Proceedings
Regional Workshop on Updated Forest and Carbon Monitoring Technologies in Asia and the Pacific

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Food and Agriculture Organization of the United Nations (FAO)

Japan Aerospace and Exploration Agency (JAXA)

Remote Sensing Technology Center of Japan (RESTEC)

MAR Working Paper 40 / 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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Japan Aerospace Exploration Agency (JAXA)

The independent administrative institution is the Japan Aerospace Exploration Agency (JAXA.)

As space development and utilization, and aviation research and development are steps to achieve the nation's policy objectives, our contribution to problem solving is an important mission for us. Under our corporate message "Reaching for the skies, exploring space," JAXA is pursuing great possibilities in various aerospace fields and is striving to succeed with various research and development missions in order to contribute to the peace and happiness of humankind.

Remote Sensing Technology Center or Japan (RESTEC)

The Remote Sensing Technology Center of Japan (RESTEC) was established in August 1975. Its purpose is to implement basic and comprehensive research and development of remote-sensing technology for investigating global phenomena and Earth resources using data obtained from satellites and to disseminate knowledge of remote-sensing technology and other utilization of space technology, in order to promote economic growth and social development, as well as the well-being of the nation.

For more than thirty years since its foundation, RESTEC has been receiving and processing data acquired by both domestic and foreign Earth-observation satellites and providing those data to users and researchers under the contract with JAXA and other related agencies. In parallel with these activities RESTEC has been conducting research and development of remote sensing technology and endeavoring to spread the results. Based on this experience RESTEC has been giving training both domestic and foreign personnel as well as promoting cooperation in many international projects.

In Japanese Fiscal Year 2005, RESTEC was appointed by JAXA as the primary distributor of ALOS data and started providing them including their value-added products developed by it. In addition, since the beginning of JFY2007, RESTEC is entrusted by JAXA to manage the operation of the Earth Observation Center located in town of Hatoyama. RESTEC is currently providing services in operation of ALOS and processing of ALOS data. RESTEC also distributes satellite data acquired by other Earth observation satellites.

At this time, all RESTEC personnel confirm our resolve to make united efforts to develop remote sensing technology and contribute to the improvement of the welfare of mankind and the sustenance of the Earth by applying our knowledge cultivated through the above activities.

For more information and collaboration opportunities, please contact the following persons:

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Executive Summary

"Regional Workshop on Updated Forest and Carbon Monitoring Technologies in Asia and the Pacific" was held in Japan on 27 - 29 October 2010. This workshop was co-organized by the Food and Agriculture Organization of the United Nations (FAO) (Strengthening Monitoring, Assessment, and Reporting on Sustainable Forest Management in Asia (GCP/INT/988/JPN)) and the Japan Aerospace Exploration Agency (JAXA) in collaboration with the Remote Sensing Technology Center of Japan (RESTEC).

The workshop was sponsored by the Government of Japan and the Government of the Republic of Korea through the FAO Programme under the Project: Strengthening Forest Resources Management and Enhancing its Contribution to Sustainable Development, Land Use and Livelihood (GCP/GLO/194/MUL).

The objectives of the workshop were; to improve participants' knowledge of updated technologies for forest and carbon monitoring and assessment to enhance national forest/carbon monitoring and assessment systems; and to facilitate coordination and collaboration between Japanese organizations and FAO in developing coherent forest/carbon monitoring systems and strengthening capacity building to countries in Asia-Pacific.

Twenty-six registrations from twenty-three countries were sent to local organizers and eventually eighteen participants from seventeen countries attended the workshop excluding staffs from FAO, JAXA, RESTEC and lecturers from the other organizations

The workshop consisted of five presentation and discussion sessions and one special session for hands-on exercise for satellite remote sensing data. Each session was chaired by FAO, JAXA and RESTEC respectively.

The participants improved their knowledge of remote sensing and field technologies for forest monitoring and assessment through the workshop and acquired basic techniques to handle satellite data observed by AVNIR-2 and PALSAR on ALOS.

The participants discussed ways to collaborate among them at session 5 "Elaboration of Forest Monitoring Activities in Countries" and summarized conclusions and recommendations of the workshop in the end.

1. Introduction

This document is the report of “Regional Workshop on Updated Forest and Carbon Monitoring Technologies in Asia and the Pacific” which was held in Japan on 27 - 29 October 2010. This workshop was co-organized by the Food and Agriculture Organization of the United Nations (FAO) (Strengthening Monitoring, Assessment, and Reporting on Sustainable Forest Management in Asia (GCP/INT/988/JPN)) and the Japan Aerospace Exploration Agency (JAXA) in collaboration with the Remote Sensing Technology Center of Japan (RESTEC).

The workshop was sponsored by the Government of Japan and the Government of the Republic of Korea through the FAO Programme under the Project: Strengthening Forest Resources Management and Enhancing its Contribution to Sustainable Development, Land Use and Livelihood (GCP/GLO/194/MUL).

1.1. Scope

FAO and JAXA jointly organized the workshop as co-organizers and RESTEC supported FAO to organize, prepare and implement the workshop as a collaborator and based on a contract. This document contains the output of discussions at the workshop as well as the results of preparation and logistics.

1.2. Contents

Section 2 reports on general information on the workshop including background and objectives.

Section 3 reports on the workshop structure including information on JAXA and RESTEC.

Section 4 reports on logistics support which RESTEC has done for the workshop.

Section 5 reports on the workshop result which consists of summaries of six sessions respectively.

Section 6 reports on evaluation of the workshop by the participants.

Section 7 is the conclusions and recommendations of the workshop.

2. Background and objectives of the workshop

FAO, JAXA and RESTEC jointly developed a "Concept Note" to announce the background, objectives and the other important information on the workshop to national focal points of FAO. The followings were background and objectives which mentioned at the concept note.

2.1. Background

Japan has initiated active collaboration with countries in the Asia-Pacific region and international organizations in forest and carbon monitoring, supporting global monitoring schemes such as the Global Earth Observation System of Systems (GEOSS), the Forest Carbon Tracking (FCT) led by the Group on Earth Observations (GEO), and the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD). Several organizations take lead initiatives in forest and carbon monitoring in Japan, such as the Japan Aerospace Exploration Agency (JAXA), the National Institute for Environmental Studies (NIES) and the Remote Sensing Technology Center of Japan (RESTEC).

Related agencies particularly in countries of the Asia- Pacific region are utilizing or interested in monitoring technologies developed in Japan, building on the Phrased Array-type L-band Synthetic Aperture Radar (PALSAR) on the Advanced Land Observing Satellite (ALOS), the Greenhouse Gases Observing Satellite (GOSAT) and other satellite technologies. Some of these countries are already well-experienced in these systems, while others still lack technical capacities in using them.

Meanwhile, FAO has elaborated satellite-based and field monitoring technologies actively under several programmes including the Global Remote Sensing Survey under the Global Forest Resources Assessment (FRA-RSS), National Forest Monitoring and Assessment (NFMA), Global Land Cover Network (GLCN), and REDD+ which is developing the Measurement, Reporting and Verification (MRV). One of the key issues in these programmes has been how to improve the accuracy of data by collating data from satellite imagery and field inventory. Another crucial issue is how to facilitate harmonization of forest monitoring technologies among various systems to ensure coherent and robust data collection for forest and carbon monitoring all over the world.

This workshop aimed to present current technologies for forest and carbon monitoring and assessment evolved in Japan as well as by FAO for participants' learning and comparison in future application.

2.2. Objectives

Objectives of the workshop were to:

- Improve participants' knowledge of updated technologies for forest and carbon monitoring and assessment to enhance national forest/carbon monitoring and assessment systems.
- Facilitate coordination and collaboration between Japanese organizations and FAO in developing coherent forest/carbon monitoring systems and strengthening capacity building to countries in Asia-Pacific.

3. Structure of the workshop

The workshop was co-organized by FAO Strengthening Monitoring, Assessment, and Reporting (MAR) project on Sustainable Forest Management (SFM) in Asia and JAXA in collaboration with RESTEC, while the workshop was sponsored by the Government of Japan and the Government of the Republic of Korea through the FAO Programme under the Project: Strengthening Forest Resources Management and Enhancing its Contribution to Sustainable Development, Land Use and Livelihood (GCP/GLO/194/MUL).

FAO covered the whole cost of the workshop within its financial capacity, while JAXA and RESTEC provided facilities and technical/administrative support for the workshop.

3.1. Capabilities and Experiences

JAXA and RESTEC were adequate as a co-organizer and a collaborative organization of the workshop as they have capabilities and experiences on forest monitoring by satellites as described below.

(1) JAXA

JAXA has contributed to the Forest Carbon Tracking (FCT) Task of the Group on Earth Observation (GEO) as one of co-leads, providing a limited amount of satellite data free of charge. JAXA has also contributed in data analysis for developing forest/non-forest map products derived from several different types of satellite data. The contributions form JAXA are very much appreciated from the other FCT member countries because of capability of PALSAR to classify forests and cover all National Demonstrator countries and techniques to mosaic and analyze PALSAR data. The outcomes of FCT were presented and discussed at international symposiums such as the 2nd Forest Monitoring Symposium in Chiang Rai, Thailand 2009 and the 4th GEOSS Asia-Pacific Symposium in Bali, Indonesia 2010. JAXA lead

the discussions at these symposiums as a co-lead, data provider and a member of product development team.

