
# 2nd THEME TEAM MEETING OF THE INTEGRATED GLOBAL OBSERVATIONS OF THE LAND (IGOL)

**USGS, Reston, Virginia**

**20-22 July 2005**

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## Welcome and Introductions

The Chairman welcomed the participants to the 2nd meeting of the IGOL Theme Team, and provided a brief background on IGOL, previous decisions, and processes for advancing the finalisation of the IGOL Report.

Participants introduced themselves.

The Chairman made special note of the absence of the two participants from China, who were unable to obtain visas. The Chairman would contact the Chinese to discuss their input, consider travelling to China to meet with them personally, and offer the option of convening the next IGOL meeting in China.

**Participants:** John Townshend (GOFC-GOLD, GTOS), John Latham (GTOS) (Co-chairs), Olivier Arino (ESA), Roberta Balstad (CIESEN), Richard Conant (ColoState), Chris Elvidge (NOAA), Jay Feuquay (USGS), Driss El Hadani (CRTS), Angas Hopkins (FAO), Chris Justice (GOFC/GOLD), Tom Loveland (USGS), Martha Maiden (NASA), Doug Muchoney (USGS), Dennis Ojima (IGBP), Francesco Palazzo (ESA), Christina Schmullius (GOFC/GOLD), Asbindu Singh (UNEP), Hirokazu Yamamoto (JAXA).

**Apologies:** Alan Belward (GCOS), Cristina Boelcke (UNEP), Andy Friedland (Dartmouth College), Tony Janetos (Heinz Center), Jiyuan Liu (CAS), Mengxue Li (NRSCC), Robert Missotten (UNESCO), Kalemani Mulongoy (CBD), Ian Noble (World Bank), Jeff Tschirley (FAO), Dan Tunstall (WRI), Gordon Young (UNESCO).

## Agenda

The draft Agenda (Version 0.2), as circulated, was discussed. John Townshend indicated a willingness to amend the Agenda as necessary during the course of the meeting if it was clear that some changes were necessary in order to achieve the objectives of the meeting. The Agenda was adopted.

## Objectives of the meeting

The focus of the 2nd meeting was to identify key deficiencies of the current version of the report and enhancements that are needed. In addition national and international remote sensing plans and related programmes were presented focusing on operational capabilities and how research missions can contribute to operational capability.

Agreed outcomes of the meeting were:

- agreement on the structure of the Report;
- agreement on the scope of the Report;
- to identifying gaps in the existing content, and approaches to filling those gaps;
- to concentrate on observational enhancements that might be required;
- to agree on the next stages (including tasks and timetable) to ensure completion of the report.

## Proposed timetable for completing the report

The Chairman outlined key events that should be noted in deciding on the process for completing the Report:

- proposed 3rd meeting of the Theme Team in Beijing, December 2005;
- progress report to IGOS-bis in London, November 2005;
- planned submission of final Report in February 2006;
- consideration and approval of the final Report by IGOS-P at the meeting in Geneva, May 2006.

Participants raised questions about input to the forthcoming UNFCC COP meeting in Montreal in November/December 2005, and the issue of what happens beyond May 2006 in relation to implementation. It was suggested that it may be valuable to identify short- to mid-term priorities in the IGOL Report, noting that GEOSS had identified 2 year, 5 year and 10 year goals in its Implementation Plan. Questions about the inter-relationships with GEOSS were also raised, leading to a brief report of discussions at the IGOS-P_12 meeting in Geneva.

## Introductory comments by participants

All participants provided initial comments on the present draft Report and related issues. These comments include:

- dealing with the issue of overlap with existing Themes, it is suggested that those other Themes should be asked to review their Reports and pick up gaps identified through the IGOL process eg. IGWCO should pick up the issues of water availability and water use on land, meeting the needs of IGOL, rather than having water covered in detail as a subtheme in the IGOL report, Carbon Theme should pick up carbon issues on land etc.
- the final Report should be a relatively small document with a few key recommendations on key enhancements rather than being a comprehensive Report. It should cover a smaller (rather than larger) number of topic areas. IGOL should focus on global scale observation and reporting.
- on issues of scale, the other things to consider are volume of data and cost (cost of purchase of data and costs of processing). It is important to focus on fundamental questions, while remaining flexible and able to respond to emerging issues.
- there is also the need to maintain flexibility in the design of an observing system to cater for new technologies and methodologies, availability of new data sets etc.
- IGOL should highlight observations and capabilities that we need now and into the future. Consideration should be given to using the Report to build awareness of future capabilities and options.
- the most strategic piece of advice would be to identify what is needed for the next satellite (or satellites).
- the filtering process described previously should be used to ensure that observations of the desired scale and significance are presented in the Report.
- an aspirational goal in preparing the Report would be to see a better coordinated group of people and institutions working on land observation issues in 5-10 years time.

