TransparentForests

FSC stakeholder survey of related hardware, software and data.

The following is a summary of the responses received from all stakeholders that provided feedback on GIS[1], GPS[2] and EO[3] data use for certification and audit purposes. There were three respondent groups:

- **20 Certification Bodies (CABs)** – who operate across all forest biomes and regions,
- **11 Forestry Organisations (FOs with FM/CoC certification)**, most of whom had operations in excess of 500k ha, and half of whom were US based
- **11 NGOs**, who operate across all regions of the world except Oceania, and advise and monitor most environmental and social aspects of forest management. Over half had a special focus on HCV's.

The questionnaire was divided into three separate subject groups

- **Use of GIS software**
- **Use of GPS technology**
- **Use of Earth Observation and Remote Sensing data**

The responses for each group are summarised in the tables below.

Overall summary

The FOs are the core users of all the technologies (note the FOs are mainly made up of large operators). CABs appear to be conservative in their use of all three technologies.

GIS software is used by all respondents. All respondents use Commercial, Open Source and Google Earth software.

GPS equipment use is quite widespread across all groups, with respondents having a wide range of equipment with navigation and positioning technology. FOs appear more knowledgeable about the equipment and related software and processing techniques. The NGOs and CABs also utilise GPS although predominantly in in-car sat navs or hiking

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[1] Geographical Information Systems

[2] GPS covers both the US Global Positioning System (GPS) and Russian Global Navigation Satellite System (GNSS).

[3] Earth Observation includes satellite and airborne mapping

type receivers such as the Garmin eTrex and smart phone/tablet devices. A wide range of phones and tablets are used with Android and ios (Apple) based devices.

In using Earth Observation data, the CABs are the most conservative and all but one rely on client's maps for all mapping information on the relevant FMU. The land cover classes most requested by FOs and NGOs include forest, cleared forest, planted forest, roads, rivers and water bodies and fires. Classes least requested were firebreaks.

Aerial photography is used by 50% of FOs, with Landsat (free), Lidar and SPOT image being the main satellite sensors used by both FOs and NGOs.

Review of responses

1. *Use of GIS Software*

Do you use GIS software?	CABs	FOs	NGO
Yes	36.0%	100.0%	72.0%
No	63.0%	0.0%	27.0%
answered question	*19*	*10*	*11*
skipped question	*1*	*1*	*0*

Software options	CBs	FOs	NGO
ESRI-based (ArcView, ArcMap, ArcGIS, etc)	66.7%	100.0%	50.0%
MapInfo	0.0%	11.1%	0.0%
Google Earth	66.7%	33.3%	37.5%
Quantum GIS (QGIS)	33.3%	22.2%	50.0%
Other software (specify name and version……)	50.0%	0.0%	12.5%
Don't know	0.0%	33.3%	12.5%
answered question	*6*	*9*	*8*
skipped question	*14*	*2*	*3*

Less than half of the CBs responded to this question. Most FOs and half the NGO respondents use ArcView (versions listed were 9.1 or 10 or 10.1); Google Earth Pro was listed by several FOs, CBs and NGOs, while Quantum GIS is the most frequently listed open source GIS software. Garmin BaseCamp is listed once under other category.

Reasons for GIS software selection	CBs	FOs	NGO
It was a Corporate selection	66.7%		
Provides better tools / extensions for Forest Management	0.0%	100.0%	50.0%
Provides better tools / extensions for Certification	66.7%	12.5%	25.0%
Provides better background map data	33.3%	37.5%	37.5%
It is easier to learn / use	50.0%	0.0%	50.0%
It has better technical support	0.0%	12.5%	12.5%
Its is cheaper	14.3%	0.0%	12.5%
It is free	14.3%	12.5%	37.5%
Not sure	0.0%	0.0%	0.0%
answered question	*7*	*8*	*8*
skipped question	*13*	*3*	*3*

All professional GIS specialists in FOs select the GIS software for the tools and extensions provided for forest management.

The main reasons that the CBs gave for not using a GIS software, related to cost (obviously not including Open Source software such as QGIS), a lack of requisite skills or it was seen as unnecessary for the job.

The main reason of not using GIS software	CBs	FOs	NGOs
Don't see any use for it	37.5%	0.0%	0.0%
Lack of skills within organisation	25.0%	0.0%	0.0%
Prohibitive software licensing / maintenance costs	75.0%	0.0%	100.0%
Lack of support	12.5%	0.0%	0.0%
Not sure	0.0%	0.0%	0.0%
answered question	*8*	*0*	*1*
skipped question	*12*	*11*	*10*

2. *Use of GPS*

Use of GPS equipment	CBs	FOs	NGO
Yes	73.7%	100.0%	90.0%
No	26.3%	0.0%	10.0%
answered question	*19*	*9*	*10*
skipped question	*1*	2	*1*

The majority of stakeholders have and use GPS - 74% of CABs; 100% of FOs and 90% of NGOs.

Most of the NGOs and CABs (about 71%) have just one GPS while the majority (67%) of the FOs have 4 or more. The FOs use a wide range of GNSS enabled equipment ranging from smart-phones and tablets to GPS enabled cameras and high accuracy professional grade receivers. None of the NGOs used professional high grade receivers. Likewise the CABs used consumer products in addition to a small percentage of professional low cost equipment.

Use of GPS in certification work?	CBs	FOs	NGOs
Yes	28.6%	77.8%	55.6%
No	71.4%	22.2%	44.4%
answered question	*14*	9	9
skipped question	*6*	2	2

56% of NGOs routinely use GPS in FSC certification related work while 78% of FO's use it in certification. More than half the NGOs and 29% of CAB routinely use GPS for certification.

