

Summary report of the GOFC-GOLD Land Cover Implementation Team

on the GOFC-GOLD LC-IT workshop Boston, January 9-12, 2012

and the GOFC-GOLD LC-IT side-meeting of the Sentinel 2 Preparatory Symposium Frascati, April 23-27, 2012

Brice Mora, Martin Herold and Curtis Woodcock

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Global Observation of Forest Cover and Land Dynamics (GOFC-GOLD) is a coordinated international effort to ensure a continuous program of space-based and in situ forest and other land cover observations to better understand global change, to support international assessments and environmental treaties and to contribute to natural resources management. GOFC-GOLD encourages countries to increase their ability to measure and track forest and land cover dynamics by promoting and supporting participation on implementation teams and in regional networks. Through these forums, data users and providers share information to improve understanding of user requirements and product quality. GOFC-GOLD is a Panel of the Global Terrestrial Observing System (GTOS), sponsored by FAO, UNESCO, WMO, ICSU and UNEP. The GOFC-GOLD Secretariat is hosted by Canada and supported by the Canadian Space Agency and Natural Resources Canada. Other contributing agencies include NASA, ESA, START and JRC. Further information can be obtained at http://www.fao.org/gtos/gofc-gold/index.html.

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Table of Acronyms

CCI Climate Change Initiative

CEOS Committee on Earth Observation Satellites

ECV Essential Climate Variable
EEA European Environment Agency
ESA European Space Agency

FAO Food and Agriculture Organization FSU Friedrich Schiller University GEO Group on Earth Observation

GFOI Global Forest Observation Initiative

GLCN Global Land Cover Network

GMES Global Monitoring for Environment and Security

GOFC-GOLD Global Observation of Forest Cover and Global Observation of Land Dynamics

GSE GMES Service Element

GTOS Global Terrestrial Observing System ICSU International Council for Science

JRC Joint Research Centre

LC-IT Land Cover Implementation Team

NASA National Aeronautics and Space Administration

PO Project Office

REDD Reducing Emissions from Deforestation and forest Degradation

UNCBD United Nations Convention on Biological Diversity
UNCCD United Nations Convention to Combat Desertification

UNCED United Nations Conference on Environment and Development

UNEP United Nations Environment Programme

UNESCO United Nations Educational, Scientific and Cultural Organization

USGS United States Geological Service VHSR Very High Spatial Resolution WMO World Meteorological Service

1. Background

The GOFC-GOLD Land Cover Project Office (LC-PO) plays an important role in the improvement of global and regional LC observations that are crucial to the understanding of climate change and its impacts to sustainable development, natural resources management, conservation, biodiversity and understanding of ecosystems and biogeochemical cycling. There is a strong push from international conventions, treaties, and implementation guidelines like the UN's Conference on Environment and Development (UNCED) Agenda 21, several UN conventions (UNFCCC, UNCBD, UNCCD), the Group of Earth Observations (GEO), the Global Monitoring for Environment and Security (GMES) initiative, and the UN Global Observing Systems implementation activities (GCOS, GTOS, GLCN) for sustained, harmonized, and validated land observation products. GOFC-GOLD as a technical panel of the Global Terrestrial Observing System (GTOS) provides the platform for international communication and cooperation for actors involved in global Earth Observation including data producers (e.g. space agencies, land cover facilities), the scientific community and data users (FAO, UNEP, EEA, global climate and modelling community etc.). These activities improve the value of current and future LC datasets for a multitude of applications and contribute to the overall goal of operational observations of the land surface.

In 2004-2010 the ESA supported GOFC GOLD LC-PO that was hosted at the Friedrich Schiller University (FSU) Jena (under GOFC-GOLD land cover team co-chair Prof. Christiane Schmullius). This effort was able to successfully fulfil the requirements and challenges posed by the international community and ESA as contracting agency. The PO is now an established international focal point for global and regional land cover observations, and is a key actor of GOFC-GOLD implementation for global monitoring and, in part, on the European level. Contributions were made to on-going ESA projects and programs such as GLOBCOVER, GLOBCARBON, and GSE Forest Monitoring, for evolving standards in land characterization and validation, and in capacity building, user involvement and awareness raising. Many activities in the first 6 years of operation have started in its implementation and will continue in the future and require some level of continuity in operating the ESA GOFC-GOLD LC team and the PO.