- input of users to the design of the Report is critical. The report should include recommendations that will help stakeholders/ users achieve their goals.
- question of how IGOL can influence actual outcomes must be considered. It was suggested that there needs to be a clearly defined from data collections through to development of information products to answer specific questions, to address defined targets.
- concern about the suggested use of watersheds (catchments) as a suitable land management unit for analysis and development of information products.
- a key issue is to understand the audience for the Report, and to tailor it to that audience. The Report needs to be appealing to this audience. A key part of the audience is the space agencies eg. for planning future missions, work programmes. One suggestion is to address the question, why do we look at land?
- desirable to have a consistent approach throughout the Report. One suggestion is to use the sequence of topic or question, requirement, measurement, issue of scale through to observations, responses and feedbacks.
- the potential of models to improve the interpretation of data, and to provide the opportunity to test implementation options should be highlighted in the Report.
- disasters relevant to the land theme, and early warning systems should be included.
- there are clear synergies between biodiversity, land use and land cover change.
- important issues for inclusion are cities/ urban development, agricultural production (food security), and climate/ climate change.
- issues of space and time scales must be addressed, noting that products at a global scale are rarely optimal at a local scale; spatial resolution should be specified at an early stage.
- cross-linkages with other themes must be identified and addressed eg Water Cycle Theme for water use, Geohazards Theme for disasters and early warning systems.
- there is a pressing need to enhance data acquisition facilities and networks.
- there is an opportunity for IGOL to contribute to the implementation of GEOSS; implementation actions will be a key to this engagement. A goal should be to define an implementation strategy for the next 3-5 years.
- integration of in situ observations & data needs more emphasis. The issue of dealing with in situ data poses some real challenges; there are also opportunities to engage stakeholders and users.
- the key question is, how will IGOL actually influence outcomes? A roadmap illustrating the route from data collections through to development of information products to answer specific questions, to address defined targets was suggested.
- the Report will have a life of 3 years, so there is the opportunity to build on the work of the first report in subsequent iterations, picking up some of the gaps.
- the Report should make recommendations for handling data of all kinds, recommendations and suggestions can be insinuated throughout the report, and cover a wide range of activities and processes.
- it is often difficult to be specific about the types of remotely sensed data are needed.
- the Report should show a consolidated table of observational requirements for land to obviate the need for users to comb through all the reports.

- different countries/ nations have different attitudes towards land and land-related data eg. European countries (with a long history of land use) don't seem to appreciate why more land mapping will help. Also, there are political issues to be considered.

## Presentations

A CD-ROM with all the presentations from the meeting can be requested from the GTOS Secretariat (GTOS@fao.org).

Presentations given at the meeting were in 2 main topic areas:

1. Presentations on the IGOS theme process, options and issues by John Townshend, John Latham, Angas Hopkins.
2. New approaches to use of data and information products by Ashbindu Singh, Martha Maiden, Dennis Okima and Doug Muchoney.
3. Capacity building by Driss El Hadani.

## Scope of the IGOL Report

A substantial proportion of the time of the meeting was devoted to discussions about the scope of the IGOL Report, and how potentially wide ranging the material could be presented succinctly. The conundrum is that the land theme potentially covers a very wide scope, yet there is a strong desire for the report to be brief, and with just a few priority/ key recommendations for enhancements.

The outcome of the discussions is that the report will deal strategically with the range of requirements, but will look to identify a just the highest priority enhancements. Agricultural production (including forestry, food security), aspects of water consumption and drought and land degradation (with soils) will be included along with the existing subthemes. Socio-economic variables are also being included: they are being incorporated in other sections where relevant, as well as appearing in a brief explanatory section for context.

There was a conscious effort to align the Subthemes with the GEOSS Societal Benefit Areas so as to make subsequent matching easier.

