Minutes v1.0
LSI-VC-10 Teleconference #2: LSI-GEOGLAM and LSI-Forests & Biomass
17/18 May 2021

Participants

Catalyst (PCI):	Wolfgang Lueck
CEO:	Marie-Claire Greening
CSA:	Paul Briand
ESA:	Frank Martin Seifert
GA:	Adam Lewis
GEOGLAM:	Alyssa Whitcraft
IEEE:	Brandon Russell, Stephen Schiller
ISRO:	Bimal Bhattacharya
JAXA:	Ake Rosenqvist, Osamu Ochiai, Koji Akiyama
LSI-VC Sec:	Matt Steventon, Libby Rose, Stephen Ward
NASA:	Bradley Doorn, Jim Irons
NOAA:	Kevin Gallo
SEO:	Brian Killough
UK Catapult for UKSA:	Electra Panagoulia
USGS:	Chris Barnes, Steve Labahn, Timothy Stryker, Thomas Cecere

The presentation slides compiled for this meeting are here and also attached in Appendix A.

Introduction

Steve Labhan (USGS, LSI-VC Co-Lead) welcomed everyone to the second of four teleconferences that make up the virtual LSI-VC-10 meeting. This call is focused on the LSI-GEOGLAM and LSI-Forests & Biomass subgroups. He thanked the teams for their work on these important topics.

LSI-GEOGLAM Subgroup

Brad Doorn (NASA) presented regarding the progress of GEOGLAM and the LSI-GEOGLAM subgroup. He acknowledged Alyssa Whitcraft's extensive work on the GEOGLAM program and maintaining the interface to CEOS.

He noted that existing products are unsuitable for the GST, which presents a good driver to move towards systematic operational analytics and replacement of one-off products. GEOGLAM sees WorldCereal as a key step towards this goal. WorldCereal will produce global cropland maps at 10m resolution, with accuracies of 80% or higher, on a seasonal basis. Global *in situ* data is a bottleneck to a lot of EO for agriculture work, and is an issue which WorldCereal seeks to address. The team also hopes to develop state-of-the-art classification algorithms.

Brad suggested that contributing to a reference network for *in situ* data could be a focus for CEOS-GEOGLAM collaboration going forward, and noted the utility of harmonised Landsat 8 and Sentinel-2 datasets for addressing the Essential Agriculture Variables (EAVs). He thanked the NASA-ESA HLS teams, and encouraged further development.

GEOGLAM is providing supplemental guidance for UNFCCC national adaptation plans, with a focus on national-scale agriculture monitoring. The team may provide further guidance to expand GEOGLAM co-development to meet expanding needs from least developed countries.

On climate adaptation, Brad highlighted opportunities for the LSI-GEOGLAM forward agenda. This includes the articulation of evolving satellite data user requirements for agriculture monitoring, including user requirements for future missions, as well as capacity (co-)development for least developed countries to collect and provide the information needed for their national mitigation and adaptation planning and response programs.

Brad presented two initiatives for enhanced *in situ* data management:

- GEOGLAM Initiative #1: *In situ* data coordination for GEOLAM. This will involve developing a GEOGLAM *in situ* data curation strategy and guidelines, identifying existing *in situ* data holdings, and producing guidance for *in situ* data quality assessment and collection tools.
- GEOGLAM Initiative #2: Intercomparison guidelines and pilot. This will involve providing guidelines and best practices and developing a pilot study. The idea behind this initiative is to provide more guidance for developers to be able to produce robust products. Brad noted the evapotranspiration case where there are 19 models, and no significant work done to compare the different models. The GEOGLAM work will be coordinated with the CEOS WGCV LPV subgroup.

Brad raised a request for CEOS-GEOGLAM Subcommittee leadership nominations. He proposed 2 Co-Leads, whose duties would involve attending LSI-VC meetings, meeting with GEOGLAM EO Technical Committee (twice per year), coordinating any CEOS cross-program activities (e.g., AFOLU Roadmap), reporting at CEOS SIT, and attending/reporting at CEOS Plenary, if needed.

Brad also noted that if there is interest in participating in the space-based EO for global agriculture under the GEOGLAM EO Technical Committee, that would be welcomed (please contact Ian Jarvis).

LSI-VC-10-07	CEOS GEOGLAM Subcommittee Leadership nominations are sought. Everyone to explore opportunities.	**ASAP**

Alyssa Whitcraft (GEOGLAM) reinforced that we need community collaboration to help this progress, however the last year has reduced the amount of time members have had to work on the project. The team has a set of EAVs that are about 98% ready. The team is currently working on the presentation of these. They are developing a website, and will begin pushing definitions and requirements soon. As the gaps are revealed, they will inform the research and development agenda, and the capacity development and acquisition problems.

Discussion

- Steve Labhan asked about the expected timelines and availability of the *in situ* data. Alyssa noted that the GEOGLAM *In Situ* Working Group had their first discussion about a month ago, which saw a lot of interest from the community. This group is a priority of NASA Harvest. Moving forward, the team hopes to evolve the knowledge management system concept, by taking a knowledge packet approach to understanding all facets of the problem. Alyssa is also working closely with the private sector to develop partnership mechanisms for data rescue, as well as locking down a database for calibration and validation purposes.

- Wolfgang Lueck (Catalyst (PCI)) asked in chat: "*So the WorldCereal product will then be based on Sentinel 2 at 10m or will they also include Landsat? This will remain a raster / grid based product, not object / field based.? Is there a plan to use crowdsourcing for ground truth collection, maybe leveraging apps such as geo-cache? Or precision agriculture systems such as those collected by John Deere.*" Alyssa Whitcraft responded: "W*olfgang, my understanding is it will be rasterized. Considering the vast majority of fields are larger than 10x10m, I think they'll leave vectorization and associated resampling errors to user groups. I do not think they are using landsat due to the 10m requirement and it is ESA funded. Yes, I have been working directly with John Deere. We have also developed tools for crowd-sourcing. Unfortunately a recent NASA proposal we put in for citizen science was not selected. But, for example, for the Iowa Derecho in 2020 we crowd sourced from farmers photos with full geographic information to help with loss and damage assessment as requested by the USDA Chief Economist.*".
- Steve Labhan commented that getting GEOGLAM re-engaged in CEOS and LSI-VC is a good idea; the subcommittee proposal above is welcomed. He suggested that a list of regular attendees would be helpful in finding people to fill the roles. Alyssa recalled that a few years ago a contact list of all CEOS people involved with agriculture was compiled and could be consulted.
- Brad noted that the co-lead roles for the proposed subcommittee would mainly involve communicating and coordinating cross-program initiatives. Steve hopes that the additional communication mechanism will help advance and provide focus for topics such as *in situ* data collection. Brad followed up by noting the group doesn't have to be large, and should involve people who want to engage in the CEOS community. Anyone interested in the development of the guidelines and initiatives for EO for global agriculture should join/follow the GEOGLAM EO Technical Committee.
- Matt Steventon (LSI-VC Sec) offered to join the CEOS-GEOGLAM subcommittee (as an observer) to help increase communication bandwidth between the group and LSI-VC.

