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

**MAR Working Paper 37**

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# Information systems for monitoring, assessment and reporting of forest resources – result of a questionnaire in South-East Asia and Pacific[1]

## Content



## 1. Introduction

The MAR/SFM project, which has 26 member countries in South-East Asia and Pacific, aims to develop a harmonized Monitoring, Assessment and Reporting (MAR) system for Sustainable Forest Management (SFM) and to apply it in the Asia-Pacific region. The author of this report was assigned to the project as a resource person in order to provide technical support.

The work started with design of a brief questionnaire regarding forest information systems and databases. This was distributed to the forest administrations in all project countries in order to create a broad picture of how they are working with these tools today.

[1] The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The questionnaire was followed by a deeper case study in Cambodia and Lao PDR. This report presents the result of the questionnaire. The case study is available as a separate document (Wellving, 2010). Both documents will be background materiel for a more comprehensive report describing forest information systems and their applications in South-East Asia and Pacific later this year.

## 2. Purpose and scope of work

The purpose of the questionnaire was to make a "rapid survey" regarding the status of forest information systems[2] including database management, GIS and decision support systems within the 26 project countries. Besides this, some issues regarding how MAR activities are organized in each country were included in the study.

The questionnaire was elaborated in January 2010 by the author in cooperation with a few officers at FAO (see references below). It was sent by mail at the end of February to the focal points of the 26 member countries. At the end of March only a few answers had been returned and a reminder was sent out.

Finally 11 answers were returned from 10 countries as Thailand has two focal points and both of them gave answers. The frequency of answers was thus around 40 %. Responding countries were: New Zealand, Indonesia, Viet Nam, Thailand, Cambodia, China, India, PNG (Papua New Guinea), Lao PDR and Japan.

## 3. Result

### 3.1 Design of the questionnaire

The questionnaire (appendix 2) contained 20 questions, most of them with a number of alternatives that could be checked as *yes* or *no*. Some questions demanded more detailed answers. The time to fill in the form was estimated to max 30 minutes. Although much effort had been made on making the questions relevant and logical, some of them turned out to be confusing for the respondents. This will be explained in next paragraph.

There were no explicit instructions for who should answer the questionnaire, so it was up to the focal point to decide. He usually belongs to the forest administration within the ministry in each country. In most cases the form is returned and therefore probably filled in by the focal point. It is apparent that the answers in these types of questionnaires are somewhat subjective. A respondent with good knowledge in forest information systems may understand the intention of the questions better than a respondent who is less familiar and therefore gives more shallow answers.

### 3.2 Summaries of the answers per question

#### 1. Which organizations are responsible for MAR (monitoring, assessment and reporting) on forest conditions at national or sub national level?

[2] "Forest information system" is simply a generic term for applications of information systems used within the forestry. They are also called Forestry Information Systems.

The purpose of the first question was to find out how MAR/SFM activities are organized in the Asia-Pacific region in general. Depending on national policies, MAR can have a stronger or weaker political influence. Several organizations responsible for MAR activities appear to have better performances, but there may also be a competition for available resources.

All countries have answered that the primary responsibility is given to the Ministry of Forestry (or the corresponding ministry) or to a department within the ministry, e.g. the Forestry Administration. China and India report more precisely that their National Forest Inventory (within the forestry administrations) is responsible. In Thailand there are two different departments within the ministry that perform MAR activities.

Only New Zealand reports that several governmental organizations under different ministries are responsible for MAR, although this in fact should be the case in most countries. If there are separate ministries for forestry and environment the latter will certainly also do monitoring of natural resources including the forest cover.

MAR activities at a sub-national level are normally performed by local offices of the forestry administration. In India, China and Indonesia there are provincial governments that have their own forestry administrations.

### 2. Which institutions or organizations mainly use data and information from MAR activities?

The purpose of this question was to find out if there are many organizations that require reports on the status of forest resources. This could say something about the demand for MAR activities.

Larger countries (Indonesia, India and China) list many users of forest data, mostly from other ministries. India's list includes 17 organizations. A few smaller countries have not mentioned any users at all. This could mean that there are only users within their own ministry but it is more likely that they have forgotten to mention other users.

The ASEAN Secretariat (ASEC) should be one user that all countries in the Asean community have forgotten to mention (e.g., Vietnam, Thailand, Cambodia, Lao PDR and Indonesia). These countries are committed to sending reports according to the ASEAN MAR format to the ASEC once a year (See below).

### 3. Is there any national forest policy or legislation that stipulates what data should be collected for monitoring purposes?

If the legislation is explicit regarding which information should be collected in a country this could give information on what kinds of systems and databases for MAR are necessary.