The fundamental approach of the newly established ESA GOFC-GOLD LC-PO is to continue the comprehensive efforts done over the last 6 years at FSU Jena. Based on this experience the GOFC-GOLD LC-PO now located at Wageningen University since February 2012, will operate for two consecutive years. The GOFC-GOLD LC-PO will continue and expand its dedicated work to manage and coordinate the execution of the GOFC-GOLD LC implementation plan, including communication and cooperation within the team and key actors and users in global land cover monitoring, including:

- Ensuring continuity and consistency of observations,
- Promoting harmonization, interoperability and synergy of land cover products,
- Developing validation standards and supporting their implementation, including making validation data sets and resources available,
- Improving adequacy and advocacy of land information products,
- Engaging regional networks and support capacity building,
- Sharing data, information, and knowledge.

To follow up two LC team meetings have been organized. The first workshop was organized in January at Boston University, and the second one in April at ESA-ESRIN (Frascati, Italy). Regular Land Cover Implementation Team (LC-IT) meetings are now possible in particular

since the ESA GOFC-GOLD Land Cover Project Office has been re-established. Information on GOFC-GOLD LC-PO activities are available at: http://www.gofcgold.wur.nl/.

2. GOFC-GOLD LC-IT Workshop in Boston

2.1. Background

The GOFC-GOLD LC-IT organized a workshop in Boston on January 9-12, 2012. The purpose of this workshop was to present and discuss the GOFC-GOLD LC-IT progress, current issues in various areas, and to define actions items for the team.

The topics of the workshop were:

- 1. General LC IT Business and Issues
- 2. Specifications for a LC Essential Climate Variable
- 3. New Working Group on global analysis of moderate resolution imagery (i.e. Landsat and Sentinel 2 resolutions)
- 4. GOFC-GOLD Global LC Validation Project
- 5. REDD and REDD Sourcebook

2.2. Participants

First Name	Last Name	Institution
Mark	Friedl	Boston U.
Chandra	Giri	USGS
Martin	Herold	Wageningen U., co-chair of the GOFC-GOLD LC-IT
Chris	Holden	Boston U.
Tom	Loveland	USGS
Brice	Mora	GOFC-GOLD LC Project Officer
Pontus	Olofsson	Boston U.
Devendra	Pandey	former Director General of Forest Survey of India
Joseph	Sexton	U. of Maryland
Stephen	Stehman	State U. of New York
Damien	Sulla-Menashe	Boston U.
Curtis	Woodcock	Boston U., co-chair of the GOFC-GOLD LC-IT
Zhe	Zhu	Boston U

2.3. Summary of outcomes

- GFOI activities:
 - o Request overall scientific leadership given GFOI objectives 2,3,4
 - Series of GEO FCT documents for GOFC-GOLD to take leadership to develop these documents
 - o Actions:

- Draft a letter to GEOSec requesting leadership
- ECV, 2 potential GOFC products/activities:
 - Synthesizing Requirements: GCOS, GTOS, etc. specific requirements from climate users (ESA-LC-CCI), GCOS needs table, Curtis, Tom
 - o Independent validation framework
- Global Landsat project:
 - o Role for GOFC-GOLD:
 - Standards and guidance, also for ECV's, advocating global (user) requirements
 - Synthesizing community consensus on processing requirements, addressing sources of errors, creating of quality layers, compositing and time-series analysis
 - Training data ... available national datasets
 - GOFC-GOLD validation framework
 - LDCM and S2 coordination
 - o Role for GEO:
 - Ongoing developments for global land cover tasks (USGS, GOFC)
 - More country involvement to be considered for Landsat-based assessments
- LC accuracy assessment
 - Special issue CEOS WGCV
 - o Best practices process, paper as first output
 - o Data for reference data interpretation
 - Digital Globe follow up data
 - NGA datasets pre-processing issues, and data policy
 - Orbview 3 USGS archive ...
- Anticipated agenda items for GOFC-GOLD LC side-meeting in Frascati:
 - GOFC-GOLD and GEO/GFOI
 - Land cover as ECV
 - o Global LC validation activities
 - o Global Landsat-type observations working group
 - o REDD Sourcebook
 - o Biomass WG

2.4. Summary of actions to take

The GOFC-GOLD LC-IT needs to clarify the role of the Office in the GEO / GFOI-related activities. This will be discussed during the next meeting in Frascati.

