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2<sup>nd</sup> Expert workshop on  
lessons learned from Accuracy  
Assessments in the context of REDD+

Oslo, Norway

26-28. June 2017

DRAFT

Information and Agenda

20-Jun-17

Organized by:

Global Forest Observation Initiative (GFOI)  
Global Observations of Forest and Land Dynamics (GOFC-GOLD)  
Norwegian Space Center (NSC)

## Background

UNFCCC negotiations have identified the need to establish national forest monitoring systems that use an appropriate combination of remote sensing and ground-based forest carbon inventory approaches for estimating anthropogenic forest-related greenhouse gas emissions by sources, and removals by sinks to support REDD+ implementation and assessing performance in implementing REDD+ activities. Countries and jurisdictions have been advancing in the development of their Reference Levels in order to be able to measure performance of their REDD+ activities in the context of results based payments. In order to set their Reference Levels, countries have to generate forest cover change information in order to estimate activity data that would facilitate combination with Emission Factors and estimate (historical) emissions. In this context, countries are producing forest cover change estimates as well as maps and are validating these through accuracy assessments. The application of Olofsson et al. (2014) is commonly used in the design of these accuracy assessments. It is becoming more and more common to replace map estimates with estimates obtained using statistically unbiased estimators and data from the confusion matrices. However, the experience in the application of this procedure has revealed some challenges that are not covered with existing guidance, e.g. implications of very imprecise estimates as well as implications for monitoring.

The application of Olofsson et al. (2014) has identified multiple issues that require some additional guidance. In view of this, it is becoming timely but urgent to gather lessons learned and constraints, and to provide additional guidance. A dedicated expert meeting and technical workshop was held Monday 3 and Tuesday 4 April 2017 at FAO. The meeting brought together several experts and international partners to discuss assessments for map accuracy purposes versus assessments for unbiased estimation of areas and how the two different objectives can be addressed in country monitoring. Some summary notes of the meeting are provided in Annex A. The outcomes of the workshop resulted in a series of concrete activities to resolve practical issues in country accuracy assessment activities. It was also clear that, based on these experiences improved guidance can be provided through additional expert synthesis (workshops) while other issues require more experiences and additional research.

The GFOI R&D coordination component (lead by the GOF-C-GOLD land cover office, <http://www.gofcgold.wur.nl>) holds regular expert workshop with the aim to provide expert synthesis and guidance to countries through GFOI (see <http://www.gfoi.org/rd/>), the most recent one being the GFOI R&D and GOF-C-GOLD Science Meeting (The Hague, Netherlands, Oct. 31-Nov. 4, 2016, [http://www.gofcgold.wur.nl/sites/gofcgold-gfoi\\_sciencemeeting2016.php](http://www.gofcgold.wur.nl/sites/gofcgold-gfoi_sciencemeeting2016.php)). In the past, the GFOI R&D coordination and MGD Component have been successful in writing MGD modules to target issues that require better guidance to countries and examples pertaining to the development of national forest monitoring systems in tropical MRV systems. These modules have since been incorporated into MGD2 and include:

1. Inference for activity data (Section 5.1.5 in MGD2). A workshop was organized in Boston 2013 by Boston University that brought together authors (McRoberts, Næsset, Olofsson, Stehman, and others) of various estimation protocols for the purpose of estimating areas of activity data. The aim of the workshop was to provide guidance for estimation of activity data. The result of this effort was a decision tree with related text that guides practitioners through various decisions related to the nature of available maps and reference observations. It also generated a longer review of estimators and sampling designs of relevance for estimating activity data, which that is currently being prepared for submission to a scientific journal.