LSI-VC-10-08	Alyssa to share the list of POCs for agriculture in CEOS and to consider opportunities for more regular meetings of LSI-GEOGLAM and this group of contacts.	**COMPLETE**

- Adam Lewis (GA, LSI-VC Co-Lead) asked about data rescue and what Alyssa sees as the specific potential of the project. Alyssa noted that often data collected *in situ* are of varying quality and with inconsistent methodologies that limit their intercompatibility. The team is trying to build guidance on collecting better *in situ* data, and Alyssa noted the JECAM experience with sites incorrectly collecting field data, by incorrect geolocation or calibration. To avoid this, they are looking at how to provide better guidance and improve data collection moving forward. Alyssa also mentioned that the private sector spends a large amount of money collecting significant volumes of data, but a lot of this very useful data doesn't leave the local/machinery level. There has been a significant amount of work done to make this data accessible and usable. This is also coming up in the context of sustainable and regenerative agriculture – which considers carbon markets, monetisation schemes and compliance practices that have arisen from governments. The private sector is also increasingly looking at sustainable sourcing, and *in situ* data can help. Data rescue is critical for long time frame analyses, and historical views are critical.

- Brad noted that private sector data for the local level is invaluable. It is important to recognise that it is an economic issue primarily, and hence there are challenges with data collection. He noted that the team aims for a 'good' solution, not necessarily a 'perfect' solution. Brad referenced his experience with openET, which is leveraging the harmonised Landsat/Sentinel datasets for use in irrigation. To extend the program beyond the US West is difficult, because of the difference in ground water data collection.
- Wolfgang Lueck asked in chat: "*Pity we can't develop a crowdsourcing app that allows field data collection with smartphones, simply taking geocoded photographs with smartphones. We have thought of something like that for REDD+ in Ghana, whereby data collectors are reimbursed for their efforts with cell phone credits. Something that was very valuable for Africa. I don't know if any of this could be related to agriculture?"* Jim Irons (NASA) responded: "*A crowd sourcing capability like that exists in the GLOBE program; part of the NASA GLOBE Observer effort. It's a protocol for land cover."* Alyssa reported that a crowdsourcing app is one of the intended outcomes of a grant for GEOGLAM. The team is trying to reduce boundaries to making the most of valuable data. Alyssa mentioned a program run in Iowa following a big storm, where a call was sent out on a radio station with directions on how to capture photos, and then asked listeners to send their photos to a specific address. Alyssa noted that a program of this type could be adapted for different places in Africa to capture a lot of valuable data.
- Jim Irons noted that there is an app in the NASA GLOBE program whose protocol could be modified for this purpose. Brad Doorn acknowledged that the team needs to be aware that there are many existing initiatives out there, and they should study what the rest of the community is already doing. AI is another key driver that needs to be studied.
- Wolfgang Lueck commented in chat: "*Smartphone cameras can be well characterised and smart image processing algorithms can find out from which direction photographs were taken. From the smartphone we have time and location in addition. In forestry we tried to derive basal areas from these photographs."*

LSI-Forests & Biomass Subgroup

Frank Martin Seifert (ESA) gave an update from the Forests and Biomass subgroup, and provided further information on the AFOLU Roadmap. Frank noted that the Global Stocktake (GST) and AFOLU work will remain the major task of the team for the foreseeable future.

The discussion paper prepared by the team for the 2020 CEOS Plenary explored the development of a CEOS AFOLU Roadmap, provided a clear statement of the technical capabilities of CEOS agency EO satellite data and their characteristics, and proposed a specific way forward for 2021 and deliverables for GST1 as the critical first deadline. At the Plenary, significant interest was expressed for coordination of the CEOS activities for the GST and ensuring necessary communication, including between the GHG and AFOLU focused teams. The top priority for 2021 is the availability of relevant data sets in time for COP26.

The AFOLU team has tasked a small expert team for each key dataset (above ground biomass, land cover and change, mangroves and agriculture) to prepare a short report outlining the CEOS coordinated input to GST1. CEOS SIT-36 discussions confirmed that GST1 outcomes are the top priority for the time being, with the SIT Chair progressing with a broad and coordinated strategy towards the GST.

The AFOLU dataset summary covers existing 'off-the-shelf' datasets as well as those that need additional resources and development. The team has recognised that a harmonised CEOS-endorsed biomass product would be particularly desirable for GST1.

Baseline targets for GST1 input for agriculture include the WorldCereal effort funded by ESA, led by VITO and supported by the GEOGLAM community. The project will produce cropland maps, crop type maps, initiate a global *in situ* reference dataset for agriculture, and develop and test classification algorithms and tools.

Frank also gave an update on behalf of Sylvia Wilson (USGS) regarding the engagement with countries (in partnership with SilvaCarbon) to improve the understanding and uptake of EO data for the GST (action 3 of the AFOLU Roadmap). The ten countries involved are Cambodia, Colombia, Gabon, Guatemala, Madagascar, Mexico, Paraguay, Peru, Solomon Islands and Zambia. The aim is to distill this list to a couple of countries that could be progressed.

Discussion

- Adam Lewis asked for more detail on the inputs to COP26. Frank Martin said the team will compile all the information together and present it on a CEOS website GST portal. There is also the potential for a demonstrator GST Data Cube.
- Adam asked if there is active discussion between the AFOLU and GHG teams. Frank Martin noted that they are having ongoing discussions specifically related to input for the synthesis report of the UNFCCC systematic observation group. There is a AFOLU/GHG workshop planned for the end of June, however it may be postponed until Q3 2021.
- Osamu Ochiai (JAXA) commented in chat: "*The Biomass Expert team has bi-weekly call to discuss the harmonization products among ESA CCI Biomass, GEDI Biomass and JPL Biomass. Intensive work is being done.*"

Frank Martin also presented the CEOS GST Strategy. He noted that the SIT Chair Team has promoted a comprehensive strategy as part of its priorities for the last 2 years, and the SIT Vice Chair Team led the drafting of a strategy paper. The Strategy Paper was reported to CEOS SEC on May 13, and will be revisited at SIT TW with a view to endorsement at CEOS Plenary.

LSI-VC should aim to maintain CEOS leadership on land surface aspects. Specifically, this would be action #1 from the GST paper:

> *WGClimate GHG Task Team should consult with the relevant elements of CEOS, including VCs, and Associates such as ISC, WCRP and GCOS, together with modellers, to check the GHG Implementation roadmap on completeness concerning requirements for terrestrial observation (SIF; NPP, land cover, biomass, etc.) for supporting mitigation actions through the development of MVS. The actions in Annex C of the roadmap shall be complemented as needed.*
>
> *Initial action: Ensure that all products from terrestrial observations needed to derive biogenic emissions as priors for Monitoring and Verification System (MVS) such as CoMVS are considered in the GHG TT Roadmap Annex C. (for SIT TW 2021).*

Discussion

- Frank Martin asked whether USGS would like to reinforce the Forests and Biomass team by providing a third co-lead. Tim Styker (USGS) responded that USGS is not in the position to support a third lead at the moment. He noted that Sylvia Wilson has been assigned to assist with consultations with countries.