Regarding the LC ECV, synthesis of the requirements from climate users still needs to be done (ESA LC-CCI), and GCOS needs a table, notably (Curtis, Tom).

Progress is being made on the independent LC validation database. More photo-plots are being interpreted and the methods being employed get optimized (segmentation, classes in

legend, interpretation expertise). The online database will be designed this year (Curtis, Martin, Brice). A follow-up on user access to DigitalGlobe data is needed.

A paper is considered as first output on best practices for LC map accuracy assessment (Curtis, Pontus), and an update of the REDD Sourcebook will be made eventually (Martin, Curtis, Pontus).

The project to make existing LC validation datasets available to user community via the GOFC-GOLD LC-IT website has been decided (Martin, Brice, Nandika).

To aid on various LC-related issues, the Project Office proposed to associate to discussions Pr. Pierre Defourny from the Universite Catholique de Louvain and Pr. Jun Chen from the National Geomatics Center of China.

The organization of a GOFC-GOLD LC-IT meeting parallel to the Sentinel-2 Preparatory Symposium that will be organized in Frascati in April has been decided (Brice, Martin).

3. GOFC-GOLD LC-IT Meeting in Frascati

3.1. Background

The GOFC-GOLD LC-IT organized a side-meeting to the Sentinel-2 Preparatory Symposium in Frascati, on 22-27 April, 2012. The purpose of this meeting was to present, address and discuss the GOFC-GOLD LC-IT progress in various areas and activities to define a future action plan.

The specific objectives of the workshop were:

- 1. discuss the GOFC-GOLD role and contribution to GEO FCT / GFOI tasks and the one on global land cover
- 2. make progress on issues, and agree on actions to further joint efforts for monitoring Land Cover as ECV
- 3. discuss on global land cover validation activities, report on progress of validation data production, online database etc.
- 4. discuss on good practices for land cover change accuracy assessment
- 5. update for the REDD+ Sourcebook
- 6. report on Biomass WG activities

The workshop objectives are built on previous meetings of similar type and the related outcomes. See:

 $\underline{http://www.gofcgold.wur.nl/documents/newsletter/GOFCGOLD-LC_newsletter_no21.pdf}$

3.2. Agenda

GOFC-GOLD LC implementation team workshop			
Monday, 23	Monday, 23 April 2012		
SESSION 1			
15.00-16.00	Introduction, LC-IT activities	Herold, Woodcock 20 min talks	
16.00-17.00	Land Cover as ECV – intro and status	Herold 20 min talk	
17.00-17.30 Break			
17:30-18:30	Global LC validation – P.1	Woodcock 20 min talk	
18.30 Closing of first day			

Tuesday, 24 April 2012		
SESSION 2		
11.00-12.00	Global LC validation – P.2	Achard 20 min talk
12.00-12.30	Updates on Biomass WG	Schmullius 15 min talk
12.30-13.30 Break		
13.30-15.00	LC change accuracy assessment	Woodcock
15.00-16.00	REDD Sourcebook	Herold, DeFries (skype)
16.00-16.30 Break		
16.30-17.30	GEO global LC task	Herold
17.30-19.00	GFOI / GEO FCT	Rosenquist, Held, Woodcock, Herold
19.00 Closing of second day		

3.3. Participants

First Name	Last Name	Institution
Frédéric	Achard	European Commission - Joint Research Centre
Olivier	Arino	European Space Agency - ESRIN
Sergey	Bartalev	RAS Space Research Institute (IKI)
Pierre	Defourny	Université Catholique de Louvain
Ruth	DeFries	Columbia University (via Skype)
Garik	Gutman	NASA LCLUC
Alexander	Held	CSIRO
Martin	Herold	GOFC-GOLD LC Project Office, Wageningen University

Inge	Jonckheere	FAO UN-REDD Programme
Benjamin	Koetz	European Space Agency - ESRIN
Erik	Lindquist	FAO FRA
Brice	Mora	GOFC-GOLD LC Project Office, Wageningen University
Heather	Reese	Swedish University of Agricultural Sciences
Ake	Rosenqvist	Group on Earth Observations – Forest Carbon Task
Giovanni	Rum	Group on Earth Observations – Forest Carbon Task
Chris	Schmullius	Friedrich-Schiller University Jena
Frank-Martin	Seifert	European Space Agency
Chris	Steenmans	European Environment Agency
Curtis	Woodcock	Boston University
Mike	Wulder	Canadian Forest Service