Most respondents has answered "yes" meaning that there is a national forest legislation in their countries. The question was actually if this legislation specifies what data that should be collected. Thailand, Cambodia and PNG report that they have no legislation that stipulates what data that should be collected. New Zealand points out that the law does not say exactly what data should be collected and this might be the same for the

other countries with legislation. In Japan there is a manual for monitoring based on the Nation-Wide Forest Plan.

## 4. Is there any dedicated analysis group at a national level?

This question concerns the assessment part of MAR. An “analysis group” can consist of a few forest officers that analyses data collected in monitoring operations, make assessments and prepare recommendations regarding the forest policy. If there is a permanent analysis group, it indicates that MAR has a strong position in a country.

PNG and Thailand have no such groups. Other countries have answered yes, but their organizations may be different and not dedicated (permanent) to MAR analysis. Japan has partly "outsourced" assessment tasks, the other assessments are done within the Planning Division. New Zealand, which has reported that there are 3 - 4 monitoring agencies in the country, describes two analysis groups belonging to the Ministries of Forestry and Environment.

## 5. Do forest officers in national monitoring organizations generally have access to the following ICT-equipment?

The purpose of this question five was to evaluate the current level of technical support regarding information systems. Developed countries such as New Zealand are expected to have larger penetration of ICT equipment than developing countries.

The following table shows the availability of ICT equipment at a national level, indicating how many respondents have checked alternatives. The maximum number regarding personal access is 10 countries. If personal access is not available, the equipment can be shared. The sum of personal and shared access can therefore not be higher than 10.

| Type | Personal Access | Shared access |
|---|---|---|
| PC with administrative software | 10 | - |
| E-mail | 10 | - |
| Internet and Web browsers | 9 | 1 |
| Map viewers | 4 | 4 |
| Data base systems | 7 | 5 |
| Geographic Information system (GIS) | 6 | 5 |

The access to email and Internet is good at central offices in all countries according to their reports. GIS software's are for several countries reported as shared access. This could be interpreted as GIS is available only in special RS/GIS centers and not actually shared by all staff.

## 6. Do forest officers in provincial or local monitoring organizations generally have access to the following ICT equipment?

The purpose was here to investigate the difference between central and local offices regarding ICT. The following table shows the availability of ICT equipment at a pro-

vincial level. The following figures indicate how many respondents that have checked the alternatives. The maximum numbers regarding personal access is 10 countries. If personal access is not available, the equipment can be shared. Therefore, the sum of personal and shared access cannot be higher than 10.

| Type | Personal Access | Shared access |
|---|---|---|
| PC with administrative software | 10 | - |
| E-mail | 10 | - |
| Internet and Web browsers | 6 | 4 |
| Map viewers | 5 | 2 |
| Data base systems | 4 | 3 |
| Geographic Information system (GIS) | 5 | 3 |

The situation regarding available ICT-equipment at provincial levels is reported as similar to the national levels in most countries. This may be an overstatement for some countries, where the IT-infrastructure is less developed in local areas. The maximum numbers regarding personal access is 10 countries in this case If personal access is not available, the equipment can be shared. Therefore, the sum of personal and shared access cannot be higher than 10.

## 7. Do forest offices at a forest management unit level generally have access to the following ICT-equipment?

The "management level" was anticipated to be the district level. In some countries such as Cambodia and Lao PDR, however, there are officers who are working at both forest management unit and national levels. The maximum numbers regarding personal access is 9 countries in this case If personal access is not available, the equipment can be shared. Therefore, the sum of personal and shared access cannot be higher than 9.

| Type | Personal Access | Shared access |
|---|---|---|
| PC with administrative software | 7 | - |
| E-mail | 9 | - |
| Internet and Web browsers | 6 | 2 |
| Map viewers | 1 | 4 |
| Data base systems | 2 | 3 |
| Geographic Information system (GIS) | 1 | 4 |

## 8. Which of the following types of data are collected and analyzed for MAR purposes within your organization?

Monitoring activities do not concern only the extent of forest cover but a large number of other parameters, included in a set of "criteria and indicators for sustainable forest man-

agement." All countries in this study are engaged in some sorts of international cooperation regarding monitoring for sustainable forest management. New Zealand, China and Japan are members of the Montreal process regarding temperate and boreal forests. They have been committed to report national forest conditions using determined criteria and indicators every year. Lao PDR, Vietnam, Cambodia, Thailand and Indonesia report values of similar indicators once a year to the ASEAN MAR database.

The following table shows the number of countries that have checked eight different criteria.

| **Criteria** | |
|---|---|
| Extent of forest resources | 10 |
| Carbon content | 1 |
| Forest ecosystems health and vitality | 7 |
| Biological diversity | 9 |
| Productive functions of forests | 9 |
| Protective and environmental functions | 8 |
| Socio-economic functions and conditions | 7 |
| Policy, legal and institutional aspects | 9 |

All countries strive apparently to monitor all criteria. The case study in Cambodia and Lao PDR (Wellving, 2010) showed, however, that in reality the content of reports to international organizations may be incomplete due to several limitations on collection of required data.