- Adam asked whether we should be using the LSI-VC to support the AFOLU work further. Osamu commented that it would be beneficial to let the groups work towards COP26 and deliver the products as discussed, but following this the team can report more frequently to LSI-VC. Further discussions are necessary regarding how LSI-VC should contribute systematically to the work going forward. Frank Martin noted that the AFOLU team currently has the right experts contributing, and are confident this will lead to delivery of the datasets for GST1.
- Matt Steventon asked whether there is a place for ARD in the CEOS GST strategy to support countries and simplify data aspects. Ake Rosenqvist (JAXA) responded affirmatively, noting that it is almost a prerequisite to give countries data that is in an easy to use form, ideally CARD4L. This would help broaden the use of satellite data. Frank Martin Seifert reinforced that the countries expect the data to be easily used, and it would be great if the data is in the CARD4L form. Brian Killough (CEOS SEO, NASA) commented that the products flagged for GST1 are higher-level and don't fit with the existing CARD4L specifications. Ake noted that many countries might want to generate their own maps using their own processes. The global maps may not have the level of detail required for local-scale analysis. Frank further noted that there is also appeal in taking ownership of the whole process, for those countries who would be interested in CARD4L products. Brian commented that the team has seen the same thing in the SDGs, where some countries are sophisticated enough where they don't want to use the global products. In that case, it is suggested that they start with CARD4L products.

Brian Killough presented on the use of the Open Data Cube to support AFOLU and the GST. He raised a number of questions for discussion, including what would be the benefit over current methods, who would bear the cost, how would the data be managed, and who would host the datasets.

Responding to the open suggestion regarding a demonstration Data Cube for COP26, Brian proposed creating a very small Data Cube for a geographically small county. It would involve compiling the data, preparing relevant notebooks, and working with in-country organisations that are responsible for UNFCCC reporting.

Discussion

- Stephen Ward (LSI-VC Sec) questioned whether one of Sylvia's test countries would be willing to work with Brian on the proposed demonstration Data Cube. Brian suggested that Mexico, Peru or Colombia could be good candidates.
- Adam Lewis noted Digital Earth Africa and suggested that the platform could be used to implement such a pilot in a very efficient manner. DE Africa has a vast network of country and regional organisation contacts, and he suggested Ghana, Tanzania and Rwanda could be good candidates.
- Brian noted that the data required are derived datasets. He asked whether these countries/DE Africa would be willing to compile it into a Cube. This would be the main challenge. LSI-VC could offer support with data flows.
- Adam noted that a country could start by connecting the global datasets before producing more detailed country-level datasets.
- Brian suggested DE Africa host the data and platform, and his SEO team can support a country with development of a GST demonstration. The SEO would rely on DE Africa support compiling the necessary data on the platform. Adam noted that while the initial demonstration would focus on one country, it can be done in such a way that it could be adopted by others in future and scaled.

LSI-VC-10-09	Brian, Adam and Matt to explore the idea of a pilot built on the DE Africa platform that will bring together all the land-related datasets that CEOS is compiling for the first UNFCCC Global Stocktake in 2023 and support a country do its reporting.	**ASAP**
LSI-VC-10-10	Stephen / Tim / Matt to ask Sylvia Wilson about potential candidate African countries from the SilvaCarbon network (perhaps Ghana, Rwanda, or Tanzania) for the Global Stocktake Data Cube (on DE Africa infrastructure) referenced in Action LSI-VC-10-09. There should be existing national capacity and drive, hence the suggestion for a SilvaCarbon-linked country.	**ASAP**

- Ake Rosenqvist reminded the team that GST1 in 2023 is the main goal, and there shouldn't be too much pressure to complete the above action for COP26.
- Brian noted that there are plenty of connections to be made in the above effort, including coordinating with CEOS Agencies to get the data in place.
- Osamu suggested the team discuss more broadly, beyond Data Cubes, and consider other infrastructure and offerings such as web portals, etc. Brian noted that they are not solely focused on Open Data Cube, but at some point the datasets need to be brought together in some sort of platform for demonstrating and understanding the challenges and hurdles of bringing all these different datasets together into something that will help less advanced countries achieve GST outputs. Data Cube is just one approach, however it is one that is familiar to many of the LSI-VC team. Atmospheric datasets and the integration of land and GHG datasets are another complication to be explored. The first challenge is getting the data and ensuring sustained pipelines to the platforms. Secondary is integrating the data together. Data access info compiled via this pilot process will also be a useful input for compiling the GST portal on the CEOS website.
- Osamu Ochiai asked in chat: "*Is there a more holistic recommendation in the GST Strategy on this infrastructure element?"* Adam agreed that it could be a good consideration, and something to keep in mind, but the strategy paper is now finalised. However, the AFOLU Roadmap could reflect this.
- Wolfgang Lueck commented in chat: *"You should download time series coefficients if you want to do analysis locally, not the whole archive. The coefficients are a good representation of the archive. So the coefficients need to be calculated once in the cube on the cloud. Someone would need to pay for this expensive calculation. Would love to discuss how the South African data cube can be used together with the DE Africa data cube Adam. I would have some technical ideas that I would love to discuss with you Adam."*

Closing

- Matt Steventon noted that the next LSI-VC-10 call on May 19 will focus on "looking forward on CEOS ARD".

Appendix A: Meeting Presentation Slides

LSI-GEOGLAM and LSI-Forests & Biomass

LSI-VC-10 Teleconference #2

1

Overview

- LSI-GEOGLAM subgroup updates / report / action items
- LSI-Forests & Biomass subgroup updates / report / action items
  - AFOLU Roadmap
  - LSI role on land cover products – for AFOLU, Global Stocktake and more broadly in CEOS
  - Using Open Data Cube to support AFOLU and GST (Brian)

2

LSI-GEOGLAM Subgroup

Brad Doorn, NASA

3

GEOGLAM Update – On-Going

- G20 Agriculture Deputies Meeting, April 2021. Strong support statement form the Ministers later this year. Acknowledgment of our 10 year anniversary and the co-development work we are now doing in Africa
- Capacity/Co-Development Working Group strategy document development. Linkage to CEOS CapDev activity
- Essential Agriculture Variables Working Group. Work has been Covid-delayed but continues. The definition phase is well underway and link to efforts around the priority areas (SDG's Climate and Disaster Risk Reduction)
  - ✔ Update current GEOGLAM documents to incorporate EAV's; including GEOGLAM Community Research and Operationalization Agenda and GEOGLAM EO Data Requirements (including accuracy).
    - EAV Website under-development
  - ✔ Priority EAV Definitions under-review: agriculture area, crop type, crop yield, crop conditions
  - ✔ Reviewing EAV's and Impact on AFOLU efforts

4

GEOGLAM Update – Climate Mitigation

AFOLU and the Roadmap

- Existing agriculture products are not suitable for assessments under the GST, or NDC's in LDCs
- Open science is transforming the monitoring landscape and enabling new solutions
- Opportunity and necessity to move towards systematic operational analytics to replace one-off products

WorldCereal, A Major Step Forward

- Most important, it is building a WorldCereal system, not just one-off products, that will:
  - Produce Global cropland maps at 10 m resolution, accuracies 80% +, on a seasonal basis
  - Initiate a global in situ reference dataset for agriculture
  - Develop and test state-of-the-art classification algorithms

Opportunities for CEOS-GEOGLAM Forward Agenda:

- Managed reference network for in situ data
- Harmonized global data sets of Landsat 8 and Sentinel 2, including full archive validated satellite-driven agricultural data products addressing Essential Agriculture Variables
- Incorporation of new data streams as they become available

5

GEOGLAM Update – Climate Adaptation

Supplemental Guidance for National Adaptation Plans

- UNFCCC Supplemental Guidance for the National Adaptation Plan (NAP) Process
- Focused on co-development of national scale agricultural monitoring systems
- May provide a roadmap to expand GEOGLAM co-development to meet expanding needs from least developed countries

Opportunities for CEOS-GEOGLAM Forward Agenda:

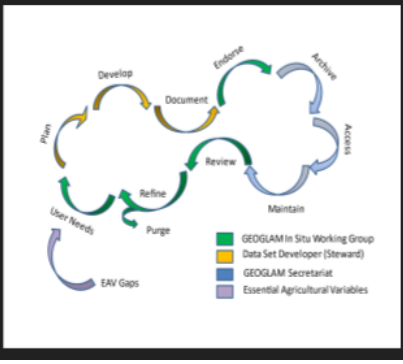
- Articulation of evolving satellite data user requirements for agricultural monitoring including user requirements for future missions
- Capacity (co)development for LDC's to collect and provide the information needed for their national mitigation and adaptation planning and response programs-Links to CEOS CapDev Wkgrp?