Another international collaboration to monitor and estimate forest carbon by satellite data is the ALOS Kyoto & Carbon (K&C) Initiative led by JAXA Earth Observation Research Center (EORC). K&C Initiative is set out to support explicit and implicit data and information needs raised by international environmental Conventions, Carbon Cycle Science and Conservation of the environment. The Initiative is being undertaken by an international Science Team, and focuses primarily on defining and optimizing provision of data products and validated thematic information derived from in-situ and satellite sensor data, focusing particularly on that acquired by PALSAR on-board ALOS. In the K&C framework, JAXA has generated and released PALSAR mosaics covering Asia and Oceania region at their website.

In addition, JAXA launched GOSAT in 2009 to measure the concentrations of carbon dioxide and methane from space. The purpose of GOSAT is to contribute to the international effort toward prevention of warming, including monitoring the greenhouse gas absorption and emission state. GOSAT provides data on concentration distribution of CO2 and CH4 at 56,000 points on the earth and the data at the same points is updated every three days when weather condition is good enough.

(2) RESTEC

RESTEC has been supporting JAXA for forest monitoring by ALOS as well as greenhouse gases monitoring by GOSAT under contracts with JAXA. RESTEC was involved with the all activities stated above. In addition to these activities, RESTEC has some projects such as research on methodologies to detect and estimate forest biomass by SAR data, utilization of ALOS data to protect forest in Brazil against illegal logging, or utilization of ALOS data to support mapping and monitoring deforestation and degradation in Indonesia. Furthermore, RESTEC has provided trainings for those who need remote sensing techniques in Japan and foreign countries in particular developing countries for over 30 years. RESTEC has abundant experience, know-how, skills, equipment and broader human network for conducting remote sensing training.

3.2. Links to IPCC and UNFCCC

Although ALOS and GOSAT data has not been utilized for IPCC documentations, the data has possibilities to contribute to and impact on IPCC documentations such as IPCC Guidelines and Assessment Report because of its global coverage, homogeneousness and consistency. JAXA has already invited Dr. Dr. Hoesung Lee, a vice chairman of IPCC to GEO Carbon

Community of Practice meeting in November 2009 in Washington D.C. and integrate many users and stakeholders of greenhouse gases from space.

GEO/FCT activities include to develop and to establish consensus among space agencies which provide satellite data and key technical experts on requirements of satellite data for operational forest carbon tracking in support of UNFCCC process and its needs including REDD. JAXA, as one of co-leads of GEO/FCT, developed the data requirement document of GEO/FCT and will update it periodically.

4. Logistics support

RESTEC provided logistical support for FAO as well as the participants. What RESTEC had done is described as follows.

4.1. Venue and Date

Appendix The workshop took place at JAXA Tsukuba Space Center (TKSC) in Tsukuba on 27 and 28 October 2010. The exercise session on 29 October took place at RESTEC HQ office in Tokyo as RESTEC has training facilities in their HQ office.

4.2. Participants of the workshop

RESTEC distributed the concept note of the workshop with a registration form to national focal points of FAO and asked them to nominate a candidate for the workshop if they were interested in. We received twenty-six registrations from twenty-three countries. Seven applicants from six countries (Bhutan, China, Malaysia, Lao PDR, Philippines and Vietnam) could not attend the workshop due to FAO MAR budget limitation. The representative of Solomon Islands canceled at the last minutes.

Eventually eighteen participants from seventeen countries attended the workshop excluding staffs from FAO, JAXA, RESTEC and lecturers from the other organizations.

A participants list of the workshop is shown at Appendix 2.

4.3. Travel support

While FAO provided travel and accommodation fees for the participants, RESTEC supported the participants for their travel including flight booking, hotel booking and visa application. RESTEC also provided "Information Note" for them in advance so that they can reach their

hotel from the airport.

The Information Note is shown at Appendix 3.

4.4. Others

RESTEC collected all presentation materials from the presenters beforehand to ensure smooth operation of the workshop. The materials were copied on a DVD and distributed to the participants. RESTEC also distributed to the participants a certificate with signatures of Masahiro Otsuka of FAO and Toru Fukuda of JAXA.

5. Workshop results

The workshop consisted of five presentation and discussion sessions and one special session for hands-on exercise for satellite remote sensing data. The final agenda of the workshop is shown at Appendix 4. Results of presentations and discussions of the workshop are as follows.

5.1. Introduction to Satellite-based Forest Monitoring and Assessment Techniques in FAO

Session 1 "Introduction to Satellite-based Forest Monitoring and Assessment Techniques in FAO" was chaired by Toru Fukuda of JAXA.

In this session, Masahiro Otsuka of FAO presented overall and technical information on FAO programs such as the Land Cover Classification System (LCCS), the Global Land Cover Network (GLCN), REDD+/Measurement, Reporting and Verification (MRV), the Global Forest Resources Assessment (FRA) and the National Forest Monitoring and Assessment (NFMA).

There was a discussion on resolution of satellite data. Many participants are interested in using high resolution data but in one aspect, FAO still relies on Landsat data since they need historical analysis for land use change. However, the participants agreed to use both high resolution and low (moderate) resolution of satellite data to complement each other.

5.2. Introduction to Satellite-based Forest Monitoring and Assessment Activities in Japan

Session 2 "Introduction to Satellite-based Forest Monitoring and Assessment Activities in Japan" was chaired by Masanobu Shimada of JAXA.

Toru Fukuda of JAXA introduced JAXA's earth observation program including their future satellites development and launch plan. Fukuda stressed that JAXA developed a Global Forest/Non-Forest map using ALOS/PALSAR 10m resolution data.

The generation of the global map above and PALSAR 10m global orthorectified mosaic was explained in detail by Masanobu Shimada of JAXA in his presentation after that. He noted that the map and the mosaic are generated from the data obtained in 2009 and JAXA would continue to generate these products using the data in other years.

Yukio Haruyama of RESTEC presented their activities for earth observation satellite with several application examples and the existing capacity building projects with ALOS data.

Yasumasa Hirata of the Forestry and Forest Products Research Institute (FFPRI) introduced their satellite-based forest monitoring and assessment activities including six past and current projects using satellite data (both optical and radar data).

Osamu Ochiai of JAXA introduced activities of GEO-FCT task showing satellite data products such as forest/non-forest map and land cover map in seven national demonstrators – i.e. Brazil, Guyana, Mexico, Indonesia (Borneo), Australia (Tasmania), Cameroon and Tanzania.

5.3. Status of RS/GIS Technologies for Forest Monitoring and Assessment in Countries

Session 3 "Status of RS/GIS Technologies for Forest Monitoring and Assessment in Countries" was chaired by Yukio Haruyama of RESTEC.

Representatives from Bangladesh, Cambodia, Fiji, India, Indonesia, Japan, Korea, Lao PDR and Mongolia made their presentations on 1st day (27 October) and from Myanmar, Nepal, New Zealand, Pakistan, Papua New Guinea, Sri Lankan, Thailand and Vanuatu made theirs on 2nd day (28 October). They introduced their forest monitoring assessment activities in their countries.

5.4. Current Techniques for Forest Monitoring and Forest Carbon Estimation

Session 4 "Current Techniques for Forest Monitoring and Forest Carbon Estimation" was also chaired by Yukio Haruyama of RESTEC.

Yoshio Awaya of Gifu University introduced examples of forest monitoring using optical remote sensing data, showing case study in Japan. He stressed that remote sensing is effective for large area monitoring. He also noted that PALSAR would provide useful

information in the humid tropics while he mainly had used optical satellite data.

Manabu Watanabe of Tohoku University - he also works for RESTEC as a visiting researcher - introduced the methods of forest biomass assessment by SAR data. He explained that there were mainly two methods to estimate forest biomass from SAR data – one is to estimate forest biomass directly from backscatter coefficient, and the other is to estimate tree height using interferometry technique before estimate forest biomass. He showed the advantages and disadvantage of the methods respectively and mainly talked about the first method.

Yoshiki Yamagata of NIES presented forest carbon monitoring using remote sensing and terrestrial ecosystem modeling, showing his four test sites which are West Siberia, Hokkaido, Pasoh and Borneo. He stressed that a linkage of radar and optical data to estimate the historical forest cover changes and regional/national/global carbon budgets can be estimated by integrating the time series of remote sensing data and ecosystem models.

An Ngoc Van of University of Tokyo introduced forest cover mapping in Vietnam. This project was conducted in the framework of the Space Applications For Environment (SAFE) which was established under the Asia-Pacific Regional Space Agency Forum (APRSAF).

Shuji Kawakami of JAXA introduced the GOSAT and its sensor the Thermal and Near-infrared Sensor for carbon Observation (TANSO). GOSAT does not observe forest itself, but it can observe CO_2 and CH_4 directly. He showed the results and status of calibration for one and half years after its launch in 2009.

Doo-Ahn Kwak of Korea University introduced estimation of forest biomass using high resolution images and airborne LiDAR data, showing three case studies which are preparation of CO_2 absorption map using IKONS image, carbon storage estimation using aerial photograph and LiDAR data, and estimation of forest biomass using airborne LiDAR data.