Measurement of carbon content is not yet implemented in any country except New Zealand. Thanks to the REDD mechanism such measurements will be started in many countries soon.

## 9. Which types of data sources do you use for data collection?

The purpose of the question was to find out what kinds of database can be used for monitoring, assessment and reporting of forest conditions in the countries. The following table shows the number of checkmarks for each option. The maximum number for each value was 10.

| | Analog data | Digital data |
|---|---|---|
| Databases from own sample inventories | 7 | 5 |
| Aerial photo interpretations | 2 | 4 |
| Satellite images | 3 | 9 |
| Written reports from local forest officers | 8 | 5 |
| Data from other departments, etc | 6 | 3 |

Most countries report that they use data from sample based inventories, satellite based remote sensing and written reports from local forest offices. Aerial photos seem to be used only by a few countries (Japan, Thailand). PNG uses only analogue data sources.

According to the instructions for ASEAN-MAR indicators, some of the required data should be collected from other departments and ministries. The table shows that these procedures are not yet operated in all countries.

## 10. How are data from MAR activities shared with and disseminated to other governmental organizations and the general public?

This question concerns the reporting part of the MAR activities and aims to give information on how well developed this is. The table shows the number of checkmarks per option. The maximum number was 10.

| Media | In local language | In English |
|---|---|---|
| Annual reports with statistics | 8 | 6 |
| On web pages as tables | 5 | 3 |
| On web pages as maps and tables | 4 | 2 |
| Data files (downloadable or possible to buy) | 3 | 2 |

All countries deliver annual reports in digital format (word- or pdf-files) and 50 percent of the countries use web pages (in local language). Data are mostly disseminated only in local languages except for Indonesia and India which also publish reports in English.

## 11. In what kind of regions (levels) of your country are data on MAR activities aggregated in statistical reports and presentations?

As Question 10, this question concerns the reporting procedures and tries to find out what types of regions are used in presentations of statistics among state, province and district.

| **Type** | **Country** | **Province** | **District** |
|---|---|---|---|
| Extent of forest resources | 10 | 9 | 6 |
| Carbon content | 1 | 0 | 0 |
| forest ecosystems health and vitality | 9 | 6 | 2 |
| Biological diversity | 10 | 8 | 4 |
| Productive functions of forests | 9 | 7 | 4 |
| Protective and environmental functions | 9 | 6 | 5 |
| Socio-economic functions and conditions | 9 | 6 | 3 |
| Policy and legal aspects | 9 | 6 | 3 |

All countries present most data on country level. Regarding presentations on provinces and districts there is a big variation between countries. Viet Nam aggregates for instance all data on all levels while PNG only aggregates the extent of forests on provinces. The ASEAN MAR format requires data to be aggregated on "Forestry Management Units", which is equal to districts. Therefore all the ASEAN countries (Vietnam, Thailand, Cam-

bodia, Lao PDR and Indonesia) should have checked districts for all criteria. At the moment most countries can apparently aggregate only a few types of data at districts, e.g. forest cover.

## 12. What kind of software is used for database management within your organization for MAR activities including decision support?

The purpose of Questions 12 and 13 was to investigate how familiar the member countries are with the most common software tools that are used in monitoring, assessment and reporting procedures. The following table shows the number of countries (out of 10) that use certain software.

| | |
|---|---|
| Spreadsheets (i.e. Excel) | 8 |
| Relational database management systems, DBMS (i.e. MS Access) | 9 |
| Geographic Information Systems, GIS (i.e. ArcGIS) | 9 |
| Image interpretation system (i.e. ERDAS) | 8 |
| Web Map Services (i.e. Google Earth) | 7 |

It is found that all countries practically use modern software in their MAR related operations. As some developing countries like Cambodia have generally received technical support and equipment from various donors, they have a similar standard as developed countries regarding software.

## 13. Which brands of software are for database management or GIS-applications used within your organization?

Eight countries had filled in this table. Almost all of them use ArcGIS for management of spatial data, the only exception is PNG which uses MapInfo. The most common software packages for satellite image interpretation is ERDAS which can be integrated with ArcGIS. Microsoft Access, Oracle, SQL Server and MySQL are used as database management system (DBMS) software. In the table below each country could check only one column per software. A note must be made that the respondent may not have been aware of the names of all database software that are used within the entire organization.

| Name of the software | Single user | Several users | Many users |
|---|---|---|---|
| Microsoft Access | 2 | 2 | |
| MySQL | | | 1 |
| Oracle | | | 2 |
| ArcView/ArcGIS | 1 | 5 | 3 |
| MapInfo | 1 | | |
| GeoMedia | | 1 | |
| ENVI | | | 1 |
| ER Mapper | 1 | | |
| PCI | 1 | 1 | |
| ERDAS | | 4 | |
| Google Earth | | 1 | 1 |

## 14. What kind of software is needed for data base management within your organization for MAR activities including decision support?