6

GEOGLAM Update – Enhanced In Situ Data Mgmt.

Initiative 1: In Situ Data Coordination for GEOGLAM

- Develop a GEOGLAM In Situ Data Curation Strategy and Guidelines
  - Data lifecycle management, update 2018 Data management discussion paper (Figure 1 below)
  - Define GEOGLAM's potential role in in situ data coordination
  - Discuss the role of knowledge management (e.g., GEO Knowledge Hub) and define a federated approach to data management (e.g., STAC, AgroStac, and other systems) in support of in situ data coordination
- Identify Existing In Situ Data Holdings
- In Situ Data Quality Assessment Guidance
- In Situ Data Collection Tools and Guidance



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GEOGLAM Update – Enhanced In Situ Data Mgmt.

Initiative 2: Intercomparison Guidelines and Pilot

- **Develop Intercomparison Guidelines and Best Practices**
  - Metadata analysis
  - Qualitative assessment
  - Products direct inter-comparison (areas of disagreement / agreement)
  - EO-based interpretation through the extraction and analysis of relevant vegetation metrics by class
  - Quantitative assessment, usability assessment for different use cases / user groups
- **Pilot Study**
  - Participants will help identify target crop maps over East Africa for intercomparison.
  - Build and document the Intercomparison Database (including both mapping products and in situ datasets used for the generation of these products-linked to in situ work)
- **Coordinate GEOGLAM work with CEOS LPV Working Group efforts on the inter-comparison guidelines**

8

Committee on Earth Observation Satellites

Forests & Biomass Team Session

LSI-VC-10, 17-18 May 2021

Osamu Ochiai (JAXA) &

Frank Martin Seifert (ESA)

Contents

LSI-VC Forests and Biomass Team

- **In 2019, SIT Chair proposed that CEOS 'sunset' ad-hoc teams after they have served their purpose. And identify permanent homes as appropriate.**

Decision 16	Plenary endorsed the transition of the *Ad Hoc* Space Data Coordination Group for GFOI to become a thematic subgroup on Forests & Biomass within LSI-VC.

- **Main observation acquisition strategy task was already satisfied given massive increase in free and open capacity**
- **SDCG evolved to become the Forests and Biomass Team of LSI-VC at 33rd Plenary in Hanoi, Oct 2019 (along with the GEOGLAM Team)**
- **ESA (Frank Martin Seifert) and JAXA (Osamu Ochiai) co-lead the team**
  - USGS co-lead lost

LSI-VC Forests and Biomass Team

- **More of a watching brief for CEOS in GFOI these days - GFOI mostly in-country programmes and capacity building**
- **Structured WP maintained** (need to address USGS representation)

LSI Forest & Biomass Work Plan

		Lead	Partners
1	**Global Baseline Acquisitions**	Frank-Martin, CEOS	
a	Low-level annual maintenance of core data stream charts to be consistent with MIM	SEC	ESA MIM team
b	No need for coverage updates other than exceptional circumstances	ESA, USGS	
2	**Data access and uptake**	Brian	
a	National annual coverage reports by SEO. Data discovery tools such as COVE.	SEO	USGS, ESA, CALM registry
b	CEOS ARD education, trials and feedback from GFOI - inc Landsat Collection 2, SAR	USGS, JAXA, SEO, ESA	LSI-VC Co-Chairs
c	Pilots with GFOI Partners in support of access and uptake - inc SEPAL/DE-Africa, ODC and cloud	SEO+	FAO, ODC, LSI-VC
d	GFOI Space Data blog established & maintained	SEC	CB Component
e	Customised data support as requested by individual countries (eg Vietnam)	SEO, agencies	User countries
3	**Biomass data**	Stephen, George	
a	Education & comms materials for practitioners, users and conventions (eg SBSTA) on new datasets	SEC+	WGCV LPV, Mission managers
b	Serve as bridge to CB component to establish data supply, user needs and feedback	USGS Co-Chair	SilvaCarbon, FAO, WB
c	Establish coverage outlook materials for relevant missions	SEC	WGCV LPV, Mission managers
d	Promote CEOS Biomass Protocol and advocate uptake	All	WGCV LPV
e	Explore CEOS ARD possibilities for new biomass data inc CARD4Lidar	NASA, ESA, JAXA	Australia SIT Team, LSI-VC
		Lead	**Partners**
4	**CB Component Collaboration**		
a	Needs and capabilities dialogue through USGS Co-Chair	USGS Co-Chair	SilvaCarbon, FAO, WB
b	Support space data aspects of de facto systems such as SEPAL and GEE & GFOI tools registry	All	SilvaCarbon, FAO, WB
c	CB and Space Data events - at Plenary or stand-alone	USGS Co-Chair	SilvaCarbon, FAO, WB
5	**Convention engagement**	Frank-Martin	
a	Support AFOLU aspects of CEOS push on convention engagement, inc for global stocktake role, RAMSAR, SDC	ESA	Australia SIT team, EC
b	Support 2020 Workshop at JRC as GFOI rep	ESA	EC
6	**MGD support**	Aka	
a	Support representation of space agency data in MGD updates	JAXA	MGD Component
7	**R&D Programme Support**	Frank-Martin	
	TBD. Pending clarity on whether GFOI will have R&D programme in phase 2		
8	**Early Warning Programme Support**	Aka	
	TBD. Pending clarity on whether GFOI will have Early Warning Activity		

LSI-VC Forests and Biomass Team

- **2020 and 2021 activities dominated by the need to provide leadership and capacity for the development of AFOLU datasets and roadmap for the UNFCCC Global Stocktake process in support of the CEOS strategy**
- **Important for LSI-VC and its agencies to demonstrate leadership in this area. LSI-VC has overseen land surface issues for more than 10 years in CEOS and its agencies are the major investors in the underlying missions and products**
- **GST/AFOLU remains our major task in the F&B team for the foreseeable future**
  - Linking GFOI and AFOLU country interaction
  - Responding to GFOI issues should any others arise
  - Periodic review of the WP