2. Inference for emissions factors (Section 5.2.5 in MGD2). A workshop was organized in Oslo 2014 by the Norwegian Space Centre to develop similar material as described above but for emissions factors. Göran Ståhl and Christoph Kleinn among others participated in addition to many of the authors of the activity data inference section. A decision tree and related text were the main outcomes of the workshop, which have been incorporated into MGD2.
3. The use global forest cover change maps (Section 4.1.7 in MGD2). Following the writing of MGD1 was the release of a global forest cover change map at 30 m spatial resolution by the Hansen lab at University of Maryland. SilvaCarbon identified a need for guidance on the use of this dataset in national forest monitoring systems. The new leadership of the GFOI R&D component by GOFC-GOLD organized a larger workshop in Wageningen in 2015 with the aim of providing tangible guidelines to be provided to the community. A five-page document outlining recommendations and guidelines was authored and published as a MGD module until incorporated into MGD2.

At the last GFOI plenary, several items have been discussed as key priorities for future R&D expert workshop. These topics include:

- Follow up from 3/4 April expert meeting: Sampling design, stratification options for area estimation, how to decrease uncertainty (country experiences/examples, new guidance, R&D gaps)
- 3/4 April expert meeting /The Hague meeting outcomes: Emission factor uncertainty (relation to total C-emissions) and uncertainty of the trend
- Assess the potential inconsistency in MGD2/The Hague meeting outcomes: Uncertainty estimation from “fully integrated tools” (wall-to-wall output such as maps of carbon emissions and removals) for Tier 3 reporting

It was decided (at the plenary) that the next workshop should focus on a direct follow up from 3/4 April expert meeting. The remaining topics are also very important and should be subject to future expert meetings.

## Objectives

Overall, we envision a similar workshop to previous ones to actively work on providing improved guidance on accuracy assessments in the context of REDD+. In particular, the workshop would aim to provide guidance to practitioners to meet the IPCC good practice criteria related to bias and uncertainty in estimates of activity data. More specifically we aim to:

- Discuss and present country examples and case studies for accuracy assessments
- Draw lessons learned and synthesize them into good practice for accuracy assessments
- Discuss how understanding of uncertainties can feed back into efforts for continuous improvements
- Scope a new MGD module capturing the new guidance
- Discuss additional related and follow-up issues for GFOI R&D synthesis (i.e. EFs) and contributions to 2019 methodological refinement of the IPCC GPG

## Sponsors

Norwegian International Climate and Forest Initiative (NICFI)  
Norwegian Space Center  
US Silvacarbon Program  
Global Forest Observations Initiative (GFOI) R&D component  
Center for International Forest Research (CIFOR)  
European Space Agency (ESA)  
Worldbank FCPF

## Local Organizing Committee Leaders

Evie Hagen (NSC)  
Martin Herold and Sarah Carter (GFOI, GOFC-GOLD)

## Logistics and venue

The meeting will be held at the **Best Western Karl Johan Hotel** (<http://www.karljohan.no/>)

The Best Western Karl Johan hotel is located at Oslo's main street and in the heart of the city, a historic hotel from 1899. The hotel is right next to the Parliament and within immediate walking distance to a variety of museums, attractions, shops, bars and restaurants.

## Travel and Accommodation

The Best Western Karl Johan hotel is less than a five-minute walk from the National Theater Station (down Karl Johan), where the Airport Express train stops. It is several ways (train, buses, taxis) to get from Oslo airport Gardermoen to Oslo City.

The recommended way to get to Oslo from Oslo airport Gardermoen, would be to take the airport express train ([www.flytoget.no](http://www.flytoget.no)) since this is both fast (ca 25 min), has a lot of departures (every 10-15 min), and are reasonably priced (NOK 180, -).

The Best Western Hotel is a partner hotel for the Norwegian Space Centre, and our guests do therefore get a small discount. For this meeting, we have reserved 15 rooms until the 1.st of June (can probably be a bit extended if needed).

### The prices are:

Single room is NOK 1195, -,

Standard double room; NOK 1395, -

Upgraded double room; NOK 1595, - (room with seating area and view towards Karl Johan street)

All the prices are per room, per night, and includes breakfast.

You can reserve your room and obtain these prices by e-mailing; [Bookingsjef@karljohan.no](mailto:Bookingsjef@karljohan.no), or call +47 23 16 17 00

Please mention when booking that you are attending a meeting hosted by "Norsk Romsenter/"The Norwegian Space Centre, or use the reference code; 1188371.