This question aimed to indicate if there is awareness of the needs for some types of software. The result showed that the awareness was high as most of the alternatives in the table above (questions 12) were needed in most countries. Japan was an exception since the respondent only reported needs for spreadsheet and DBMS. All ten countries had answered.

| | |
|---|---|
| Spreadsheets (i.e. Excel) | 9 |
| Relational database management systems, DBMS (i.e. MS Access) | 9 |
| Geographic Information Systems, GIS (i.e. ArcGIS) | 9 |
| Image interpretation system (i.e. ERDAS) | 8 |
| Web Map Services (i.e. Google Earth) | 7 |
| Others (specify) | 0 |

## 15. What kinds of datasets or databases produced by other organizations do you need or use in order to create GIS-applications for MAR purposes?

In this question the word "GIS" could have been changed to "map" since most countries use GIS mainly for map design. The table shows a number of spatial data layers for which the respondents could check "needed" and "used" (implicitly for map design). The maximum number is 10.

| | Needed | Used |
|---|---|---|
| Elevation | 9 | 7 |
| Hydrographical data | 9 | 5 |
| Aerial photos | 6 | 6 |
| Administrative boundaries | 8 | 7 |
| Cadastral information (land ownership) | 9 | 5 |
| Geodetic control points | 9 | 6 |
| Transportation (roads and railways) | 9 | 7 |
| Protected areas for different reasons | 9 | 7 |
| Areas with restrictions for different reasons | 9 | 7 |
| Land use | 8 | 6 |
| Forest industry facilities, i.e. saw mills | 7 | 4 |

All countries except Japan have reported that most of the listed layers are used and that almost all of them are needed.

## 16. Which are the main constraints on filling the gap between current and ideal situations regarding information systems within your organization?

The purpose was to find out which measures that should be prioritized in order to improve the technological levels of forest information systems. The result is summarized in following table that shows the number of checkmarks for each constraint. The maximum number for each item is 8 due to that Japan and New Zealand did not answer this question.

| | |
|---|---|
| Poor funding for this type of systems | 5 |
| Little awareness within the organization | 3 |
| Lack of necessary databases | 7 |
| Low human capability within the organization | 5 |
| Shortage of staff | 7 |
| Insufficient ICT-support | 7 |

The result is that the main constraints are lack of necessary databases and insufficient ICT-support.

## 17. Do you use any of the following data portals and web map services in MAR activities?

Internet provides the increasing number of sources for data that could be useful. The question aims to investigate if Internet based tools and data sources are used in MAR operations. The table shows how many respondents that have checked each alternative. The maximum number of checkmarks per line is 10.

| | |
|---|---|
| Google Maps | 2 |
| Google Earth | 2 |
| ArcGIS Online Map Service (former Geography Network) | 0 |
| FAO GeoNetwork | 0 |
| NOAA's National Climatic Data Centre (NCDC) | 1 |

The conclusion is that Internet sources are hardly used at all. Only New Zealand and Thailand report use of Google Earth and Google Maps.

## 18. Does your organization manage any e-services that forest owners can benefit from?

Indonesia is the only country that has reported that they manage a web-based application. The system can be used by forest commissioners to report plans on raw material supply for the forest industry. Thailand and China have indicated that applications are under development. New Zealand reports that the Ministry of Agriculture and Forestry gives "extensive advice" on their web pages. The other countries have no special web service for forest owners.

### 19. Is your organization involved in any national or international projects that aim at standardization or harmonization of forest data?

Examples of international projects are those that administrate reports regarding criteria and indicators for sustainable forest management (e.g. ASEAN MAR). As mentioned before all responding countries are members of several international reporting processes, but most of the countries have reported only that they have national standards for forest data. Indonesia and New Zealand mention that they are engaged in the FAO-project FRA (Forest Resource Assessment). Only India has reported collaboration with the MAR/SFM project (which all countries in fact should have done since the questionnaire in hand originates from this project).

New Zealand reports engagement in several international working groups. Japan mentions membership in the Montreal Process which aims at developing criteria and indicators for sustainable forestry. Other types of projects could have been cooperation in national working groups for development of SDI (spatial data infrastructure), but there was no such notice among responding countries.