20 mins

Committee on Earth Observation Satellites

AFOLU Roadmap Activity Update

Background

- Recognised for land sector issues in recent IPCC reports - substantial capabilities of CEOS agencies in this area and needs raised by UNFCCC
- **AFOLU Task Team**, led by LSI-VC Forests and Biomass, established
- Discussion paper prepared for 2020 CEOS Plenary
  - → **A CEOS AFOLU Initiative for the UNFCCC Global Stocktake Process:** A Discussion Paper for CEOS Plenary to explore the development of a CEOS AFOLU Roadmap
  - → Provide a clear statement of the technical capabilities of CEOS agency EO satellite data and their characteristics - **capabilities and datasets** for inclusion in **the UNFCCC Synthesis Report on Systematic Observations**
  - → Propose a specific way forward for 2021 and **deliverables for GST1** as the critical first deadline
- **Significant interest expressed at Plenary** on coordination of the CEOS activities for the GST & ensuring necessary communication, inc between GHG and AFOLU
- **CEOS-34-07 : CEOS Agriculture, Forestry, and Other Land Use (AFOLU) Roadmap Team to follow up with CEOS Agencies to determine their willingness to contribute to the development of an AFOLU Roadmap. In 2021, the effort will prioritise AFOLU Products for the first UNFCCC Global Stocktake give the urgency, followed by a longer-term vision in a CEOS Roadmap document.**

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AFOLU Team Participation

Co-Lead: Osamu Ochiai, JAXA & GFOI Co-Lead

Co-Lead: Frank Martin Seifert, ESA & GFOI Co-Lead

Member

Shanty Reddy, Australia
Kostas Papathanassiou, DLR
Richard Lucas, ESA/CCI
Shaun Quegan, UK & ESA/CCI
Heather Kay, ESA/CCI
Zoltan Szantoi, EC & LSI VC
Ian Jarvis, GEOGLAM
Alyssa Whitcraft, GEOGLAM
Martin Herold, GOFC-GOLD & ESA/CCI
Stephen Ward, JAXA
Ake Rosenqvist, JAXA
Takeo Tadono, JAXA
Benjamin Poulter, NASA
Michael Falkowski, NASA
Hank Margolis, NASA
Krishna P Vadrevu, NASA
Sassan Saatchi, NASA
Laura Duncanson, UMD
Ritvik Sahajpal, UMD
Brad Doorn, NASA
Christine McMahon-Bognar, NASA
Brian Killough, NASA
Kevin P Gallo, NOAA
Steven Labahn, USGS
Chris Barber, USGS
Sylvia Wilson, USGS
John Remedios, UKSA
Ruben Van De Kerchove, VITO
Nancy Haris, WRI
Fred Stolle, WRI

SIT Vice Chair Team
Ivan Petiteville, ESA
Stephen Briggs, ESA

GHG Task Team
David Crisp, NASA
Mark Dowell, EC/JRC

WGClimate
Albrecht Von-Bergen, DLR

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2021 Activities

- Top priority to the availability of relevant datasets in time for **COP-26 (early Nov 2021)** along with the prototype GHG products
- A **comprehensive roadmap** can follow successful completion of GST1 deliverables
- Task team agreed to focus on - a **small number of mature AFOLU products**, complete with comprehensive guidance and communication materials to the **UNFCCC Synthesis Report**. Both national and global scale products are in scope.
- 2020 capabilities review identified a number of promising candidates

AFOLU Category	Dataset Name	Description	Spatial Resolution	Temporal Coverage	Agency
Agriculture	ESA World Cereals, NASA CMS Global Fluxes from Agriculture	Local to global annual cropland extent maps (global for maize and wheat)	10 m	2020	esa, nasa
Forest (Above Ground Biomass)	CCI Biomass (ESA, with JAXA partnership)	Global above-ground forest biomass maps with associated maps of precision, derived from L-band and C-band SAR data.	100 m	2010, 2017 & 2018 released, 2020 & 2021 planned	esa, JAXA
	LiDAR Forest Biomass (NASA/UMD)	Global maps of mean and variance of above-ground forest biomass derived from LiDAR (datasets under development)	1 km (51.6° N to 51.6° S); 100m (>N52°)	2019-2022 (release ~2021)	nasa,
Forest (Area)	UMD/GLAD Treecover and GFW Datasets	Global maps of forest extent and changes, derived from Landsat data. Maps updated in near real-time.	30 m	Current	USGS

AFOLU Category	Dataset Name	Description	Spatial Resolution	Temporal Coverage	Agency
Land Cover	Copernicus Global Land Cover Service, ESA CCI Land Cover	Annual global land cover maps (23 classes) derived from optical coarse resolution sensor data	100 m - 300 m	2015 - today, 1992-2015	esa
	WorldCover (ESA)	Global land cover maps (10 classes) derived from Sentinel-1 and Sentinel-2	10 m	2020 (release mid 2021)	esa
Fire	ESA CCI Fire	Global burned area	250 m - 300 m	2001-2019	esa
OLU Wetlands (Mangrove area)	Global Mangrove Watch (JAXA)	Global extent of mangrove forests derived from L-band SAR and optical data. Official UNEP dataset used for SDG 6.6.1 reporting.	25 m	1996, 2007-2010, 2015-2018 + annually from 2020	JAXA
OLU Wetlands (Mangrove biomass)	Mangrove Blue Carbon (NASA)	Global maps of amount and density of carbon stored in mangrove biomass and soil. Total values represent the sum of aboveground carbon, and the soil organic carbon values, attributed to mangrove forests.	30 m	2000	nasa

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2021 Activities

- Further prioritisation considered to **identify key datasets** being communicated (the process should be by on-going elaboration)
- The AFOLU Team tasked **small expert teams in each key dataset (below)** formed by ideally most relevant agencies and with different geographic balance
  - → **Above Ground Biomass:** Laura Duncanson / Sassan Saatchi (NASA), Martin Herold (GOFC/GOLD & ESA/CCI)
  - → **Land Cover & Change - inc Forests:** Martin Herold (GOFC-GOLD & ESA/CCI), Ben Poulter (NASA), Michael Cherlet (EC), Ake Rosenqvist (JAXA) and Frank Martin Seifert (ESA)
  - → **Mangroves (OLU):** Ake Rosenqvist (JAXA), Richard Lucas (ESA/CCI)
  - → **Agriculture:** Ian Jarvis (GEO Sec) and GEOGLAM colleagues
- The expert teams prepared a short report outlining the **CEOS coordinated input to GST1** (what may be possible given more time after GST1)
- **Solicit CEOS Principals necessary support** in order to deliver the datasets by COP-26

Expert Teams will present 1-2 slides with their suggestions as to both default and optimal outcomes for their product type for GST1 and what is required from CEOS agencies to achieve each one

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Last call & SIT-36 outcomes

- **Confirmed that GST1 outcomes are the top priority for the time being.**
  - an integrated set of products with comprehensive user guidance
- **Expert teams proposed a baseline and enhanced target** for COP-26 (and beyond) for each of the key AFOLU datasets
- **A test group of national inventory users** being identified and engaged to provide feedback on the product selection and application
- **Dataset producer engagement** flagged to Principals and asked to expect approach for support (baseline or enhanced targets)
- **SIT Chair (with SIT Vice-Chair support for continuity) progressing with a broad and coordinated strategy towards the GST,** including on communications

