UN-REDD FAO & Brazil's INPE:

Building Capacities for National Satellite Forest Monitoring

I. Executive Summary:

The UN-REDD Programme is the United Nations' collaborative initiative on Reducing Emissions from Deforestation and forest Degradation (REDD) in developing countries. The Programme was launched in 2008 and builds on the convening role and technical expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP). The UN-REDD Programme supports nationally-led REDD+ processes and promotes the informed and meaningful involvement of all stakeholders, including Indigenous Peoples and other forest-dependent communities, in national and international REDD+ implementation.

Several components of UN-REDD involve elements of South-South Cooperation (SSC). One such initiative is support to the "National Forest Monitoring Systems Based on Remote Sensing and Geographic Information System." Through this program, UN-REDD, FAO, and Brazil's National Institute for Space Research (INPE) are working side-by-side to support the set-up of national satellite monitoring systems to interested UN-REDD Programme countries. The concept grew out of a 2009 Memorandum of Understanding (MOU) signed between FAO and INPE, and recent capacity-building activities include a series of training sessions lead by INPE and FAO experts and attended by representatives from Ecuador, Guyana, Mexico, Democratic Republic of the Congo (DRC), Vietnam, Papua New Guinea (PNG), Tanzania, and Zambia. After the centralized trainings, the FAO-UN-REDD Programme is responsible for the in-country implementation and operationalization of national satellite forest monitoring systems to ensure that these systems are adapted to accommodate the national circumstances and conditions.

II. Actors and Their Roles:

Recipient Entity	Basic Information	Role
Training participant countries (as of March 2012): • Ecuador • Guyana • Mexico • Democratic Republic of the Congo (DRC) • Tanzania • Zambia • Vietnam • Papua New Guinea (PNG)	*Sector*: Country delegations consisting of IT and forestry experts *Center of Operations:* Varied *Ownership:* National	Participate in INPE training sessions on the TerraAmazon technology and work with FAO/UN-REDD specialists on adaptation to national contexts and forest conditions Develop comprehensive national satellite forest monitoring systems in compliance with REDD+ requirements

Initiating Entity	Basic Information	Role
Food and Agriculture Organization of the United Nations (FAO) / UN-REDD Programme	*Sector:* International organization, environment, agriculture, forestry *Center of Operations:* Rome, Italy *Ownership:* Intergovernmental organization, 191 member nations, two associate members, and one member organization (European Union)	In-country implementation of national forest monitoring systems and the support of set-up of the TerraAmazon and web portal technology

Supporting Entity	Basic Information	Role
Brazil's National Institute for Space Research (INPE)	*Sector:* Public, scientific *Center of Operations:* São José dos Campos, Brazil *Ownership:* Brazilian Ministry of Science and Technology	Conduct training sessions with UN-REDD Programme partner countries on tropical forest monitoring and the Brazilian TerraAmazon technology

III. About the Initiative:

The implementation of REDD+ requires advanced methods for monitoring forest carbon stocks. Current measuring, reporting, and verification (MRV) systems in many countries are not sufficiently accurate—or simply non-existent—for evaluating forest carbon stocks as required for

REDD+ participation. For this reason, several countries are exploring techniques to design and implement operational forest monitoring systems in a cost-efficient way.

The TerraAmazon platform developed by Brazil's INPE provides one such example of a freely available package with remote sensing (RS) and GIS options, tools, and algorithms with the ability to be adapted according to country needs; moreover, INPE is fully committed to sharing its experience in large-scale monitoring of deforestation that can help provide accurate and transparent data to the general public.

To this end, UN-REDD (through its FAO representatives), is currently collaborating with INPE to provide training and implementation assistance on this successful forest monitoring technology, which was previously developed and deployed within Brazil. INPE's new Amazon training center (CRA) in Belém, Brazil, is responsible for hosting the centralized trainings on the Brazilian monitoring forest systems. These systems use TerraAmazon as the Brazilian software platform for estimating annual rates of deforestation (PRODES), detection of forest degradation (DEGRAD), selective logging activities (DETEX), and "near-real time" monitoring of forest cover in support of more effective forest control and enforcement activities (DETER). TerraAmazon, developed by INPE, integrates both geographical information systems (GIS) image processing and database management functionalities.

The Brazilian satellite monitoring system is the largest and most robust forest monitoring system in the world and has been providing official annual rates of gross deforestation to the Brazilian government since the late 1980s. Additionally, since 2004, the system has provided monthly data on forest cover changes in Amazonia to the government control and enforcement agency, allowing appropriate regulating bodies to take early measures to prevent further non-authorized deforestation activities.

Beginning with a training session in October 2010 (and continued through subsequent technical meetings and additional training sessions in 2011), these data and monitoring systems have been made available to various interested countries to enhance their forest monitoring for MRV technology. As freely available products, DETER, DETEX, DEGRAD, PRODES, and TerraClass are accessible free of charge, as is all available INPE RS data.

As set forth at the start of the initiative, the program aims to conduct technical trainings for representatives from 30 to 40 countries within two years.[1] While INPE is responsible for conducting trainings on the Brazilian technologies, FAO is charged with assisting in-country implementation (which will increase in the near future, as the program continues). Thus far, the program, which was conceived within the framework of a 2009 MOU signed between FAO and INPE, has achieved the following major milestones:

- development of a joint work programme between FAO and INPE during an April 2010 meeting;
- roll-out of a pilot training course in October 2010 for delegations from Ecuador, Guyana, and Mexico aimed at supporting these countries in setting up autonomous national MRV systems for monitoring of deforestation and forest degradation;

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[1] Source: http://www.un-redd.org/Newsletter8_UNREDD_and_INPE/tabid/4543/language/en-US/Default.aspx.