### 20. How can your organization contribute to a potential web-based Asian Forest Information portal?

The purpose of the question is to investigate the interest in potential cooperation around an Asia-Pacific forest portal corresponding to the European forest portal, *Euroforest*. The following table summarizes the number of checkmarks per alternative, where the maximum can be 10.

| | |
|---|---|
| Provide news | 6 |
| Add links to national institutions and data sources | 6 |
| Provide downloadable data | 4 |
| Add links to selected topics of common interest | 6 |

The table shows that many countries are willing to contribute to a forest portal by providing links and news. India and PNG put a check mark to all alternatives.

## 4. Summary and conclusions

#### 4. 1 Introductory remarks

The ten countries that have answered the questionnaire is a subset of the 26 member countries of the MAR/SFM project. A question is whether the compilation of the answers in this subset is representative for the whole group or perhaps for all countries in the Asia and Pacific region. Among the answering countries there is a mix of technologically advanced countries and less developed countries. There is also a mix in population size from China and India to Lao PDR. Some of the responding countries have bans for all timber production, e.g. Thailand, and for other timber is a main natural resource.

Although that there are large differences between the countries conditions for forest management there appears to be remarkable similarities in their answers. The reason is probably that the issues in these questions are managed in a similar way "everywhere". All countries have a governmental forestry administration that is responsible for MAR operation. They all strive to collect the same type of data even if their forest conditions differ and they use practically the same tools for data collection, database management, assessments, reporting and map design. Richer countries, especially Japan (in this region), have provided funds to the less developed countries for purchase of equipment and technical assistance which implies that they have modern equipment. In conclusion the 10 countries in this study can be seen as a representative sample of the countries in the Asia-Pacific region.

The following paragraphs contain some conclusions of the questionnaire. They should give a fairly good general view of the status of forest information systems for MAR in this part of the world. As mentioned before there is also a case study available (Wellving, 2010) that describes the situation in Cambodia and LAO PDR more in detail. Other case studies for special countries plan to be produced by other consultants within the coming UN-REDD project.

### 4. 2 Conclusions

**Organization of MAR**
MAR activities are primarily performed within the ministry responsible for the forestry in each country. Under the minister there is usually the forestry administration that organizes MAR activities. In larger countries like China and India there may be a separate department called National Forest Survey that does this work. Monitoring of forest resources can also be performed within several other departments, e.g. Ministry of Environment. When several ministries are involved in MAR, there may be competition regarding human and technical resources.

Normally there are several users of reports and statistics regarding the status of forests. India has for example listed 17 organizations that are users of data. There are also many international organizations that expect to get reports from each country, e.g. FAO. Most respondents to the questionnaire were however not aware of the number of external users.

Most countries have forest legislation that includes some kinds of regulations for MAR. These regulations do not, however, specify exactly what data should be included in the monitoring operations.

**Monitoring**
All countries strive to collect information about forest resources using specific variables such as criteria and indicators as requested by international reporting processes. In practice most of the countries have problems fill in the forms. Only New Zealand has for instance included the $8^{th}$ criterion which is carbon content in the collection procedures.

A variety of sources are used for monitoring purposes in most countries. The most common sources are satellite imagery and sample based inventories.

**Assessment**
70 percent of the countries have dedicated groups of experts within forest administrations that do analyses and assessments. In New Zealand there are even two such groups.

**Reporting**
All countries deliver annual reports and half of them also use web pages for presentation of statistical data. These data are mostly disseminated only in local languages except for several countries such as Indonesia and India.

The aggregation of data regarding the forest cover is generally made at levels of country, province and district. For other data types there are big variations and only a few countries present these data down to district level.

**Forest Information Systems**
Regarding spatial databases, almost all countries have GIS databases that contain several layers. However, the countries reports that more digital data of different kinds are needed to design GIS and mapping applications.

Many countries face constraints on development of forest information systems. The main constraints are a lack of necessary databases and insufficient ICT-support.

Available databases and analysis tools on Internet are hardly used at all. Only New Zealand and Thailand use Google Earth and Google Maps.

Indonesia is currently the only country that manages a web based application. The system can be used by forest entrepreneurs to "report plans for raw material supply for the forest industry". Thailand and China have applications under development.

**Cooperation for development of FIS**
Only a few countries are engaged in national or international projects that aim at standardization or harmonization of forest data. Some of them have national standards for forest data and a few cooperate with FAO.

Most countries are willing to contribute to a possible Asian Forest Portal. Its contribution would mostly be to provide links and news on forest management.