If you would like to stay at another hotel, [www.Booking.com](http://www.Booking.com) and/or [www.hotels.com](http://www.hotels.com) will provide you with a variety of nice hotels close to Karl Johan/ in the city center of Oslo.

# Agenda

Monday, 26. June 2017		
10:30 10:45 11:00	Opening and coffee Background and objectives Summary from first workshop on this topic: experiences: <ul style="list-style-type: none"> <li>• What has been agreed?</li> <li>• What requires further discussion at this workshop?</li> </ul>	NICFI Martin Herold Andres Espejo
12:30	Lunch break	
13:30  Coffee at ~15:30	Presentation of case studies and experiences: <ul style="list-style-type: none"> <li>• What are good practices for countries to assess the uncertainty of accuracy for area estimates /activity data – what are the lessons learned from your country examples?</li> <li>• How methodological advancements and new data can improve estimation (i.e. from Sentinels) and how should that effect the AA procedures? (~30 mins each)</li> </ul>	Henrik Fliflet FAO Andres Espejo Silvacarbon Christoph Sannier (also on behalf of Frank-Martin, ESA) Andres Espejo Kay Kallweit
17:30	Closing for the day	

Tuesday, 27. June 2017		
09:00  Coffee at ~10:30	Further discussions on case studies and experiences: <ul style="list-style-type: none"> <li>• What type of guidance can be provided with respect to operational methods/examples?</li> <li>• What issues remain open issue and require further discussions to develop solutions?</li> <li>• What issues cannot be solved because we lack basic R&amp;D? (~30 mins each)</li> </ul>	Erik Naeset Ronald McRoberts Pontus Olofsson Stephen Stehman
12:30	Lunch	
13:30  Coffee at ~15:30	Working groups on synthesizing and developing new guidance <ul style="list-style-type: none"> <li>• What new points need to be included in the guidance?</li> <li>• Is any current guidance obsolete?</li> </ul>	Discussion facilitated by MariaSanz Sanchez
19:00	Workshop dinner	

Wednesday, 28. June 2017

09:00	Working group discussions and presentations on scoping of new MGD module:	Discussion facilitated by Carly Green
Coffee at ~10:30	<ul style="list-style-type: none"><li>• What guidance is needed for the MGD?</li><li>• How can we formulate this?</li><li>• What new modules are required?</li></ul>	
12:30	Lunch	
13:30	Next steps:	Discussion facilitated by Martin Herold
Coffee at ~15:30	<ul style="list-style-type: none"><li>• Addressing additional issues which need further (i.e. uncertainties of trends?)</li><li>• Input to IPCC refinement</li><li>• Next expert workshops on uncertainties related to EFs and biomass estimates</li></ul>	
16:00	Closing of meeting	
16:30	End	

## Confirmed participants

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## Invitees (pending confirmation of attendance)

Name	Entity	Email
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# Annex 1: Summary notes from 3/4. April expert workshop

## Group 1 - How to reduce uncertainties cost-effectively, now (for RL)?

Lessons learned:

- Omission errors in large stable strata are the main source
- Lack of adequate SOPs and QC (training) QA (several interpreters) affects quality of reference data
- First exercise gives information on the distribution and sources of errors, and whether stratification is efficient
- Stratification can help, but be more useful after design phase. If you have information on where errors occur or potentially could occur (high risk of change vs low change, reduced sampling intensity in low change areas), this could be considered in the stratification)
- Keep in mind the stratification for emission factors (trade offs)
- Sampling design (including allocation) depends very much on objectives (area estimation, UA, or both) and error information, but it should not differ much from proportional allocation
- Reference observations should be collected following the same definitions as the country, i.e. MMU, classification system, deforestation etc.

