conclusions during the workshop.

### Session 9 Closing ceremony (GIC building)

11:30 – 12:00 Closing ceremony

- Closing addresses
- Delivery of certificate

**Social event**

12:00 - An optional social event will be arranged in the afternoon.

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# *Appendix 2 - List of Participants*

**Regional Workshop on "Development of Effective Tools for Management of Forest Information for Sustainable Forest Management", 14-17 September 2010, Pathum Thani, Thailand**

| No. | Country | Name | Title | Organization | Address | Email | Tel/Mobile | Fax |
|---|---|---|---|---|---|---|---|---|
| 1 | Bangladesh | Mr. Md. Zaheer Iqbal | Deputy Conservator of Forests | RIMS-GIS Unit, Bangladesh Forest Department | Banabhaban, Agargaon, Dhaka-1207, Bangladesh. | z.iqbal67@yahoo.com | 88 2 8127779 Mobile: 88 01711443750 | 88 2 8119453 |
| 2 | Bhutan | Dr. Dhan Bahadur Dhital | Forest Resources Management Specialist | Forest Resources Development Division, Department of Forests & Park Services, Ministry of Agriculture, Royal Government of Bhutan | P.O. Box 751, Thimphu Bhutan | db_dhital@moa.gov.bt dhan.dhital@yahoo.com | 975 2 325835 Mobile: 975 1 7607014 | 975 2 322560 |
| 3 | Cambodia | Mr. Nak Van Siv | Officer of Department of Forestry and Forest Community | Forestry Administration, Ministry of Agriculture, Forestry and Fisheries | 40 Preah Norodom Blvd., Phsar Kandal 2, Khamn Daun Penh, Phnom Penh, Cambodia | sivvannak_gis@yahoo.com | 855-23-6317197 Mobile: 855-12924013 | |
| 4 | China | Dr. Bai Wei Guo | Officer | Forest Resources Management Department, State Forestry Administration of China | No.18,Hepingli East Street, Dongcheng District, Beijing, 100714, China | baicaf@sohu.com; baiweiguo@forestry.gov.cn | 86-10-84239810 Mobile: 86-13581885371 | 86-10-84238684 |
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| 15 | Sri Lanka | Mr.Kachchakaduge Premakantha Tilak | Divisional Forest Officer | Forest Department | Divisional Forest Office, Wathimi Road, Kurunegala, Sri Lanka | premakanthakt@gmail.com | 94-37-2231885<br>Mobile: 94-714466020 | 94-37-2222127 |
| 16 | Thailand-RFD | Mr. Thada Suwannawimon | Technical Forest Officer | Royal Forest Department | 61 Phaholyothin Road Chatuchak, Bangkok 10900, Thailand | thada46@hotmail.com | 662-5614292-3 ext: 473<br>Mobile: 66-814061309 | 662-5798532 |
| 17 | Thailand-National Park | Mr. Anuchit Ratanasuwan | Director | Geoinformatics Division, Department of National Park, Wildlife and Plant | 61 Paholyothin Rd., Chatuchak, Bangkok 10900, Thailand | anuchit46@gmail.com | 662-5610777 ext 1530<br>Mobile: 66-87- | |

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| | | | | Conservation | | | 7739739 | |
| 18 | Timor Leste | Mr. Pascoal Barros do Carmo | Head | Department of Planning and Strategic, The National Directorate of Forestry, Ministry of Agriculture & Fisheries | Caicoli Street, Dili Timor - Leste | pascoalbdc@yahoo.com | 670-331-0052 Mobile: 670-7292039 | |
| 19 | FAO (Italy) | Mr. Marco Piazza | Forestry Consultant | National Forest Monitoring and Assessment Programme | Viale delle Terme di Caracalla 00153, Rome, Italy | Marco.Piazza@fao.org | 39-6-57053471 Mobile: 39-3334716957 | |
| 20 | FAO | Mr. Masahiro Otsuka | Forestry Officer | FAO Regional Office for Asia and the Pacific | 39 Phra Atit Road, Bangkok 10200, Thailand | Masahiro.Otsuka@fao.org | 66-2-697-4130 Mobile: 66-81-454-6034 | 66-2-697-4445 |
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| 25 | AIT | Dr. Pradeep Kumar Dash | Program Specialist | Geoinformatics Center, School of Engineering and Technology | Asian Institute of Technology (AIT), Km. 42 Paholyothin Highway, Klong Luang, Phathum Thani 10120, Thailand | pradeepdash@gmail.com | 66-2-524-6485 | 66-2-524-6147 |
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| 27 | AIT | Mr. Remesh De Silva | IT Officer | Geoinformatics Center, School of Engineering and Technology | Asian Institute of Technology (AIT), Km. 42 Paholyothin Highway, Klong Luang, Phathum Thani 10120, Thailand | | | 66-2-524-6147 |
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# *Appendix 3 – Summary of Course modules*