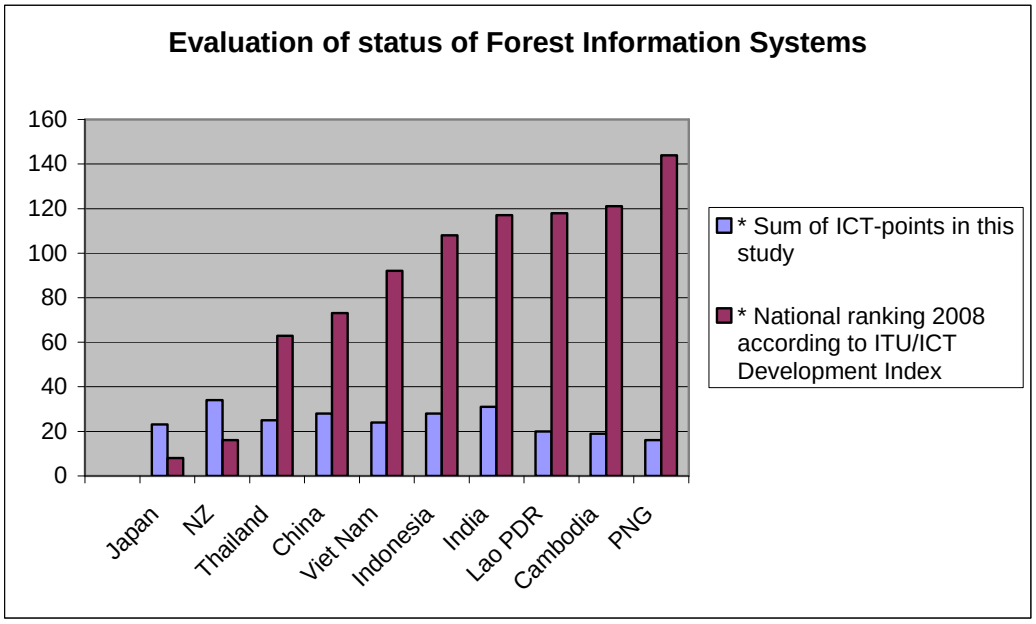
**Level of ICT usage in forestry administrations**
The access to ICT-equipment is fairly good at central offices in all countries which mean that all forestry officers have access to office software, mail, Internet with web maps. GIS software is used in several countries as shared access.

The access to ICT-equipment at provincial level is similar to what is available at national levels. This means rather good in most countries. This may be an overstatement, at least for some countries where the IT-infrastructure is not sufficient in rural areas.

Nearly all countries have access to modern software in their MAR related operations. One reason for this is that developing countries usually have received technical assistance and equipment from various donor countries.

Practically all use the Microsoft Office package and ArcGIS for spatial data. The most common software packages for satellite image interpretation are ERDAS and PCI. MS Access, Oracle and MySQL were mentioned as DBMS software.

The level of ICT (Information and Communication Technology) usage within forest administrations has tentatively been quantified by the author, based on the answers to a subset of the questions. These questions were related to usage of computers, software and database. A value between 1 and 5 was set for each question where 5 means high IT-usage and 1 means very low or no use. The result of the analysis is compiled in a table (Appendix 1) and the sum for each country is visualized in the chart below.




The light blue bars show the number of credits each country has got in this evaluation. For comparison with the overall level of ICT usage in each country, the result of an international survey (ITU/ICT Development Index ) has been added to the chart. The dark red bars show countries relative ranking according to this study. A lower value means a higher rank.

The smallest red bar should correspond to the largest blue bar, if there was a direct correlation between overall ICT usage and usage of ICT in the forestry. This seems to be true for New Zealand in the left part and PNG in the right end . For the other countries this correlation is not very distinct.

It must be pointed out that the questionnaire was not designed in order to quantify ICT usage in the forestry in this way. This means that the accuracy of the blue bars could have been better. The chart can however be used to illustrate the conclusion above about availability of ICT equipment even in less developed countries.

# 5. References

**Questionnaire**
Following persons have significantly contributed
to the elaboration of the questionnaire

Masahiro Otsuka, FAO Bangkok
Dan Altrell, FAO Rome
Magnus Grylle, FAO Rome

**Literature**
Wellving, 2010: Information systems for monitoring, assessment and reporting of forest resources – a case study in Cambodia and Lao PDR. FAO working paper.

**Web links**
Euroforest portal http://forestportal.efi.int/

ITU/ICT Development Index
http://www.itu.int/net/pressoffice/backgrounders/general/pdf/5.pdf

# 6. Terminolgy

| | |
|---|---|
| ASEAN | Association of Southeast Asian Nations |
| DBMS | Database Management System |
| FIS | Forest Information System |
| GIS | Geographic Information System |
| ICT | Information and Communication Technology |
| ITU | International Telecommunication Union |
| IT | Information Technology |
| MAR | Monitoring, Assessment and Reporting system for |
| SDI | Spatial Data Infrastructure |
| SFM | Sustainable Forest Management |
| PNG | Papua New Guinea |
| UN-REDD | United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation |

ArcGIS, ERDAS, PCI, MS Access, Oracle, MySQL, SQL Server, Google Earth and Google Maps are names of proprietary (protected trade-mark) software.