AFOLU Dataset summary

	COP-26 (Nov 2021)	GST1 (2021-23?)	Beyond (2024+)	Notes
Biomass (Forest AGB)	**Fall back is individual existing datasets Synthesised biomass product providing estimates at a jurisdictional level globally**	Synthesized, jurisdictional level biomass, emission factors (and prototype biomass change)	Synthesized spatially explicit, annual biomass, emission factors and biomass change	Work plan and schedule provided
Land Cover & Forest (area)	**-- Copernicus annual global land cover - C3S/CCI Land Cover - WorldCover, - HILDA+ - Global Forest Watch tree cover loss and forest fluxes**	Synthesised map products and estimates of land cover and change at regional, and global levels Global tree cover and forest emissions and removals	Statistically robust activity data estimates (6 IPCC classes) at national and global levels Global annual forest emissions and removals at 30-100 m resolution.	GOFC-GOLD coordination proposed
OLU - Mangroves & Wetlands	**- Global Mangrove Watch cover and change (1996-2016) - Global Mangrove biomass (2000)**	Global mangrove cover and change at 25 m (2019+) Global mangrove biomass at 12 m (2015)	Global annual mangrove emissions and removals at 10-25 m resolution.	In coordination with GMW
Agriculture	**Demonstration WorldCereal products for at least 5 countries (Argentina, Spain, France, Ukraine and Tanzania)**	**Initial WorldCereal map and analytical system.** On-going seasonal analysis products	Continual system improvement and production of seasonal state and change products	In coordination with GEOGLAM

Indicates off the shelf datasets possible. **Indicates additional resources needed.**

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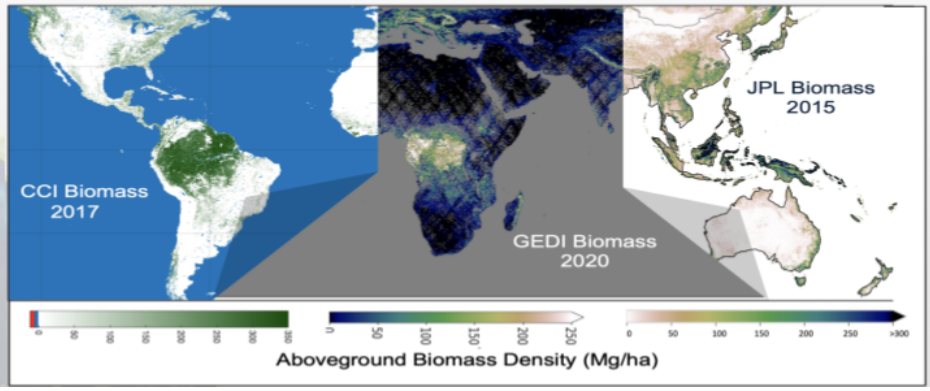
Proposed Biomass Product Harmonization Activity for the GST1

- Several biomass products will be publicly available in advance of the GST (e.g. NASA's GEDI, ESA's CCI Biomass)
- To bolster uptake of these considerable CEOS agency investments, **a single CEOS-endorsed biomass product is desirable** and demonstrations of space-based biomass uptake by countries



GST1 Input - Biomass

First expert meeting on 13. April 2021:

1. Support from key agencies: NASA, ESA, JAXA, DLR, UK Space agency ...
   - Includes ongoing projects and initiatives (CCI-Biomass, GEDI, ICESAT, ALOS ...)
   - Agencies putting additional resources towards harmonized biomass for GST by COP 26 (final decisions pending)
2. Implementation plan for GST harmonized biomass for COP 26 demonstrations:
   - Delivery of updated datasets, global and regional biomass maps for comparison, validation and global estimation by mid-July
   - Products will be assessed following the WGCV biomass protocol using available reference data - collection of suitable reference data should start (many partners, agreements)
   - MAAP-platform as basis for such an open science effort: ready soon to start for populating with algorithms and datasets
   - Country demonstrators to showcase uptake of space-based biomass data for national estimation
   - Harmonization and biomass estimation framework at jurisdictional level is still under discussion

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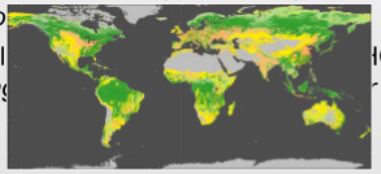
GST1 Input - Land Cover, Forest, Wetlands and Change

- ❑ Forest/land cover/wetland and change essential for national GHG inventories estimating activity data and to global AFOLU modeling and assessments
- ❑ Many agencies producing relevant data and products; aim of a joint effort is to provide synthesis of available products and experiences in three main areas:
  - → Support of national GHG inventories for activity data estimation following the IPCC GPG: *showcase experiences of countries using satellite-derived activity data and demonstrate progress in novel products related to land use change, wetlands, forest/land degradation, fire/burnt area*
  - → Improved global land change data for AFOLU and modeling assessments: *Present long-term harmonized global land cover change data and novel, next generation global land cover/change products at higher spatial/tempo*
  - → Enhance consistency/comparability of national HG estimates: *Develop best available global land cover chang statistical comparison with reported data*
- ❑ Activities: expert meetings, coordinate input from CEOS partners, synthesis towards COP26 presentation
- ❑ Coordination builds upon GOFC-GOLD



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GST1 Input - Land Cover & Forest, Area and Change

The following products are proposed as the most suitable choices to present the dedicated CEOS agency support for the GST by UNFCCC COP26 in Nov. 2021:

1. **Useful for countries and national reporting:**
   - **LCLUC Global Mangrove Mapping** data on AGB and Total Biomass (30 m, NASA JPL/GSFC)
   - **Copernicus annual global land cover service** (2015-onwards, 100 m, EC)
   - **WorldCover** (2020, 10 m, ESA)
2. **For (longer-term) global modeling and GHG assessments:**
   - **LC CCI annual 1992-2015** (now continued under Copernicus climate service C3S until today, 1 km change, ESA/EC)
   - **HILDA+ 1960-2019 g**lobal, annual land cover change harmonized with FAO statistics (synthesis product for modeling community)
3. **For linking national reporting with global estimation (in a statistical sense)**
   - **Nancy Harris/GFW forest fluxes data 2000-2019** (NASA)
   - **Copernicus annual global land cover service and regional land cover change statistics** (using reference data for estimation, EC/ESA)

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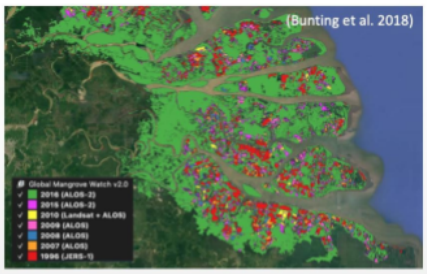
GST1 Input - Other Land Use Mangroves and Wetlands

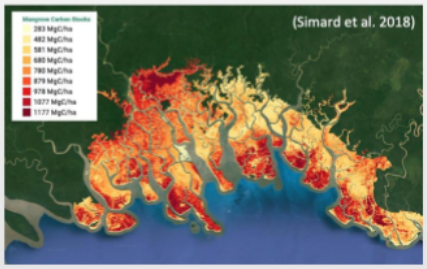
Activity Data – Global Mangrove Watch (JAXA K&C)

- Global maps of mangrove area and annual changes at 25 m derived from L-band SAR and optical data. Open access in public domain.
- 1996–2018 available for COP-26. 2019-2021 for GST1.
- Official UNEP SDG 6.6.1 mangrove dataset.



Emission Factors - LCLUC Global Mangrove Mapping (NASA JPL/GSFC)

- Global maps of mangrove Height, AGB and total biomass at 30 m. Open access in public domain.
- Baseline year 2000 derived from SRTM DEM.
- New 2015 baseline at 12 m from TanDEM-X DEM available for GST1.