The course is developed for a workshop within the FAO project Strengthening Monitoring, Assessment, and Reporting (MAR) on Sustainable Forest Management (SFM) in Asia (GCP/INT/988/JPN) and given at the Geoinformatics Center of Asian Institute of Technology, Pathum Thani, Thailand on the 24 – 27 May 2010. The course modules are designed by FAO in collaboration with the Geoinformatics Center. The work is sponsored by: Government of Japan and Food and Agriculture Organization of the United Nations (FAO).

**Background**
Information regarding forest resources are nowadays generally collected by digital technology like image processing of satellite data, digitizing of maps, computer assisted measurements in the fields, GPS-positioning, etc. Data are stored in databases and processed with different kinds of software. Geographic information systems (GIS) are the main tools to design forest maps but they can also be used for several other purposes.

**Purpose**
The purpose of the course is to introduce effective tools to manage forest related information. These tools are available in many modern GIS packages. ArcGIS is the market leading software, but there are many other packages that have similar functions, often to a lower price. Some software packages are free to download and therefore called "open source".

**Course content**
The course includes lectures, computer exercises, presentations on case studies, and group discussions. The duration of the course is 3.5 days. The participants will get copies of slide sets and text documents.

**Target group**
The target group are forest officers in developing countries in Asia-Pacific region who manage forest information in their ordinary jobs at national forest administrations or provincial forestry offices. Some earlier experience in GIS and remote sensing technologies is required.

**Expected outputs**
The participants will gain general understanding of available tools for management of geospatial information and their applications for monitoring, assessment and reporting of forest resources.

## Course modules

**Module 1 Forest-related information management**

**Lecture.** Basic concepts regarding information systems, database structures, metadata and related issues
**Exercise** Demonstration and exploration of various kinds of environmental datasets using GIS. Map design in a GIS environment. Software: ArcGIS

**Case studies.** Presentations on relevant cases from participants' countries

**Module 2 Open-source software for geospatial data management**

**Lecture:** Open-source software – a nice alternative to licensed GIS? Free software and database packages suitable for monitoring, assessment and reporting
**Exercise:** Demo and practical exercises with various downloadable open source (free) software. Design of simple applications Software: QGIS
**Case studies:** Presentations on relevant cases from participants' countries

**Module 3: GIS and remote sensing data**

**Lecture** Current trends in remote sensing technology for monitoring and assessment of forest resources
**Exercise** Using remote sensing data in combination with geospatial forest information
**Case studies:** Presentations on relevant cases from participants' countries

**Module 4. Data portals (and harmonization) of forest data**

**Lecture:** Web Map Servers and Data Portals, Harmonization of databases and classification systems, Spatial Data Infrastructures (SDI)
**Exercise:** Exploration of relevant web portals and map servers. How to publish geospatial forest-related data on the web using Google Earth and Google Maps
Software: FTP-tool, Google Earth
**Case studies:** Presentations on relevant cases from participants' countries

**Module 5. Using data from sample based forest inventories**

**Lecture:** Design of a sample based inventories for monitoring of the environment with emphasis on tools for data collection, storage, analysis and presentation.
**Exercise:** Working with sample-based inventory data in a relational database management system (MS Access), Integration of sample data with geospatial information in a GIS environment. Software: MS Access, ArcGIS
**Case studies:** Presentations on relevant cases from participants' countries