## *Appendix 1. Quantitative analysis of countries' levels of ICT usage based on their answers*

| Question | Japan | NZ | Thai-land | China | Viet Nam | Indonesia | India | Lao PDR | Cambodia | PNG |
|---|---|---|---|---|---|---|---|---|---|---|
| Do forest officers in national monitoring organizations generally have access to the following ICT-equipment? | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 3 | 3 |
| Do forest officers in provincial/local monitoring organizations generally have access to the following ICT-equipment? | 5 | 5 | 5 | 5 | 3 | 4 | 5 | 2 | 2 | 4 |
| Which types of data sources do you use for data collection? | 3 | 5 | 2 | 4 | 5 | 4 | 5 | 4 | 3 | 2 |
| How are data from MAR activities shared with and disseminated to other governmental organizations and the general public? | 2 | 4 | 3 | 4 | 5 | 4 | 5 | 2 | 4 | 1 |
| What kind of software is used for data base management within your organization for MAR activities, including decision support? | 3 | 5 | 3 | 4 | 3 | 5 | 5 | 4 | 3 | 3 |
| Which are the main constraints on filling the gap between current and ideal situations regarding information systems within your organization? | 5 | 5 | 2 | 3 | 1 | 1 | 3 | 2 | 2 | 1 |
| Do you use any of the following data portals and web map services in MAR activities? | 1 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | 1 | 1 |
| Does your organization manage any e-services that forest owners can benefit from? | 1 | 2 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 1 |
| **Sum of ICT-credits in this study** | **23** | **34** | **25** | **28** | **24** | **28** | **31** | **20** | **19** | **16** |
| National ranking 2008 according to ITU/ICT Development Index[3] | 8 | 16 | 63 | 73 | 92 | 108 | 117 | 118 | 121 | 144 |

Credits have been assigned to each country based on their answers. A five-degree scale has been used, where a high value means a high level of ICT usage (ICT =Information and Communication Technology). The credits were set by the author on a subjective basis and should not be taken as undisputable.

[3] The ranking list is available on the following link:
http://www.itu.int/net/pressoffice/backgrounders/general/pdf/5.pdf

***Appendix 2. Questionnaire***

| **Name and organisation** |
|---|
| Name and position of respondent |
| Organisation (for which the answers are valid) |

# Questions
## 1. Institutional issues

| **1. Which organizations are responsible for monitoring, assessment and reporting of forest conditions at national, provincial or local levels?** (expand the areas for answer below if necessary) |
|---|
| National level |
| Provincial and/or local levels |

| **2. Which institutions or organizations mainly use data and information from MAR activities?** Give the names of main governmental and non-governmental organizations. |
|---|
| |

| **3. Is there any national forest policy or legislation that stipulates what data should be collected for monitoring purposes?** |
|---|
| ☐ Yes ☐ No ☐ Unknown<br>3.1. Briefly specify the policy or legislations |
| |

| **4. Is there any dedicated analysis group at a national level?** An "analysis group" can consist of a few forest officers that continuously analyses the states of forests and prepare reports. |
|---|

| ☐ Yes ☐ No ☐ Unknown<br><br>4.1 If there is a group, describe the organization and its tasks briefly below |
|---|
| |

## 2. Access to ITC-support

**5. Do forest officers in national monitoring organizations generally have access to the following ICT-equipment?**

(Answer yes/no/unknown.)

| Type | Personal Access | Shared access |
|---|---|---|
| PC with administrative software | | |
| E-mail | | |
| Internet and Web browsers | | |
| Map viewers | | |
| Data base systems | | |
| Geographic Information system (GIS) | | |
| Others (specify) | | |

**6. Do forest officers in provincial/local monitoring organizations generally have access to the following ICT-equipment?**

(Answer yes/no/unknown.)

| Type | Personal Access | Shared access |
|---|---|---|
| PC with administrative software | | |
| E-mail | | |
| Internet and Web browsers | | |
| Map viewers | | |
| Data base systems | | |
| Geographic Information system (GIS) | | |
| Others (specify) | | |

**7. Do forest officers at a management level generally have access to the following ICT-equipment?**

(Answer yes/no/unknown.)

| Type | Personal Access | Shared access |
|---|---|---|
| PC with administrative software | | |
| E-mail | | |
| Internet and Web browsers | | |
| Map viewers | | |

| | | |
|---|---|---|
| Data base systems | | |
| Geographic Information system (GIS) | | |
| Others (specify) | | |