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GST1 Input - Land Cover, Forest, Wetlands and Change

What else can be done with additional resources:

➔ **Support of national GHG inventories for activity data estimation following the IPCC GPG:**

- Enhanced synthesis/lessons learned for update of EO-data in tropical countries for national forest estimation and reporting
- Work on specific country demonstrators for uptake of more novel novel EO-data streams in national reporting: land use change, wetlands, forest/land degradation, fire/burnt area

➔ **Improved global land change data for AFOLU and modeling assessments:**

- Work on uptake of long-term harmonized global land cover change data global modeling approaches
- Improved global dataset separating managed and unmanaged land

➔ **Enhance consistency/comparability of national GHG inventories and global GHG estimates:**

- Develop best available global land cover change estimates at regional level for statistical comparison with country-reported data (could be done based on Copernicus global land cover service and available reference data)
- Linking IPCC land class and area changes with emissions and removal estimates (i.e. combining with harmonized biomass derived factors?)

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GST1 Input - Agriculture

1. Reminder of baseline targets for GST1:
   WorldCereal is a consortium effort funded by ESA, led by VITO and supported by the GEOGLAM community

   Most important, it is building a system, not just one-off products, that will produce:
   - **Cropland Map**: Global, 10 m resolution, accuracies 80% +, on a seasonal basis for 2022
   - **Crop Type Map:** Initial 2022 focus on global maize and wheat
   - Initiate a global **in-situ reference dataset** for agriculture, transitioning to a GEOGLAM community initiative post 2022
   - Developing and testing **classification algorithms and tools** (open access)

2. Actions required for delivery and guidance:
   Harmonized global data sets of Landsat 8 and Sentinel 2

⇒ WorldCereal: A major step forward, but just a first step…

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GST1 Input - Agriculture

3. Discussion of enhanced targets and development of detailed propositions

Beyond GST1, Moving towards a systematic approach to monitoring…

- **WorldCereal** will develop the initial system, but several activities required to ensure delivery of ongoing agriculture state and change to the GST and support for NDC's

Gaps Include:

- A **reference network** for in situ data
- Algorithms to address a **wider range of crops** important for global food security, carbon accounting and stocktaking and change
- Building on the Landsat-Sentinel2 archive, **validated satellite-driven agricultural data products** addressing **Essential Agriculture Variables**
- Incorporation of **new data streams** as they become available
- Articulation of **evolving user requirements** for agricultural monitoring
- **Capacity (co)development** for LDC's to collect and provide the information needed for their national mitigation and adaptation planning and response programs

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GST1 Input - Summary of actions & actors

	COP-26 (Nov 2021)	Leadership on baseline products	Leadership on enhanced products proposal	Provider agencies
Biomass	**Fall back is individual existing datasets** **Synthesised biomass product providing estimates at a jurisdictional level globally**	Multi-mission group (L Duncanson, S Satchi, M Herold) and agency experts	Multi-mission group (L Duncanson, S Satchi, M Herold)	
Land Cover & Forests	**- Copernicus annual global land cover** **- C3S/CCI Land Cover** **- WorldCover,** **- HILDA+** **- Global Forest Watch tree cover loss and forest fluxes**	M Herold, B Poulter, M Cherlet, with participation from ESA, VITO, WRI/GFW USGS/UMD on Forests?	M Herold, B Poulter, M Cherlet, with participation from ESA, VITO, WRI/GFW USGS/UMD on Forests?	
OLU-Mangroves & Wetlands	**- Global Mangrove Watch cover and change (1996-2016)** **- Global Mangrove biomass (2000)**	A Rosenqvist, R Lucas on Mangroves	A Rosenqvist, R Lucas on Mangroves	
Agriculture	**Demonstration WorldCereal products for at least 5 countries (Argentina, Spain, France, Ukraine and Tanzania)**	I Jarvis, S Gilliams (VITO), with participation of ESA and USGS	I Jarvis, S Gilliams (VITO), with participation of ESA and USGS	

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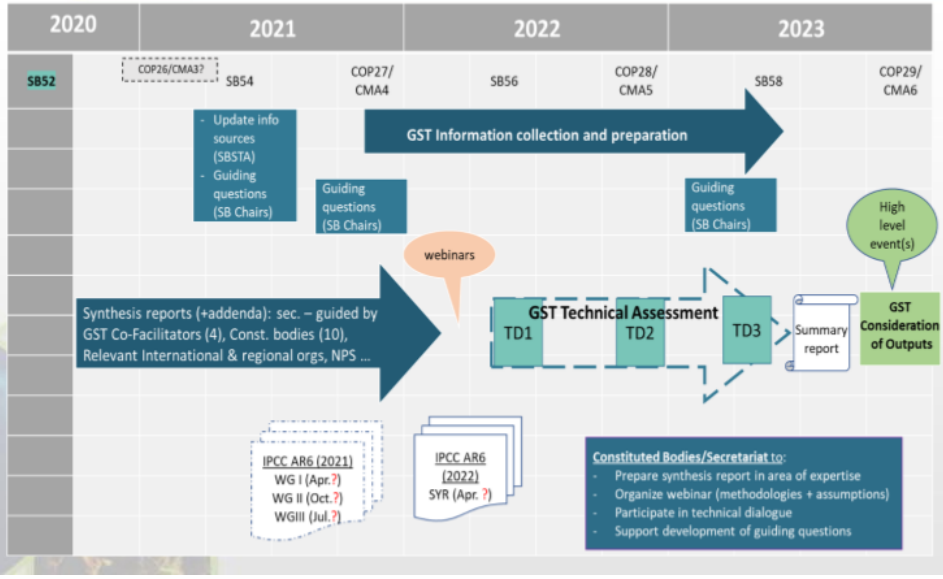
Latest UNFCCC SEC Engagement - Global Stocktake Timeline



UNFCCC SEC engagement

- SO paper...

Engaging with countries to improve understanding and uptake of EO data: Action 3 of the Roadmap

Sylvia N. Wilson, USGS

Phase 2: Initial consultation and introduction of the CEOS initiative

Country	Region	First Call Introduction	Second Call Feedback	Third Call Next Steps
Cambodia	Asia	5/25/2021	Tbd	Tbd
Colombia	Latin American	4/26/2021	Tbd	Tbd
Gabon	Africa	4/20/2021	Tbd	Tbd
Guatemala	Latin American	4/21/2021	Tbd	Tbd
Madagascar	Africa	5/11/2021	Tbd	Tbd
Mexico	Latin America	4/26/2021	Tbd	Tbd
Paraguay	Latin America	4/16/2021	Tbd	Tbd
Peru	Latin America	4/23/2021	Tbd	Tbd
Solomon Islands	Asia	5/12/2021	Tbd	Tbd
Zambia	Africa	5/06/2021	Tbd	Tbd

Deliverables

The engagement with countries will produce actionable results to inform CEOS members best practices to carry out their missions. Whit this in mind, we will provide direct findings from interactions with selected countries that include ideas related to interactive, tailored products.

For example:

1. A report with feedback for the CEOS GST effort for each country might be easily accessible and informative for CEOS members.
2. A case study with one or two SilvaCarbon countries ingesting a global dataset into their monitoring system.
3. A case study in a country with no NFI or on the initial stages of NLI to ingest a pantropical or global biomass product into their current emission calculation methods.
4. Recommendations for actionable interventions will be formulated after the data is gathered and analysed. These may include partnering with CEOS members or making the trainings on the use of global datasets more accessible to countries.