A revised Table of Contents was developed and circulated at the end of the meeting. The revised ToC is:

**IGOL REPORT Proposed Revised Structure**

**1. INTRODUCTION /EXECUTIVE SUMMARY**

**2. THE NEED FOR IGOL**

AGRICULTURE and FORESTRY AND COMBATING

DESERTIFICATION

Food Security And Sustainable Development

Sustainable Forestry

Land Degradation

ECOSYSTEMS

Ecosystem Goods and Services

BIODIVERSITY

Biodiversity and Conservation

HUMAN HEALTH

Impact of land properties on vectors

WATER RESOURCE MANAGEMENT

Consumption

DISASTERS

Fires, floods, droughts

Early Warning Systems (include in every section as relevant and in DIS section at end )

CLIMATE

WEATHER

ENERGY *Fuelwood and Biomass Ag/*Wind

URBANIZATION AND INFRASTRUCTURE

## 3. STAKEHOLDERS/USERS/ APPLICATIONS FOR LAND OBSERVATIONS

3.1. INTERNATIONAL REQUIREMENTS

3.2. CONVENTIONS
3.3. GOVERNMENTS (Arino to write)
3.3. DECISION-MAKERS

3.4. NATURAL RESOURCE MANAGERS

3.6. CIVIL SOCIETY (NGO'S INCLUDED HERE)
3.7. EVOLVING SCIENTIFIC REQUIREMENTS.

## 4. RELATION OF IGOL TO OTHER IGOS THEMES (PUT IN INTRO OR IN A BOX)

## 5. MAIN SETS OF PRODUCTS AND OBSERVABLES NEEDED.

Each section will contain:

i) statement of requirements based on sections 2 and 3
ii) current remote sensing capabilities and needed enhancements
iii) current in situ capabilities and needed enhancements
iv) current capabilities for socio-economic variables (census etc) and needed enhancements

5.1. LAND COVER, LAND COVER CHANGE (INCLUDES fires)

5.2. LAND USE, LAND USE CHANGE

5.3 BIOPHYSICAL PROPERTIES (may fit better under ecosystems goods and services)
BIOMASS, 3-D STRUCTURE, etc

5.4 AGRICULTURE/Forestry AND FOOD and Fibre PRODUCTION

5.5. LAND DEGRADATION AND SOILS

5.6 ECOSYSTEMS GOODS AND SERVICES (states and fluxes coud be used to deal with this efficiently)
BIODIVERSITY.

5.7 SOCIO-ECONOMIC VARIABLES
Human settlement and infrastructure

Tenure

Farming systems

5.8 WATER AVAILABILITY AND USE WEATHER (to the extent missing from other docs)

5.9 CLIMATE AND WEATHER (to the extent missing from other docs)

5.10 TOPOGRAPHY

Each enhancement will be considered under a standard classification of technical improvements, continuity improvements, accessibility and usability improvements.

## 6. INTEGRATION ISSUES

6.1 VALIDATION AND QUALITY ASSESSMENT

6.2 DATA MODEL FUSION REQUIREMENTS

6.3 DATA ASSIMILATION

6.3 SCALE (Space and time

6.4 TIMING OF OBSERVATIONS (SOCIO-ECONOMIC IN RELATION TO OTHER PHENOMENA)

## 7. DELIVERING INFORMATION

7.1 DATA AND PRODUCT ACCESS

7 .2 DATA AND INFORMATION DELIVERY SYSTEMS

REAL TIME AND NEAR REAL TIME SYSTEMS (Not a blanket requirement – needs specific examples with information on end to end use)

## 8. IMPLEMENTATION

8.1 STRATEGY

8.2 ROLES AND RESPONSIBILITY

Some additional points arising in discussion were:

- the need to have a section on information/delivery systems;
- look carefully at climate and weather to see whether existing Reports meet needs, and identify thos additional needs e.g. for drought reporting;

- the question was raised on who fills all the gaps in land observations, and how is the process to be organized?
- Text boxes and story boxes should be used throughout the text to explicate particular issues without interrupting the flow of the main text.
- The style of writing in the Geohazards Report is very readable, and should be considered as a model for the IGOL Report. It might be necessary to get in a specialist writer/ editor for a final draft. (John Townshend to contact Stuart Marsh about this.)
- In relation to issues of scale (space & time), it should be noted that there are play-offs between these two dimensions. How does the Theme Team identify the user needs in relation to these dimensions and respond? Should IGOL dictate a view based on the collective wisdom of the Theme Team, with some user input?
- The section on validation may draw on an existing report by Martin Herold and Christina Schmullius.
- The Report needs information on the intensification of in situ observations.

## Stakeholders and other users

There was a discussion on stakeholders and other users, and how their needs might be adequately identified and met through IGOL. The UN organisations and Conventions are clearly a major group of stakeholders. Nations who are signatories to relevant conventions also have requirements to report to the Convention COPs, and so could be considered users. NGOs also have an important role to play, and contribute to raising public awareness based on available information, so can be considered as an important group of users.

It is important to identify all the relevant stakeholders/ users, and make it clear in the Report how they would benefit from the implementation of IGOL.