5.5. Elaboration of Forest Monitoring Activities in Countries

Session 5 "Elaboration of Forest Monitoring Activities in Countries (work plan, networking, etc.)" was chaired by Masahiro Otsuka of FAO. He introduced three aspects in this session - i.e. Part 1: Harmonization of Forest & Carbon Monitoring, Part 2: Integration of satellite & field data, and Part 3: Strengthening of countries' capacities, and then the participants discussed how to harmonize different collaboration.

There was a discussion on standard metadata to develop a database by each country. FAO is expected to take lead initiatives to develop harmonized metadata systems and indeed some

experts in FAO have been discussing standard metadata.

There also was discussion on satellite remote sensing for forest monitoring. The required resolution of satellite data depends on purposes and countries don't need high resolution data according to their purpose. Continuity of remote sensing data is the most important. If Landsat 5 is in trouble, there will be a problem. FAO is expected to ensure continuous availability of satellite imagery with time-series data. The participants indicated that developing countries still need more capacity building regarding satellite data. Many participants have a cloud problem in their countries and they expect radar data which can penetrate cloud and observe forest.

5.6. Hands-on Exercise on RS/GIS for forest monitoring and assessment

Hands-on Exercise for use of ALOS data was done by three main lecturers, Aya Yamamoto, Nobuhiro Tomiyama and Manabu Watanabe. Yamamoto explained how to analyze the observation data of the Advanced Visible and Near Infrared Radiometer type 2 (AVNIR-2) on ALOS with ground truth data. RESTEC provided the participants with software "Remote-10" developed by RESTEC free of charge.

Watanabe explained two methods to estimate forest biomass from PALSAR data, continuing his presentation at session 4 on the previous day, and then Tomiyama showed how to handle PALSAR data with free software tool for PALSAR data "MapReady" developed by Alaska Satellite Facility (ASF).

Participants learned and acquired basic techniques for handling ALOS data with the software. A few assistants of RESTEC who are also very familiar with handling ALOS data helped the participants understand to use the software. They need to learn more to use ALOS data for their operational forest monitoring, but this was the important basic step.

6. Evaluation of the workshop by the participants

Appendix 5 summarizes participants' evaluation of the workshop. Twelve participants out of eighteen submitted the evaluation form after the workshop (ratio is 67%). Overall, six persons rated the workshop as "Very good" and five rated as "Fairly good" while one rated "Moderate". While most of the participants appreciated and were satisfied with contents, organization and arrangements of the workshop, four participants answered that they were dissatisfied with the number of days. They think they need more time for the workshop in particularly for discussions.

7. Conclusions and recommendations

The participants improved their knowledge of remote sensing and field technologies for forest monitoring and assessment through the workshop and acquired basic techniques to handle satellite data observed by AVNIR-2 and PALSAR on ALOS. In addition, an adaptive and comprehensive model of integrated forest monitoring and assessment systems with remote sensing and ground truthing examined through review of current technical approaches and countries' achievements.

The participants discussed ways to collaborate among them at session 5 "Elaboration of Forest Monitoring Activities in Countries" and Masahiro Otsuka summarized the draft conclusions and recommendations. They discussed on it at the end of special session and adopted it with some amendments. The followings are the final conclusions and recommendations of the workshop adopted by the participants.

(1) Participants received information on the recent status of activities in FAO (GLCN, MRV, FRA, and NFMA) and JAXA/RESTEC (ALOS/AVNIR-2, PALSAR, PRISM, GOSAT, GEO/FCT, etc.) as well as other organizations in Japan together with hands-on sessions. Then the participants shared their presentations on forest monitoring activities with RS/GIS and inventories in countries.

(2) These presentations were valuable for the participants, whereas they would require more clarifications especially on methodologies of biomass estimation using SAR from densities, types and forms of trees in combination with optical sensors.

(3) Techniques have to be further developed to improve data accuracy through fixed validation procedures.

(4) Participants discussed the needs of high-resolution imagery for accurate forest and land cover assessment with smaller MMU particularly in hardly accessible areas due to natural or human factors. By contrast, low-/medium-resolution imagery has been used to analyze historical trends of forest and land cover change at the global level in FAO. Countries require small-scale forest assessment to estimate fragmentation of natural forests as well as development of small patches of woodlots. Airborne LiDAR would be interesting for countries despite its high costs.

(5) Ground surveys/NFIs have to be strengthened to ensure comprehensive forest and GHG inventories towards development of multi-resource inventories. They are

essential for estimation of emission factors in MRV. Meanwhile, countries still face difficulties in comprehensive and regular ground surveys/truthing (still conducting on an ad-hoc basis). Sampling frameworks would also depend on objectives of assessment (e.g. cluster, stratified random sampling, etc.), though systematic sampling is considered more effective to reduce errors n NFMA.

(6) Countries require more technical support for assessment of forest degradation using UNFCCC/IPCC guidelines under the UN-REDD programme. FAO is expected to take lead initiatives in elaborating and verifying MRV to improve national capacities for forest degradation assessment.

(7) Participants suggest the flexibility in application of forest classification systems and monitoring technologies in countries in view of diverse ecological conditions. Minimum-level harmonization of forest definitions and classifications would still be required at the international level, beyond which each country would be able to develop its own systems.

(8) Standard metadata procedures need to be fixed at the global level. In this regard, FAO is expected to take lead initiatives to develop harmonized metadata systems, as have been done in several programmes.

(9) Countries need improved thematic assessment for trees outside forests, biodiversity/habitat conditions, soils (carbon, moisture, etc.) and other variables. Suitable methodologies and indicators need to be elaborated to capture environmental indicators in integrated forest and carbon monitoring.

(10) Some countries face difficulties in overall forest and tree cover assessment for the whole territory under forestry authorities that have collected data only in officially designated national forest areas. It is necessary to strengthen coordination among related agencies (remote sensing/GIS, statistics, agriculture, etc.) to enable overall assessment of forests and trees at the national level. Categories of forest species are controversial between countries and international organizations such as FAO under FRA (e.g. rubber, palm, etc.) in tree assessment outside forests.

(11) Participants discussed the technical feasibility of species-level assessment with available models together with assessment by forest type, though it still needs to be further investigated at this moment.

(12) FAO is expected to ensure continuous availability of satellite imagery with time-series data to be used by countries (e.g. Landsat data for the past decades)

(13) Countries are requested to ensure frequent/regular forest and carbon monitoring for timely and accurate assessment. Meanwhile, monitoring cycles may be varied among each monitoring scheme (more frequent for basic and wall-to-wall forest/land cover assessment than thematic or high-resolution analysis). Secured collection of cloud-free data is still a critical challenge in many countries.

(14) Participants acknowledged hands-on exercises for ALOS/AVNIR-2 and PALSAR. They expect follow-up collaboration with JAXA/RESTEC to further examine and apply Japan's monitoring technologies.

(15) As a whole, countries request follow-up capacity building processes by international organizations (e.g. FAO, UN-REDD, GEO) and national organizations (e.g. JAXA, RESTEC, FFPRI/REDD Center & NIES in Japan, universities, national organizations in other countries, etc.). Sufficient coordination between these organizations should be strengthened to provide complementary and synergistic technical support to countries.

(16) Training is very useful, but participants require more time for discussions.

8. List of Attachments

Appendix 1: List of Abbreviations

Appendix 2: List of Participants

Appendix 3: Information Note

Appendix 4: Agenda of the Workshop

Appendix 5: Participants' Evaluation of the Workshop

Appendix 1: List of Abbreviations

ALOS:	Advanced Land Observing Satellite
APRSAF:	Asia-Pacific Regional Space Agency Forum
ASF:	Alaska Satellite Facility
AVNIR-2:	Advanced Visible and Near Infrared Radiometer type 2
EORC:	Earth Observation Research Center
FCT:	Forest Carbon Tracking
FAO:	Food and Agriculture Organization of the United Nations
FFPRI:	Forestry and Forest Products Research Institute
FRA-RSS:	Global Remote Sensing Survey under the Global Forest Resources Assessment
GEO:	Group on Earth Observations
GEOSS:	Global Earth Observation System of Systems
GLCN:	Global Land Cover Network
GOSAT:	Greenhouse Gases Observing Satellite
IPCC:	Intergovernmental Panel on Climate Change
JAXA:	Japan Aerospace Exploration Agency
LCCS:	Land Cover Classification System
MAR:	Strengthening Monitoring, Assessment, and Reporting
MRV:	Measurement, Reporting and Verification
NFMA:	National Forest Monitoring and Assessment
NIES:	National Institute for Environmental Studies
PALSAR:	Phrased Array-type L-band Synthetic Aperture Radar
REDD:	Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
RESTEC:	Remote Sensing Technology Center of Japan
SAFE:	Space Applications For Environment
SAR:	Synthetic Aperture Radar
SFM:	Sustainable Forest Management
TANSO:	Thermal and Near-infrared Sensor for carbon Observation
TKSC:	Tsukuba Space Center
UNFCCC:	United Nations Framework Convention on Climate Change

Appendix 2: List of Participants

Participant List of FAO Regional Workshop
(Oct. 27-29, 2010)