Dataset Producer engagement

- AFOLU roadmap needs to be implemented by Space agencies' contributions to produce datasets in the shortlist
- Senior-level (CEOS Principal) engagement needed to ensure key agency's contributions
- Propose to contact relevant Principals in coming weeks
  - USGS confirmed with Matt Hansen on GFW

AFOLU Roadmap

- Discussion and questions?

Heritage 1/3

- **Plenary discussion encouraged SIT Chair Team to establish an ad-hoc study team to:**
  - **Confirm the requirements for the GHG and AFOLU datasets,** and explore the extent to which these two datasets can be used separately and together to inform the development and verification of emission estimates for GST1.
  - **Consider the longer-term commonalities in approach needed between the thematic activities in CEOS to achieve the integrated policy support envisioned.**
  - **Confirm the full set of target datasets and communication materials intended in support of GST1** by the different teams and the CEOS agencies undertaking the investment of the data production in 2021.
  - **Consider the organisational aspects necessary** - both for the urgent objectives related to GST1 and for an effective long-term integrated approach to a Roadmap for the Stocktake process.
  - Full TORs.

Heritage 2/3

- 4 calls to date with expanding participation, including GCOS SC Chair and ECMWF
- Frequent updates from GHG & AFOLU teams on their COP-26 targets and beyond
- Strong consensus in the study team on the need for a **high-level strategy statement** which identifies all the potential aspects and dimensions for CEOS engagement in the Global Stocktake process. This should include a sense of priorities, be clear on what is underway and remains to be done, and guidance on the need for linkages between the different thematic activities and groups across CEOS. SIT Vice-Chair (ESA) took on the paper leadership. SIT Chair Team contributed suggested actions to take forward the recommendations.
- At SIT-36, several agencies asked for more time and attention to the paper to address comments and suggestions

Heritage 3/3

- 27 April call very productive in achieving consensus on recommendations and actions
- A fully updated and clean version (3.0) of the Strategy Paper circulated 5th May - which reflects all of the comments and suggestions received on the last version as well as any refinements agreed on the call. Actions embedded as an annex.
- Paper will be reported to CEOS SEC on 13th May
- Goal is to finalise soon and prosecute actions, especially for COP-26
  - eg SIT Chair Team will coordinate tasks such as a portal on ceos.org for all GST datasets
- Paper will be revisited at SIT TW with a view to endorsement by CEOS Plenary

GST Strategy and Communications

- SIT Chair Team has promoted a comprehensive strategy as part of its priorities last 2 years
- SIT Vice-Chair Team led draft Strategy paper
  - latest telcon is next week
- Suggestion of a CEOS Data Cube for the GST… discussion with SEO and LSI-VC?
- Actions from SIT-36 in relation to communications
  - working with SEO to establish dedicated GST1 products and guidance website on ceos.org
  - needs coordination with all data and guidance providers, including GHG team, AFOLU team and individual agencies
  - CEOS Chair exploring national delegation statement to COP-26

LSI-VC Interest

- **Generally…** maintaining CEOS leadership on land surface aspects
- **Specifically**... action #1 from the GST paper:
  - *WGClimate GHG Task Team should consult with the relevant elements of CEOS, **including VCs**, and Associates such as ISC, WCRP and GCOS, together with modellers, to check the GHG Implementation roadmap on completeness concerning requirements for terrestrial observation (SIF; NPP, land cover, biomass, etc.) for supporting mitigation actions through the development of MVS. The actions in Annex C of the roadmap shall be complemented as needed*
  - *Initial action: Ensure that all products from terrestrial observations needed to derive biogenic emissions as priors for Monitoring and Verification System (MVS) such as CoMVS are considered in the GHG TT Roadmap Annex C. (for SIT TW 2021)*

Discussion

- **Generally…** maintaining CEOS leadership on land surface aspects
- **Specifically**... action #1 from the GST paper:
  - *WGClimate GHG Task Team should consult with the relevant elements of CEOS, **including VCs**, and Associates such as ISC, WCRP and GCOS, together with modellers, to check the GHG Implementation roadmap on completeness concerning requirements for terrestrial observation (SIF; NPP, land cover, biomass, etc.) for supporting mitigation actions through the development of MVS. The actions in Annex C of the roadmap shall be complemented as needed*
  - *Initial action: Ensure that all products from terrestrial observations needed to derive biogenic emissions as priors for Monitoring and Verification System (MVS) such as CoMVS are considered in the GHG TT Roadmap Annex C. (for SIT TW 2021)*

~ 40 mins

Committee on Earth Observation Satellites

Discussion

Seed topics from the slide deck

1. **Forests & Biomass Team**
   a. How about a 3rd lead for F&B team?
   b. Reassigning the USGS F&B GFOI WP tasks
   c. The main biomass product activity is mostly outside CEOS in the multi-mission team (mainly US-Europe)

2. **AFOLU**
   a. Substantial dataset coordination activities ahead for GST1, 2 etc… can we use LSI-VC telcons and meetings to steward and track these activities?
   b. Similarly the national inventory user test group - pioneered by USGS/SilvaCarbon, this would be a great asset for LSI-VC to foster and have in its structure?
   c. Support for F&B (and GEOGLAM) team from LSI-VC Co-Leads in approaching CEOS Principals on the enhanced dataset options? Including your own agencies.
   d. Representation at the virtual AFOLU-GHG JRC Workshop

Seed topics from the slide deck

3. **GST Strategy**

   a. Engagement with WGClimate GHG task team on the terrestrial supplement to the GHG Roadmap Annex C for SIT TW 2021
   b. And similar land-sector actions that may arise…
   c. Is there a place for **ARD** in the CEOS GST strategy to support countries and simplify data aspects?
   d. LSI a logical contributor/home to a CEOS Data Cube for the GST?

Committee on Earth Observation Satellites

Using the Open Data Cube to support AFOLU and GST

Brian Killough
CEOS SEO

ODC for AFOLU and GST

- A commitment to produce and host and Open Data Cube (ODC) to support AFOLU and GST will require a considerable discussion to assess ...
  - What is the benefit of an AFOLU and GST data cube? Why is this needed versus current methods and data sources?
  - Will the data cube be the accepted as the primary source of data to support AFOLU and GST or will users get their data from preferred sources?
  - Will the data cube be free/open and allow users access and analysis without cost?
  - Who are the users and do they have sufficient technical knowledge to utilize a data cube?
  - What are the core datasets? Is ARD required? Will these datasets be available into the future as consistent time series?
  - How will such data be managed? Is the intent to use a cloud and discourage local downloading?
  - Will the AFOLU and GST teams commit to making documentation and tools to use this data?
  - Who will host these datasets and manage them into the future. This requires a commitment of resources which could be significant.
  - Is something needed for COP-26 by November 2021?

A Data Cube Vision for AFOLU/GST

- The **Open Data Cube** is merely a data management system that take advantage of common open source methods for accessing data
- **Datasets** can come from many different sources but can be adjusted to allow interoperable use (e.g. grid projections, resolution). A review of the current priority datasets suggests there are many sources of data … clouds (e.g. AWS, Google, MS-Azure) and Agencies (Copernicus, JAXA).
- The typical implementation is on a **cloud computer**, but local installations are possible with added complexity
- Analysis products are typically done through **Jupyter notebooks** and Python code

Wrap-up

LSI-VC Leads

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