There are a wide a range of preferences in use of GPS across the different groups.

Types of data recorded or checked with GPS	CBs	FOs	NGOs
Identify location in field visits	100.0%	71.4%	75.0%
Checking location of forest roads and boundaries	75.0%	100.0%	50.0%
Monitoring/mapping of felling coupes, skid trails, temporary roads	25.0%	71.4%	50.0%
Georeferencing of sample plot information	0.0%	57.1%	50.0%
Locating fires, encroachments or other boundary relevant events	50.0%	71.4%	0.0%
Georeferencing ecological and conservation related data	50.0%	71.4%	100.0%
Locating social issues (e.g. location of settlements, sacred sites	50.0%	57.1%	25.0%
answered question	*4*	7	4
skipped question	*16*	4	7

For the NGOs 'Geo-referencing ecological and conservation related data' was the main use followed by 'identification of locations in field visits'. For the FOs the main use was for checking the location of forest roads and boundaries. It was also used for monitoring felling coupes, georeferencing ecological and conservation issues and other uses as well. For the CABs, GPS is mainly used for identifying the location of field visits followed by checking of forest roads and boundaries amongst other uses.

None of the issuer groups had an issue with the GPS accuracy as they all found that it always or in most cases had an acceptable level of accuracy.

GPS readings accuracy acceptable for needs?	CBs	FOs	NGOs
Accuracy always acceptable	25.0%	71.4%	75.0%
In most cases accurate enough	75.0%	28.6%	25.0%
Often insufficiently accurate	0.0%	0.0%	0.0%
answered question	*4*	7	4
skipped question	*16*	4	7

In all groups 75% found that GPS readings generally agreed with map locations.

A high percentage of the FOs (89%) utilised trained professionals in collecting the GNSS survey data while none of the CABs used trained professionals

GNSS constellation, signals, etc

Most of the NGO and CAB respondents did not know whether their receiver was multi-constellation capable, EGNOS assisted or high sensitivity. However a few recorded that their receivers had high sensitivity capability. The FOs were more familiar with the GPS specifications of their equipment. 67% had high sensitivity GPS equipment and this high sensitivity capability will assist in getting a position fix under dense canopy. 22% of the FOs surveyed had multi-constellation sensors.

Mobile Mapping, navigational and tracking Apps

All groups used smart phones and tablets with popular Android based and Apple products such as iPhone and Samsung Galaxy range the most common. In addition Blackberry and Nokia Lumia (Windows) were also used by some respondents. Of note was one respondent who used the Thuraya which is a satellite based phone.

Google Earth, Google Maps, GPS Tracks and WorldView are the main smart phone apps used. Trimble Geo Explorer Series equipment which are low cost hand held (1-2m) professional GIS quality GNSS recorders were also used by the FOs.

3. EO data sources and use

Purchase of satellite imagery or aerial photos for an FMU audit?	CBs	FOs	NGOs
Yes	0.0%	66.7%	50.0%
No	100.0%	33.3%	50.0%
answered question	*19*	*9*	*10*
skipped question	*1*	*2*	*1*

The majority of FOs and NGOs use this technology in audit preparation or forest monitoring.

Types of remote sensed data used	CABs	FOs	NGOs
Aerial photography	0.0%	100.0%	25.0%
LANDSAT or other free optical satellite imagery	0.0%	83.3%	75.0%
SPOT or other commercial optical satellite imagery	0.0%	50.0%	25.0%
Commercial radar satellite data	0.0%	16.7%	0.0%
Airborne SAR	0.0%	0.0%	0.0%
Lidar	0.0%	83.3%	0.0%
answered question	*0*	*6*	*7*
skipped question	*20*	*5*	*4*

Aerial photography is used by all FO respondents except one, with Landsat (free), Lidar and SPOT image being the main satellite sensors used by both FOs and NGOs. Interestingly most FOs also use LiDAR.

Land cover types currently mapped or monitored	CABs	FOs	NGOs
Forest	0.0%	100.0%	100.0%
Cleared forest	0.0%	83.3%	100.0%
Planted forest	0.0%	100.0%	75.0%
Agricultural areas	0.0%	33.3%	75.0%
Roads	0.0%	83.3%	50.0%
Rivers and/or water bodies	0.0%	83.3%	50.0%
Wetlands	0.0%	66.7%	25.0%
Habitation	0.0%	33.3%	50.0%
Firebreaks	0.0%	33.3%	0.0%
Fires	0.0%	83.3%	0.0%
Topographical features	0.0%	66.7%	50.0%
answered question	*0*	*6*	*4*
skipped question	*20*	*5*	*7*

The land cover classes most requested by FOs and NGOs include forest, cleared forest, planted forest, roads, rivers and water bodies and fires. Classes least requested were firebreaks

Reasons why respondents did not buy remote sensed data

Reasons for not buying satellite imagery or aerial photos for auditing	CABs	FOs	NGOs
We rely exclusively on the client's maps	77.8%		
We do not have the technical skills	16.7%	0.0%	0.0%
It is illegal in the countries we work in	5.6%	0.0%	0.0%
Client FMUs are too small	16.7%	0.0%	0.0%
Mapping is too costly	11.1%	100.0%	25.0%
Adequate publicly available independent maps	50.0%	100.0%	75.0%
answered question	*18*	*1*	*4*
skipped question	*2*	*10*	*7*

None of the CB respondents purchase independently generated satellite imagery or maps of FMUs. They rely exclusively on the FOs.