No.	Country	Titel	First Name	Family Name	Organization	Position	E-mail	Address	Tel	Fax
1	Bangladesh	Mr	Haradhan	Banik	Forest Department, Government of the Peoples Republic of Bangladesh	Conservator of Forests	banikhd@yahoo.com	Ban Bhaban, Mohakhali, Dhaka, Bangladesh	880 2 9890401	880 2 989149
2	Cambodia	Mr	Chivin	Leng	Forestry Administration, MAFF, Cambodia	In charge as Chief of Watershed and Forestland Management Office	lengchivin@yahoo.com	#40, Norodom Bvld, Chark Daumuk, Phnom Penh, Cambodia.	855 23 6317197	
3	Fiji	Ms	Akosita Tiko	Lewai	MINISTRY OF PRIMARY INDUSTRIES, FORESTRY DEPARTMENT	FOREST OFFICER GIS	akosita_lewai@yahoo.com	P.O.Box 2218, Government Building, Suva	679 332 677(ext.0)	679 332 311
4	India	Mr	Sanjay Kumar	Srivastava	TAMIL NADU FOREST DEPARTMENT	CHIEF CONSERVATOR OF FORESTS (IT)	sks2700@yahoo.co.in	Panagal Maaligai, Saidapet, Chennai- 600015 (Tamil Nadu) India	91 44 24312185	91 44 24343407
5	Indonesia	Dr	Ruandha Agung	Sugardiman	Directorate General of Forestry Planning, Ministry of Forestry	Deputy Director of Spatial Data Network /& Deputy Director of Forest Monitoring	ra.sugardiman@gmail.com	Manggala Wanabakti Building Block I 7th Floor, Jakarta-10270, INDONESIA	62-21-5730293	62-21-5734632
6	Japan	Mr	Rikikya	Konishi	Internatonal Forestry Cooperation Office, Forestry Agency	Assistant Director	rikiya_konishi@nm.maff.go.jp	1-2-1 Kasumigaseki Chioda-ku Tokyo 100-8952 Japan	81-3-3591-8449	81-3-3593-9565
7	Korea	Dr	Doo Ahn	Kwak	Environmental GIS/RS Center Korea University	Senior Researcher	tulip96@korea.ac.kr	L501 West Hall, College of Life Science and Biotechnology, Korea University, Seoul, 136-713, Republic of Korea	82-2-3290-4734	82-2-3290-4734
8	Lao PDR	Mr	Somchay	Sanonty	Forest Inventory and Planning Division	Manager	somchaysanontry@yahoo.com			
9	Lao PDR	Mr	Sombath	Pangnasack	GIS & RS Unit	Deputy Head				
10	Mongolia	Ms	Narangerel	Zagdaa	Environmental Information center of Ministry of Nature Environment and Tourism, Mongolia	Forest specialist	znarangerel@yahoo.com	Juulchin Street 5, Building Institute Of Meteorology And Hydrology, Room 104, Ulaanbaatar 15160, Mongolia	976 11318911 ext.16	976 11 318911(14)
11	Myanmar	Dr	Myat Su	Mon	FOREST DEPARTMENT, MINISTRY OF FORESTRY, MYANMAR	STAFF OFFICER	sumonforest@gmail.com	Building No. 39, Forestest Department, Head Office, Ministry Of Forestry, Nay Pyi Taw, Myanmar	95 67 405109	95 67 405016
12	Nepal	Mr	Sahas Man	Shrestha	Department of Forest Research and Survey	Director General	sahas1957@hotmail.com	Department Of Forest Research And Survey (DFRS), Babar Mahal Kathmandu, Nepal	977 1 4226944	
13	New Zealand	Dr	Thomas	Paul	Scion	Scientist	Thomas.Paul@scionresearch.com	49 Sala Street, Private Bag 3020 Rotorua 3046, New Zealand	64 7343 5653	64 7348 952
14	Pakistan	Mr	Abdul	Hamid	Planning Commission of Pakistan	Chief Forestry & Wildlife	marwat67@yahoo.com	P-Block, Room # 606, Pak Secretariat Islamabad	92-51-9208027	92-51-9210227
15	Papua New Guinea	Mr	Rabbie	Lalo	PAPUA NEW GUINEA FOREST AUTHORITY (PNGFA)	PLANNING ANALYST	rlalo@pngfa.gov.pg	P.O.Box 5055 BOROKO NATIONA CAPITAL DISTRICT PNG	675 3277 916(ext.916)	675 325 4433
16	Sri Lankan	Mr	Ariyadasa	Kalutantri Patabendi	Forest Department	Conservator of Forests	ariyadasa@yahoo.com	82, Rajamalwatta Road, Battaramulla, Sri Lanka	94 11 2866624	94 11 2866633
17	Thailand	Mr	Anuchit	Ratanasuwan	Department of National Park, Wildlife and Plant Conservation	Director	anuchit46@gmail.com	61 Paholyothin RD. Chatuchuk Bangkok 10990, Thailand	662 561 0777	662 579 9484
18	Vanuatu	Mr	Rickson	Viranamangga	Department of Forests	Senior Forest Officer – Planning	virarexon@yahoo.com	Pmb 9064, Port Vila, Vanuatu	678 23171	678 23856
19	Thailand	Mr	Masahiro	Otsuka	FAO Regional Office for Asia and the Pacific	Forestry Officer	Masahiro.Otsuka@fao.org	39 Phra Athit Road, Phra Nakhon, Bangkok 10200, THAILAND	66-2-697-4130	66-2-697-4445
20	Japan	Dr	Shinichi	Sobue	JAXA	Planning Manager	sobue.shinichi@jaxa.jp	2-1-1 Sengen, Tsukuba-shi, Ibaraki 305-8505, JAPAN	81-50-3362-5782	81-29-868-2961
21	Japan	Mr	Masatoshi	Kamei	RESTEC	Deputy Manager	kamei@restec.or.jp	Roppongi First Bldg., 12F 1-9-9, Roppongi, Minato-ku Tokyo 106-0032,Japan	81-3-5561-4538	81-3-5574-8515
22	Japan	Ms	Tomoko	Kawashima	RESTEC	Staff	kawashima_tomoko@restec.or.jp	Roppongi First Bldg., 12F 1-9-9, Roppongi, Minato-ku Tokyo 106-0032,Japan	81-3-5561-4528	81-3-5574-8515

INFORMATION NOTE

Regional Workshop on Updated Forest and Carbon Monitoring Technologies in Asia and the Pacific

27 - 29 October, 2010

Day 1 & 2: Japan Aerospace Exploration Agency (JAXA) in Tsukuba

Day 3: Remote Sensing Technology Center of Japan (RESTEC) in Tokyo

1. WORKSHOP VENUE AND DATES

Day 1 & Day 2 (27-28 October, 2010)

JAXA Tsukuba Space Center (JAXA/TKSC)

2-1-1 Sengen, Tsukuba-City,

Ibaraki-ken, 305-8505, Japan

Tel: +81-50-3362-5782

Day 3 (29 October, 2010)

RESTEC Tokyo Office

Roppongi First Bldg., 7F

1-9-9, Roppongi, Minato-ku

Tokyo 106-0032, Japan

Tel: +81-3-5561-4538

2. LOCATION

Tsukuba city is located in north east direction of Tokyo and it takes about one hour by Tsukuba Express (TX) train from Tokyo to Tsukuba.

3. AIRPORT

For participating in this WS, we recommend that you would arrive at Narita International Airport.

Narita International Airport

http://www.narita-airport.jp/en/index.html

4. ACCOMMODATION

Accommodation for the participants has been arranged at Daiwa Roynet Hotel Tsukuba, one minute walk from Tsukuba Station and Tsukuba Center Bus Center.

Room Rate

Single Standard without breakfast:

7,000 JPY (Saturday & Sunday)

7,300 JPY (Monday & Friday)

7,500 JPY (Tuesday, Wednesday & Thursday)

Twin Standard without breakfast:

12,000 JPY (Saturday & Sunday)

12,500JPY (Monday & Friday)

13,000 JPY (Tuesday, Wednesday & Thursday)

*These rates are cooperate rates.

*Breakfast is served at a restaurant in the hotel and costs 850 JPY.

*The organizer will be responsible for room charge and breakfast of participants with financial aid. Please be noted costs of early check-in, late check-out, min-bar, room services and so on will be at your expense.