# *Appendix 4 - Participants' evaluation of the workshop*

18 responses out of the 18 participants (100 %)

**1. Achievement of workshop objectives**

- Perfectly achieved: 22 %
- Fairly achieved: 73 %
- Poorly achieved 5 %

Suggestions:

- More time should be allocated for exercises
- Reduce time for country presentations

**2. Content of the workshop**

- Very satisfied: 28 %
- Fairly satisfied: 61 %
- Unknown: 11 %

**3. Most interesting sessions for the participants.**

The table shows the number of checkmarks distributed on levels of interest. Sessions 3-7 were course modules comprising one lecture and one exercise. The country presentations were distributed in the modules (3 presentations per module).

| Sessions | Presenter | Most interest | 2nd most interest | 3rd most interest |
|---|---|---|---|---|
| Session 1-2 Introduction | | 0 | 0 | 0 |
| Session 3 Forest-related information management | Wellving | 4 | 3 | 0 |
| Session 4 Open source software for geospatial data management | Wellving | 3 | 3 | 1 |
| Session 5 GIS and remote sensing data | Phonekeo | 4 | 3 | 2 |
| Session 6 Web-GIS's and geospatial Web-portals | Wellving | 5 | 1 | 1 |
| Session 7 Using data from sample based forest inventories | Piazza | 2 | 2 | 6 |
| Session 8 Evaluation and future activities | Participants | 0 | 0 | 0 |

**4. Organization of the workshop (agenda/program)**

- Very satisfied: 33 %
- Fairly satisfied: 62%
- Fairly dissatisfied: 5 %

Suggestions: the dissatisfaction seemed to be related to the length of workshop (too short)

**5. Period (days) of the workshop**

- Very satisfied: 11 %
- Fairly satisfied: 56 %
- Unknown: 5 %

- Fairly dissatisfied: 11 %
- Very dissatisfied: 17 %

Suggestions: the workshop should have been longer according to 12 participants, 5 to 14 were suggested.

**6. Venue of the workshop (AIT Geoinformatics Center)**

- Very satisfied: 40 %
- Fairly satisfied: 55 %
- Unknown: 5 %

Suggestions: The venue should be nearer to Bangkok

**7. Preparations/arrangements before the workshop**

- Very satisfied: 55 %
- Fairly satisfied: 34 %
- Unknown: 11 %

**8. Recommended programs after this workshop**

(Directly cited from the evaluation forms)

- Share knowledge to colleagues through intranet
- Session 4, session 5, session, 6 session 7, session 8 (should be given in a workshop again)
- Holding of such workshops at national (country) level
- Ground truthing and visit some area related to the subject that we study in the class theory
- Training for GIS and remote sensing\
- Similar trainings at higher level
- Increasing the content meeting
- Case study – complete guidelines and procedures; - unique reporting format
- The use of remote sensing
- An advanced one or two weeks training course can be organized on the same theme
- In depth training of management of forest information systems
- Module 7 – web GIS and geospatial web portals
- Standardization for MAR; basic training for standard
- Dissemination of workshop output to national level
- Based on country need I would appreciate more training on remote sensing ... management tool and satellite image analysis
- To introduce effective tools of forest management for decision makers; more detailed training is important

**9. Other suggestions/comments**

(Directly cited from the evaluation forms)

- Arrange mid- to long term courses.
- This workshop is more to introduce software and not really for training. Hope to rectify this in the future.
- More days and more professional knowledge.
- MAR related mainly to forest cover classification and forest inventory, that is why the tools, technique and detailed instruction for introducing how to do it is very important for participants in meeting.
- Encourage participants to think about the goal and aim of forestry data management.

- FAO can think of a standard software/guidelines for assessment of forest resources in Asian countries.
- AIT to be the nominated training institution in all forest information systems for the region by FAO.
- Training is needed for each country; application of open source is needed for Asian countries; national sample based inventories are needed in each country if FAO can support.

## 10 Overall rating of this workshop

- Very good: 33 %
- Fairly good: 50 %
- Moderate: 17 %