## Improvements identified

The meeting participants all provided a response to the questions:

1. What are the key improvements needed for remote sensing observations? (Categorise in terms of technical, continuity and availability challenges that need to be overcome)
2. What are the key improvements needed for in situ observations? (ditto)
3. What are the key improvements needed in information systems?
4. What are other key improvements eg. capacity, understanding, training, networking etc

Chris Justice. 1. Need for high resolution data. Need 8 day coverage for agricultural condition. For post-fire assessment, need 2-4 day response time. Issue of continuity. Issue of moving high resolution data provision into an implementation/ operational mode. Issue of data access – the real issue is the cost.

2. Fire. Need 1 hour fire detection with good geospatial resolution. There is a need for these data for Asia especially Japan, China, Korea. Also need global data networks, mechanisms to facilitate access to data.

3. Operationalising global multi-year observations. Also a key validation issue.

4. capacity to observe soil moisture, reservoir height, river discharge

Olivier Arino 1. Continuity from Landsat, need systematic weekly (to compensate for cloud cover) acquisition of scenes, that can then be referenced back to archive data. Need to go to 10m resolution to meet requirements for reporting for Kyoto.

2. Vegetation dynamics (coupled with continuity of medium resolution data – though this need is reduced if there is coverage with high resolution data).

3. Need for multi-spectral data and the development of ortho-rectified products.

4. Issue of useability – the desirability of involving users in validation and product development.

Dris El Hadani 1.[Improved] use of existing observations, move towards 1m resolution data, interoperability of data sets,

2. Need increased coverage and density of in situ observations

3. Need increased capacity for planning acquisitions – it is difficult at present to know what is available, and what will become available in and what timeframe.

4. Increased hyperspectral measurements, continuity, integration especially remotely sensed observations with in situ measurements .

Tom Loveland 1. liberalizing data access policies including timelines, cost structures need improvement – prohibitive for high resolution data

3. Validation strategies

4. More effective consideration of land use.

Ashbindu Singh 1. Continuity of 20-30m data, orthorectification.

2. More investment in in-situ data, including land use, land cover, water quality, air quality, urban waste

3. Timeliness, easy access eg suggest similar techniques to that used for Google Map, need for 3D visualization tools

4. Investment in capacity building especially in developing countries, and to improve linkages between technical people and policy makers.

Dennis Ojima 1. Meshing remotely sensed data with in situ data (suggest modeling may provide the tools).

2. Land cover, land use, getting more information on biophysical parameters associated with each land cover class eg. detailed vegetation structure & composition.

3. Scalars, to mix & match high resolution data & temporal resolution eg. geostationary satellite data.

4. Estimates of uncertainty.

Jan Feuguay 1. Continuity of observations.

2. Reducing the cost of access to space.

3, data policy. There is a need to develop strong arguments re improved access and lower costs eg. transparency, economic benefits.

4. Better/ earlier integration of in situ observations – it is a 2-way process. Also the potential to access all data via a single entry popint.

Richard Conant 1. Continuity and on-going use of existing data, improved data access

2. SOTER database needs to be completed.

John Latham 1. Continuity, consistency, validation, harmonization of products with a common classification system to facilitate easy understanding and presentation of products; need global coverage of land cover at 1:250,000 or better; need accurate mapping of land degradation; soils (to 1:500,000 to 1:250,000) (also complete the soils database and LADA); fresh water resources at 1:1,000,000; irrigated areas, fluxes of small waterbodies; population distribution; disaggregated pixel-level data on socio-economic parameters; drought & drought early warning system down to the enterprise level; crop area & yield.

2. In situ observations on livestock, fuelwood supply (and use?), biomass estimates.

Angas Hopkins 2. In situ - global and regional networks are not fully integated, and the range of observations is very limited. Propose trebling number of sites, developing a system or system of systems, and developing standardized methodologies. Not that many countries have rangeland in situ sites that are not part of any regional or global system.

Hirokazu Yamamoto 1. Corrections for interference caused by aerosol in the atmosphere eg. smoke from Russia and China in 2003.Methodologies for compositing eg. for use using SAR data in areas with high cloud cover. Need to collaborate with developing countries.

2. Important to improve in situ observations, but there are problems of data quality. Also the issue of scaling-up site data to scales similar to those used for satellite observations.

3. Integration of various data sets.

Chris Elvidge 1. Prefer higher resolution data for night lights. 3-5μ band for fires, need to be able to deal with overglow – the halo of light surrounding a large city. Some work shows that use of moderate resolution data is feasible, though there are some technical problems. Need annual coverage cloud free.