Check-in & out Time

Check-in Time: 14:00

Check-out Time: 11:00

Address & Contact Numbers

Daiwa Roynet Hotel Tsukuba

1-5-7 Azuma, Tsukuba-shi,

Ibaraki-ken 305-0031, Japan

Tel: +81-29-863-3755

Fax: +81-29-863-7955

URL: http://www.daiwaroynet.jp/english/locate.html

5. ACCESSES

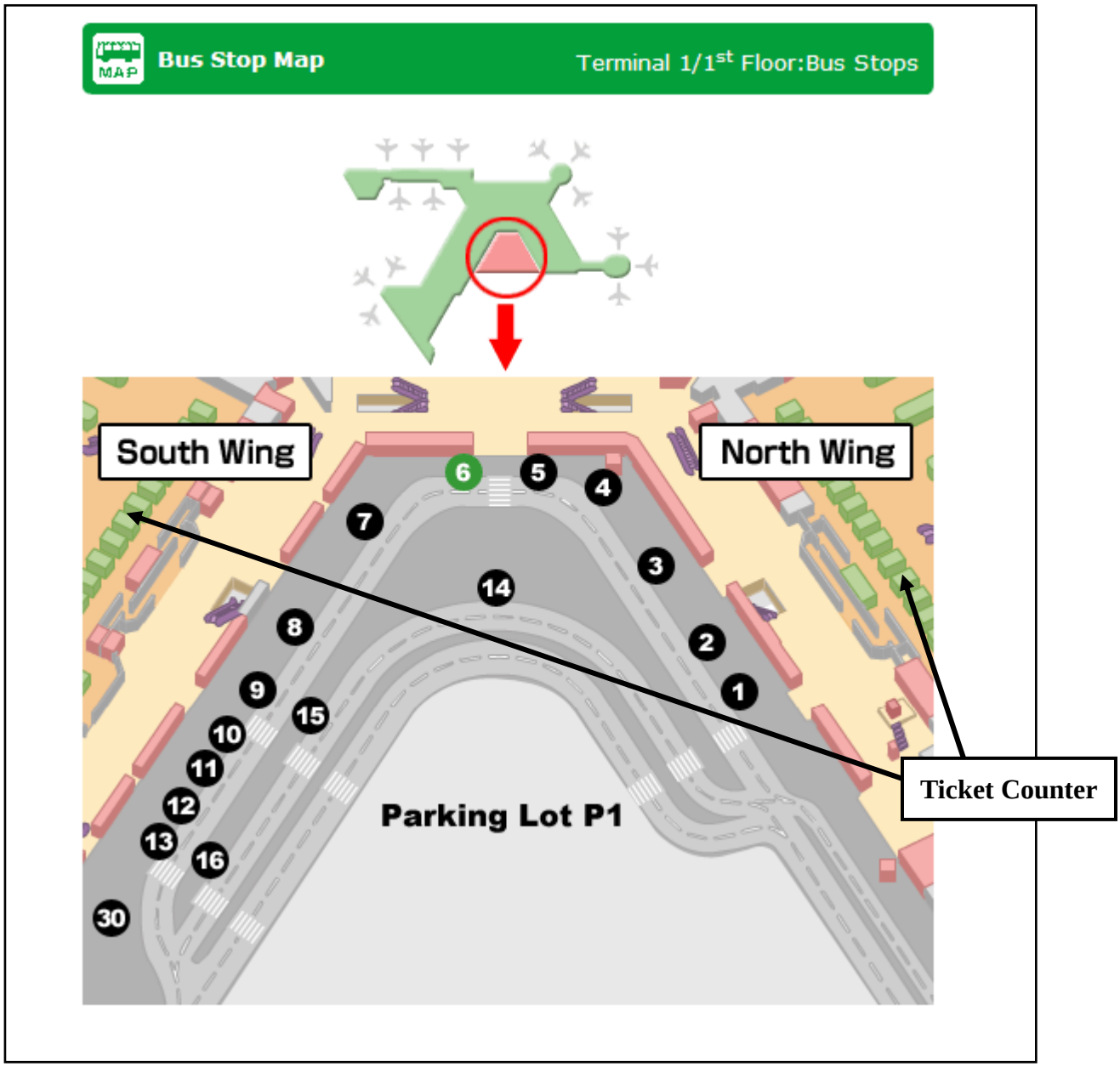
From Narita International Airport to the Hotel

Airport Limousine bus operates between Narita International Airport and Tsukuba Center Bus Terminal. The hotel is located very close to the bus terminal. It costs 2,540 JPY per one way and takes about 100 minutes. The bus from the

airport terminates at Tsuchiura Station East Exit and Tsukuba Center Bus Terminal is the fifth stop. (If you take the bus from the terminal2, it would be the sixth stop.) The ticket counters are located in the arrival lobbies. Time tables of the bus are attached to this paper. (Attachment 1)

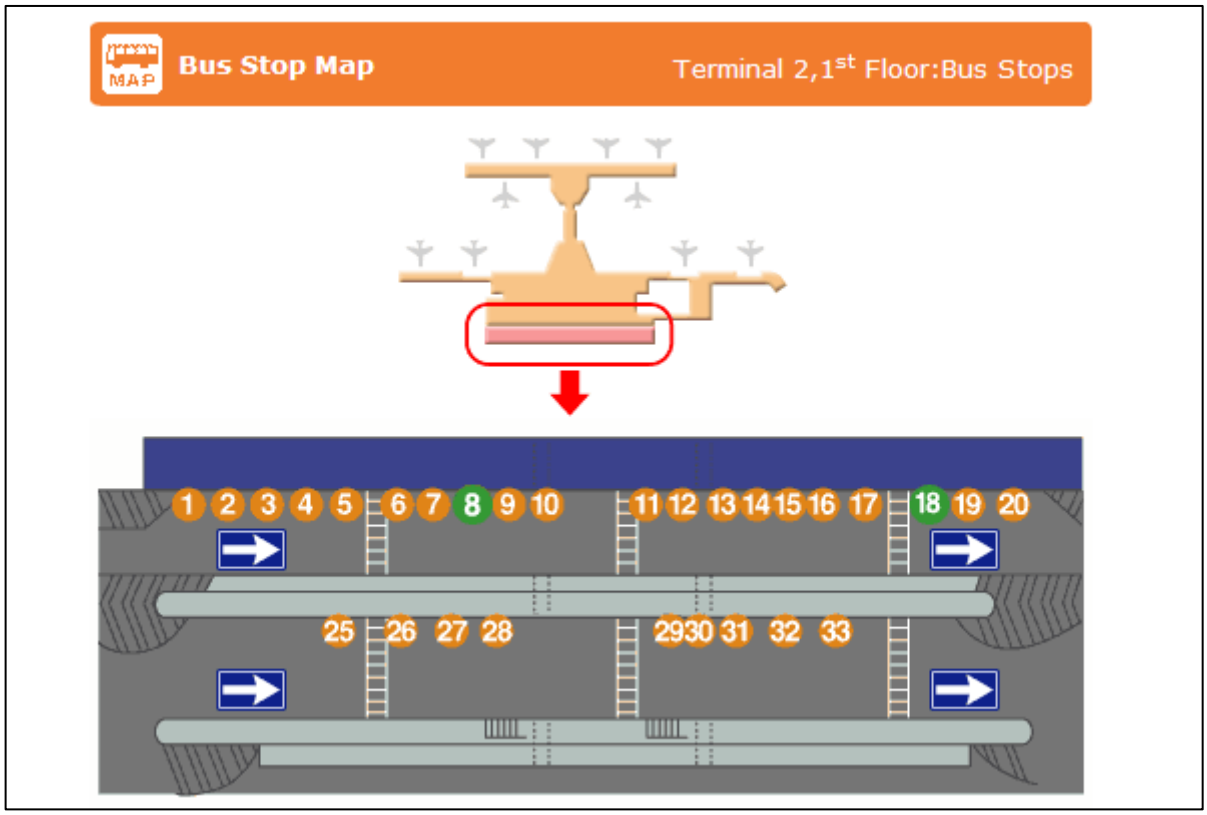
Location Map of Terminal 1

Airport Limousine Bus for Tsuchiura Station East Exit starts at the **bus stop8.** The ticket is available at Keisei counters. (Green colored bus stop 6 is a bus stop for terminal connection bus)



Location Map of Terminal 2

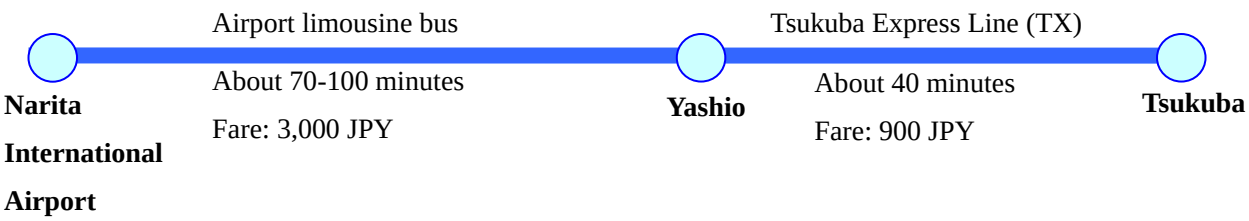
Airport Limousine Bus for Tsuchiura Station East Exit starts at **bus stop10**. The ticket is available at Keisei counters. (Green colored bus stop 8 and 18 are bus stops for terminal connection bus)



Airport Limousine Bus for Yashio

In case you missed the last limousine bus for Tsuchiura station East Exit, you would need to take an airport limousine bus to Yashio Station North Exit and then take a train (Tsukuba Express Line, TX) which terminates at Tsukuba.

You can take the limousine bus at bus stop 4 or 13 in the terminal1 and at bust stop4 or 14 in the terminal2. Tsukuba Express terminates at Tsukuba and the hotel is very close to the station. Time tables for the limousine bus are attached to this paper. (Attachment 2)



Map around Tsukuba Station

Daiwa Ryonet Hotel Tsukuba is very close to both Tsukuba Center and Tsukuba Station.

When you take an airport limousine bus for Narita International Airport from this terminal, you can get on the bus at the bus stop 8. The ticket is available at the ticket office.

Please also see attachment 3, an English map of central area of Tsukuba city.