- a follow-up technical meeting in May 2011 during which INPE and FAO trainers defined next steps to support interested UN-REDD Programme countries in the set-up of their autonomous national forest monitoring systems;
- a second training course held at INPE's CRA training center in Belém, Brazil, in September 2011 and attended by delegations from DRC, Vietnam, and PNG; and
- a third training course held at INPE's CRA training center in Belém, Brazil, in March 2012 and attended by delegations from Tanzania and Zambia.

The "South-South Cooperation Components" section of this case study contains further details on each of these project stages as well as future plans to expand the initiative to provide in-country implementation assistance for UN-REDD Programme partner countries.

IV. Financial Arrangements:

The "Forest Monitoring Systems Based on Remote Sensing and Geographic Information System Techniques" initiative is funded by the global UN-REDD Programme budget at FAO, while travel costs are paid for by the UN-REDD National Programmes.

V. South-South Cooperation Components:

Memorandum of Understanding (MOU)
Signed in December 2009, the MOU between FAO and INPE calls for joint action by the two agencies to help establish technological systems and build capacity in UN-REDD Programme partner countries. INPE is willing to share its experience with its Brazilian satellite monitoring system. This technology provides data vital for measuring and reporting on national forests and hence can help to create accurate and comprehensive national forest MRV systems, as required for participation in REDD+. Meanwhile, FAO works to link these scientific trainings with efforts of the country governments.

Pilot Training Course: Ecuador, Guyana, and Mexico
The first training course, held in October 2010 at INPE's headquarters in São José dos Campos, Brazil, focused on the applicability in UN-REDD Programme partner countries of the Brazilian satellite forest monitoring system, TerraAmazon. Trainers from the UN-REDD Programme (through FAO), and REDD+ country delegations from Ecuador, Guyana, and Mexico participated. The goal of the collaboration in this capacity-building effort was to train technical forestry and IT experts to use the TerraAmazon system, adapt it to individual country needs, and ultimately enhance existing national forest monitoring systems.

Second Training Course: DRC, Vietnam, and PNG
The second training programme, which took place in September 2011, set forth a targeted training program for country-level technical experts from DRC, Vietnam, and PNG. Country delegations to the training included computer science experts as well as GIS forestry specialists from national government institutions responsible for the implementation of REDD+ and/or national forest monitoring.

The first part of the training incorporated hands-on exercises using the Brazilian monitoring projects and data. The second part of the training focused on the application of forest monitoring techniques and image processing in home country contexts. The training included practical exercises using a standardized set of Brazilian satellite data as well as respective country-specific data and imagery.

The course aimed to improve baseline knowledge of RS and information technology and modeling techniques for a satellite-based forest monitoring system. The curriculum also included assessment of historical forest cover changes within respective home countries. This dual discussion of Brazilian technologies alongside analysis of country-specific contexts was particularly valuable for enhancing capacity to apply the technologies to a variety of regions and settings. A follow-up meeting with these countries was held in November in FAO headquarters in Rome.

In-Country Implementation Assistance for UN-REDD Programme Partner Countries
With the ultimate aim of implementing national MRV programs within participant countries, the trainings provide the opportunity among REDD+ countries to set up autonomous satellite forest monitoring systems that will also be valuable as a tool to report greenhouse gas emissions following the Intergovernmental Panel on Climate Change (IPCC) Guidelines and Guidance.

In that context, FAO, UN-REDD, and INPE worked with DRC and PNG to launch their national forest monitoring systems in December 2011 at COP17 in Durban. The portals allow all end-users to follow and have open access to available forest data, updated frequently to represent national forest conditions within each country. The use of RS data allows a high frequency of data availability as well as the possibility for wall-to-wall monitoring of the forests in both DRC and PNG. Additionally, the use of National Forest Inventory data augments the RS data in order to fulfill the reporting requirements of the UNFCCC.

Starting in 2012, FAO has been working on the set-up and support of the national satellite monitoring systems of Vietnam, Paraguay, and Zambia as well. The ultimate goal of all these joint efforts is to build up the autonomous capacity of REDD+ countries to monitor their forest-related land cover, generating annual data on deforestation, forest degradation, and forest conversions. This will allow each country to produce national and sub-national forest related change matrices, at the level of each land-use change subcategory that will provide activity data on changes in the use of land in units of area per year.

VI. Lessons Learned and Conclusion:

The joint collaboration with INPE for the capacity building has shown that capacity building in most of the REDD+ countries is lacking and in need of a, coordinated, in-depth effort amongst the multiple initiatives ongoing in the countries. Both the transfer of technical skills as well as the introduction of the national forest monitoring systems for REDD+ are a major challenge. FAO and INPE show that by using a freely available platform, namely TerraAmazon, which can be tailored to country conditions, REDD+ countries can get into Phase 2 for the national MRV

systems. A major emphasis is the capacity building, in order to make sure that the country becomes autonomous in monitoring its forests for REDD+.

VIII. Project Contacts:

Initiating Entity	Contact	
Food and Agriculture Organization of the United Nations (FAO) / UN-REDD Programme	**INGE JONCKHEERE**	Inge.jonckheere@fao.org

Supporting Entity	Contact	
Brazil's National Institute for Space Research (INPE)	**ALESSANDRA GOMES**	Alessandra.gomes@inpe.br

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Alessandra Gomes, Chefe Substituta, INPE

Inge Jonckheere, PhD, UN-REDD Programme, FAO of the United Nations

Orlena Scoville, South-South Cooperation Intern, Interagency & Country-level Coordination Unit, Division of Regional Cooperation, UNEP

United Nations Environment Programme, Division of Regional Cooperation, UN Reform & South-South Cooperation, P.O. Box 47074, Nairobi, Kenya