## 3. Data collection

| **8. Which of the following types of data are collected and analysed for MAR purposes within your organization?**<br>The following "criteria's" are explained at http://www.fao.org/forestry/ci/en/ | |
|---|---|
| Extent of forest resources | |
| Global carbon cycles | |
| Forest ecosystems health and vitality | |
| Biological diversity | |
| Productive functions of forests | |
| Protective and environmental functions | |
| Socio-economic functions and conditions | |
| Policy, legal and institutional aspects | |
| Others (specify) | |

| **9. Which types of data sources do you use for data collection?** | | |
|---|---|---|
| | Analogue data | Digital databases |
| Data from your own sample inventories | | |
| Aerial photo interpretations | | |
| Satellite images | | |
| Written reports from local forest officers | | |
| Data from other departments, etc (give the names below) | | |
| | | |
| | | |

## 4. Dissemination of information

| **10. How are data from MAR activities shared with and disseminated to other governmental organizations and the general public?**<br>Answer: Yes/No | | |
|---|---|---|
| **Media** | **In local language** | **In English** |
| Annual reports with statistics | | |
| On web pages as tables | | |

| | | |
|---|---|---|
| On web pages as maps and tables | | |
| Data files (downloadable or possible to buy) | | |
| | | |
| | | |

**11. In what kind of regions (levels) of your country are data from MAR activities aggregated in statistical reports and presentations?**
Answer yes/no for relevant information

| Type | Country | Provinces | Districts |
|---|---|---|---|
| Extent of forest resources | | | |
| Global carbon cycles | | | |
| Forest ecosystems health and vitality | | | |
| Biological diversity | | | |
| Productive functions of forests | | | |
| Protective and environmental functions | | | |
| Socio-economic functions and conditions | | | |
| Policy and legal aspects | | | |
| | | | |
| | | | |

# 5. Information systems

**12. What kind of software's for data base management is used within your organization for MAR activities including decision support?**
Answer yes/no. Add systems if missing.

| | |
|---|---|
| Spreadsheets (i.e. Excel) | |
| Relational database management systems, DBMS (i.e. MS Access) | |
| Geographic Information Systems, GIS (i.e. ArcGIS) | |
| Image interpretation system (i.e. ERDAS) | |
| Web Map Services (i.e. Google Earth) | |
| Others (specify) | |

**13. Which brands of software's for database management or GIS-applications <u>are used</u> within your organization?**

Give the name of the software's in the list below and indicate the number of the forest officers that have access to each type of software.

| Name of the software (add lines if necessary) | Single user | Several users | Many users |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| Etc. | | | |

| **14. What kind of software's for data base management <u>is needed</u> within your organization for MAR activities including decision support?** Answer yes/no. Add systems if missing. | |
|---|---|
| Spreadsheets (i.e. Excel) | |
| Relational database management systems, DBMS (i.e. MS Access) | |
| Geographic Information Systems, GIS (i.e. ArcGIS) | |
| Image interpretation system (i.e. ERDAS) | |
| Web Map Services (i.e. Google Earth) | |
| Others (specify) | |

| **15. What kinds of datasets or databases produced by other organizations do you need or use in order to create GIS-applications for MAR purposes?** | Needed | Used |
|---|---|---|
| Elevation | | |
| Hydrographical data | | |
| Aerial photo imagery | | |
| Administrative boundaries | | |
| Cadastral information (land ownership) | | |
| Geodetic control points | | |
| Transportation (roads and railways) | | |
| Protected areas for different reasons | | |
| Areas with restrictions for different reasons | | |
| Land use | | |
| Forest industry facilities, i.e. saw mills | | |
| | | |

| **16. Which are the main constraints to filling the gap between current and ideal situation regarding information systems within your organization?** | |
|---|---|
| Poor funding for this type of systems | |
| Little awareness within the organization (which means no demand) | |
| Lack of necessary databases | |
| Low human capability within the organization | |
| Shortage of staff | |
| Insufficient ICT-support | |
| Others (Specify) | |
| | |

| **17. Do you use any of the following data portals and web map services in MAR activities?** Tick in the appropriate portion. | |
|---|---|
| Google Maps | |

| | |
|---|---|
| Google Earth | |
| ArcGIS Online Map Service (former Geography Network) | |
| FAO GeoNetwork | |
| NOAA's National Climatic Data Centre (NCDC) | |
| Others (Specify) | |
| | |

| **18. Does your organization manage any e-services that forest owners can benefit of?**<br>(For instance, web-forms where forest managers can report planned cuttings. Describe existing or planned services.) |
|---|
| |

## 6. Others

| **19. Is your organization involved in any national or international projects that aim at standardization or harmonization of forest data?**<br>Describe these shortly below |
|---|
| |

| **20. How can your organization contribute to a potential web-based Asian Forest Information web portal?**<br>Refer to the Euroforest portal: http://forestportal.efi.int/ | |
|---|---|
| Provide news | |
| Add links to national institutions and data sources | |
| Provide downloadable data | |
| Add links to selected topics of common interest | |
| Other contributions (Specify) | |