Follow step-wise approach:

- Study patterns (based on existing data), i.e. understanding distribution errors, opportunities for stratification
- Definition of sampling design considering Objectives
- Response design: Definition of clear SOPs (country specific): Definitions, classes, MMUs, etc., reference observations
- Make the map, for stratification (or other purposes)
- Analysis, i.e. stratified estimation of activity data

## Group 2 - How to address different classes, forest types and how to take into account uncertainty of the trend ?

Different classes, forest types :

- Preliminary recommendations:
  - Keep it simple and the number of classes low for the purpose of emissions estimation
  - Make sure the sample size is large is enough in each of the classes to meet the desired precision
  - Don't use population level stratified estimates to derive sub-population estimates (no top-down)

- If there is a desire/need for more classes for purposes other than activity data, allow classes to be merged for the activity data
- Medium-term R&D:
  - Explore use of time series of satellite data for mapping forest types, including the use of different sensors over time
  - Explore fixed sample of permanent plots/reference data that are measured over time combined with temporary plots/reference data based on expected changes /risks
  - Explore the contribution of the emission factor uncertainty in relation to the uncertainty of the carbon emissions and the uncertainty of the trend
  - How to take the result of the accuracy assessment to continuously improve the monitoring
  - Explore the use of model-based (model-dependent) estimators

#### Uncertainty of the trend

- Preliminary recommendations:
  - Use MGD guidance on the use of IPCC guidance on uncertainty of the trend
  - Apply Monte Carlo
  - Keep in mind the trade-off with the sampling design for the reference level
- Medium-term R&D:
  - Review existing guidance and consider what gaps exist
  - Link to processes to continuously improve data over time
  - Explore fixed sample of permanent plots/reference data that are measured over time combined with temporary plots/reference data based on expected changes /risks
  - Explore the contribution of the emission factor uncertainty in relation to the uncertainty of the carbon emissions and the uncertainty of the trend

#### **List of discussion points and issues related to Accuracy Assessments in the context of REDD+ (notes from M. Herold)**

- Objectives of accuracy assessment and area estimation:
  - Assess/reduce bias in area (change) estimation and provide confidence intervals
  - Understand types and sources of errors to improve the map and monitoring system over time
  - Both are important to consider!
- Sampling/design:
  - Several feasible options with various advantages and disadvantages (Ron and Steve)
  - Sample size? Can we use some good practices from country examples?
  - Best sample unit for area estimation? Again, perhaps use some country examples to present choice and pros/cons
  - Sampling options: use of maps in design or in post-stratification
  - The more categories (i.e. change types) to more complicated the estimation
  - Best reference sample design for multi-year assessment?
  - Focus on post-stratification for longer-term, multi-date change estimation and/or if dealing multiple change types
  - Keep simple (in terms of estimation procedures) and consider costs for reference data collection
  - Overall: rather little practical experiences of testing/comparing different sampling designs in REDD+ countries
- Response design:

- Multiple options and experiences
- Consider multi-year assessments, temporal dimension (and precision) in the reference information
- Analysis:
  - Confidence intervals might wide – in issue (in particular) to estimate small changes
  - How to estimate the uncertainty of the trend and deal with autocorrelation in errors over time
- Other critical issues:
  - How to deal with one/few omissions in large no-change strata? What examples/experiences exist?
  - How to make use of the accuracy information to understand the mapping errors, and when and how to adjust monitoring methods to improve over time?
    - What are reasonable CI's to expect for change detection from Landsat analyses?
    - What are reasonable area differences between a map and a stratified estimate?
    - Could be synthesized from some of the country examples?
  - There is need for both the area estimates and the map: how reduce the difference between map and area estimation (over time)?
  - How to treat known uncertainties in using maps for national/sub-national purposes (i.e. benefit sharing, hotspot/drivers assessments)? What is the best way to make sub-national estimates from national estimates?
  - Proliferation of more time-series approaches for trajectories – implications of accuracy assessment, estimation and use of the maps
  - Current focus is on activity data, what about the uncertainty of the EFs and for moving to spatially-explicit and/or wall-to-wall approaches?