A:Tsukuba Center Bus Terminal
B: Ticket Office
C: Tsukuba Station Exit
D: Q't Shopping Mall

From the Hotel to JAXA Tsukuba Space Center

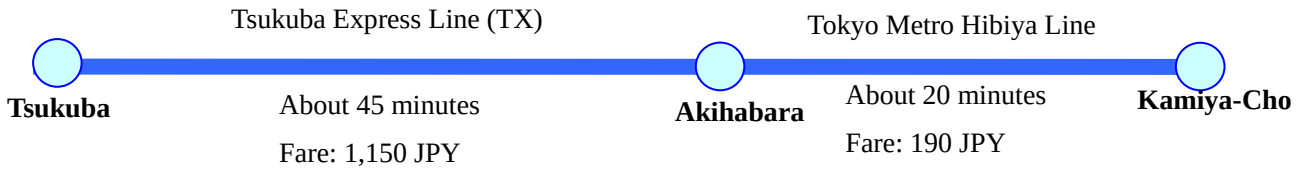
Local bus operates between the hotel and JAXA Tsukuba Space Center. It takes about 10 minutes. **Please gather in the hotel lobby in the morning of 27 and 28 October. RESTEC staff will pick up the participants at 08:45.**

Map around Tsukuba Station and JAXA Tsukuba Space Center

From the Hotel to RESTEC Tokyo Office

You will need to take trains from Tsukuba Station to Kamiya-cho when you go to RESTEC Tokyo Office. RESTEC Staff will accompany with the participants from the hotel to the office. **Please gather in the lobby at 07:50.**

Train access



Access Map from Kamiya –cho Station to RESTEC Tokyo Office

6. GENERAL INFORMATION ON TSUKUBA AND TOKYO

Visit the following sites to learn more about general conditions on Tsukuba, Tokyo and Japan.

http://www.tsukubainfo.jp/

http://www.japan-guide.com/e/e2164.html

http://www.japan-guide.com/

- The following are useful telephone numbers in case of emergency:

Police	110
Ambulance, Fire	119

- Hospitals

Hospital	Tel	URL
Tsukuba Medical Center Hospital	029-851-3511	http://www.tmch.or.jp/hosp/b06.html
Sanno Hospital (Tokyo)	03-3402-3151	http://www.sannoclc.or.jp/english/index.html
Roppongi Hills Clinic(Tokyo)	03-3796-0066	http://www.66clinic.com/english/index.html

*Telephone numbers are without international telephone code, assuming that you would make a phone call in Japan.

7. CLIMATE

The weather in October is fine and very comfortable for travelling. Average maximum temperature in Tokyo is at 22°C and minimum temperature is 15°C in October. In Tsukuba in this season is similar to its in Tokyo but it is cooler than Tokyo early morning and evening.

Average Temperature in October

Place	Average Maximum Temperature	Average Minimum Temperature
Tokyo	22°C	15°C
Tsukuba	21°C	11°C

8. CURRENCY

The monetary unit of Japan is Japanese Yen (JPY). Paper currencies are 10,000, 5,000, and 1,000 JPY note. Coins are 500, 100, 50, 10, 5 and 1 JPY. The exchange rate (as of 17 August 2010) is approximately 1 US$ = 88 Yen. All major credit cards and travelers checks are readily accepted in Japan. Money exchange is not available at Daiwa Roynet Hotel Tsukuba, so that we recommend that you would make exchange at the airport. There is a bank where you can exchange US Dollar into Japanese Yen near the hotel. However, the workshop will be hold during its opening hours.

9. VISA INFORMATION

Please visit the website: http://www.mofa.go.jp/j_info/visit/visa/index.html and check whether you are required to obtain a visa or not to enter Japan.

If you need document(s) issued from Japan side for visa application, please contact the local organizer by email (FAO_WS@restec.or.jp) at your earliest convenience.

Please also make sure that your passport will be valid for more than 6 months at the time of your entry into Japan.

10. ELECTRICITY

Electric Voltage: 100V AC

Electric plug: flat two-pronged plug, type A (please bring your own plug adapters for your equipment)

11. CONTACT PERSON

For more information on logistic support, please contact Mr. Masatoshi Kamei or Ms. Tomoko Kawashima at FAO_WS@restec.or.jp or +81-3-5561-4538.

Attachment 1

Time Table for Tsuchiura Station East Exit							
Narita Airport Terminal 2	**Narita Airport Terminal 1**	Shintone	Ryougasaki New Town	Ushiku	Hitachino Ushiku Station	**Tsukuba Center**	Tsuchiura Station East Exit
07:40	**07:45**	08:25	08:43	08:55	09:00	**09:20**	09:40
09:05	**09:10**	09:50	10:08	10:20	10:25	**10:45**	11:05
10:35	**10:40**	11:20	11:38	11:50	11:55	**12:15**	12:35
12:50	**12:55**	13:35	13:53	14:05	14:10	**14:30**	14:50
14:30	**14:35**	15:15	15:33	15:45	15:50	**16:10**	16:30
16:15	**16:20**	17:00	17:18	17:30	17:35	**17:55**	18:15
17:20	**17:25**	18:05	18:23	18:35	18:40	**19:00**	19:20
18:45	**18:50**	19:30	19:48	20:00	20:05	**20:25**	20:45
20:10	**20:15**	20:55	21:13	21:25	21:30	**21:50**	22:10

Time Table for Narita Airport							
Tsuchiura Station East Exit	**Tsukuba Center**	Hitachino Ushiku Station	Ushiku	Ryougasaki New Town	Shintone	**Narita Airport Terminal 1**	**Narita Airport Terminal 2**
05:40	**06:00**	06:20	06:25	06:37	06:55	**07:40**	**07:45**
06:40	**07:00**	07:20	07:25	07:37	07:55	**08:40**	**08:45**
08:30	**08:50**	09:10	09:15	09:27	09:45	**10:25**	**10:30**
10:20	**10:40**	11:00	11:05	11:17	11:35	**12:15**	**12:20**
12:00	**12:20**	12:40	12:45	12:57	13:15	**13:55**	**14:00**
13:15	**13:35**	13:55	14:00	14:12	14:30	**15:10**	**15:15**
14:15	**14:35**	14:55	15:00	15:12	15:30	**16:10**	**16:15**
15:30	**15:50**	16:10	16:15	16:27	16:45	**17:25**	**17:30**
17:15	**17:35**	17:55	18:00	18:12	18:30	**19:10**	**19:15**

Attachment 2

Time Table of Airport Limousine Bus for Yashio Station North Exit

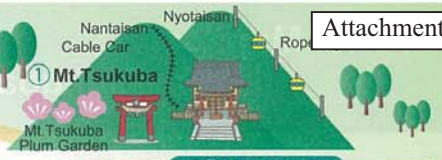
Narita Airport Terminal 2	08:15	09:15	10:30	14:30	15:50	17:00	18:30	20:00	**21:30**
Narita Airport Terminal 1 South Wing	08:20	09:20	10:35	14:35	15:55	17:05	18:35	20:05	**21:35**
Narita Airport Terminal 1 North Wing	08:25	09:25	10:40	14:40	16:00	17:10	18:40	20:10	**21:40**
Yashio Station north exit	09:50	10:50	12:05	16:05	17:30	18:40	19:55	21:20	**22:50**

Tourist Map Tsukuba Watch

漫遊空間

Points of interest!

Fantastic City,Tsukuba
Unique blend of natural beauty, history and science.



① Mt.Tsukuba

Consists of two peaks called Nantaisan(871m) and Nyotaisan(877m). There are hiking trails,cable-car and ropeway. Enjoy the majestic view of the Kanto plain.

Mt.Tsukuba tourist information office
Open:8:30~17:15
Phone:029-866-1616
http://www.kanko-tkb.net
The details look at back side

② National Science Museum

A tropical forest and dessert area with 4000 types of native plants. Beautiful flowers can be seen throughout a year.

Open:9:00~16:30 entrance close:16:00 Holidays:Monday (next day in case of public holiday), 12/28~1/4
Phone:029-851-5159
http://www.tbg.kahaku.go.jp/

③ University of Tsukuba Gallery

The Gallery displays the University's historical materials and works of art. In addition, there are also materials of famous athletes as well.

Open: 9:00~17:00
Phone: 029-853-2382
http://www.tsukuba.ac.jp/english/public/institutions/index.html
Holidays: Mondays and year-end through New Year holidays

④ The Science Museum of Map and Survey

Explains the principles behind map creation. History of maps is fun!

Open:9:30~16:30
Phone:029-864-1872
http://www.gsi.go.jp/MUSEUM/
Holidays:Monday (next day in case of public holiday)12/28~1/3

Around of Tsukuba Center

Hotels in central Tsukuba

Tremont Hotel	029-851-8711
Tsukuba kensyu Center	029-851-5152
Okura Frontier Hotel Tsukuba	029-852-1112
Hotel Matsushima	029-856-1191
Hotel Grand Shinonome	029-856-2211
Tsukuba Sky hotel	029-851-0008
Gakuen Sakurai Hotel	029-851-3011
Okura Frontier Hotel Tsukuba Epochal	029-860-7700
Hotel New Takahashi Takezono	029-851-2255
Daily inn Tsukuba	029-851-0003
Pension Gakuen	029-851-0008
Hotel New Taka	029-851-4788
Hotel Suwa	029-836-4011

① Tsukuba Expo Center

Learn and experience the space in a fun way.
Enjoy the planetarium,too.

Open:10:00~17:00 Holidays:Monday (next day in case of public holiday),last Tuesday of the month.
Phone:029-858-1100
http://www.expocenter.or.jp

⑨ Tsukuba Culture Center "Ars"

Tsukuba Culture Center "Ars" has a library, museum, public hall and studio.