3.4. Summary of outcomes

- GEO FCT requests:
 - o arrange through GOFC-GOLD input rather than individuals (Mike)
- INSPIRE LC definition and specifications doc (Steffen) to be circulated
- ECV GOFC-GOLD PO to follow up on joint activities
- GOFC-GOLD global LC validation initiative:
 - o Database of available LC validation datasets (GOFC PO)
 - Ongoing validation exercises:
 - 500+ sample of (BU lead)
 - LC CCI (JRC lead)
 - Need to look at synergies
- Check availability of USGS VHSR for CCI sites
- Opportunity to use RN meetings to submit problematic sample plots/segments for interpretation by attending experts
- Biomass user consultation meeting overlap with LULC science team meeting in India
- Scope and objectives of biomass WG to be better defined
- 15-19. April 2013 Book rooms for GOFC-GOLD LC symposium
- EEA, ESA for funding the LC symposium
- REDD Sourcebook discussions:
 - o Communication among core author team
 - o Idea: not evolve as manual
 - Update should be focused on areas of significant progress
 - Biomass mapping from EO data perhaps add new section a set of key experts
 - Update on evolving technologies section
 - Review of approaches for REDD readiness activities
 - Contact section authors for section review and suggest potential updates
 - Next release should list changes operated compared to previous version
 - Make document more interactive (add links to presentations...)

- FAO makes country-specific documents to help implementation of Sourcebook recommendations. Proposition to make handbooks to help implementation of different key points of the Sourcebook (LC, LC change, carbon estimation). Telcon on this topic before COP18 between Martin, Ruth, Sandra, and Frédéric is proposed.
- GEO LC task:
 - o Data access open
 - Validation and map data quality
 - Coordination meeting
 - Synthesis of on-going global surveys
 - o Investment of countries as global good
 - Many systems are useful
 - Survey of GEO members
 - Added value to GEO
- GEO FCT and GFOI activities
 - Satellite data coordination group
 - o GOFC-GOLD role:
 - Integrate on-going efforts as much as practicable in country interaction/capacity development efforts
 - Help in definition, review (synthesis) and execution of R&D plan clear plan to be developed based on key needs and approach it in a structured way
 - Engage in coordinated capacity development (training manuals) also involve FAO/UN-REDD, South/South cooperation, Silvacarbon link, GOFC-GOLD regional networks (Curtis)
 - Development of guidance documents
 - Advisory group to be set up (Giovanni to coordinate)
 - GOFC-GOLD can help
 - Build upon Sourcebook
 - GOFC-GOLD work should be further recognized

3.5. Summary of key actions to take

The decision to organize the next GOFC-GOLD LC-IT meeting on April 2013 on the campus of Wageningen University, Netherlands, has been taken. Details on the meeting will be provided via the Newsletter of the team. Continuous progress on the development of Boston U. / GOFC-GOLD LC validation database keeps being done with the interpretation of new photo plots (Curtis). GOFC-GOLD Regional networks could be contacted to aid the interpretation of the most problematic photo plots (Curtis, Brice). The design of the online database's architecture is about to be started (Brice, Boston U.) and the availability of VHSR data from USGS on the sample plot locations needs to be checked (GOFC-GOLD PO).

Update of some sections of the REDD Sourcebook will be considered, for the evolving technology section notably. In general, authors of the Sourcebook should be contacted to

review each section and propose potential updates. The REDD Sourcebook will be made more interactive with the inclusion of links to key presentations for example.

Regarding GEO / GFOI activities, the GOFC-GOLD LC-IT is decided to be further engaged in capacity building (training manuals) along with the FAO, and in the promotion of South-South cooperation with the support of the GOFC-GOLD Regional networks notably. GOFC-GOLD LC Office is contributing to the development of the guidance document on LC and LC change (GEO FCT Task). Significant progress on the redaction of the document is expected in the coming weeks. An advisory group is to be set up (Giovanni).

Increased advocacy of GOFC-GOLD LC-IT role and competencies has been stressed. Communication on the LC-IT activities needs to be further sought. The re-activation of the Project Office in February 2012 contributes to this task.