2. Need on-ground data defining the boundaries of urban centres, quantification of sparce development plus population distribution, living conditions

Christina Schmullius 1. Need to have good GIS data layers and capacity for areas where changes are occurring, and ready access to historical (archived) data sets to identify the changes; desirability of having access to federal datasets including land use, land tenure eg. to differentiate legal from illegal logging; vegetation structure (height & density), soil moisture

2. More stations (including for meteorological observations), preferablky linked with observations of soil moisture, vegetation structure, phenology, need to address funding issues in US, also to increase public participation/ engagement.

3. Issues of Landsat continuity, continuity of radar data.

4. Developing multi-scale monitoring approaches; public engagement, training in the use of radar sensing techniques, data on water bodies including thaw, ice bodies (noting overlap with cryosphere theme); integrated information systems eg. as used for the Athens Olympics.

Roberta Balstad 1. Socio-economic data/ observations should be integrated into all relevant areas of the Report, with a section explaining why it is important to have socio-economic observations eg. adds meaning, human dimension to all areas of observations; noting tha approach, quality of data may differ from one region to another, difference in sources, methodologies, timing of observations. Categories of socio-economic data include:

- human settlements & infrastructure, ?patterns of human settlement outside cities;
- population, population density, households, household density;

- rates of increase in settlements/ urbanisation (?5-yearly, maybe more over hotspots);
- need for improved roads database, civil infrastructure, dams, irrigation systems/ technologies;
- administrative boundaries (socio-economic data collected this way), legal arrangements associated with these administrative boundaries;
- land tenure.

There will be a workshop on socio-economic data at global scales on 21-23 September 2005

A brief discussion followed, in which the following additional points were raised:

- It might be possible to use a risk/ vulnerability assessment approach to identify the priority socio-economic data sets required.
- There are technical issues associated with the use of socio-economic data, especially with pixcellation; and this raises the question of their usefulness as provide at present
- There are human rights issues that may need to be addressed eg. appropriation of indigenous lands in some less developed countries.

## Information systems

Following a presentation on this topic by Marttha Maiden, the ensuing discussion included the following points:

- There is a need for network services and transformations that can perform functions easily, that are easily accessible eg. for matching datasets etc generally an issue of data quality, data access and data policy.
- There should be systems or arrangements that allow individuals and institutions to share algorithms, models, source code easily.
- (Martha to circulate NASA Guidelines)
- There would be merit in having a single shopfront to facilitate data acquisition eg. middleward ECHO clearing house
- There are still issues wrt disparity in data structures that need standardization.
- Sugest perhaps a may or flow chart of how the IGOL system as a whole might work, who does what, contact details etc, to make the system more accessible to others wanting access to data etc.

## Information and modelling

There was a brief presentation on this topic by Dennis Ojima. Models have a central role in systems such as IGOL, and this will increase in importance in the future, for:

- Operational applications;
- Science applications; and
- Communication,.

There are critical and limiting issues of uncertainty for error estimates of data sets.

## Research priorities

The discussion on research priorities highlighted the following points:

- the potential for using harmonization schemes to look at ecosystems, ecosystem goods & services and delivery of these Goods and services;
- drivers of land ue change, and the use of socio-economic data to facilitate the development of projections;
- issueof what happens when global data sets are used in modeling;
- question of resolution of data sets  land use change at a global scale – may be a particular problem with weather observations;
- question of lack of error estimates  of field data sets (?in situ);

## Concluding points

Ashbindu Singh stressed the point that capacity building is critical, and suggested that the IGOL Report should place priority on capacity building amongst decision-makers, especially those at the highest levels.  It might be possible to do this via GEOSS, but there are very few of the developing countries involved in this programme.

Chris Justice reiterated the point that the Report should highlight the priority enhancements needed, and suggested that one should be support for regional networks.

Other participants suggested that key outcomes of IGOL should include improved networking and communication, and the issue of improved marketing f the information products provided by observation systems should be highlighted.

It might be possible to sell the IGOL concept on information needs stemming from drought, food security.

There is a need for improved data gathering tools for in situ data/ observations.

Cooperative projects between space agencies, international and national organizations as a memans of promoting the benefits of IGOL and ensuing systems, providing training for local people (as an inducement) – arrangements resulting in incubators of local expertise.

John Latham provided a concluding presentation which highlighted the need for implementation outreach as a matter of urgency; the need to address isssues of data custodianship, long-term oversight, data management (including archival), quality control, coordination; and considering IGOL as a dynamic entity rather than as a static Report.

The Chairman thanked the participants for their contributions and indicated that he looked forward to continuing involvement.