⑤ JAXA/Tsukuba Space Center

Advanced research in space exploration. Artificial satellites and rockets are exhibited.Tour with guide is available. It need a reservation.

Open:10:00~17:00 Holidays:year end
Phone:029-868-2023 and new year
http://www.jaxa.jp

⑥ Geological Museum & Science square Tsukuba

Geological Museum:Explains earth science.Science Square Tsukuba: Exibits the most advanced technology.

Open:9:30~16:30
Phone:
Geological Museum 029-861-3750
Science Square Tsukuba 029-862-6215
Holidays:Monday (next day in case of public holiday), 12/28~1/4
http://www.aist.go.jp/aist-j/exibition/index.html

⑦ Tsukuba Research Gallery

Aids in development of agricultural tools/instruments and environment friendly agriculture

Open:9:00~16:00
Phone:029-838-8980
http://trg.affrc.go.jp/
holidays:year end and new year

⑧ pedestrian(Koen Dori)

Popular road joining Akatsuka park in south and Matsumi park in north. Perfect for cycling

Renting a bicycle
Appication 9:00~16:00 Return until 18:30
Fee : Adult 500yen age 6-12 250yen
Registration : Tsukuba city Information(in front of Tsukuba station)

Tsukuba ScienceTour Bus

Start Tsukuba Exp. Tsukuba station

Science City Tsukuba --- You will find many epochs.
- Ticket is "One day passport". You can get on and off several times you want.
- Tickets are available at Tsukuba City Information Center --- in front of ticket gate of Tsukuba Station.
- Price of ticket :
  Adult 500yen
  Child(age6~12) 250yen
- Bus move on **Saturday, Sunday and Holiday.**
- 12 drives / 1day (Regular course : 8, TRG course : 4) 8:55~16:55

Tsukuba Science Tour
phone : 029-863-6868
URL http://www.i-step.org/tour/

- Science Tour Bus stop
- Leisure facilities
- Shopping
- Gas station
- Convenience store
- Taxi
- Restaurant
- Bakery
- Cellular phone shop
- Bank

Hiratsuka-dori
Techno-park Sakura
Tsukuba Univ. of Technology (Amakubo Campus)
Tremont hotel
Geographical Survey Institute
Yukari no mori
Kimura Tea Shop
Tsukuba Univ.of Technology (Kasuga Campus)
Univ. of Tsukuba
Amakubo park
Trident maple Ave.
Aji no mingei
Coco's
Saiki
Tsukuba Ham
Medical Center Hosp. TEL 029-851-3511
Tsukuba Univ. Hospital TEL.029-853-3570
Amakubo Shopping Center
Tsukuba Kenshu Center
Housing Gallery
Fire Station
Bic Echo (Karaoke)
Matsumi Park
Matsumi Restaurants
Nurses' Training School
Japanese horse Chestnut Ave.
Matsumi Taxi
PeterPan(Bakery)
Yuhodo Book Store
Ibarakiken Shinyo Kumiai
Gakuen Kita Odori
Tsukuba Gakuin Univ.
Univ. of Tsukuba (Library and Information Science)
Denny's
Ohsone Taxi
Sakura Folk Park
Chuo Park
Tsukuba Express
Japanese zelkova・Tulip tree Ave.
Tsukuba Station
Tsukuba GovernmentOffice
Sakura Traffic Park
OkuraFrontier Hotel Tsukuba Central
Post Office
Monument of selected 100 roads of Japan
Takezono High School
To Tsuchiura
Rural Kise
Creo
Hotel Matsushima
Coco's
Hotel Grand Shinonome
URA
Tsukuba Central Police Station
JTB(Tour)
Soft Bank
Mitsui Building
OLIX Rent-a-car
Oshimizu Park
Tsukuba Capio
Tsukuba Sky Hotel
Sansui-tei
Coco's
Mac
Ginkgo Ave.
Gust
Internet Cafe
Steak Miya
Kantetsu Taxi
Sato Taxi Kentucky
LaLa Garden Lottery
Spa Sauna Daigaku
DoCoMo
Korun(Bakery)
Takezono Shopping Center
Joyo Bank
To Bando
Ibaraki BK.
Sweet gum Ave.
Gakuen Sakurai Hotel
Okura Frontier Hotel Epochal
Epochal Tsukuba International conference, exhibition, parties are held.
Hotel New Takahashi Takezono
Ishimaru Electric Shop
TSUTAYA (Book Shop)
Tsukuba International Congress Center (Epochal Tsukuba)
Mito shinyo Kinko
Internet Cafe au
Tsukuba Center for Institutes
National Institute for Material Science
Tsuchiura Taxi
Kojima Electric Shop
Gakuen Minami Odori
Minami-Odori Higashi
Minami-Odori Nishi
Gakuen Nishi Odori
Japanese zelkova・Tulip tree Ave.
Trident maple Ave.
Sengen 1chome
Daily inn Tsukuba
Chinrai (Ramen Noodle)
ShinkoTaxi
Ninomiya house
Ninomiya Park
pedestrian(Koen Dori)
JAXA
AIST
Tsukuba Center,Inc Restaurant Anje
Sengen 2chome
Tsukuba Public health Center
Joyo Bank
Matsushiro Shopping Center
Pension Gakuen
Andersen (Bakery)
Morgen (Bakery)
Doho Park
Kuronne (Bakery)
Hotel Suwa
Metropolitan Inter-City Exp.Way
To Joso
Agriculture Research Institutes
To Ushiku
Tsukuba JCT.
Tsukuba Ushiku IC
To Hitachino-ushiku
Joban Exp.Way
Spa resort Cinema
National Institute for Materials Science
Namiki Shopping Center
Kanto Tsukuba BK
Hotel New Taka
Joyo Bank
Amakawa Taxi
Sakura・Tsuchiura IC
To Arakawaoki
Karima
Hara
Onozaki
Kasuga 3chome
Kasuga 1chome
Kasuga 2chome
Amakubo 2chome
Amakubo 1chome
Azuma 3chome
Azuma 2chome
Azuma 1chome
Takezono 1chome
Takezono 3chome
Takezono 2chome
Higashi Arai
Matsushiro 1chome
Matsushiro 2chome
Matsushiro 4chome
Saiki
Gakuen Higashi
ATM

Appendix 4: Agenda of the Workshop

AGENDA

(Updated on 27 Oct 2010)

Regional Workshop on Updated Forest and Carbon Monitoring Technologies in Asia and the Pacific

27 - 29 October, 2010

Day 1 & 2: Japan Aerospace Exploration Agency (JAXA) in Tsukuba
Day 3: Remote Sensing Technology Center of Japan (RESTEC) in Tokyo

Organized by:
the Food and Agriculture Organization of the United Nations (FAO)
(Strengthening Monitoring, Assessment, and Reporting on Sustainable Forest Management in Asia (GCP/INT/988/JPN))
and the Japan Aerospace Exploration Agency (JAXA)

In collaboration with:
Remote Sensing Technology Center of Japan (RESTEC)

Sponsored by:
the Government of Japan
and the Government of the Republic of Korea through the FAO Programme under the Project: Strengthening Forest Resources Management and Enhancing its Contribution to Sustainable Development, Land Use and Livelihood (GCP/GLO/194/MUL)

DAY 1 (@JAXA/TKSC "Conference Room B2" on 2nd Floor of Headquarters Building)

09:15 - 09:30 Registration

Opening session
(Session Chair: Toru Fukuda)

09:30 - 09:35 Welcome address by FAO (Masahiro Otsuka)
09:35 - 09:40 Keynote address by JAXA (Toshio Doura)
09:40 - 09:45 Opening address by RESTEC (Yukio Haruyama)
09:45 - 09:55 Introduction of participants and resource persons
09:55 - 10:00 Introduction to the workshop programs and logistics (Masatoshi Kamei)

10:00 - 10:30 *Group photo and Refreshments (coffee/tea break)*

Session 1: Introduction to Satellite-based Forest Monitoring and Assessment Techniques in FAO
(Session Chair: Toru Fukuda)

10:30 - 10:45 Global Land Cover Network (GLCN) (Masahiro Otsuka)
10:45 - 11:00 REDD+/Measurement, Reporting and Verification (MRV) (Masahiro Otsuka)
11:00 - 11:15 Global Remote Sensing Survey under the Global Forest Resources Assessment (FRA) 2010 (Masahiro Otsuka)
11:15 - 11:30 Combination of field inventory data and satellite data in the National Forest Monitoring and Assessment (NFMA) (Masahiro Otsuka)
11:30 - 11:45 Discussions

11:45 - 13:00 *Lunch at JAXA/TKSC cafeteria*

Session 2: Introduction to Satellite-based Forest Monitoring and Assessment Activities in Japan
（Session Chair: Masanobu Shimada)

13:00 - 13:20 JAXA (Toru Fukuda)
13:20 - 13:40 JAXA Kyoto & Carbon Initiative (Masanobu Shimada)
13:40 - 14:00 RESTEC (Yukio Haruyama)
14:00 - 14:20 Forestry and Forest Products Research Institute (Yasumasa Hirata)
14:20 - 14:50 Group on Earth Observation (GEO) / Forest Carbon Tracking (FCT) (Osamu Ochiai)
14:50 - 15:20 Discussions

15:20 - 15:50 *Refreshments*

Session 3: Status of RS/GIS Technologies for Forest Monitoring and Assessment in Countries
(Session Chair: Yukio Haruyama)

15:50 - 17:20 Country 1 - 9 (10 minutes per country)
(See the attached time table)
17:20 - 17:50 Discussions

18:15 - 19:30 Reception hosted by FAO at JAXA/TKSC cafeteria

DAY 2 (@JAXA/TKSC "Conference Room A" on 2nd Floor of Headquarters Building)

Session 3: Status of RS/GIS Technologies for Forest Monitoring and Assessment in Countries (continued)
(Session Chair: Yukio Haruyama)

09:40 - 10:30 Country 10 - 14 (10 minutes per country)
(See the attached time table)

10:30 - 10:45 *Refreshments*

10:45 - 11:15 Country 15 - 17 (10 minutes per country)
(See the attached time table)
11:15 - 11:45 Discussions

11:45 - 13:00 *Lunch at JAXA/TKSC cafeteria*

Session 4: Current Techniques for Forest Monitoring and Forest Carbon Estimation
(Session Chair: Yukio Haruyama)

13:00 - 13:20 Examples of Forest Monitoring using Optical Remote Sensing Data (Y. Awaya, Gifu Univ)
13:20 - 13:40 Forest Biomass Assessment by SAR (M. Watanabe, Tohoku Univ / RESETC)
13:40 - 14:00 Forest Carbon Monitoring using RS and Terrestrial Ecosystem Modelling (Y. Yamagata, NIES)
14:00 - 14:20 Forest Cover Mapping in Vietnam as a SAFE Prototype (An Ngoc Van, Univ. of Tokyo)
14:20 - 14:40 The results of GOSAT TANSO observation in one and half years and the status of the calibration (Shuji Kawakami and Masakatsu Nakajima, JAXA)
14:40 - 15:00 Estimation of Forest Biomass using High Resolution Images and Airborne LiDAR Data (Doo-Ahn Kwak, Korea Univ)
15:00 - 15:20 Discussions

15:20 - 15:40 *Refreshments*

Session 5: Elaboration of Forest Monitoring Activities in Countries (work plan, networking, etc.)
(Session Chair: Masahiro Otsuka)

15:40 - 17:30 Presentations and Discussions
Part 1: Harmonization of Forest and Carbon Monitoring Technologies
Part 2: Integration of Satellite and Field Data
Part 3: Strengthening of Countries' Capacities with Updated Technologies

DAY 3 (@RESTEC Training Room on 7th Floor)

Special Session: Hands-on Exercise on RS/GIS for forest monitoring and assessment

10:00 - 12:45 Session 1 (Forest Monitoring Analysis Using ALOS/AVNIR-2 Data and Ground Truth Data)

12:45 - 13:45 *Lunch*

13:45 - 16:10 Session 2 (Forest Monitoring Analysis Using ALOS/PALSAR Data and Ground Truth Data)

16:10 - 16:30 Conclusions/Recommendations

Concluding Session
(Session Chair: Yukio Haruyama)

16:30 - 16:35 Closing Remarks by FAO (Masahiro Otsuka)
16:35 - 16:40 Closing Remarks by JAXA (Shinichi Sobue)
16:40 - 16:45 Closing Remarks by RESTEC (Masahiro Kawasaki)
16:45 - 17:00 Delivery of Certificates and Materials (CD-ROM)
17:00 - 17:15 Vote of Thanks by a Representative of Participants

17:15 - 18:30 Reception hosted by and at RESTEC

Presentation Time Table for Session 3

#	Date	Time	Country
1	27 October	15:50-16:00	Bangladesh
2	27 October	16:00-16:10	Cambodia
3	27 October	16:10-16:20	Fiji
4	27 October	16:20-16:30	India
5	27 October	16:30-16:40	Indonesia
6	27 October	16:40-16:50	Japan
7	27 October	16:50-17:00	Korea
8	27 October	17:00-17:10	Lao PDR
9	27 October	17:10-17:20	Mongolia
10	28 October	09:40-09:50	Myanmar
11	28 October	09:50-10:00	Nepal
12	28 October	10:00-10:10	New Zealand
13	28 October	10:10-10:20	Pakistan
14	28 October	10:20-10:30	Papua New Guinea
		10:30-10:45	Break
15	28 October	10:45-10:55	Sri Lankan
16	28 October	10:55-11:05	Thailand
17	28 October	11:05-11:15	Vanuatu

Appendix 5: Participants' Evaluation of the Workshop

12 participants out of 18 submitted the evaluation form (67%)

(1) Has the meeting achieved its objective enough?

1: Perfectly good	4 persons
2: Fairly achieved	8 persons
3:Poorly achieved	
4: Not achieved	
5: Unknown	

Comments;

- ✓ Fruitful
- ✓ Should discuss in details
- ✓ The meeting schedule is too intensive and it is important to have more time for discussions after each presentation.

(2) Are you satisfied with the content of the meeting?

1: Very satisfied	5 persons
2: Fairly satisfied	6 persons
3: Unknown	
4: Fairly dissatisfied	
5: Very dissatisfied	
(no check)	1 person

Comments;

- ✓ I am satisfied on the content of the meeting in terms of importation sharing, knowledge and regulation, however the explanation in a bit fast.
- ✓ Some information might be very technical in their areas, but it is important to be aware what is out there.

(3) Which subjects/sessions was the most interesting to you?

- ✓ Example of forest monitoring
- ✓ Forest carbon monitoring
- ✓ Technique of using SAR technique for interoperation on estimation on biomass

- ✓ Session 2
- ✓ Session 4
- ✓ Exercise
- ✓ Hands on exercise
- ✓ Technical session
- ✓ Special Session
- ✓ Country report
- ✓ Session 1
- ✓ Change deletion of forest monitoring
- ✓ Forest carbon estimation
- ✓ Discussion on the monitoring of carbon and the issues
- ✓ REDD Mar
- ✓ Biomass assessment

Summary of above comments (by RESTEC)

- ✓ Session 1 (FAO) 1 person
- ✓ Session 2 (Activities in Japan) 1 person
- ✓ Session 3 (Country report) 1 person
- ✓ Session 4 (Current techniques) 2 persons
- ✓ Special Session (Exercise) 3 persons
- ✓ Forest biomass / carbon estimation 5 persons
- ✓ Forest monitoring 2 persons
- ✓ REDD Mar 1 person

(4) Are you satisfied with organization of the meeting?

1: Very satisfied	5 persons
2: Fairly satisfied	5 persons
3: Unknown	1 person
4: Fairly dissatisfied	1 person
5: Very dissatisfied	

Comments;

- ✓ Perfect
- ✓ Exercise time was very short
- ✓ The chair of each session should be stop talking not to overflow correct time.
- ✓ Discussion time is needed
- ✓ Need more time for the training

(5) Are you satisfied with the number of days of the meeting?

1: Very satisfied	2 persons
2: Fairly satisfied	5 persons
3: Unknown	
4: Fairly dissatisfied	4 persons
5: Very dissatisfied	
(no check)	1 person

Comments;

- ✓ Test training if FAO can provide one day on optical RS classification analysis and other one day to high resolution image is most considerable
- ✓ Number of days of the workshop was very short.
- ✓ Need one full week

(6) Are you satisfied with the venue of the meeting?

1: Very satisfied	5 persons
2: Fairly satisfied	5 persons
3: Unknown	1 person
4: Fairly dissatisfied	
5: Very dissatisfied	
(no check)	1 person

Comments;

- ✓ JAXA and Roppoingi were superb
- ✓ Well selected

(7) Are you satisfied with preparations and arrangements before the meeting?

1: Very satisfied	7 persons
2: Fairly satisfied	4 persons
3: Unknown	
4: Fairly dissatisfied	1 person
5: Very dissatisfied	

Comments;

- ✓ Perfect
- ✓ Participants must be informed well in time for their presentation.

(8) What programmes do you think should be organized after this meeting?

- ✓ Training on Forest carbon monitoring
- ✓ Calculate carbon stock training to hot spot area
- ✓ RS theory and field training
- ✓ Standardization of methodology and system for monitoring and classification
- ✓ Supporting of the data source and methodology for carbon monitoring
- ✓ Performance to set up a technical support to setup a model for carbon monitoring or hand book for use in Asia and the Pacific.
- ✓ Continue update on the development of carbon monitoring through RS
- ✓ Organise specific training on RS for countries that being to use RS
- ✓ Carbon Biomass assessment
- ✓ Hands on exercise on RS/GS
- ✓ Field monitoring and assessment
- ✓ Forest monitoring analysis using ALOS data
- ✓ JAXA Kyoto and Carbon institute
- ✓ G map on Earth observation(GEO)

(9) Other suggestions or comments

- ✓ If possible, should be 4-day workshop
- ✓ To support for application
- ✓ To enquire more training for application of the updated technologies
- ✓ Country capacity development in carbon monitoring
- ✓ Can be more days
- ✓ We should wait till clear result for biomass collaboration with biodiversity and carbon monitoring are known

(10) How do you rate this meeting as a whole?

1: Very good	6 persons
2: Fairly good	5 persons
3: Moderate	1 person
4: Not very good	
5: Very bad	